

OX2 WIND FINLAND OY

## **Halsuan tuulivoimahanke**

Melu- ja varjostusmallinnukset

**Sisällysluettelo**

1	MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET.....	3
2	LÄHTÖTIEDOT JA MENETELMÄT .....	4
2.1	Melu .....	4
2.1.1	Melumallinnus .....	4
2.1.2	Matalataajuinen melu .....	4
2.2	Varjostusmallinnus .....	5
2.3	Kartta-aineisto .....	5
2.4	Voimalat.....	6
2.5	Raja- ja ohjeavot.....	8
2.5.1	Melu .....	8
2.5.2	Varjostus .....	9
3	MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET.....	10
3.1	Melun laskentatulokset ISO 9613-2.....	10
3.1.1	Melumallinnus .....	10
3.2	Matalataajuiset melutasot.....	13
3.3	Varjostusmallinnuksen tulokset .....	15
3.3.1	Varjostus (no forest) .....	15
3.3.2	Varjostus (Luke forest) .....	18

Rintamäki, Henna-Riikka

29.4.2021

**Liitteet**

Liite 1: Halsuan tuulivoimahanke – Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2/2014

Liite 2: Halsuan tuulivoimahanke – Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2/2014 yhteisvaikutushankkeiden kanssa

Liite 3: Halsuan tuulivoimahanke – Matalataajuisen melun rakennuskohtaiset arvot

Liite 4: Halsuan tuulivoimahanke – Matalataajuisen melun rakennuskohtaiset arvot yhteisvaikutushankkeiden kanssa

Liite 5: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset "real case, no forest"

Liite 6: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset "real case, no forest, yhteisvaikutushankkeiden kanssa

Liite 7: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset "real case, Luke forest"

Liite 8: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset "real case, Luke forest", yhteisvaikutushankkeiden kanssa

29.4.2021

---

## Halsuan tuulivoimahanke

### 1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Halsuan kunnassa sijaitsevan Halsuan tuulivoimahankkeessa hankeomistajat Halsuan Tuulivoima Oy ja OX2 Wind Finland Oy suunnittelevat 36 voimalan rakentamista Honkakankaan ja Kanniston alueelle. Voimaloiden melupäästö on 106,0 dB(A) +2 dB ja voimalatornin napakorkeus on 221 metriä. Varjostusmallinuksissa voimalan roottorin halkaisija on 180 metriä ja voimalan napakorkeus 210 metriä. Voimaloiden kokonaiskorkeus on 300 metriä, joka on sama kuin Honkakankaan ja Kanniston yleiskaavojen mahdollistama maksimikorkeus.

Mallinuksissa on otettu huomioon yhteisvaikutukset Lestijärvelle suunniteltujen tuulivoimapuistojen Hittisennevan ja Kosolankankaan osalta. Voimaloiden N131-3.0MW melupäästö on 104,5 dB(A) + 2 dB, voimaloiden napakorkeus on 165 metriä ja roottorin halkaisija 131 metriä. Varjostusmallinuksissa on käytetty voimalaa Vestas V150, napakorkeudella 165 metriä, jolloin kokonaiskorkeus on 240 metriä.

Tuulivoimaloiden aiheuttama melu on arvioitu melun laskentamallin avulla, jonka mukaan on tehty melumallinnus WindPRO-ohjelmalla tuulivoimapuistosta DECIBEL-moduulilla ympäristöministeriön ohjeistuksen mukaisesti (Ympäristöhallinnon ohjeita 2/2014 Tuulivoimaloiden melun mallintaminen). Tuulivoimaloiden aiheuttamat varjostukset on mallinnettu WindPro-ohjelman SHADOW-moduulilla. Melu- ja varjostusvaikutukset on mallinnettu 11.2.2021 sijoitusten mukaisesti.

Melu- ja varjostusmallinnukset on laatinut ins. Henna-Riikka Rintamäki FCG Finnish Consulting Group Oy:stä ja laaduntarkistuksen on tehnyt FM Liisa Karhu FCG Finnish Consulting Group Oy:stä.

29.4.2021

## 2 LÄHTÖTIEDOT JA MENETELMÄT

### 2.1 Melu

#### 2.1.1 Melumallinnus

Tuulivoimaloiden aiheuttamat äänenpainetasot on mallinnettu WindPRO-laskentaohjelmalla ISO 9613-2 standardin mukaisesti. Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen 2/2014 mukaisesti tuulen nopeutena käytettiin 8 m/s, ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisenä kosteutena 70 %, maanpinnan kovuutena arvoa 0,4 ja järvien vesipinnan kovuutena arvoa 0,0. Laskenta on tehty 4,0 m maan pinnan tasosta. Laskennan pystysuora resoluutio on 1,0 m ja vaakasuora resoluutio on 1 m.

Melumallinnusten laskentatuloksia on havainnollistettu ns. keskiäänitasokarttojen avulla. Keskiäänitasokartoissa on melun keskiäänitaso eli ekvivalenttiäänitasokäyrät (LAeq) 5 dB välein.

#### Taulukko 1. Käytetyt mallinnusparametrit ISO 9613-2 laskelmissa sekä melulle altistuvat kohteet

MALLINNUSOHJELMA JA VERSIO:			
WindPRO version 3.3.247		Mallinnusmenetelmä: ISO 9613-2	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskenta korkeus		Laskentaruudun koko [m·m]	
4,0 m		25x25 m	
Suhteellinen kosteus		Lämpötila	
70 %	Muu, mikä ja miksi:	15 C°	
Maastomallin lähde ja tarkkuus			
Maastomallin lähde: MML maastotietokanta		Vaakaresoluutio: 1,0	Pystyresoluutio: 0,5
Maan- ja vedenpinnan absorptioon ja heijastuksen huomioiminen, käytetyt kertoimet			
Maa	0,4	HUOM	
Vesistöt	0,0		
Ilmakehän stabiilius laskennassa/meteorologinen korjaus			
Neutraali, (0): Neutraali		Muu, mikä ja miksi:	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus			
Tuulen suunta: 0-360°		Tuulenoisuus: 8 m/s	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä	Muu, mikä, miksi:		

#### 2.1.2 Matalataajuinen melu

Matalataajuinen melu laskettiin Ympäristöministeriön ohjeen 2/2014 mukaisin menetelmin käyttäen voimalavalmistajilta saatuja arvioita niiden äänitehotasoista.

29.4.2021

Ohje 2/2014 antaa menetelmän matalataajuisen melun laskentaan rakennusten ulkopuolelle. Sosiaali- ja terveysministeriön Asumisterveysasetus 2015 antaa matalataajuiselle melulle toimenpiderajat asuinhuoneissa. Rakennusten sisälle kantautuva äänitaso arvioitiin Turun AMK:n (Keränen, Hakala ja Hongisto, 2018) julkistamien Anojanssi projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

**Taulukko 2. Suomalaisen pientalon julkisivun äänitasoeron alalikiarvo Anojanssi projektin tulosten mukaisesti.**

f [Hz]	20	25	31.5	40	50	63	80	100	125	160	200
DL $\sigma$ [dB]	7.6	8.3	9.2	10.3	11.5	13.0	14.8	16.8	18.8	21.1	22.8

Tulokset on esitetty taajuuskohtaisena taulukkona hankealueen läheisyyteen sijoittuville asuin- ja lomarakennuksille.

## 2.2 Varjostusmallinnus

Tuulivoimaloiden varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Laskennoissa varjot huomioidaan, jos aurinko on yli 3 astetta horisontin yläpuolella ja varjoksi lasketaan, kun siipi peittää vähintään 20 % auringosta.

Varjostusmallin laskennassa on huomioitu hankealueen korkeustiedot, tuulivoimaloiden sijainnit, tuulivoimalan napakorkeudet ja roottorin halkaisija sekä hankealueen aikavyöhyke. Mallinnuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, pilvisuus kuukausittain eli kuinka paljon aurinko paistaa ollessaan horisontin yläpuolella sekä tuulivoimalaitosten arvioitu vuotuinen käyntiaika.

Varjostuksen tarkastelukorkeutena lähialueen asuin- tai lomarakennusten pihapiirissä käytettiin 1,0 metriä ja laskenta-alueen kokoa 5,0 x 5,0 metriä. Laskentaikkunoiden suunnat asennettiin voimaloita kohti ns. "greenhouse mode".

Auringon keskimääräiset paistetunnit perustuvat Uumajan sääaseman tietoihin. Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Varjostusmallinnuksissa (Luke forest) on huomioitu puuston peittävyys käyttämällä Luonnonvarakeskuksen vuoden 2017 puustonkeskipituus aineistoa.

Varjostusmallinnuksen tuloksia on havainnollistettu kartan avulla. Kartalla esitetään varjostusvaikutuksen (1, 8 ja 20 tuntia vuodessa) laajuus. Sen lisäksi mallinnuksessa on erikseen laskettu vaikutus tuulivoimapuistoalueen ympäristössä oleviin herkkiin kohteisiin.

## 2.3 Kartta-aineisto

Korkeustiedot perustuvat Maanmittauslaitoksen (MML) maastotietokannan korkeuskäyrä aineistoon. Korkeusaseman intrapoloitimenetelmänä kohteille on käytetty WindPro TIN-menetelmää.

29.4.2021

Melumallinnuksen, varjostusmallinnuksen ja matalataajuisen melun mallinnuksen laskentapisteen perustuvat Maanmittauslaitoksen Maastotietokannan rakennuskantaa koskeviin tietoihin sekä Halsuan kunnan rakennusvalvonnan tietoihin Maanmittauslaitoksen Maastotietokannassa asuin- ja lomarakennuksiksi merkittyjen rakennusten käyttötarkoituksesta. Hankealueen läheisyydestä MML:n Maastotietokannan rakennuskanta-aineisto on tarkistettu Halsuan kunnan rakennusvalvonnasta.

## 2.4 Voimat

Halsuan hankkeen voimalan G158-5.3MW sekä Lestijärven hankkeen voimalan N131-3000 voimalamallin valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitason, jolloin kummankin hankkeen voimalan lähtöarvoihin lisätään mallinnuksissa +2 dB.

### Taulukko 3. Halsuan tuulivoimahankkeen tuulivoimaloiden tyyppitiedot ja äänitehotasot sekä melun erityispiirteet.

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: General Electric				Tyyppi: GE158 – 5.3MW		Sarjanumero/t:-	
Nimellisteho: 5,3 MW		Napakorkeus: 221 m		Roottorin halkaisija: 158 m		Tornin tyyppi: teräs	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:		Level 0	
Ei		Ei		Noise mode, lähtömelutaso		106,0 dB(A)	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot perustuvat dokumenttiin "Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01.docx". Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitason, jolloin voimalan lähtöarvoihin lisätään mallinnuksissa +2 dB.							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
31,5	-	20	63,1	200	90,8	2000	94,3
63	87,2	25	67,8	250	92,3	2500	92,3
125	92,6	31,5	72,2	315	93,6	3150	89,7
250	97,2	40	76,1	400	94,1	4000	85,9
500	99,7	50	79,4	500	94,9	5000	81,8
1000	101,3	63	82,2	630	95,5	6300	75,5
2000	99,1	80	84,4	800	96,0	8000	65,9
4000	91,7	100	86,1	1000	96,5	10 000	53,3
8000	76,0	125	87,7	1250	97,0		
<b>106,0 dB(A)</b>		160	89,2	1600	95,7		
Melun erityispiirteiden mittaustulos ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, Mikä:	
kyllä	Ei	kyllä	ei	kyllä	ei	kyllä	ei

29.4.2021

**Taulukko 4. Lestijärven yhteisvaikutushankkeiden voimaloiden tyyppitiedot ja äänitehotasot sekä melun erityispiirteet yhteisvaikutusten laskentaa varten.**

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: Nordex				Tyyppi: N131-3000		Sarjanumero/t:-	
Nimellisteho: 3.0 MW		Napakorkeus: 165 m		Roottorin halkaisija: 131 m		Tornin tyyppi: teräs	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	-	dB	Kyllä	-	dB	Noise mode säätö:	Standard Mode
Ei			Ei			Noise mode, lähtömelutaso	104,5 dB(A)
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot perustuvat dokumenttiin "Technical Report Third octave sound power levels Nordex N131/3000, F008_246_A04_EN Revision 01 2014-03-11". Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitasoa, jolloin voimalan lähtöarvoihin lisätään mallinnuksissa +2 dB.							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
31,5	-	20	57,8	200	88,5	2000	92,9
63	83,0	25	63,5	250	89,7	2500	92,3
125	90,0	31,5	66,3	315	91,4	3150	91,9
250	94,8	40	71,5	400	90,7	4000	91,5
500	96,4	50	75,0	500	91,4	5000	89,3
1000	99,3	63	78,4	630	92,5	6300	84,6
2000	98,2	80	79,8	800	94,2	8000	78,6
4000	95,8	100	84,0	1000	94,8	10 000	68,6
8000	85,7	125	84,7	1250	94,7		
<b>104,5 dB(A)</b>		160	86,5	1600	94,8		
Melun erityispiirteiden mittausta ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, Mikä:	
kyllä	Ei	kyllä	ei	kyllä	ei	kyllä	ei

**Taulukko 5. Halsuan tuulivoimahankkeen tuulivoimaloiden kokotiedot varjostusmallinnuksissa.**

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: -Generic				Tyyppi: RD180 HH210		Sarjanumero/t:-	
Nimellisteho: -		Napakorkeus: 210 m		Roottorin halkaisija: 180 m		Tornin tyyppi:	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	-	dB	Kyllä	-	dB	Noise mode säätö:	-
Ei			Ei			Noise mode, lähtömelutaso	-



29.4.2021

**Taulukko 6. Lestijärven yhteisvaikutushankkeiden tuulivoimaloiden kokotiedot varjostusmallinuksissa.**

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)					
Tuulivoimalan valmistaja: -Vestas			Tyyppi: RD150 HH165		Sarjanumero/t:-
Nimellisteho: -		Napakorkeus: 165 m		Roottorin halkaisija: 150 m	Tornin tyyppi:
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun					
Lapakulman säätö		Pyörimisnopeus		Muu, mikä	
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:	-
☒		☒		Noise mode, lähtömelutaso	-

**2.5 Raja- ja ohjearvot**

## 2.5.1 Melu

Valtioneuvoston asetuksessa (1107/2015) tuulivoimaloille on määritelty ohjearvot päivä- ja yöajan keskiäänitasojen maksimiarvolle. Jos tuulivoimalan melu sisältää tonaalisia, kapeakaistaisia tai impulssimaisia komponentteja, tai se on selvästi amplitudimoduloitunutta, mallinnustuloksiin tulee ohjeen mukaan lisätä viisi desibeliä ennen ohjearvoon vertaamista. Koska ohjearvo sisältää jo tyyppillisen tuulivoimamelun piirteet, edellä mainitut äänenpiirteiden tulee olla tuulivoimalalle epätyypillisen voimakkaita, jotta mallinnustuloksissa täytyy huomioida viiden desibelin lisä äänenvoimakkuuteen.

**Taulukko 7. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason ohjearvot (Valtioneuvoston asetus 1107/2015).**

Vaikutuskohde	Päivä (7-22)	Yö (22-7)
Pysyvä asutus	45 dB	40 dB
Loma-asutus	45 dB	40 dB
Hoitolaitokset	45 dB	40 dB
Oppilaitokset	45 dB	—
Virkistysalueet	45 dB	—
Leirintäalueet	45 dB	40 dB
Kansallispuistot	40 dB	40 dB

Sosiaali- ja terveysministeriön asetuksessa (545/2015) on annettu matalataajuiselle melulle toimenpiderajoja. Toimenpiderajat koskevat asuinhuoneita ja ne on annettu taajuuspainottamattomina yhden tunnin keskiäänitasoina tersseittäin. Toimenpiderajat koskevat yöaikaa ja päivällä sallitaan 5 dB suuremmat arvot.

29.4.2021

**Taulukko 8. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.**

<b>Terssikaista Hz</b>	<b>20</b>	<b>25</b>	<b>31,5</b>	<b>40</b>	<b>50</b>	<b>63</b>	<b>80</b>	<b>100</b>	<b>125</b>	<b>160</b>	<b>200</b>
Keskiäänitaso LZeq,1h, dB	74	64	56	49	44	42	40	38	36	34	32
Edellisestä laskettu keski- äänitaso A- painotettuna LAeq,1h, dB	24	19	17	14	14	16	18	19	20	21	21

Lisäksi yöaikainen mahdollisesti unihäiriötä aiheuttava melu, joka erottuu selvästi taustamelusta, ei saa ylittää 25 dB yhden tunnin keskiäänitasona LAeq,1h mitattuna niissä tiloissa, jotka on tarkoitettu nukkumiseen.

## 2.5.2 Varjostus

Suomessa ei ole viranomaisten antamia yleisiä määräyksiä tuulivoimaloiden muodostaman varjostuksen enimmäiskestoista eikä varjonmuodostuksen arviointiperusteista. Ympäristöministeriön tuulivoimarakentamisen suunnitteluohjeistuksessa esitetään käytettäväksi muiden maiden suosituksia välkkeen rajoittamisesta (Ympäristöministeriö 2016).

Useissa maissa on annettu raja-arvoja tai suosituksia hyväksyttävän välkevaikutuksen määrästä. Esimerkiksi Ruotsissa suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä.

Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa ("real case") esiintyy vähintään kahdeksan tuntia vuodessa.

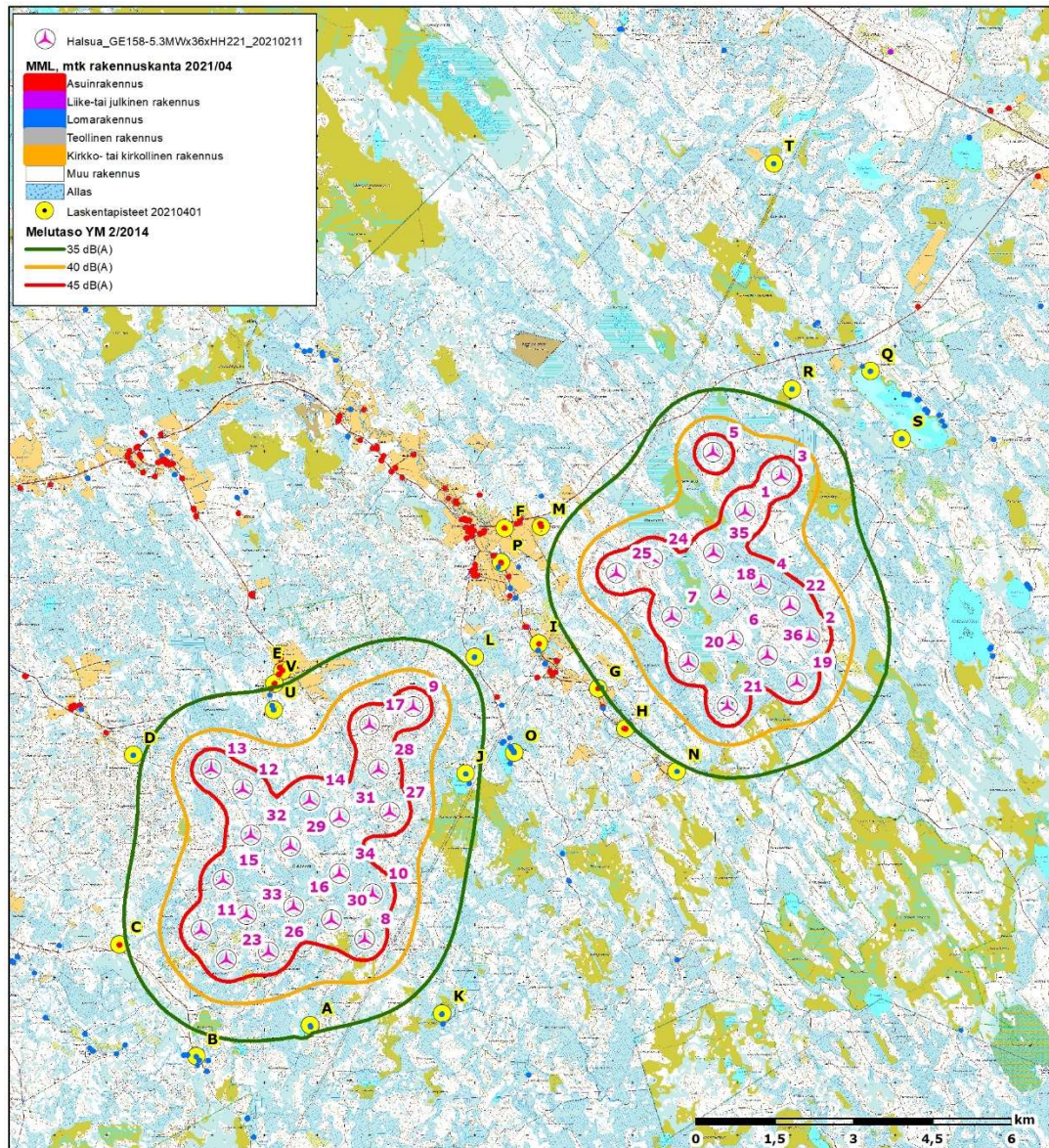
29.4.2021

### 3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

#### 3.1 Melun laskentatulokset ISO 9613-2

##### 3.1.1 Melumallinnus

Tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä melutasot jäävät laskelmien mukaan alle 40 dB(A). Katso tarkemmat laskentatulokset liitteestä 1.



Kuva 1. Laskennalliset melutasot standardin ISO 9613-2 mukaisesti

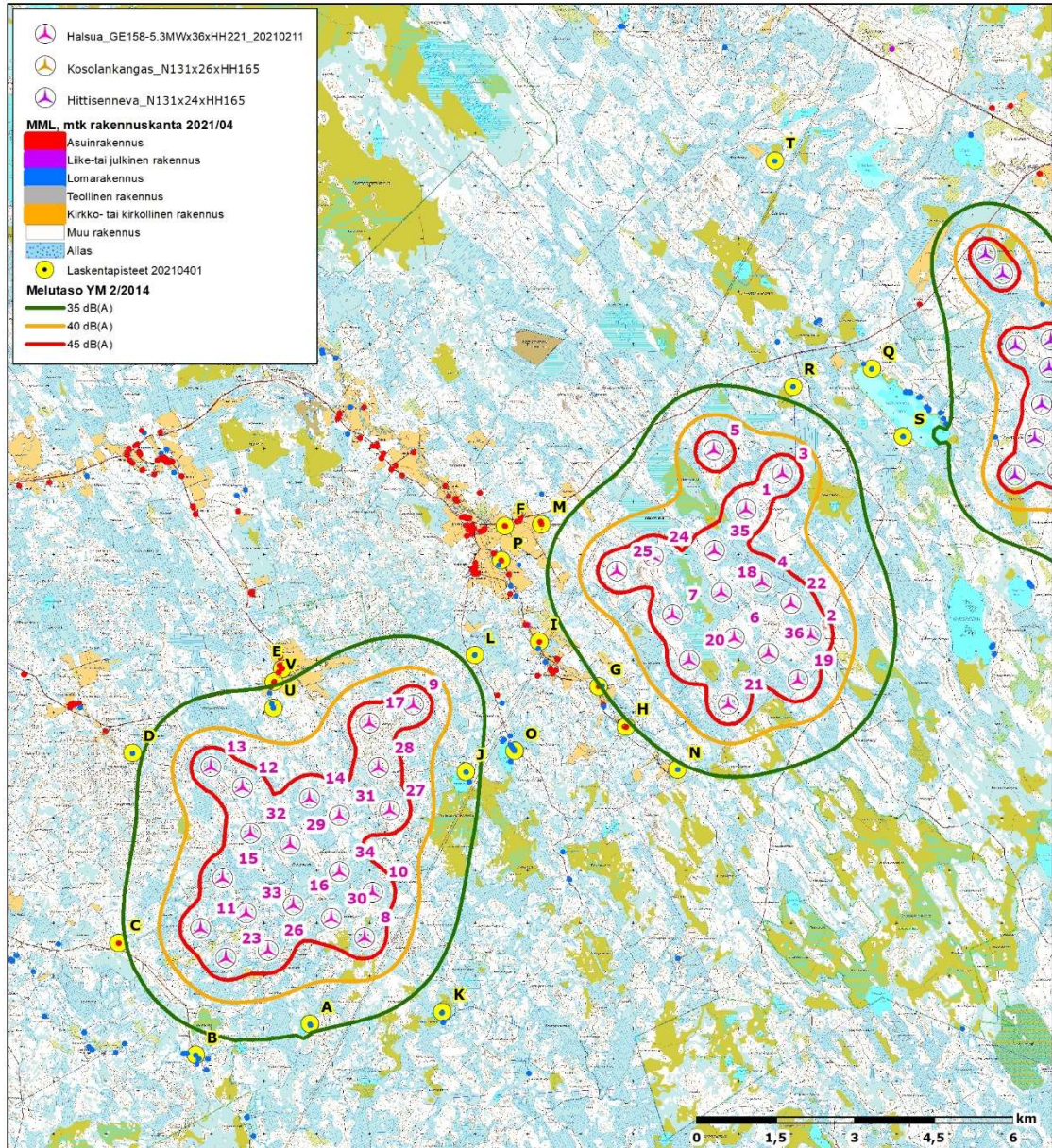
29.4.2021

**Taulukko 9. Laskennalliset melutasot standardin ISO 9613-2 mukaisesti.**

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)	Melutaso dB(A) yhteisvaikutus
Lomarakennus A (Kuuslammentie)	367873	7031085	163,2	4,0	36,0	36,0
Lomarakennus B (Loukkukoskentie 700)	365699	7030495	157,5	4,0	32,5	32,5
Asuinrakennus C (Loukkukoskentie, Mantyla)	364243	7032622	153,8	4,0	34,2	34,2
Lomarakennus D (Purola)	364501	7036228	143,4	4,0	33,8	33,8
Asuinrakennus E (Kannistontie 557)	367345	7037828	140,9	4,0	34,0	34,0
Asuinrakennus F (Lestijarventie 1468)	371569	7040539	143,5	4,0	30,5	30,7
Asuinrakennus G (Hautakoskentie 455)	373347	7037488	155,1	4,0	34,8	34,9
Asuinrakennus H (Hautakoskentie 544)	373867	7036728	157,6	4,0	34,4	34,5
Asuinrakennus I (Hautakoskentie 289)	372224	7038341	150	4,0	33,1	33,2
Lomarakennus J (Katajajarventie 49)	370829	7035870	162,5	4,0	36,6	36,7
Lomarakennus K (Silostenlampi)	370383	7031311	170	4,0	31,9	31,9
Lomarakennus L (Harjunpaantie 215)	370996	7038086	152,5	4,0	33,8	33,8
Lomarakennus M (Hakala, Iso-Mottonen)	372265	7040574	147,5	4,0	33,0	33,1
Lomarakennus N (Hautakoski)	374845	7035914	162,5	4,0	34,2	34,3
Lomarakennus O (Harjunpaantie 398)	371749	7036270	166,1	4,0	33,3	33,4
Asuinrakennus P (Hautakoskentie 135)	371498	7039888	142,5	4,0	31,1	31,3
Lomarakennus Q (Lemmistonrannantie)	378528	7043527	160	4,0	28,9	31,6
Lomarakennus R (Peuraneva,Valvatintie)	377034	7043182	165	4,0	33,1	33,6
Lomarakennus S (Talonpaikantie 141)	379124	7042238	160,7	4,0	29,4	32,9
Lomarakennus T (Ruipontie)	376687	7047472	157,5	4,0	21,0	23,8
Lomarakennus U (Kannistontie, Kivioja)	367174	7037088	144,1	4,0	36,7	36,7
Asuinrakennus V (Kannistontie 586)	367193	7037585	142,5	4,0	34,7	34,7

29.4.2021

Yhteismelumallinnuksessa tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä melutasot jäävät laskelmien mukaan alle 40 dB(A). Katso tarkemmat laskentatulokset liitteestä 2.



**Kuva 2. Laskennalliset melutasot yhteisvaikutushankkeiden kanssa standardin ISO 9613-2 mukaisesti.**

29.4.2021

### 3.2 Matalataajuiset melutasot

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin (kts. taulukko 8).

Taulukkoon on koottu matalataajuisen melun laskentatuloksia ja verrattu niitä STM:n toimenpiderajoihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella. Taulukossa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo).

Matalataajuiset äänitasot jäävät kaikissa rakennuksissa toimenpiderajojen alapuolelle, kun rakenteiden ääneneristävyys huomioidaan (kts. taulukko 2).

#### Taulukko 10. Matalataajuisen melun mallinnustulokset herkissä kohteissa verrattuna Sosiaali- ja terveysministeriön asumisterveysohjeeseen.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h - Asumisterveys- ohje sisällä	Hz	L eq,1h - Asumisterveys- ohje sisällä	Hz
Lomarakennus A (Kuuslammentie)	5,5	63	-6,3	50
Lomarakennus B (Loukkukoskentie 700)	3,2	63	-8,5	50
Asuinrakennus C (Loukkukoskentie, Mantyla)	4,3	63	-7,5	50
Lomarakennus D (Purola)	4,0	63	-7,7	50
Asuinrakennus E (Kannistontie 557)	4,6	63	-7,2	50
Asuinrakennus F (Lestijarventie 1468)	2,6	63	-9,1	50
Asuinrakennus G (Hautakoskentie 455)	5,2	63	-6,5	50
Asuinrakennus H (Hautakoskentie 544)	4,9	63	-6,8	50
Asuinrakennus I (Hautakoskentie 289)	4,3	63	-7,4	50
Lomarakennus J (Katajajarventie 49)	6,0	63	-5,8	50
Lomarakennus K (Silostenlampi)	3,2	63	-8,6	50
Lomarakennus L (Harjunpaantie 215)	4,4	63	-7,3	50
Lomarakennus M (Hakala, Iso-Mottonen)	3,7	63	-8,0	50
Lomarakennus N (Hautakoski)	4,5	63	-7,2	50
Lomarakennus O (Harjunpaantie 398)	4,2	63	-7,5	50
Asuinrakennus P (Hautakoskentie 135)	3,0	63	-8,7	50
Lomarakennus Q (Lemmistonrannantie)	0,4	63	-11,3	50
Lomarakennus R (Peuraneva,Valvatintie)	3,2	63	-8,6	50
Lomarakennus S (Talonnaikantie 141)	1,3	63	-10,4	50
Lomarakennus T (Ruipontie)	-4,1	63	-15,6	50
Lomarakennus U (Kannistontie, Kivioja)	6,2	63	-5,5	50
Asuinrakennus V (Kannistontie 586)	5,0	63	-6,8	50

29.4.2021

**Taulukko 11. Matalataajuinen melu yhteisvaikutushankkeiden kanssa.  
Mallinnustulokset herkissä kohteissa verrattuna Sosiaali- ja terveysministeriön  
asumisterveysohjearvoon.**

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h - Asumisterveys- ohje sisällä	Hz	L eq,1h - Asumisterveys- ohje sisällä	Hz
Lomarakennus A (Kuuslammentie)	5,5	63	-6,2	50
Lomarakennus B (Loukkukoskentie 700)	3,3	63	-8,4	50
Asuinrakennus C (Loukkukoskentie, Mantyla)	4,3	63	-7,4	50
Lomarakennus D (Purola)	4,1	63	-7,7	50
Asuinrakennus E (Kannistontie 557)	4,7	63	-7,1	50
Asuinrakennus F (Lestijarventie 1468)	2,8	63	-8,9	50
Asuinrakennus G (Hautakoskentie 455)	5,4	63	-6,4	50
Asuinrakennus H (Hautakoskentie 544)	5,2	63	-6,6	50
Asuinrakennus I (Hautakoskentie 289)	4,5	63	-7,2	50
Lomarakennus J (Katajajarventie 49)	6,1	63	-5,7	50
Lomarakennus K (Silostenlampi)	3,3	63	-8,4	50
Lomarakennus L (Harjunpaantie 215)	4,6	63	-7,2	50
Lomarakennus M (Hakala, Iso-Mottonen)	4,0	63	-7,8	50
Lomarakennus N (Hautakoski)	4,8	63	-7,0	50
Lomarakennus O (Harjunpaantie 398)	4,4	63	-7,4	50
Asuinrakennus P (Hautakoskentie 135)	3,3	63	-8,5	50
Lomarakennus Q (Lemmistonrannantie)	2,7	63	-9,2	50
Lomarakennus R (Peuraneva,Valvatintie)	4,0	63	-7,8	50
Lomarakennus S (Talonpaikantie 141)	3,8	63	-8,2	50
Lomarakennus T (Ruipontie)	-1,9	63	-13,7	50
Lomarakennus U (Kannistontie, Kivioja)	6,3	63	-5,5	50
Asuinrakennus V (Kannistontie 586)	5,1	63	-6,7	50

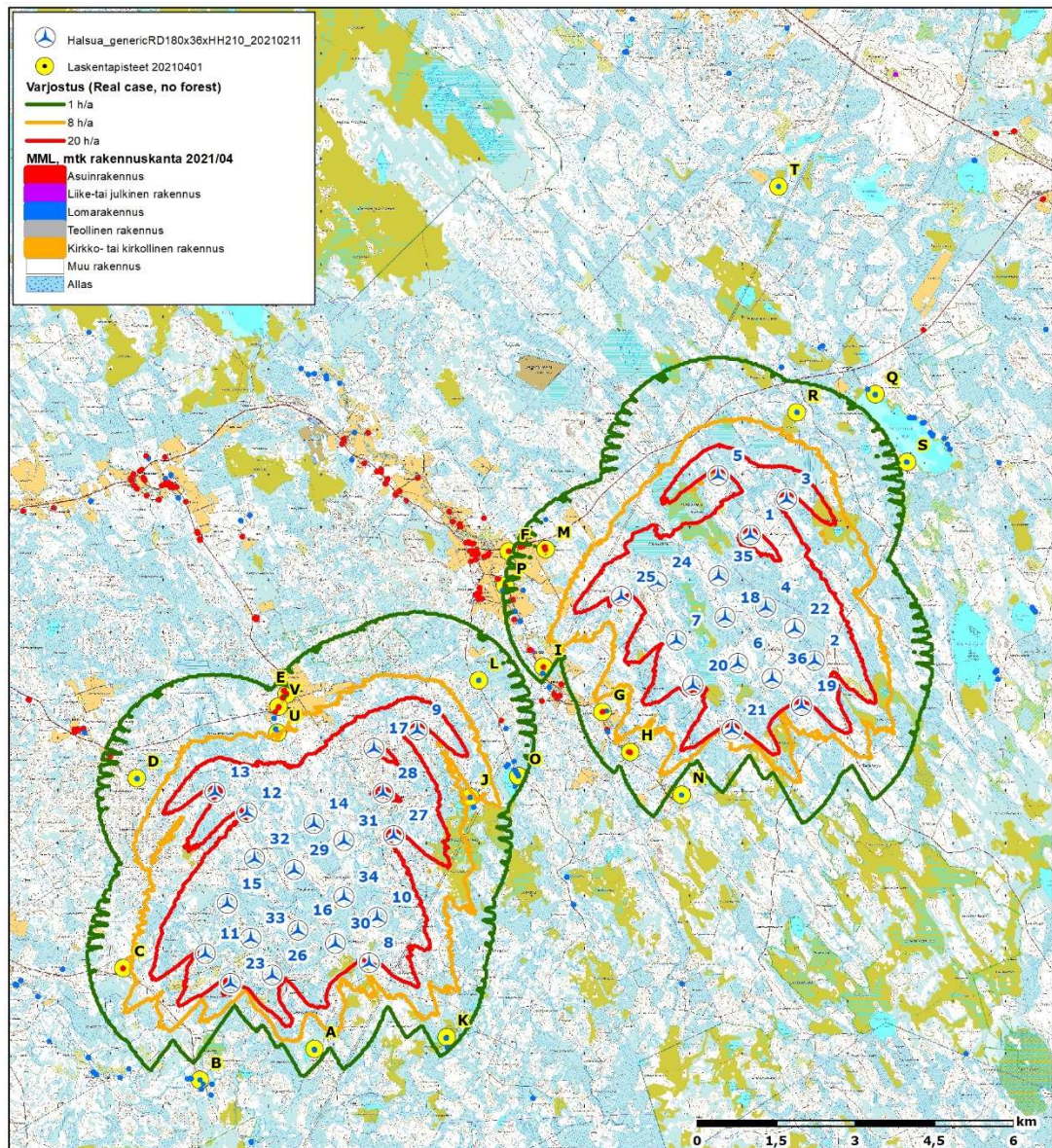
29.4.2021

### 3.3 Varjostusmallinnuksen tulokset

#### 3.3.1 Varjostus (no forest)

Tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus on yli 8 h/a laskentapisteessä lomarakennus U (Kannistontie, Kivioja) 8 tuntia 36 minuuttia, kun puuston suojaavaa vaikutusta ei ole huomioitu.

Tarkemmat tulokset ovat liitteessä 5.



**Kuva 3. Laskennalliset varjostusmallinnuksen tulokset "real case, no forest".**



29.4.2021

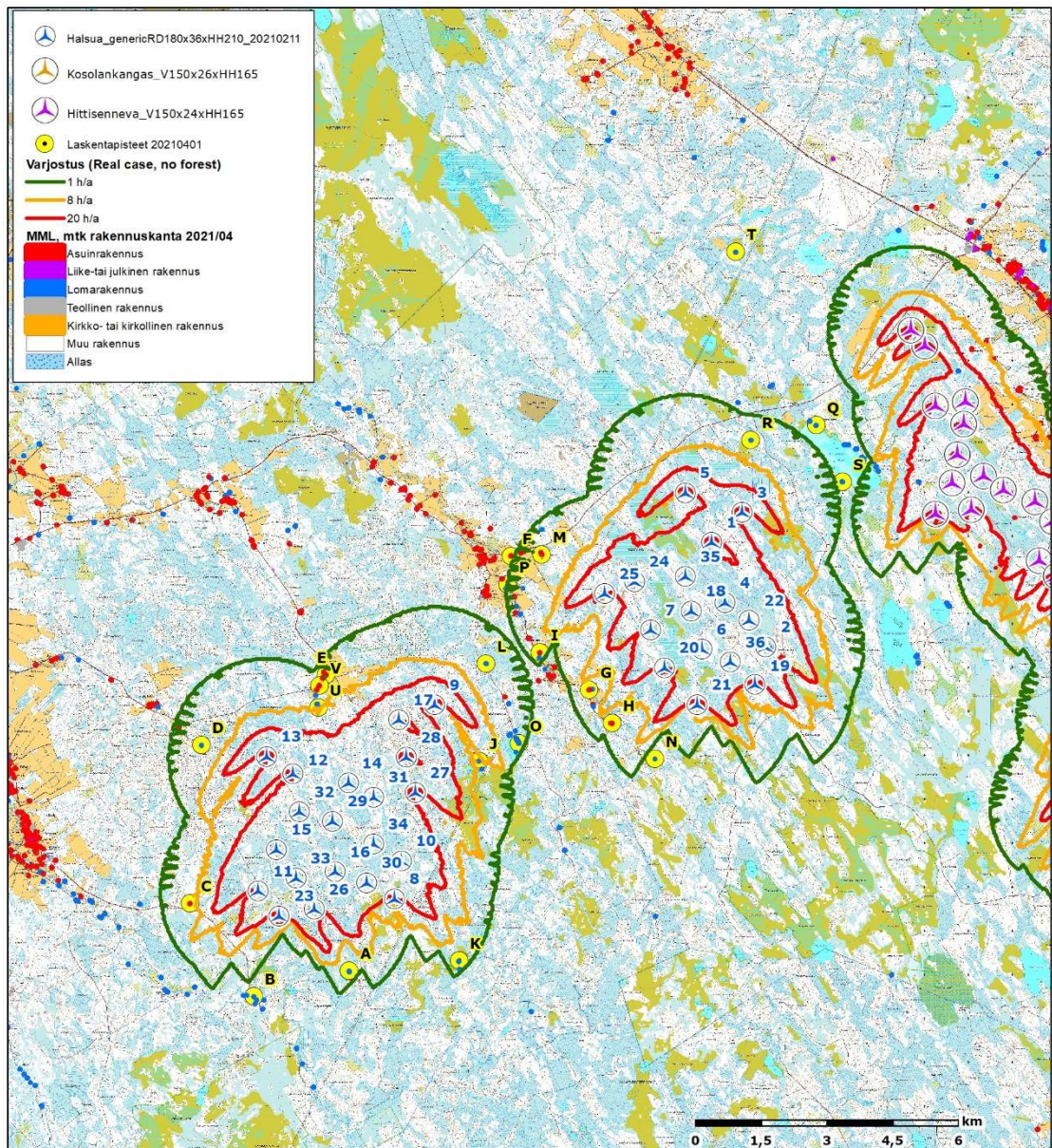
**Taulukko 12. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".**

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Varjostus (h/a)	Varjostus (h/a) yhteisvaikutu
Lomarakennus A (Kuuslammentie)	367873	7031085	163,2	4:29	4:29
Lomarakennus B (Loukkukoskentie 700)	365699	7030495	157,5	0:00	0:00
Asuinrakennus C (Loukkukoskentie,	364243	7032622	153,8	4:20	4:20
Lomarakennus D (Purola)	364501	7036228	143,4	3:45	3:45
Asuinrakennus E (Kannistontie 557)	367345	7037828	140,9	1:37	1:37
Asuinrakennus F (Lestijarventie 1468)	371569	7040539	143,5	0:00	0:00
Asuinrakennus G (Hautakoskentie 455)	373347	7037488	155,1	5:32	5:32
Asuinrakennus H (Hautakoskentie 544)	373867	7036728	157,6	2:19	2:19
Asuinrakennus I (Hautakoskentie 289)	372224	7038341	150	4:00	4:00
Lomarakennus J (Katajajarventie 49)	370829	7035870	162,5	7:14	7:14
Lomarakennus K (Silostenlampi)	370383	7031311	170	5:46	5:46
Lomarakennus L (Harjunpaantie 215)	370996	7038086	152,5	2:48	2:48
Lomarakennus M (Hakala, Iso-Mottonen)	372265	7040574	147,5	3:15	3:15
Lomarakennus N (Hautakoski)	374845	7035914	162,5	0:00	0:00
Lomarakennus O (Harjunpaantie 398)	371749	7036270	166,1	1:56	1:56
Asuinrakennus P (Hautakoskentie 135)	371498	7039888	142,5	1:14	1:14
Lomarakennus Q (Lemmistonrannantie)	378528	7043527	160	0:00	0:00
Lomarakennus R (Peuraneva,Valvatintie)	377034	7043182	165	4:25	4:25
Lomarakennus S (Talonpaikantie 141)	379124	7042238	160,7	0:00	0:00
Lomarakennus T (Ruipontie)	376687	7047472	157,5	0:00	0:00
Lomarakennus U (Kannistontie, Kivioja)	367174	7037088	144,1	8:36	8:36
Asuinrakennus V (Kannistontie 586)	367193	7037585	142,5	4:48	4:48

29.4.2021

Mallinnettaessa yhteisvaikutusta Lestijärven hankkeiden kanssa lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus on yli 8 h/a laskentapistessä Lomarakennus U (Kannistontie, Kivioja) 8 tuntia 36 minuuttia, kun puuston suojaavaa vaikutusta ei huomioitu. Tulos on sama laskentapistessä lomarakennus U myös Halsuan omassa mallinnuksessa ilman yhteisvaikutusta (kts. kuva 3, taulukko 12) , joten yhteismallinnus ei lisää varjostusta lomarakennus U:n osalta.

Tarkemmat tulokset ovat liitteessä 6.

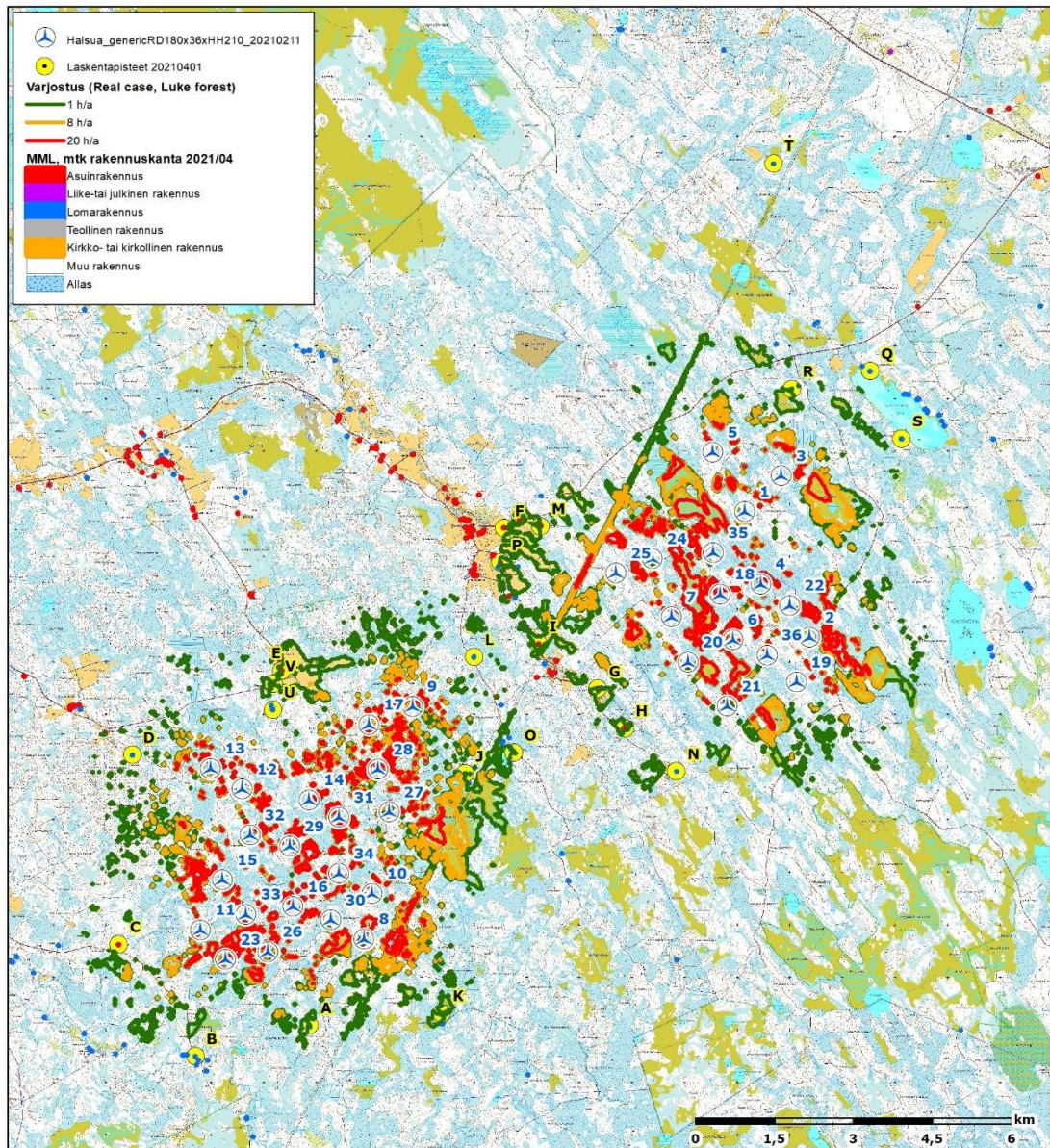


**Kuva 4. Laskennalliset varjostusmallinnuksen tulokset yhteisvaikutushankkeiden kanssa "real case, no forest".**

29.4.2021

### 3.3.2 Varjostus (Luke forest)

Tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus on laskelmien mukaan alle 8 h/a, kun puusto huomioidaan. Esimerkiksi rakennuksen U kohdalla varjostusvaikutus on 0 h/a, kun puusto huomioidaan. Tarkemmat tulokset ovat liitteessä 7.



Kuva 5. Laskennalliset varjostusmallinnuksen tulokset "real case, Luke forest".

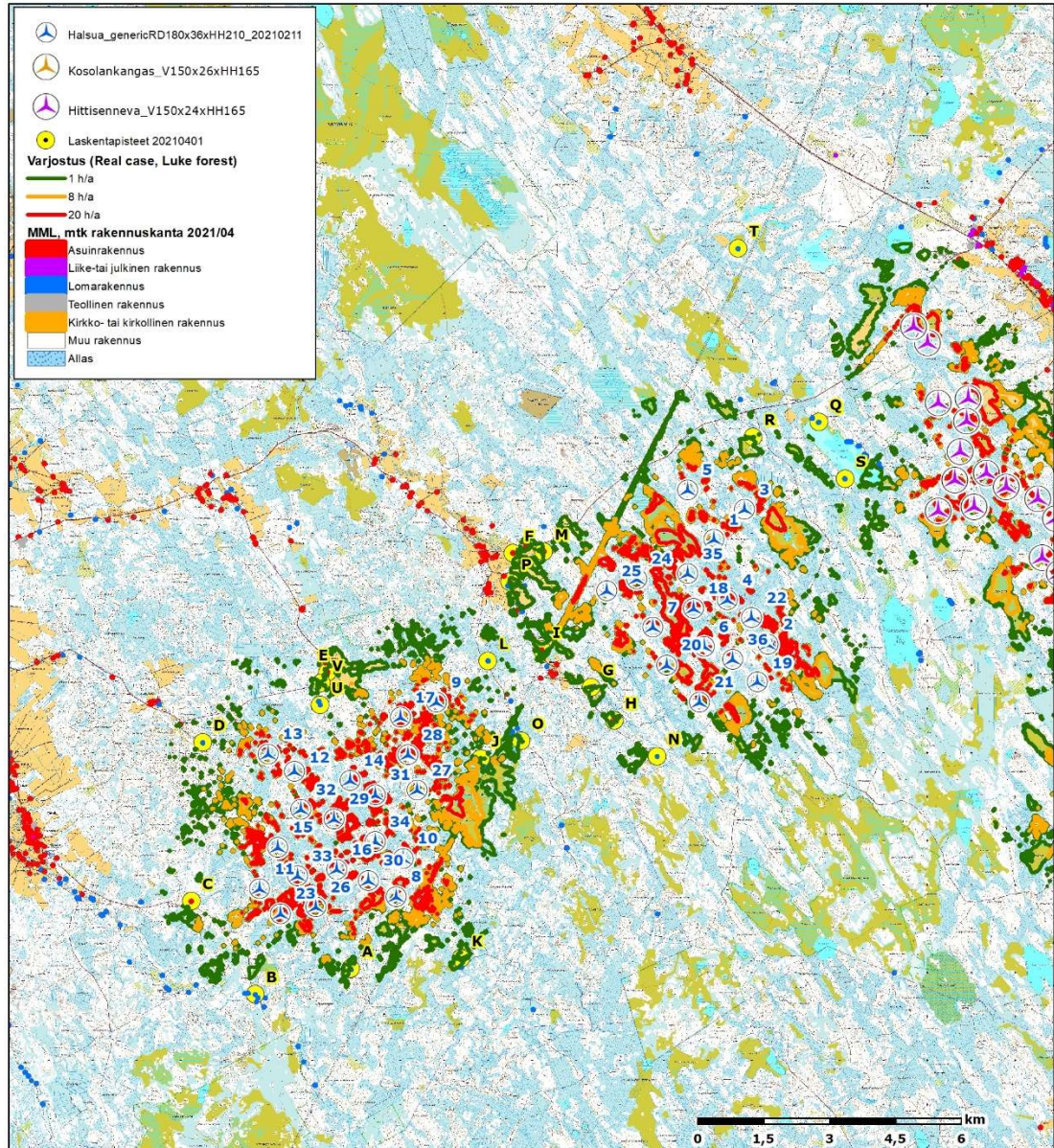
29.4.2021

**Taulukko 13. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, Luke forest".**

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Varjostus (h/a)	Varjostus (h/a) yhteisvaikutu
Lomarakennus A (Kuuslammentie)	367873	7031085	163,2	4:29	4:29
Lomarakennus B (Loukkukoskentie 700)	365699	7030495	157,5	0:00	0:00
Asuinrakennus C (Loukkukoskentie,	364243	7032622	153,8	0:00	0:00
Lomarakennus D (Purola)	364501	7036228	143,4	0:00	0:00
Asuinrakennus E (Kannistontie 557)	367345	7037828	140,9	1:37	1:37
Asuinrakennus F (Lestijarventie 1468)	371569	7040539	143,5	0:00	0:00
Asuinrakennus G (Hautakoskentie 455)	373347	7037488	155,1	2:33	2:33
Asuinrakennus H (Hautakoskentie 544)	373867	7036728	157,6	2:19	2:19
Asuinrakennus I (Hautakoskentie 289)	372224	7038341	150	4:00	4:00
Lomarakennus J (Katajajarventie 49)	370829	7035870	162,5	7:14	7:14
Lomarakennus K (Silostenlampi)	370383	7031311	170	5:46	5:46
Lomarakennus L (Harjunpaantie 215)	370996	7038086	152,5	2:48	2:48
Lomarakennus M (Hakala, Iso-Mottonen)	372265	7040574	147,5	2:07	2:07
Lomarakennus N (Hautakoski)	374845	7035914	162,5	0:00	0:00
Lomarakennus O (Harjunpaantie 398)	371749	7036270	166,1	1:56	1:56
Asuinrakennus P (Hautakoskentie 135)	371498	7039888	142,5	1:14	1:14
Lomarakennus Q (Lemmistonrannantie)	378528	7043527	160	0:00	0:00
Lomarakennus R (Peuraneva,Valvatintie)	377034	7043182	165	1:47	1:47
Lomarakennus S (Talonpaikantie 141)	379124	7042238	160,7	0:00	0:00
Lomarakennus T (Ruipontie)	376687	7047472	157,5	0:00	0:00
Lomarakennus U (Kannistontie, Kivioja)	367174	7037088	144,1	0:00	0:00
Asuinrakennus V (Kannistontie 586)	367193	7037585	142,5	1:30	1:30

29.4.2021

Mallinnettaessa yhteisvaikutushankkeiden kanssa tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus on laskelmien mukaan alle 8 h/a, kun puusto huomioidaan. Tarkemmat tulokset ovat liitteessä 8.



**Kuva 6. Laskennalliset varjostusmallinnuksen tulokset yhteisvaikutushankkeiden kanssa "real case, Luke forest".**

**FCG Suunnittelu ja tekniikka Oy**

Laatija

Tarkastaja

29.4.2021

---

**Liite 1: Halsuan tuulivoimahanke – Melun leviämismallinnuksen tulokset ISO 9613-2,  
YM 2/2014**

## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS\_Halsua 20

Area type with hard ground: Halsua\_vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Fixed penalty added to source noise of WTGs with pure tones

WTG catalogue

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in model has priority

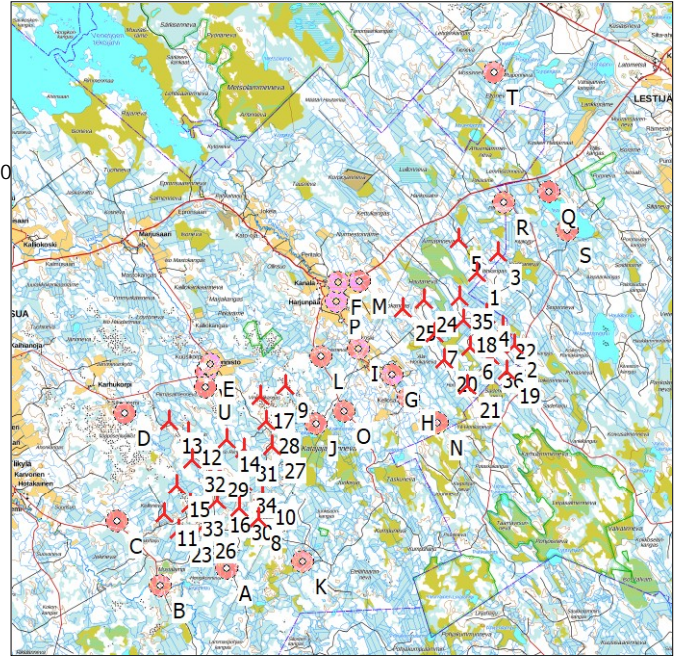
Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



Scale 1:250 000  
 New WTG Noise sensitive area

## WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
					Valid	Manufact.	Type-generator				Creator	Name		
	[m]													
1	376 145	7 040 853	169,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
2	377 373	7 038 465	172,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
3	376 837	7 041 535	170,2	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
4	376 444	7 039 476	167,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
5	375 536	7 041 980	165,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
6	375 916	7 038 416	167,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
7	374 748	7 038 849	162,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
8	368 911	7 032 725	165,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
9	369 826	7 037 147	157,3	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
10	369 062	7 033 588	162,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
11	365 799	7 032 897	160,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
12	366 591	7 035 576	153,3	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
13	365 986	7 035 968	147,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
14	367 861	7 035 366	155,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
15	366 214	7 033 846	157,3	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
16	367 557	7 033 342	160,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
17	369 000	7 036 800	160,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
18	375 673	7 039 283	164,1	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
19	377 129	7 037 609	175,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
20	375 066	7 037 992	164,7	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
21	375 806	7 037 151	168,9	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
22	376 995	7 039 070	171,8	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
23	366 276	7 032 332	162,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
24	374 380	7 039 957	161,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
25	373 695	7 039 683	159,3	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
26	367 076	7 032 483	160,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
27	369 380	7 035 142	160,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
28	369 173	7 035 951	160,4	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
29	367 493	7 034 489	157,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
30	368 275	7 033 089	162,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
31	368 432	7 035 039	155,7	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
32	366 741	7 034 702	155,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
33	366 662	7 033 192	157,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
34	368 431	7 033 972	157,5	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
35	375 546	7 040 069	165,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0
36	376 570	7 038 123	172,0	GE WIND ENERGY 5.3-158...	Yes	GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER	5.3-158 106,0 +2 dB HH221	8,0	106,0

## Calculation Results

## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

### Sound level

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]
A	Lomarakennus A (Kuuslammentie)	367 873	7 031 085	163,2	4,0	40,0	36,0
B	Lomarakennus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	4,0	40,0	32,5
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243	7 032 622	153,8	4,0	40,0	34,2
D	Lomarakennus D (Purola)	364 501	7 036 228	143,4	4,0	40,0	33,8
E	Asuinrakennus E (Kannistontie 557)	367 345	7 037 828	140,9	4,0	40,0	34,0
F	Asuinrakennus F (Lestijarventie 1468)	371 569	7 040 539	143,5	4,0	40,0	30,5
G	Asuinrakennus G (Hautakoskentie 455)	373 347	7 037 488	155,1	4,0	40,0	34,8
H	Asuinrakennus H (Hautakoskentie 544)	373 867	7 036 728	157,6	4,0	40,0	34,4
I	Asuinrakennus I (Hautakoskentie 289)	372 224	7 038 341	150,0	4,0	40,0	33,1
J	Lomarakennus J (Katajajarventie 49)	370 829	7 035 870	162,5	4,0	40,0	36,6
K	Lomarakennus K (Silostenlampi)	370 383	7 031 311	170,0	4,0	40,0	31,9
L	Lomarakennus L (Harjunpaantie 215)	370 996	7 038 086	152,5	4,0	40,0	33,8
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	4,0	40,0	33,0
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	4,0	40,0	34,2
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	4,0	40,0	33,3
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	4,0	40,0	31,1
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	4,0	40,0	28,9
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	4,0	40,0	33,1
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	4,0	40,0	29,4
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	4,0	40,0	21,0
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	4,0	40,0	36,7
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	4,0	40,0	34,7

### Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	12800	14711	14470	12529	9305	4587	4376	4713	4657	7286	11147	5846	3890	5107	6351	4746	3582	2493	3285	6641	9729	9530
2	12029	14135	14371	13065	10048	6164	4142	3913	5150	7040	10002	6389	5526	3592	6038	6045	5192	4729	4160	9033	10292	10218
3	13768	15682	15428	13429	10190	5362	5344	5651	5611	8258	12091	6784	4672	5964	7322	5587	2613	1659	2393	5939	10637	10421
4	11994	14004	13994	12377	9247	4990	3680	3768	4370	6673	10169	5623	4321	3904	5686	4963	4556	3753	3849	8000	9573	9442
5	13320	15122	14666	12444	9183	4221	4997	5511	4921	7713	11848	5982	3561	6105	6852	4547	3368	1921	3597	5611	9688	9430
6	10882	12928	13031	11623	8591	4838	2731	2655	3693	5688	9005	4931	4241	2722	4688	4657	5740	4895	4990	9089	8843	8762
7	10370	12315	12211	10577	7473	3600	1953	2297	2575	4923	8710	3829	3023	2937	3956	3412	6014	4899	5535	8838	7776	7660
8	1941	3910	4669	5632	5338	8253	6509	6371	6520	3683	2041	5752	8535	6736	4541	7616	14463	13241	13957	16672	4696	5155
9	6369	7828	7186	5404	2573	3813	3538	4063	2679	1624	5863	1500	4206	5168	2113	3211	10790	9401	10601	12397	2653	2669
10	2771	4569	4914	5270	4574	7389	5794	5740	5709	2886	2633	4896	7685	6233	3796	6755	13725	12474	13269	15840	3977	4412
11	2754	2404	1580	3575	5167	9575	8835	8931	8421	5843	4851	7344	10037	9536	6839	9020	16584	15232	16273	18193	4411	4891
12	4671	5159	3773	2190	2375	7029	7022	7367	6275	4249	5707	5070	7561	8261	5204	6533	14343	12919	14194	15603	1620	2097
13	5235	5481	3772	1508	2303	7215	7517	7918	6674	4844	6405	5439	7787	8859	5770	6764	14644	13195	14557	15712	1633	2018
14	4281	5329	4540	3469	2515	6364	5883	6159	5281	3011	4776	4150	6820	7005	3991	5804	13431	12051	13194	14982	1854	2317
15	3221	3390	2320	2934	4139	8571	8009	8178	7505	5039	4880	6391	9048	8875	6042	8027	15664	14291	15398	17186	3381	3865
16	2279	3399	3391	4204	4491	8239	7122	7161	6839	4135	3480	5859	8629	7728	5113	7641	14970	13662	14592	16823	3766	4259
17	5825	7117	6331	4535	1948	4536	4402	4868	3573	2052	5661	2374	4990	5912	2799	3972	11663	10260	11492	13152	1849	1970
18	11316	13293	13229	11582	8454	4292	2938	3129	3575	5926	9567	4828	3644	3469	4948	4218	5115	4130	4543	8252	8778	8648
19	11324	13463	13817	12703	9786	6285	3784	3379	4959	6535	9229	6152	5696	2844	5545	6075	6081	5574	5041	9873	9969	9936
20	9972	11997	12081	10711	7723	4326	1791	1742	2863	4739	8159	4071	3809	2090	3738	4040	6529	5551	5873	9618	7944	7883
21	9986	12102	12418	11343	8488	5425	2482	1985	3774	5139	7969	4900	4925	1567	4152	5104	6933	6155	6073	10359	8632	8624
22	12123	14182	14289	12813	9730	5622	3976	3908	4826	6947	10194	6080	4963	3819	5947	5557	4713	4112	3817	8408	10019	9914
23	2027	1925	2053	4282	5599	9765	8752	8772	8455	5766	4232	7442	10188	9287	6742	9186	16596	15279	16223	18374	4840	5333
24	11002	12841	12512	10559	7350	2871	2676	3270	2694	5414	9525	3867	2203	4070	4530	2882	5473	4177	5264	7861	7756	7568
25	10384	12180	11798	9822	6615	2292	2222	2960	1991	4770	9003	3136	1685	3940	3929	2206	6175	4837	6000	8344	7019	6832
26	1609	2418	2836	4545	5352	9224	8024	8008	7798	5055	3509	6838	9612	8493	6014	8625	15910	14616	15502	17806	4606	5103
27	4328	5928	5721	4999	3370	5823	4609	4759	4280	1622	3960	3358	6150	5519	2623	5198	12409	11101	12054	14333	2942	3279
28	5037	6468	5948	4680	2620	5175	4448	4758	3876	1658	4795	2807	5561	5672	2595	4573	12038	10681	11771	13755	2300	2567
29	3425	4378	3748	3461	3342	7294	6578	6756	6101	3611	4296	5021	7733	7489	4613	6723	14264	12907	13976	15909	2619	3111
30	2044	3656	4058	4909	4829	8145	6714	6672	6571	3776	2758	5689	8482	7151	4710	7525	14631	13364	14192	16662	4148	4624
31	3993	5302	4836	4107	2993	6331	5492	5691	5028	2537	4208	3982	6732	6472	3538	5738	13190	11845	12890	14924	2404	2831
32	3790	4334	3250	2711	3184	7574	7170	7408	6581	4252	4977	5436	8062	8194	5247	7038	14725	13336	14496	16186	2425	2918
33	2430	2864	2485	3727	4686	8834	7947	8026	7579	4953	4170	6537	9267	8624	5945	8260	15736	14401	15399	17448	3929	4425
34	2940	4422	4400	4532	4006	7278	6044	6095	5786	3058	3300	4848	7634	6701	4036	6664	13901	12603	13515	15824	3360	3819
35	11815	13734	13535	11694	8502	4005	3390	3739	3745	6315	10166	4964	3320	4214	5372	4052	4566	3450	4184	7490	8887	8714
36	11188	13280	13498	12217	9230	5554	3285	3042	4351	6167	9202	5574	4954	2803	5165	5370	5748	5080	4843	9350	9453	9392



Project: Halsua 20190717 -  
Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 12.00/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS\_Halsua 20190717\_9.w2r (12)

Area type with hard ground: Halsua\_vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Fixed penalty added to source noise of WTGs with pure tones

WTG catalogue

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in model has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: GE WIND ENERGY 5.3-158MW HH221 5300 158.0 !O!

Noise: 5.3-158 106.0 +2 dB HH221

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	27.4.2021 11.48

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]	Octave data							
						63	125	250	500	1000	2000	4000	8000
From Windcat	221,0	8,0	106,0	Yes	2,0	87,2	92,6	97,2	99,6	101,3	99,1	91,7	76,0

Noise sensitive area: A Lomarakenus A (Kuuslammentie)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Lomarakenus B (Loukkukoskentie 700)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Loukkukoskentie, Mantyla)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Project: Halsua 20190717 -  
Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 12.00/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

Noise sensitive area: D Lomarakennus D (Purola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Kannistontie 557)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Lestijarventie 1468)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Asuinrakennus G (Hautakoskentie 455)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: H Asuinrakennus H (Hautakoskentie 544)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Hautakoskentie 289)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakennus J (Katajarventie 49)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Lomarakennus K (Silostenlampi)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Lomarakennus L (Harjunpaantie 215)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 12.00/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: M Lomarakennus M (Hakala, Iso-Mottonen)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: N Lomarakennus N (Hautakoski)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: O Lomarakennus O (Harjunpaantie 398)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: P Asuinrakennus P (Hautakoskentie 135)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: Q Lomarakennus Q (Lemmistonrannantie)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: R Lomarakennus R (Peuraneva,Valvatintie)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: S Lomarakennus S (Talonpaikantie 141)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: T Lomarakennus T (Ruipontie)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

27.4.2021 12.00/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427

Noise sensitive area: U Lomarakennus U (Kannistontie, Kivioja)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: V Asuinrakennus V (Kannistontie 586)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

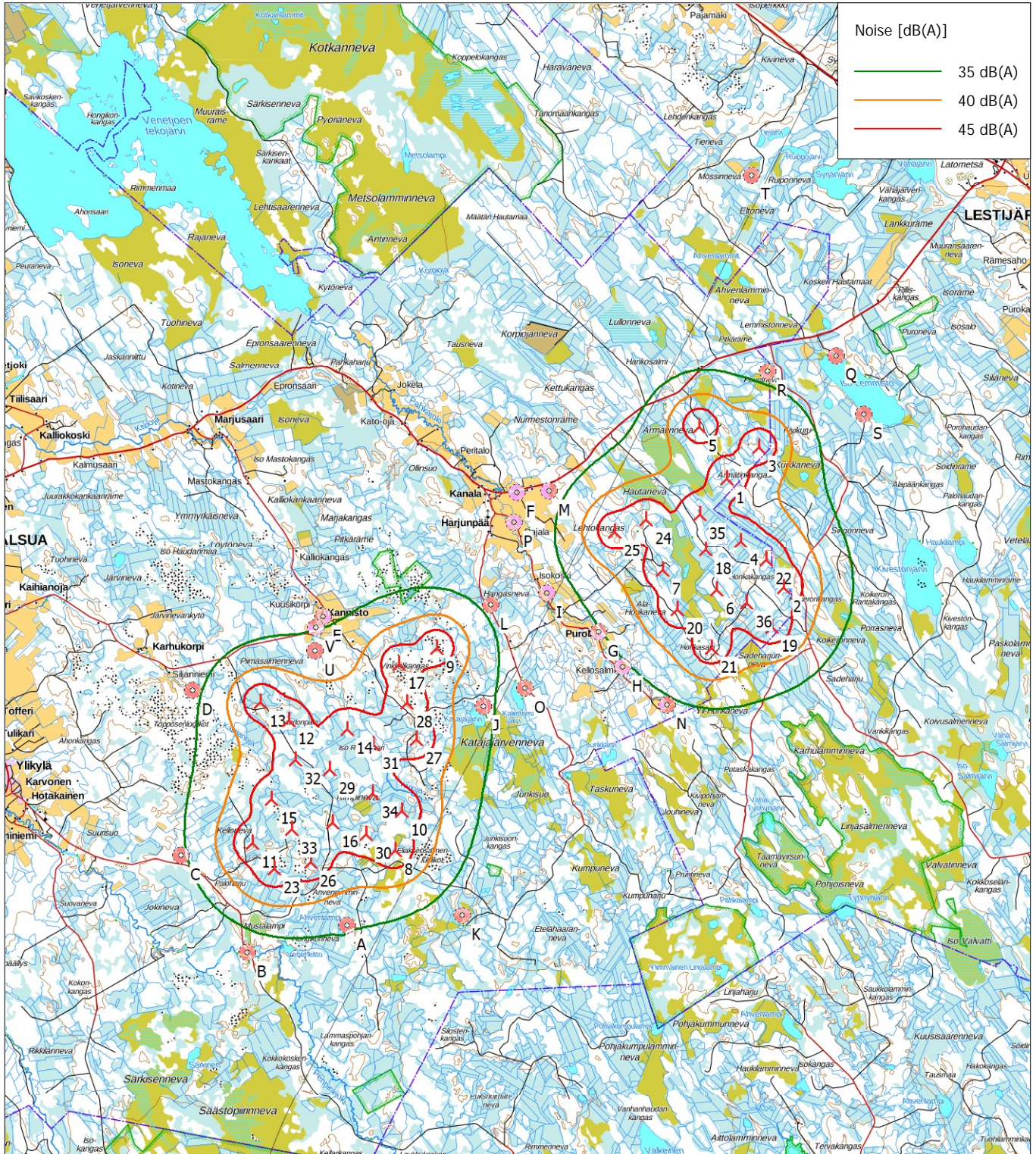
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

### DECIBEL - Map 8,0 m/s

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB\_20210427



0 2,5 5 7,5 10km

Map: aastokarttarasteri 100K , Print scale 1:125 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 371 586 North: 7 038 652

🚧 New WTG

🏠 Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s

Height above sea level from active line object

29.4.2021

---

**Liite 2: Halsuan tuulivoimahanke – Melun leviämismallinnuksen tulokset ISO 9613-2,  
YM 2/2014 yhteisvaikutushankkeiden kanssa**

## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS\_Halsua 20

Area type with hard ground: Halsua\_vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Fixed penalty added to source noise of WTGs with pure tones

WTG catalogue

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in model has priority

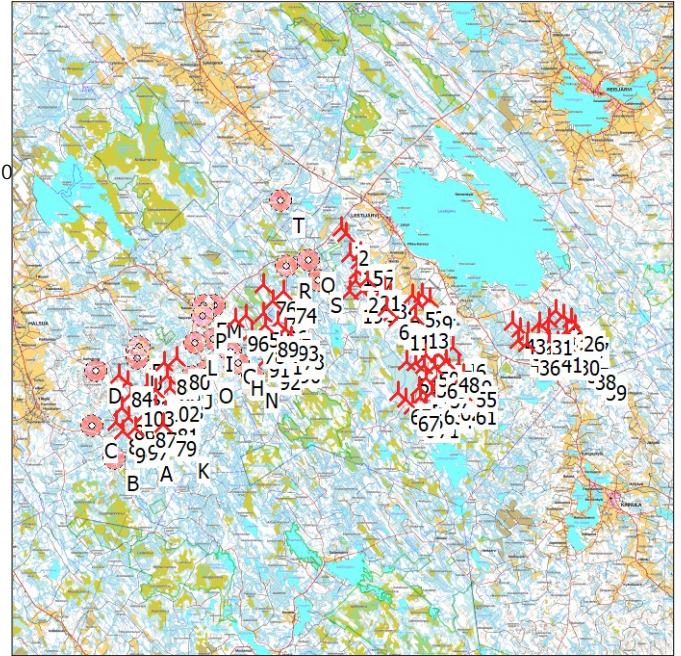
Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



Scale 1:500 000

New WTG

Noise sensitive area

## WTGs

East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
				Valid	Manufact.					Creator	Name		
1	380 684	7 045 698	150,9 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
2	381 007	7 045 328	151,7 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
3	383 517	7 041 785	155,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
4	383 921	7 041 331	152,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
5	385 377	7 041 252	150,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
6	383 621	7 040 446	163,9 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
7	384 366	7 040 664	153,1 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
8	385 748	7 040 770	152,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
9	386 533	7 040 991	152,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
10	384 006	7 040 089	165,1 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
11	384 378	7 039 713	160,3 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
12	385 046	7 040 278	155,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
13	385 544	7 039 842	155,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
14	384 960	7 039 279	160,9 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
15	381 256	7 043 966	155,6 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
16	381 931	7 044 063	150,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
17	381 895	7 043 549	152,7 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
18	381 752	7 042 851	156,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
19	381 247	7 041 502	170,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
20	382 062	7 041 595	168,7 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
21	382 350	7 042 369	157,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
22	382 800	7 042 046	162,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
23	381 625	7 042 211	167,3 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
24	386 021	7 041 317	150,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
25	395 347	7 039 951	162,6 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
26	395 838	7 039 702	167,1 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
27	396 097	7 039 224	165,1 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
28	395 534	7 038 921	157,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
29	394 402	7 039 654	152,7 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
30	395 525	7 038 117	162,4 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
31	393 773	7 039 438	157,6 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
32	394 347	7 038 874	157,1 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
33	393 684	7 038 796	160,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
34	392 490	7 039 058	161,6 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
35	392 977	7 038 762	160,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
36	392 928	7 038 093	160,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
37	396 111	7 037 578	162,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
38	396 579	7 037 148	160,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
39	397 331	7 036 447	163,4 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
40	394 933	7 038 137	157,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
41	394 396	7 038 302	160,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
42	394 805	7 040 229	155,5 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
43	391 991	7 039 513	165,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
44	397 026	7 036 726	162,7 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
45	392 367	7 038 283	153,9 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5
46	388 010	7 037 832	155,0 NORDEX N131/3000 3000 1...	Yes	NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER	Mode 0 - 104.5 dB(A) - R00	8,0	104,5

To be continued on next page...

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

27.4.2021 21.07/3.4.388

## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

...continued from previous page

East	North	Z	Row data/Description	WTG type Valid Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data Creator Name	Wind speed [m/s]	LwA,ref [dB(A)]
47	387 110	7 037 362	160,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
48	387 614	7 036 963	158,4 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
49	388 428	7 036 760	158,7 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
50	386 241	7 037 319	157,5 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
51	384 992	7 036 878	159,1 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
52	385 558	7 036 812	158,2 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
53	386 107	7 036 645	160,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
54	387 785	7 036 395	165,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
55	388 702	7 035 986	165,4 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
56	386 237	7 035 806	166,9 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
57	387 014	7 035 959	168,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
58	388 741	7 035 374	167,8 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
59	385 820	7 035 172	164,4 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
60	387 147	7 035 440	168,9 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
61	388 745	7 034 846	166,4 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
62	387 731	7 035 082	167,5 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
63	386 636	7 034 860	172,3 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
64	387 159	7 034 572	171,4 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
65	384 386	7 034 826	160,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
66	385 843	7 034 542	172,5 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
67	384 948	7 034 376	163,7 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
68	385 365	7 033 972	170,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
69	386 798	7 036 582	164,1 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
70	387 892	7 035 785	165,2 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
71	386 250	7 033 976	169,0 NORDEX N131/3000 3000 1...	Yes NORDEX	N131/3000-3 000	3 000	131,0	165,0	USER Mode 0 - 104,5 dB(A) - R00	8,0	104,5
72	376 145	7 040 853	169,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
73	377 373	7 038 465	172,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
74	376 837	7 041 535	170,2 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
75	376 444	7 039 476	167,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
76	375 536	7 041 980	165,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
77	375 916	7 038 416	167,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
78	374 748	7 038 849	162,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
79	368 911	7 032 725	165,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
80	369 826	7 037 147	157,3 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
81	369 062	7 033 588	162,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
82	365 799	7 032 897	160,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
83	366 591	7 035 576	153,3 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
84	365 986	7 035 968	147,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
85	367 861	7 035 366	155,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
86	366 214	7 033 846	157,3 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
87	367 557	7 033 342	160,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
88	369 062	7 036 800	160,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
89	375 673	7 039 283	164,1 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
90	377 129	7 037 609	175,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
91	375 066	7 037 992	164,7 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
92	375 806	7 037 151	168,9 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
93	376 995	7 039 070	171,8 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
94	366 276	7 032 332	162,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
95	374 380	7 039 957	161,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
96	373 695	7 039 683	159,3 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
97	367 076	7 032 483	160,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
98	369 380	7 035 142	160,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
99	369 173	7 035 951	160,4 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
100	367 493	7 034 489	165,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
101	368 275	7 033 089	162,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
102	368 432	7 035 039	157,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
103	366 741	7 034 702	155,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
104	366 662	7 033 192	157,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
105	368 431	7 033 972	157,5 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
106	375 546	7 040 069	165,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0
107	376 570	7 038 123	172,0 GE WIND ENERGY 5.3-158M...	Yes GE WIND ENERGY	5.3-158MW HH221-5 300	5 300	158,0	221,0	USER 5.3-158 106,0 +2 dB HH221	8,0	106,0

## Calculation Results

### Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]
A	Lomarakennus A (Kuuslammentie)	367 873	7 031 085	163,2	4,0	40,0	36,0
B	Lomarakennus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	4,0	40,0	32,5
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243					



## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	4,0	40,0	33,1
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	4,0	40,0	34,3
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	4,0	40,0	33,4
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	4,0	40,0	31,3
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	4,0	40,0	31,6
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	4,0	40,0	33,6
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	4,0	40,0	32,9
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	4,0	40,0	23,8
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	4,0	40,0	36,7
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	4,0	40,0	34,7

## Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	19433	21347	21007	18750	15488	10475	11011	11267	11212	13918	17694	12321	9856	11394	12990	10869	3060	4433	3796	4373	16021	15742
2	19374	21316	21035	18848	15586	10584	10961	11178	11223	13894	17588	12356	9951	11252	12953	10955	3064	4516	3619	4823	16102	15836
3	18953	21093	21340	19811	16649	12013	11040	10895	11806	13999	16798	13056	11317	10472	12996	12167	5284	6632	4416	8888	17005	16855
4	19039	21200	21518	20079	16942	12378	11250	11057	12073	14185	16842	13326	11680	10570	13182	12506	5823	7131	4882	9489	17276	17142
5	20242	22426	22827	21472	18354	13827	12605	12367	13471	15511	17990	14726	13130	11807	14510	13945	7217	8563	6330	10687	18673	18550
6	18320	20499	20898	19580	16486	12053	10691	10439	11590	13586	16084	12844	11357	9878	12586	12136	5953	7133	4841	9871	16787	16675
7	19073	21257	21670	20354	17256	12798	11467	11213	12362	14361	16822	13617	12101	10640	13361	12891	6502	7752	5473	10262	17560	17446
8	20330	22528	22996	21727	18637	14181	12827	12550	13740	15703	18043	14994	13484	11935	14705	14277	7729	9042	6785	11270	18935	18826
9	21126	23328	23809	22541	19447	14971	13643	13364	14552	16518	18829	15807	14274	12743	15520	15075	8397	9748	7513	11788	19749	19637
10	18475	20668	21126	19883	16813	12445	10971	10681	11911	13835	16206	13163	11751	10067	12838	12509	6467	7627	5333	10395	17097	16998
11	18624	20829	21347	20180	17137	12836	11253	10927	12231	14083	16323	13481	12144	10262	13090	12881	6984	8122	5829	10925	17403	17316
12	19479	21680	22167	20941	17870	13480	12027	11729	12968	14885	17188	14220	12785	11096	13889	13553	7283	8522	6238	11028	18155	18055
13	19722	21936	22491	21351	18310	13993	12422	12085	13404	15241	17396	14654	13299	11398	14250	14046	7925	9142	6852	11690	18576	18489
14	18950	21169	21760	20686	17675	13451	11750	11383	12771	14536	16613	14015	12761	10660	13550	13476	7708	8835	6543	11644	17921	17847
15	18575	20579	20448	18456	15205	10276	10223	10344	10641	13201	16684	11826	9610	10293	12232	10575	2763	4294	2744	5759	15672	15443
16	19132	21155	21065	19110	15863	10945	10812	10901	11268	13798	17203	12462	10277	10799	12822	11237	3445	4976	3348	6255	16323	16099
17	18760	20801	20760	18872	15634	10756	10478	10534	10984	13469	16801	12192	10079	10392	12487	11022	3367	4875	3065	6520	16077	15865
18	18195	20258	20278	18479	15258	10443	9970	9984	10542	12964	16200	11765	9757	9790	11975	10673	3294	4730	2699	6856	15676	15482
19	16952	19049	19182	17557	14379	9726	8861	8789	9560	11843	14895	10805	9030	8498	10844	9881	3390	4535	2247	7512	14749	14589
20	17657	19772	19950	18363	15191	10546	9634	9531	10362	12608	15561	11609	9850	9185	11607	10700	4027	5272	3007	7964	15555	15400
21	18355	20451	20563	18876	15677	10936	10241	10188	10898	13228	16294	12135	10244	9899	12231	11132	3994	5378	3229	7623	16069	15894
22	18519	20636	20812	19202	16020	11332	10494	10396	11206	13470	16414	12451	10637	10044	12470	11506	4521	5877	3681	8174	16394	16232
23	17688	19771	19851	18139	14937	10194	9530	9500	10166	12520	15658	11401	9502	9253	11525	10389	3365	4692	2501	7215	15332	15155
24	20834	23024	23450	22114	19000	14474	13240	12992	14115	16139	18565	15369	13777	12414	15139	14593	7813	9179	6959	11181	19316	19194
25	28869	31119	31955	31070	28082	23786	22137	21720	23179	24855	26417	24423	23090	20896	23884	23849	17195	18596	16383	20118	28318	28253
26	29262	31513	32378	31529	28554	24284	22599	22171	23653	25300	26802	24895	23589	21332	24333	24340	17728	19123	16905	20667	28783	28723
27	29374	31626	32531	31738	28786	24564	22816	22370	23890	25490	26904	25127	23871	21509	24527	24608	18089	19470	17239	21090	29002	28950
28	28749	31002	31918	31150	28210	24020	22233	21778	23317	24892	26277	24553	23328	20907	23933	24055	17619	18984	16742	20696	28419	28372
29	27878	30129	30968	30097	27119	22851	21166	20743	22217	23875	25427	23459	22156	19912	22905	22905	16340	17723	15495	19364	27349	27287
30	28532	30784	31760	31081	28181	24078	22186	21702	23302	24798	26046	24529	23389	20797	23848	24092	17837	19172	16911	21033	28370	28336
31	27214	29464	30306	29448	26477	22232	20519	20090	21577	23220	24762	22818	21538	19254	22251	22279	15784	17153	14914	18881	26703	26644
32	27595	29848	30746	29963	27022	22839	21045	20592	22129	23708	25128	23364	22147	19725	22748	22871	16489	17841	15590	19642	27232	27184
33	26938	29190	30081	29296	26357	22184	20379	19925	21465	23041	24473	22699	21493	19058	22080	22213	15877	17218	14961	19083	26565	26518
34	25876	28126	28970	28132	25175	20974	19207	18768	20279	21894	23425	21516	20282	17923	20928	21008	14660	15997	13739	17903	25393	25340
35	26252	28503	29383	28589	25649	21482	19671	19218	20758	22336	23791	21992	20792	18355	21375	21509	15215	16545	14283	18473	25858	25811
36	26017	28269	29202	28489	25585	21499	19590	19110	20706	22211	23543	21933	20812	18215	21258	21505	15392	16689	14413	18755	25774	25740
37	28975	31226	32251	31639	28767	24720	22764	22260	23899	25339	26480	25120	24034	21331	24398	24721	18562	19883	17615	21799	28941	28918
38	29339	31588	32650	32091	29242	25239	23234	22715	24384	25781	26838	25600	24554	21769	24846	25230	19145	20455	18182	22411	29405	29389
39	29942	32187	33308	32831	30018	26085	24006	23466	25178	26508	27433	26386	25404	22493	25583	26061	20092	21385	19106	23404	30164	30159
40	27964	30216	31181	30492	27590	23488	21596	21113	22710	24210	25481	23938	22799	20211	23260	23500	17268	18597	16332	20495	27779	27745
41	27487	29739	30682	29967	27055	22936	21064	20589	22172	23691	25009	23401	22247	19696	22738	22952	16706	18034	15771	19942	27249	27212
42	28442	30691	31494	30568	27565	23239	21632	21229	22660	24369	25999	23906	22543	20422	23394	23309	16608	18015	15809	19512	27810	27738
43	25548	27795	28590	27686	24703	20448	18753	18337	19802	21473	23112	21044	19755	17520	20500	20496	14049	15400	13152	17250	24935	24872
44	29694	31941	33039	32529	29702	25742	23691	23159	24855	26211	27188	26066	25059	22196	25282	25723	19709	21009	18732	23003	29855	29845
45	25530	27782	28688	27942	25026	20921	19036	18565	20143	21673	23063	21372	20232	17682	20717	20930	14799	16097	13821			

## DECIBEL - Main Result

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
60	19759	22010	23076	22660	19945	16391	13950	13342	15202	16323	17264	16366	15742	12311	15421	16268	11819	12736	10515	15943	20041	20068
61	21208	23453	24602	24283	21607	18095	15622	14996	16886	17945	18699	18042	17447	13941	17056	17968	13407	14375	12132	17458	21687	21725
62	20256	22504	23616	23258	20570	17059	14583	13961	15846	16920	17753	17003	16412	12913	16026	16929	12490	13417	11193	16597	20655	20690
63	19139	21387	22504	22178	19518	16102	13546	12905	14827	15839	16636	15970	15465	11838	14954	15951	11868	12706	10529	16064	19590	19633
64	19598	21843	22998	22719	20080	16693	14116	13466	15403	16381	17090	16541	16058	12387	15504	16538	12437	13291	11105	16616	20143	20192
65	16931	19182	20263	19935	17304	14033	11355	10690	12660	13597	14437	13782	13415	9603	12720	13847	10489	11130	9090	14805	17361	17413
66	18300	20547	21685	21409	18788	15483	12839	12174	14139	15073	15794	15265	14858	11084	14200	15309	11587	12339	10217	15844	18843	18897
67	17389	19636	20778	20531	17938	14730	12010	11327	13327	14197	14883	14437	14116	10219	13334	14535	11178	11839	9784	15483	17980	18042
68	17728	19970	21164	20986	18428	15279	12521	11823	13848	14659	15216	14947	14669	10698	13809	15076	11749	12419	10358	16049	18456	18527
69	19707	21959	22900	22300	19493	15735	13481	12932	14680	15984	17240	15874	15071	11972	15053	15653	10799	11785	9533	14860	19631	19630
70	20563	22815	23859	23396	20649	17002	14644	14057	15875	17063	18071	17052	16344	13048	16151	16900	12150	13138	10887	16191	20759	20777
71	18603	20843	22048	21866	19293	16081	13372	12685	14689	15536	16089	15798	15463	11569	14682	15892	12282	13026	10910	16540	19328	19395
72	12800	14711	14470	12529	9305	4587	4376	4713	4657	7286	11147	5846	3890	5107	6351	4746	3582	2493	3285	6641	9729	9530
73	12029	14135	14371	13065	10048	6164	4142	3913	5150	7040	10002	6389	5526	3592	6038	6045	5192	4729	4160	9033	10292	10218
74	13768	15682	15428	13429	10190	5362	5344	5651	5611	8258	12091	6784	4672	5964	7322	5587	2613	1659	2393	5939	10637	10421
75	11994	14004	13994	12377	9247	4990	3680	3768	4370	6673	10169	5623	4321	3904	5686	4963	4556	3753	3849	8000	9573	9442
76	13320	15122	14666	12444	9183	4221	4997	5511	4921	7713	11848	5982	3561	6105	6852	4547	3368	1921	3597	5611	9688	9430
77	10882	12928	13031	11623	8591	4838	2731	2655	3693	5688	9005	4931	4241	2722	4688	4657	5740	4895	4990	9089	8843	8762
78	10370	12315	12211	10577	7473	3600	1953	2297	2575	4923	8710	3829	3023	2937	3956	3412	6014	4899	5535	8838	7776	7660
79	1941	3910	4669	5632	5338	8253	6509	6371	6520	3683	2041	5752	8535	6736	4541	7616	14463	13241	13957	16672	4696	5155
80	6369	7828	7186	5404	2573	3813	3538	4063	2679	1624	5863	1500	4206	5168	2113	3211	10790	9401	10601	12397	2653	2669
81	2771	4569	4914	5270	4574	7389	5794	5740	5709	2886	2633	4896	7685	6233	3796	6755	13725	12474	13269	15840	3977	4412
82	2754	2404	1580	3575	5167	9575	8835	8931	8421	5843	4851	7344	10037	9536	6839	9020	16584	15232	16273	18193	4411	4891
83	4671	5159	3773	2190	2375	7029	7022	7367	6275	4249	5707	5070	7561	8261	5204	6533	14343	12919	14194	15603	1620	2097
84	5235	5481	3772	1508	2303	7215	7517	7918	6674	4844	6405	5439	7787	8859	5770	6764	14644	13195	14557	15712	1633	2018
85	4281	5329	4540	3469	2515	6364	5883	6159	5281	3011	4776	4150	6820	7005	3991	5804	13431	12051	13194	14982	1854	2317
86	3221	3390	2320	2934	4139	8571	8009	8178	7505	5039	4880	6391	9048	8875	6042	8027	15664	14291	15398	17186	3381	3865
87	2279	3399	3391	4204	4491	8239	7122	7161	6839	4135	3480	5859	8629	7728	5113	7641	14970	13662	14592	16823	3766	4259
88	5825	7117	6331	4535	1948	4536	4402	4868	3573	2052	5661	2374	4990	5912	2799	3972	11663	10260	11492	13152	1849	1970
89	11316	13293	13229	11582	8454	4292	2938	3129	3575	5926	9567	4828	3644	3469	4948	4218	5115	4130	4543	8252	8778	8648
90	11324	13463	13817	12703	9786	6285	3784	3379	4959	6535	9229	6152	5696	2844	5545	6075	6081	5574	5041	9873	9969	9936
91	9972	11997	12081	10711	7723	4326	1791	1742	2863	4739	8159	4071	3809	2090	3738	4040	6529	5551	5873	9618	7944	7883
92	9986	12102	12418	11343	8488	5425	2482	1985	3774	5139	7969	4900	4925	1567	4152	5104	6933	6155	6073	10359	8632	8624
93	12123	14182	14289	12813	9730	5622	3976	3908	4826	6947	10194	6080	4963	3819	5947	5557	4713	4112	3817	8408	10019	9914
94	2027	1925	2053	4282	5599	9765	8752	8772	8455	5766	4232	7442	10188	9287	6742	9186	16596	15279	16223	18374	4840	5333
95	11002	12841	12512	10559	7350	2871	2676	3270	2694	5414	9525	3867	2203	4070	4530	2882	5473	4177	5264	7861	7756	7568
96	10384	12180	11798	9822	6615	2292	2222	2960	1991	4770	9003	3136	1685	3940	3929	2206	6175	4837	6000	8344	7019	6832
97	1609	2418	2836	4545	5352	9224	8024	8008	7798	5055	3509	6838	9612	8493	6014	8625	15910	14616	15502	17806	4606	5103
98	4328	5928	5721	4999	3370	5823	4609	4759	4280	1622	3960	3358	6150	5519	2623	5198	12409	11101	12054	14333	2942	3279
99	5037	6468	5948	4680	2620	5175	4448	4758	3876	1658	4795	2807	5561	5672	2595	4573	12038	10681	11771	13755	2300	2567
100	3425	4378	3748	3461	3342	7294	6578	6756	6101	3611	4296	5021	7733	7489	4613	6723	14264	12907	13976	15909	2619	3111
101	2044	3656	4058	4909	4829	8145	6714	6672	6571	3776	2758	5689	8482	7151	4710	7525	14631	13364	14192	16662	4148	4624
102	3993	5302	4836	4107	2993	6331	5492	5691	5028	2537	4208	3982	6732	6472	3538	5738	13190	11845	12890	14924	2404	2831
103	3790	4334	3250	2711	3184	7574	7170	7408	6581	4252	4977	5436	8062	8194	5247	7038	14725	13336	14496	16186	2425	2918
104	2430	2864	2485	3727	4686	8834	7947	8026	7579	4953	4170	6537	9267	8624	5945	8260	15736	14401	15399	17448	3929	4425
105	2940	4422	4400	4532	4006	7278	6044	6095	5786	3058	3300	4848	7634	6701	4036	6664	13901	12603	13515	15824	3360	3819
106	11815	13734	13535	11694	8502	4005	3390	3739	3745	6315	10166	4964	3320	4214	5372	4052	4566	3450	4184	7490	8887	8714
107	11188	13280	13498	12217	9230	5554	3285	3042	4351	6167	9202	5574	4954	2803	5165	5370	5748	5080	4843	9350	9453	9392

Project: Halsua 20190717 -  
Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 21.07/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS\_Halsua 20190717\_9.w2r (12)

Area type with hard ground: Halsua\_vesistöt

Ground factor for hard ground: 0,0

Meteorological coefficient, CO:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Fixed penalty added to source noise of WTGs with pure tones

WTG catalogue

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in model has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: NORDEX N131/3000 3000 131.0 !O!

Noise: Mode 0 - 104.5 dB(A) - R00

Source	Source/Date	Creator	Edited
NORDEX	3.12.2013	USER	27.4.2021 16.27
F008_246_A03_R00,	21.11.2013		

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	Penalty	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	165,0	8,0	104,5	Yes	2,0	82,9	90,0	94,8	96,4	99,3	98,2	95,8	85,7

WTG: GE WIND ENERGY 5.3-158MW HH221 5300 158.0 !O!

Noise: 5.3-158 106.0 +2 dB HH221

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	27.4.2021 16.30

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	Penalty	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	221,0	8,0	106,0	Yes	2,0	87,2	92,6	97,2	99,6	101,3	99,1	91,7	76,0

Noise sensitive area: A Lomarakennus A (Kuuslammentie)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 21.07/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

Noise sensitive area: B Lomarakennus B (Loukkukoskentie 700)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Loukkukoskentie, Mantyla)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: D Lomarakennus D (Purola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Kannistontie 557)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Lestijarventie 1468)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Asuinrakennus G (Hautakoskentie 455)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: H Asuinrakennus H (Hautakoskentie 544)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Hautakoskentie 289)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakennus J (Katajarventie 49)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 21.07/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: K Lomarakennus K (Silostenlampi)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: L Lomarakennus L (Harjunpaantie 215)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: M Lomarakennus M (Hakala, Iso-Mottonen)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: N Lomarakennus N (Hautakoski)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: O Lomarakennus O (Harjunpaantie 398)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: P Asuinrakennus P (Hautakoskentie 135)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: Q Lomarakennus Q (Lemmistonrannantie)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Noise sensitive area: R Lomarakennus R (Peuraneva,Valvatintie)

Predefined calculation standard:  
Immission height(a.g.l.): Use standard value from calculation model  
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)  
No distance demand

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
27.4.2021 21.07/3.4.388

## DECIBEL - Assumptions for noise calculation

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427

Noise sensitive area: S Lomarakennus S (Talonpaikantie 141)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakennus T (Ruipontie)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: U Lomarakennus U (Kannistontie, Kivioja)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: V Asuinrakennus V (Kannistontie 586)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

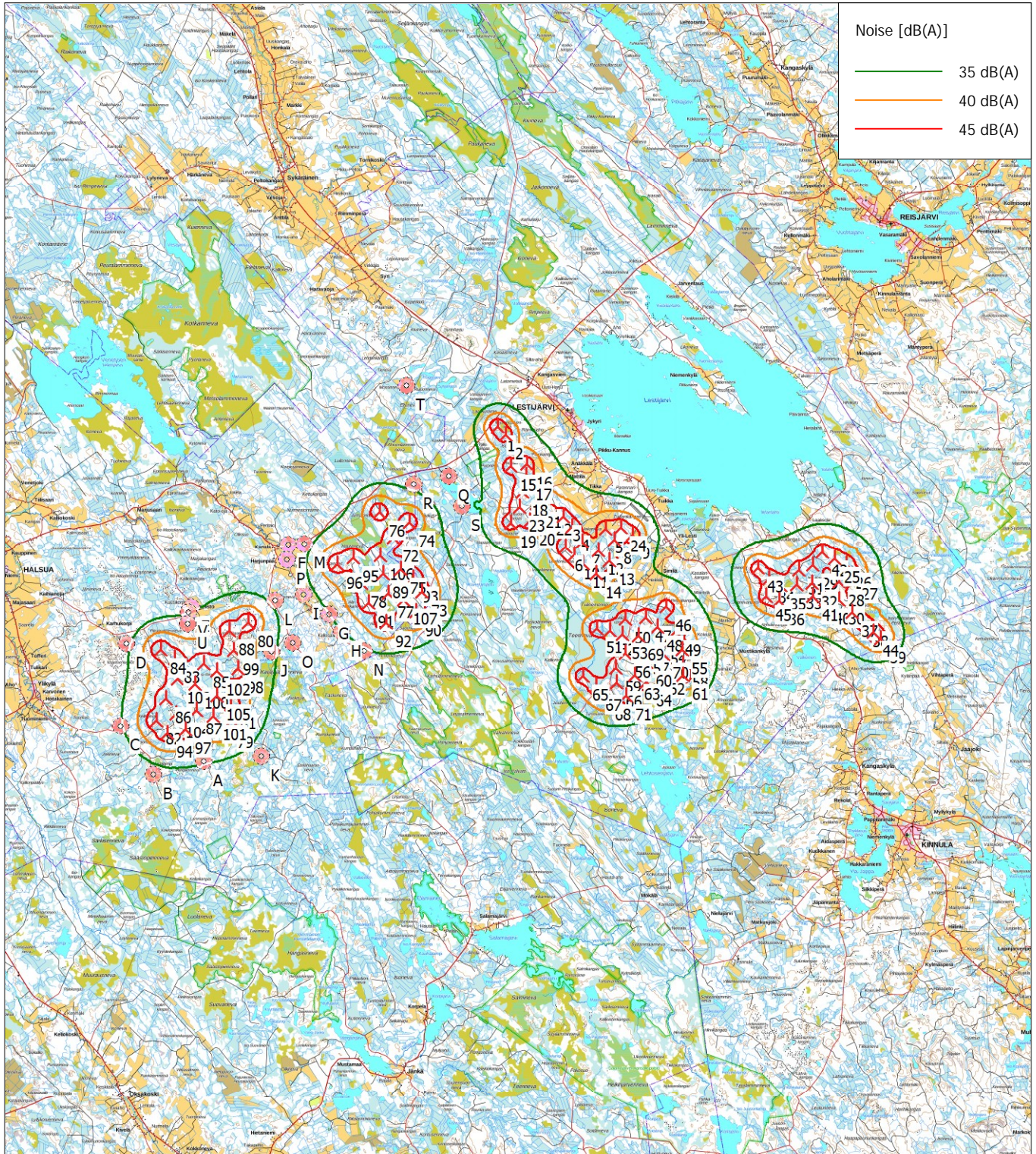
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

## DECIBEL - Map 8,0 m/s

Calculation: Halsua\_GE158 5.3MWx36xHH221\_106.0dB+2.0dB+yhteisvaikutukset\_20210427



0 2,5 5 7,5 10km

Map: aastokarttarasteri 100K , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 381 565 North: 7 039 015

New WTG

Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s  
Height above sea level from active line object

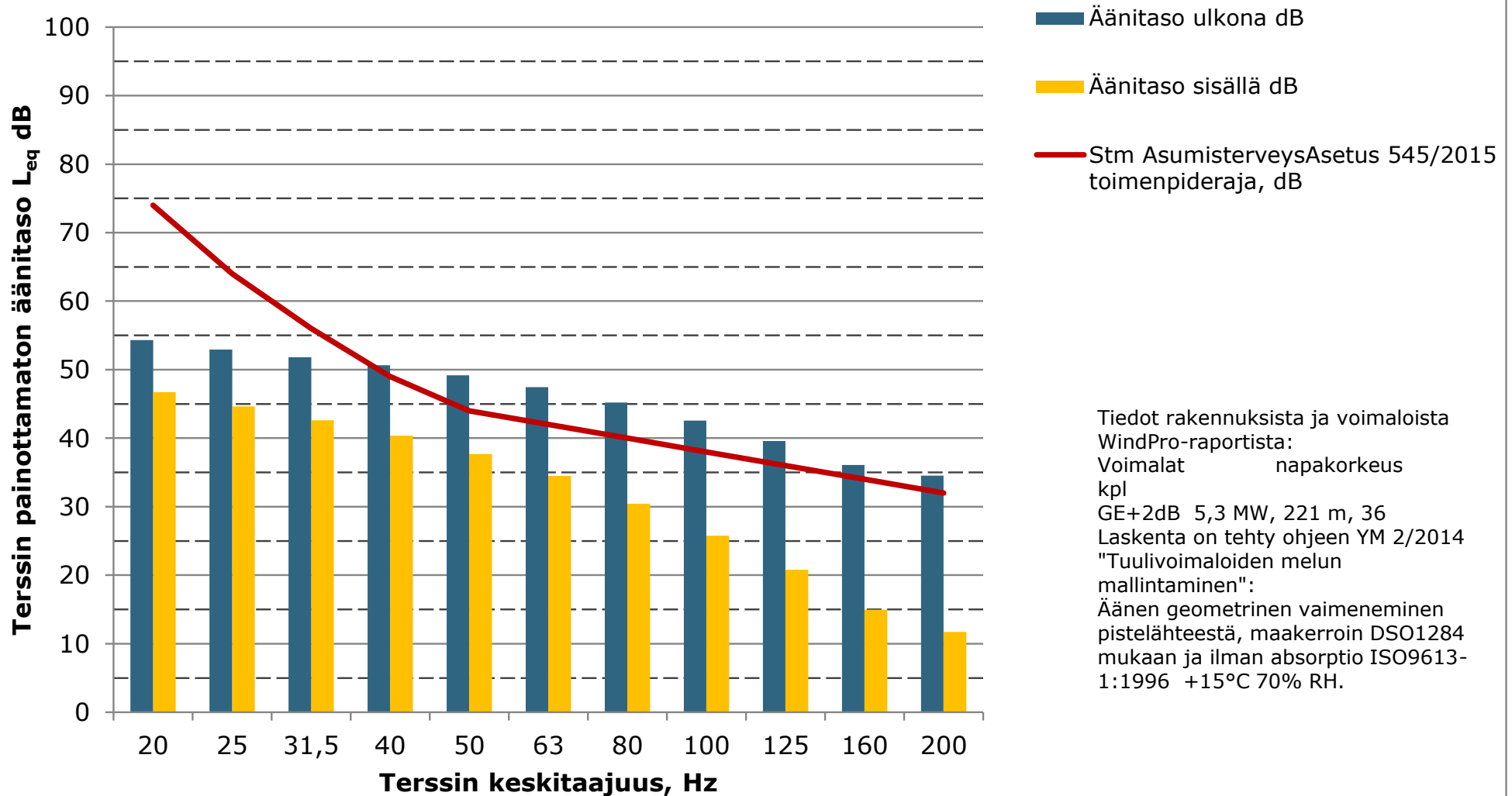
29.4.2021

---

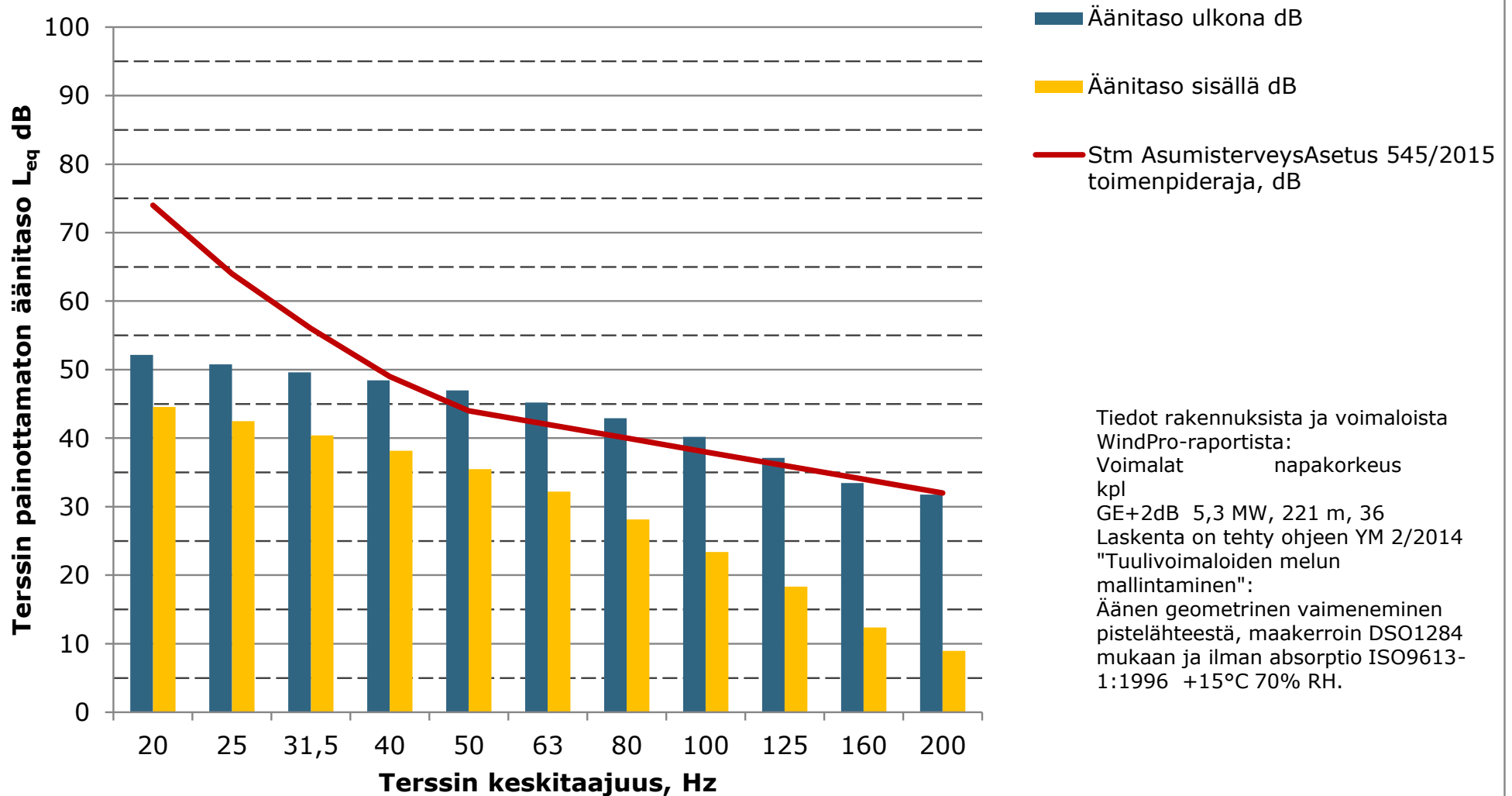
**Liite 3: Halsuan tuulivoimahanke – Matalataajuisen melun rakennuskohtaiset arvot**



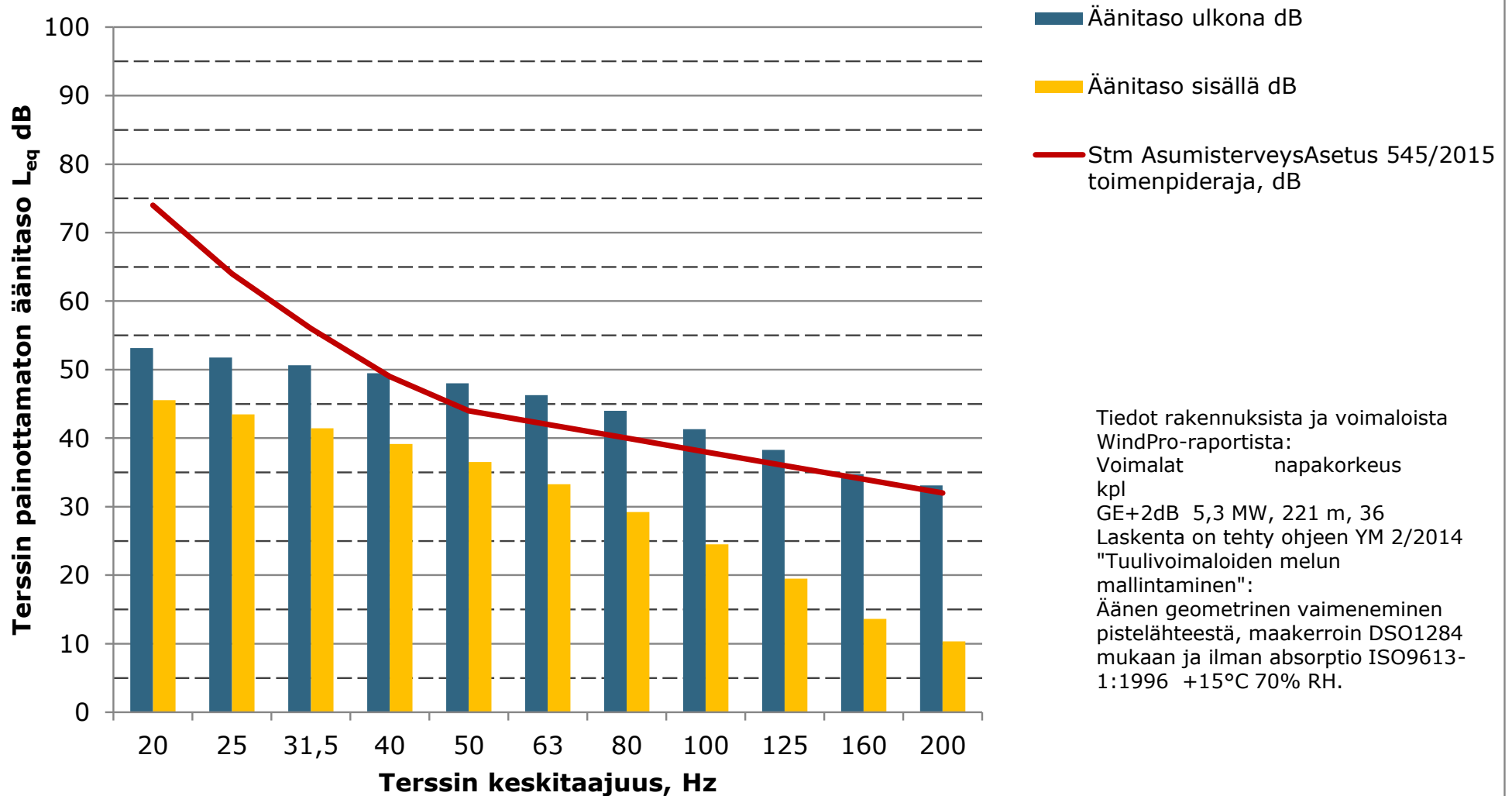
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus A  
(Kuuslammentie), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

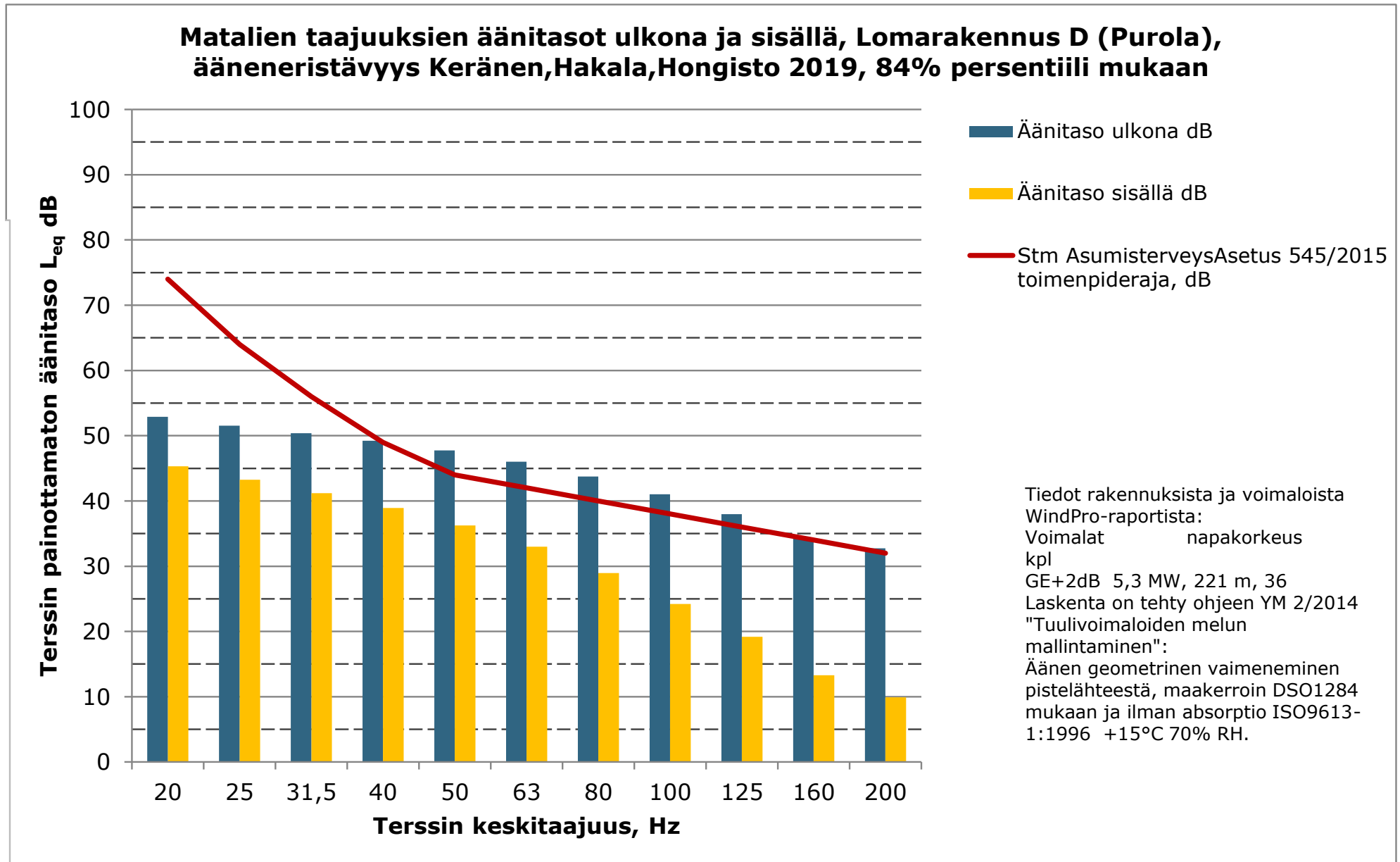


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus B  
(Loukkukoskentie 700), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

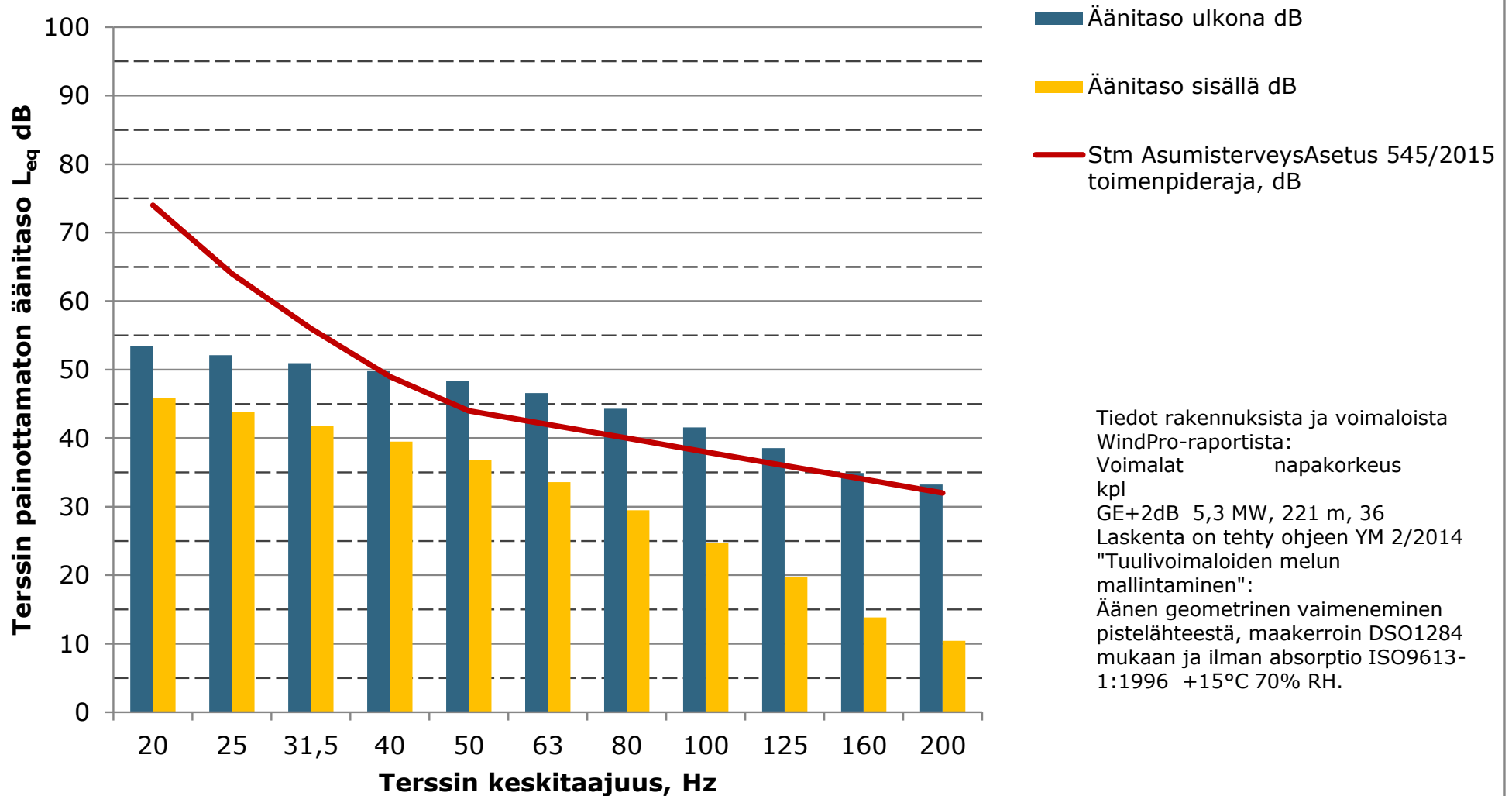


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C  
(Loukkukoskentie, Mantyla), ääneneristävyys Keränen, Hakala, Hongisto 2019,  
84% persenttiili mukaan**

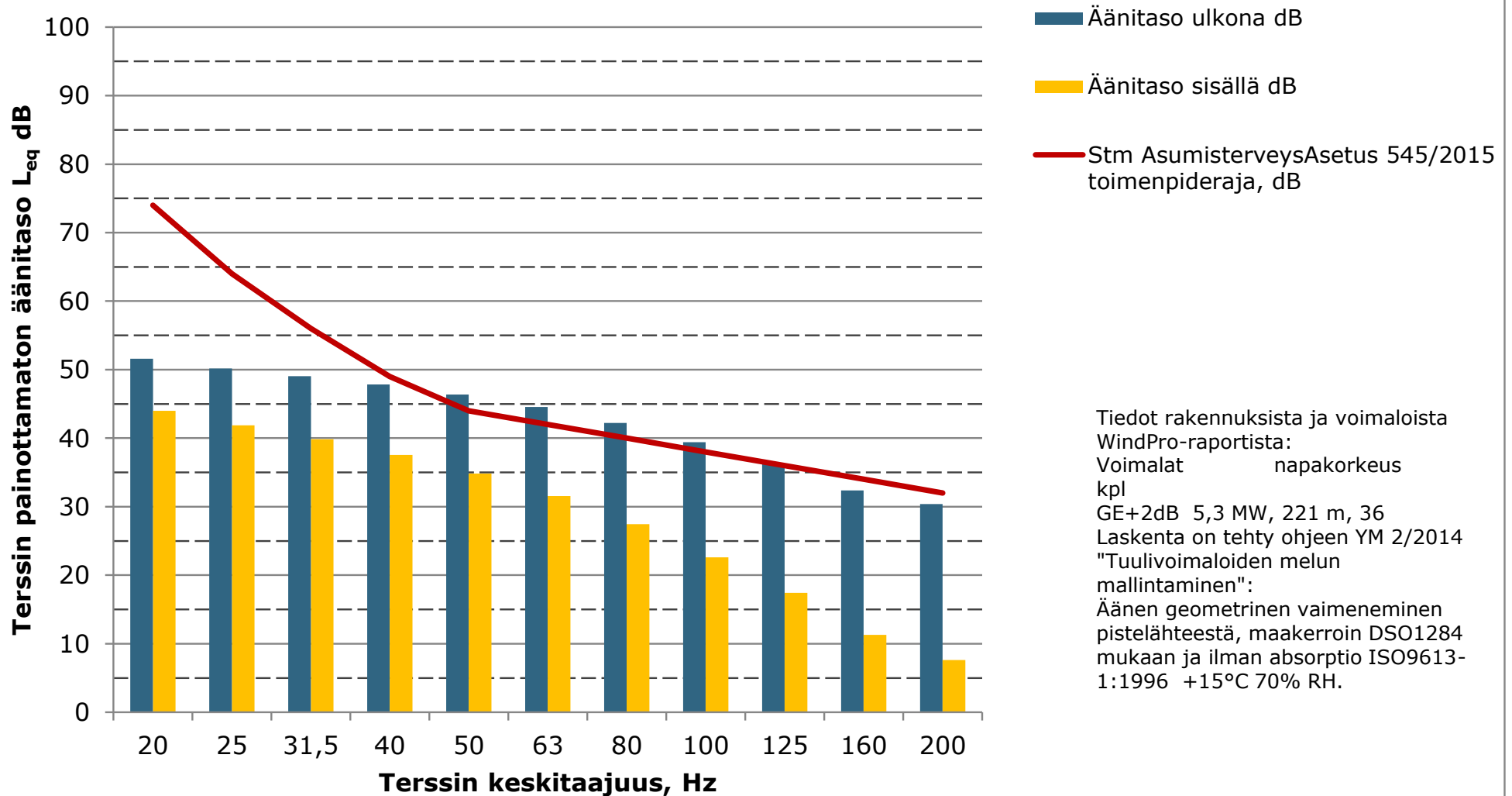




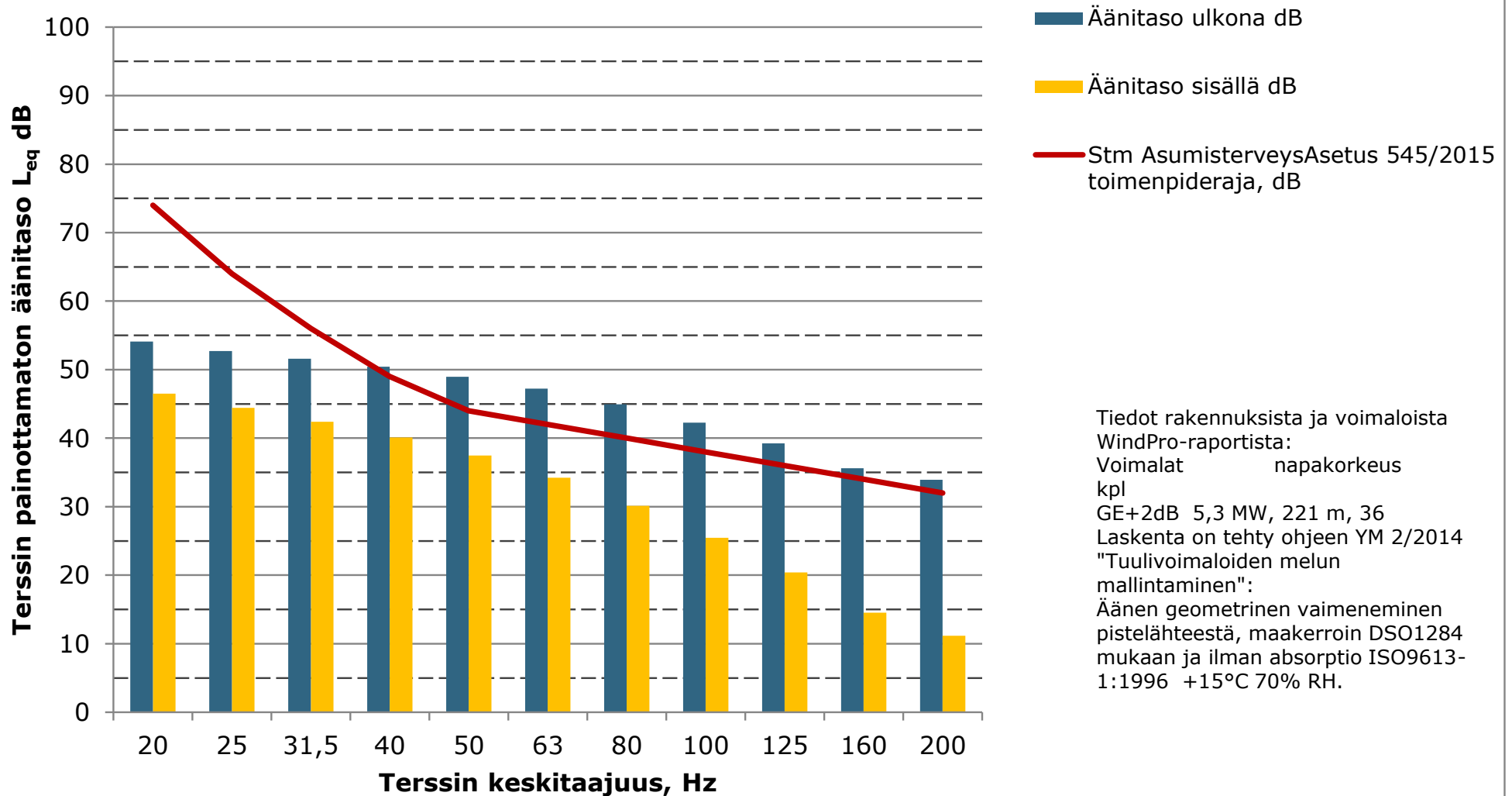
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E  
(Kannistontie 557), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**



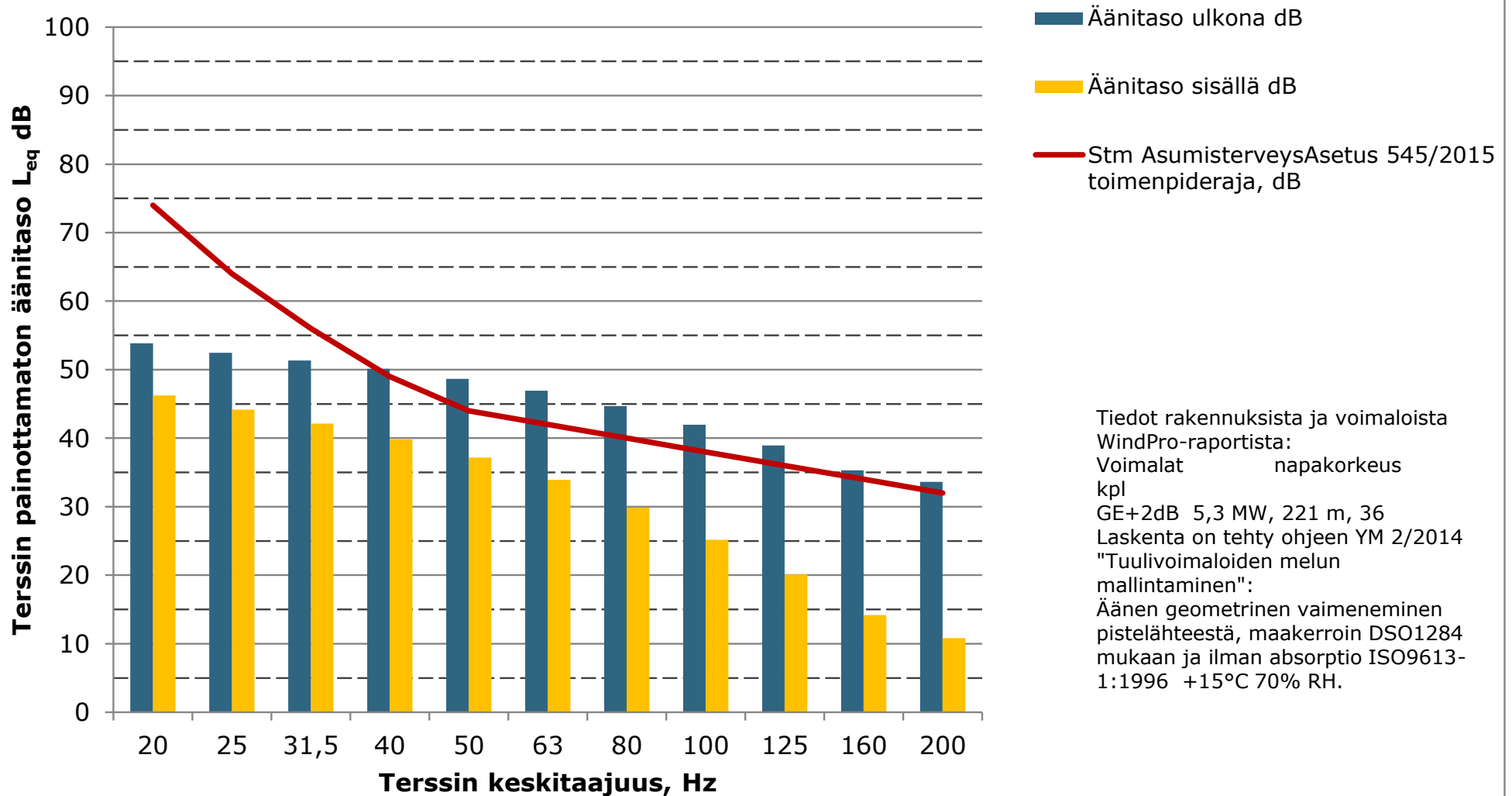
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F  
(Lestijarventie 1468), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus G  
(Hautakoskentie 455), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

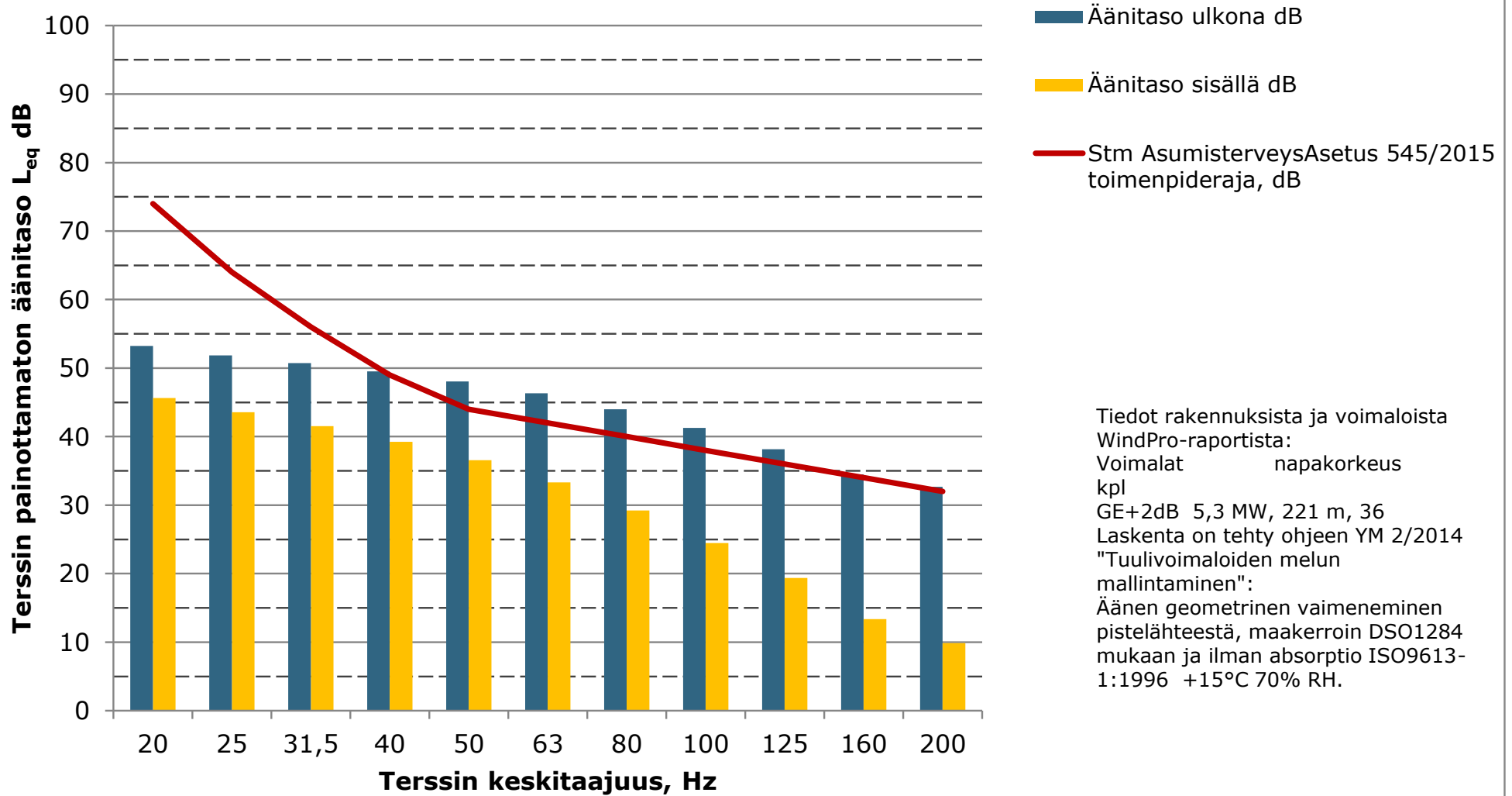


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H  
(Hautakoskentie 544), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



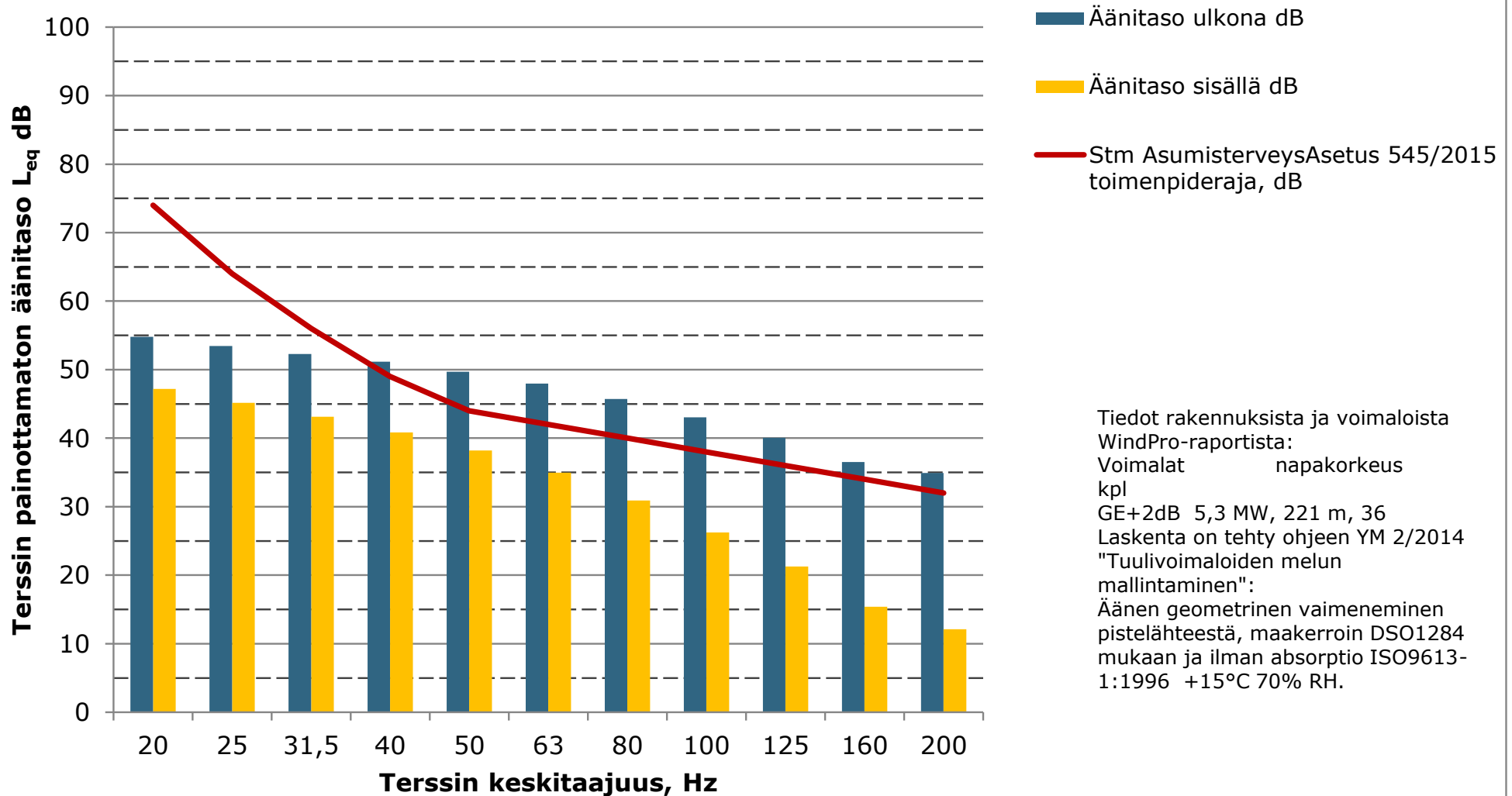


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus I  
(Hautakoskentie 289), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

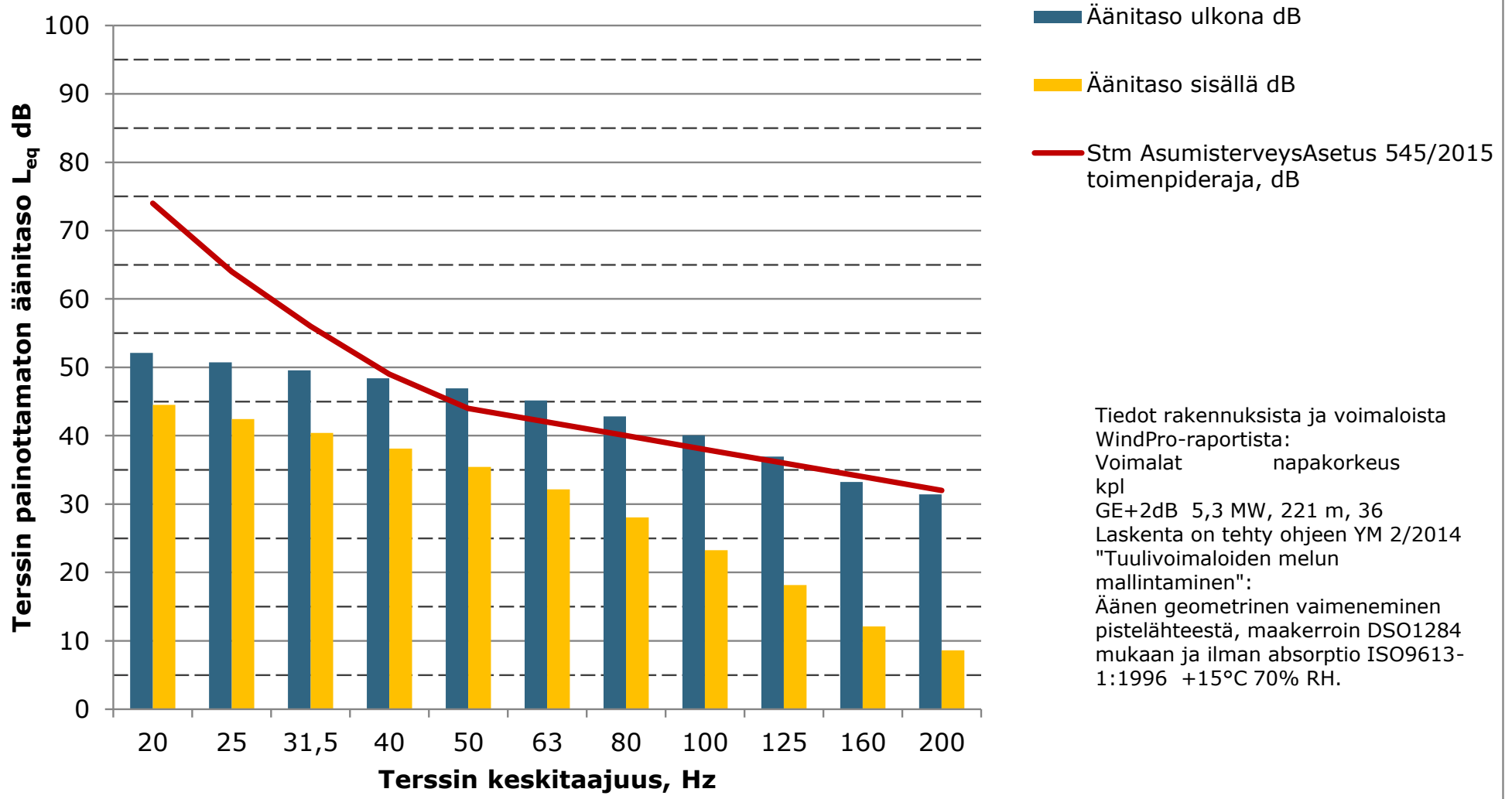


Tiedot rakennuksista ja voimaloista  
WindPro-raportista:  
Voimalat                  napakorkeus  
kpl  
GE+2dB 5,3 MW, 221 m, 36  
Laskenta on tehty ohjeen YM 2/2014  
"Tuulivoimaloiden melun  
mallintaminen":  
Äänen geometrinen vaimeneminen  
pistelähteestä, maakerroin DSO1284  
mukaan ja ilman absorptio ISO9613-  
1:1996 +15°C 70% RH.

**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J  
(Katajajarventie 49), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

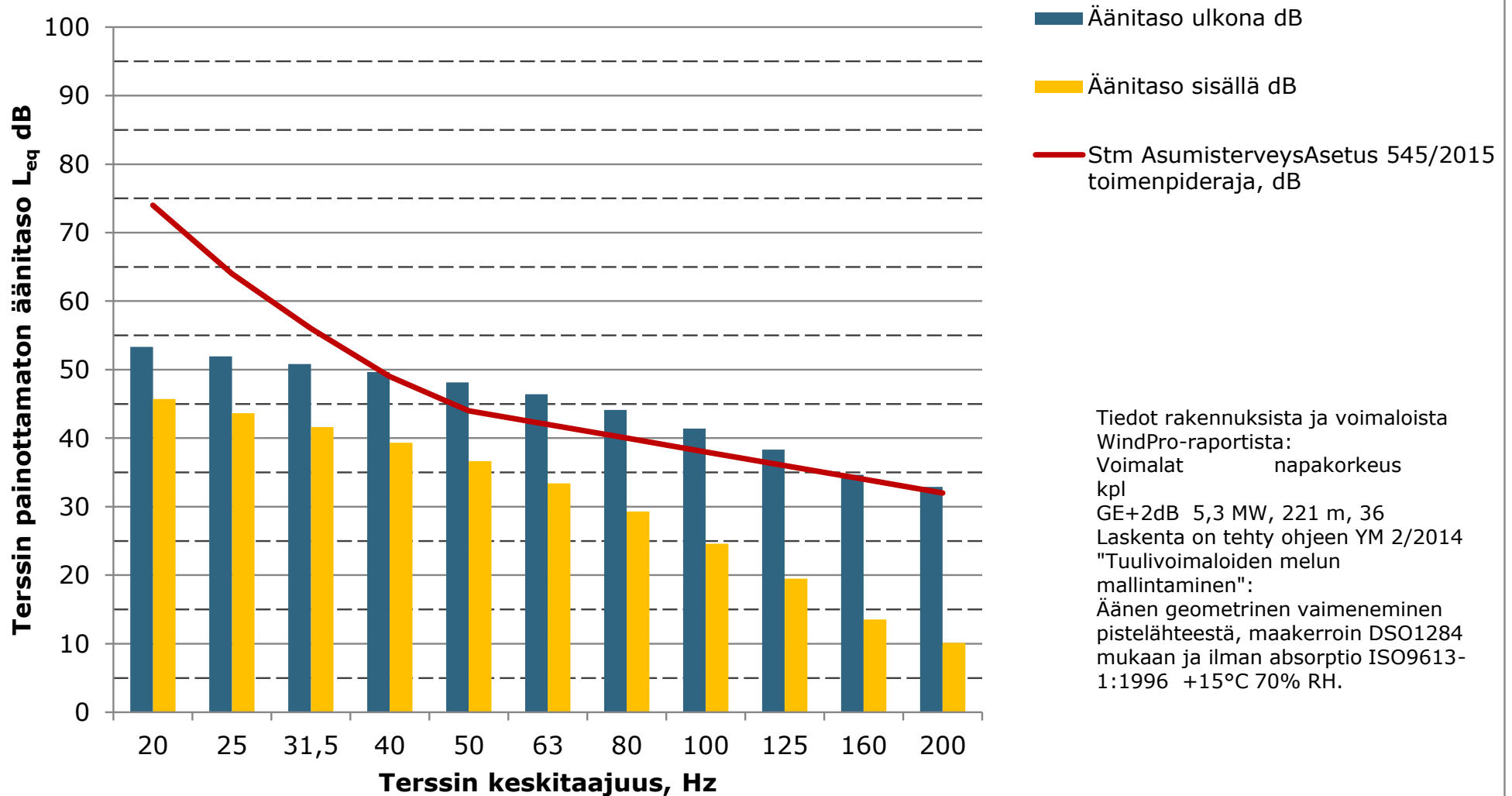


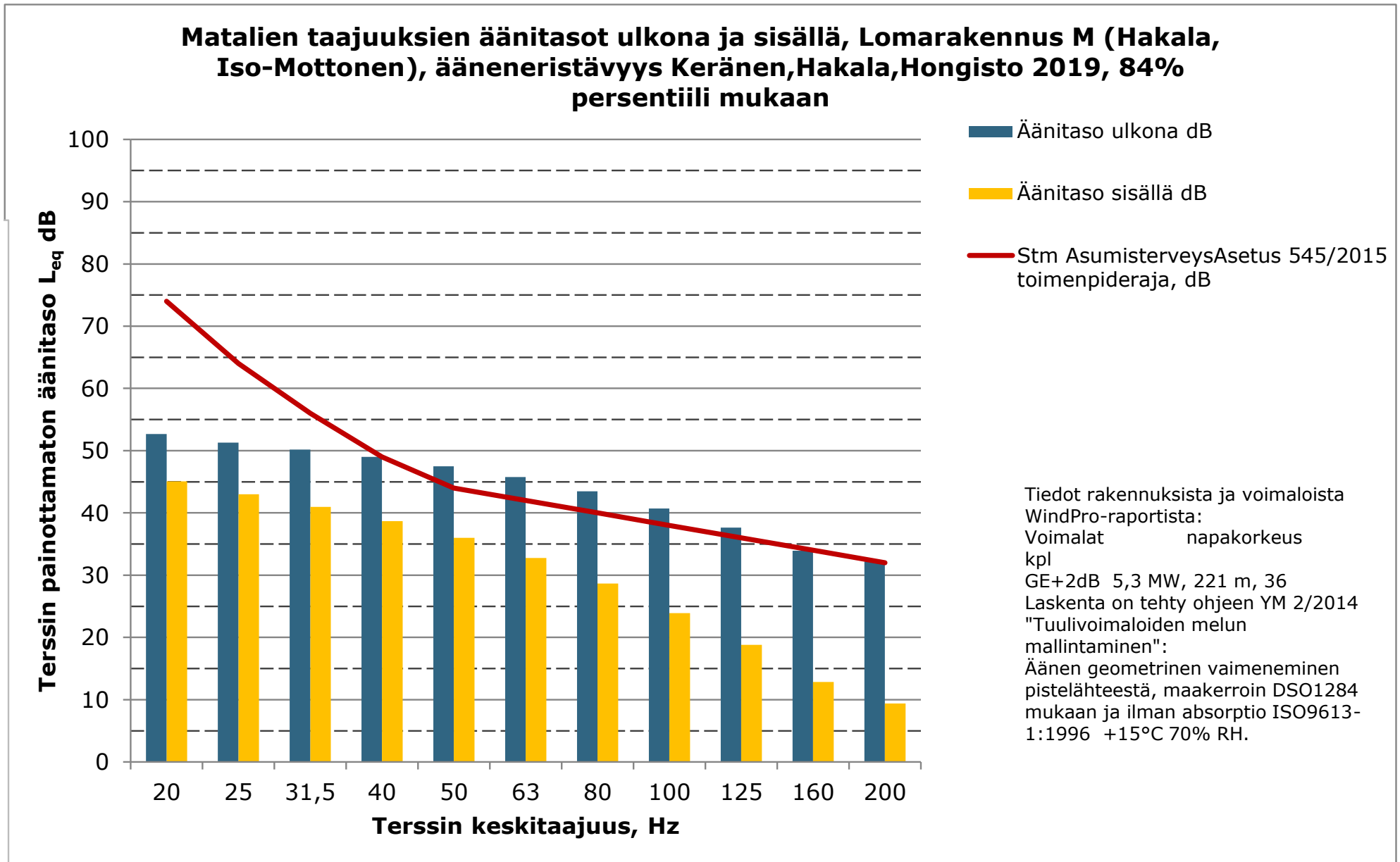
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus K (Silostenlampi), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



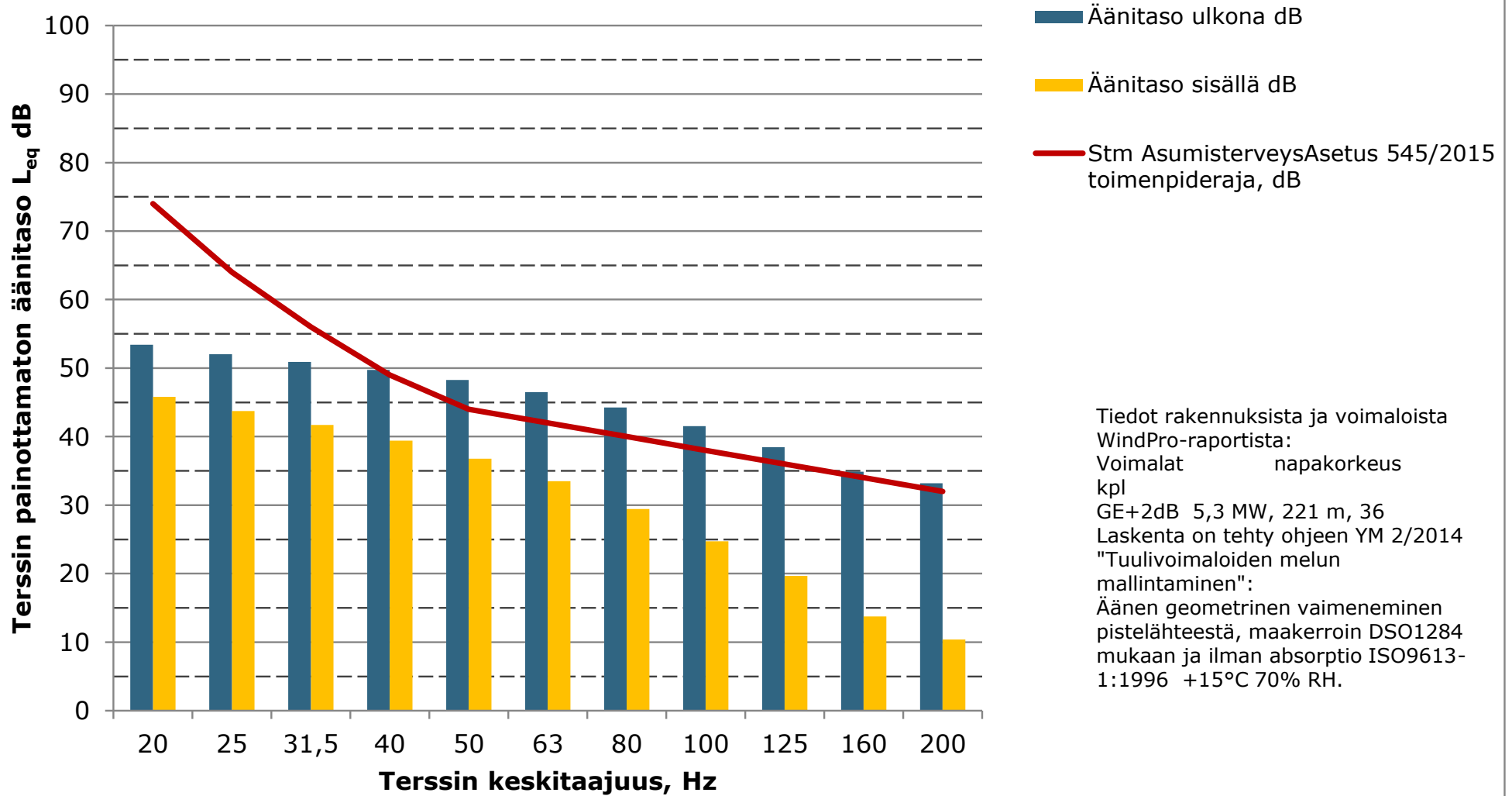
Tiedot rakennuksista ja voimaloista WindPro-raportista:  
 Voimalat napakorkeus  
 kpl  
 GE+2dB 5,3 MW, 221 m, 36  
 Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":  
 Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus L  
(Harjunpaantie 215), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

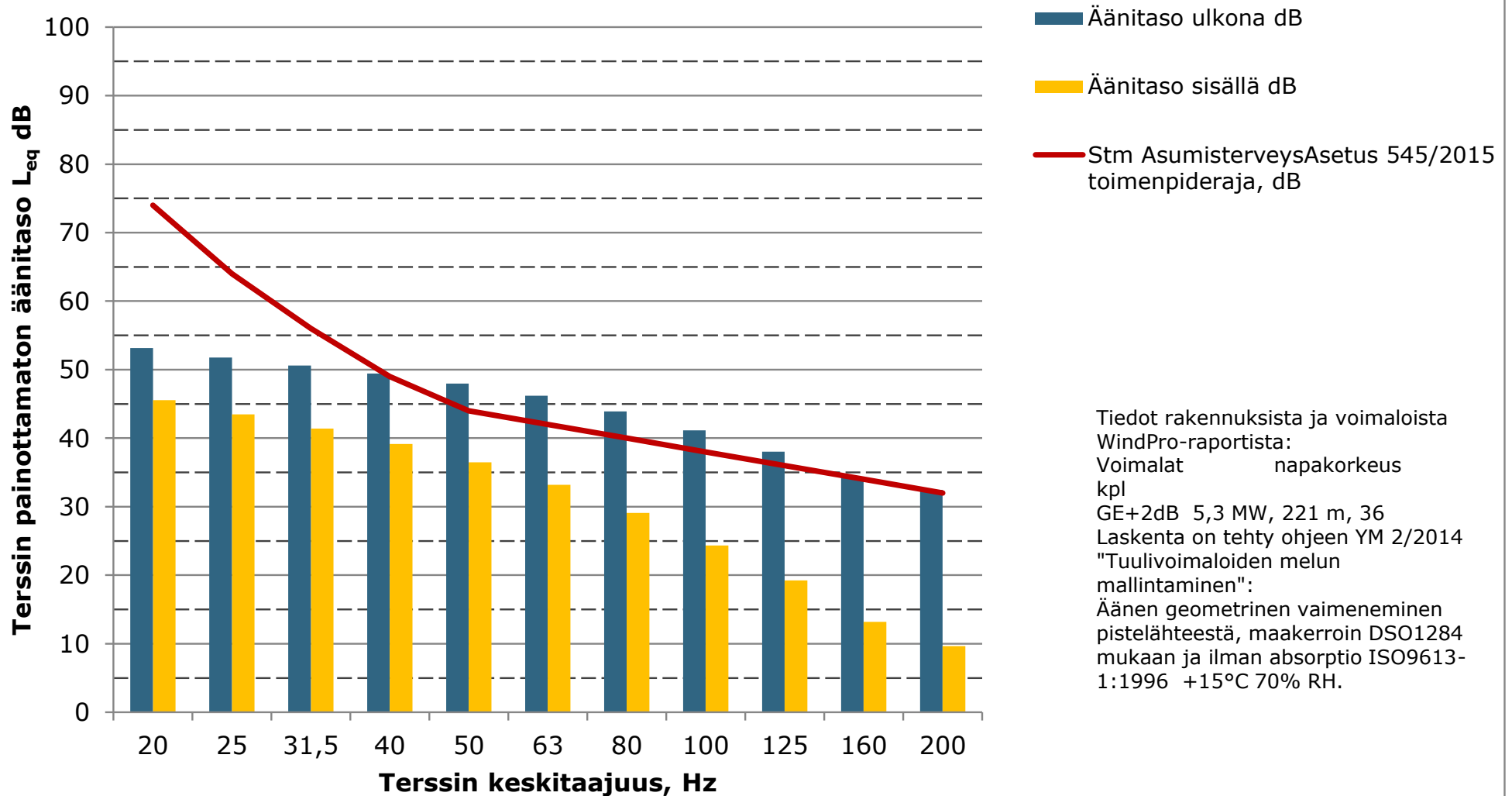




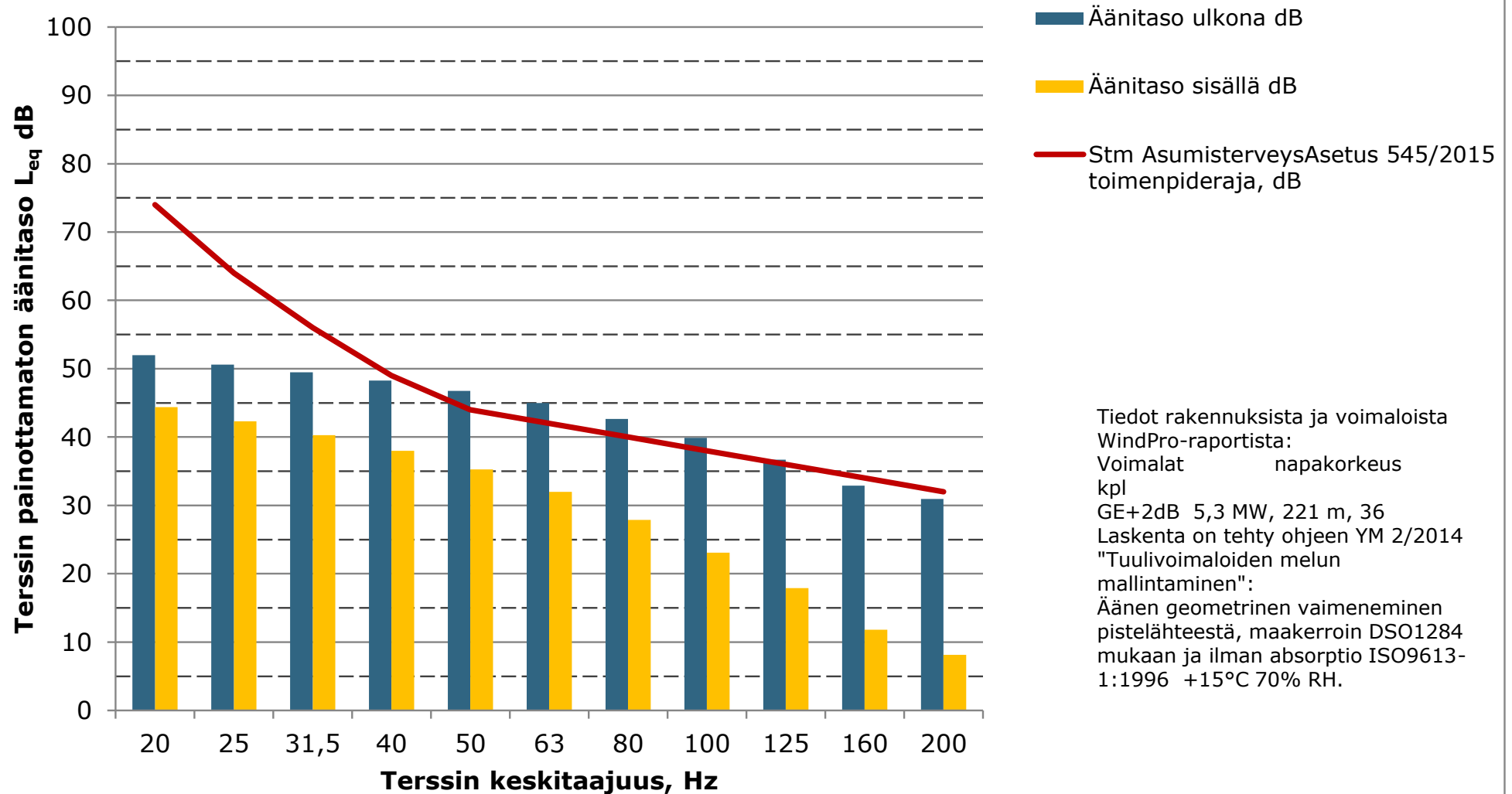
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N (Hautakoski), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus O  
(Harjunpaantie 398, ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

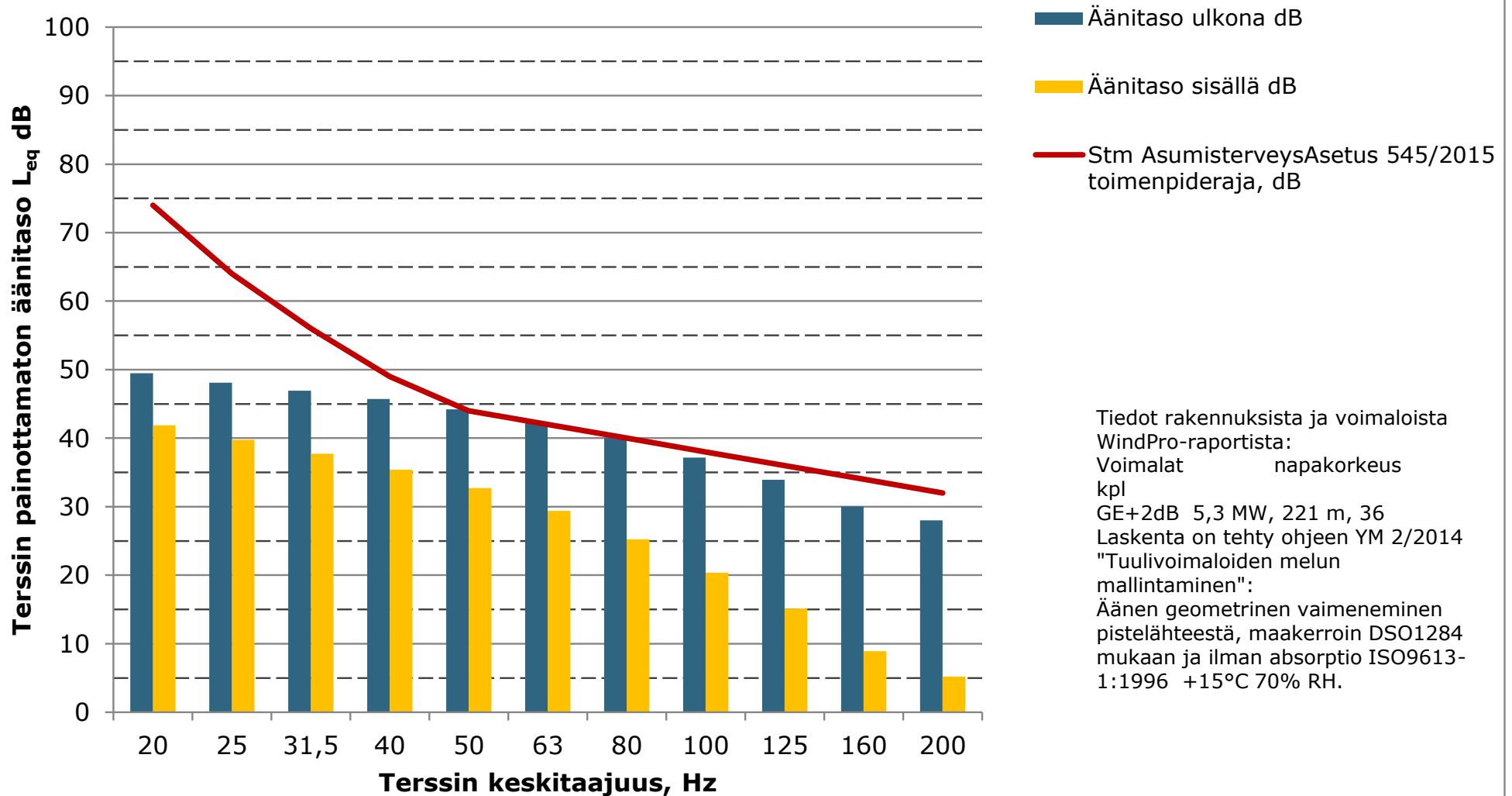


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Hautakoskentie 135), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

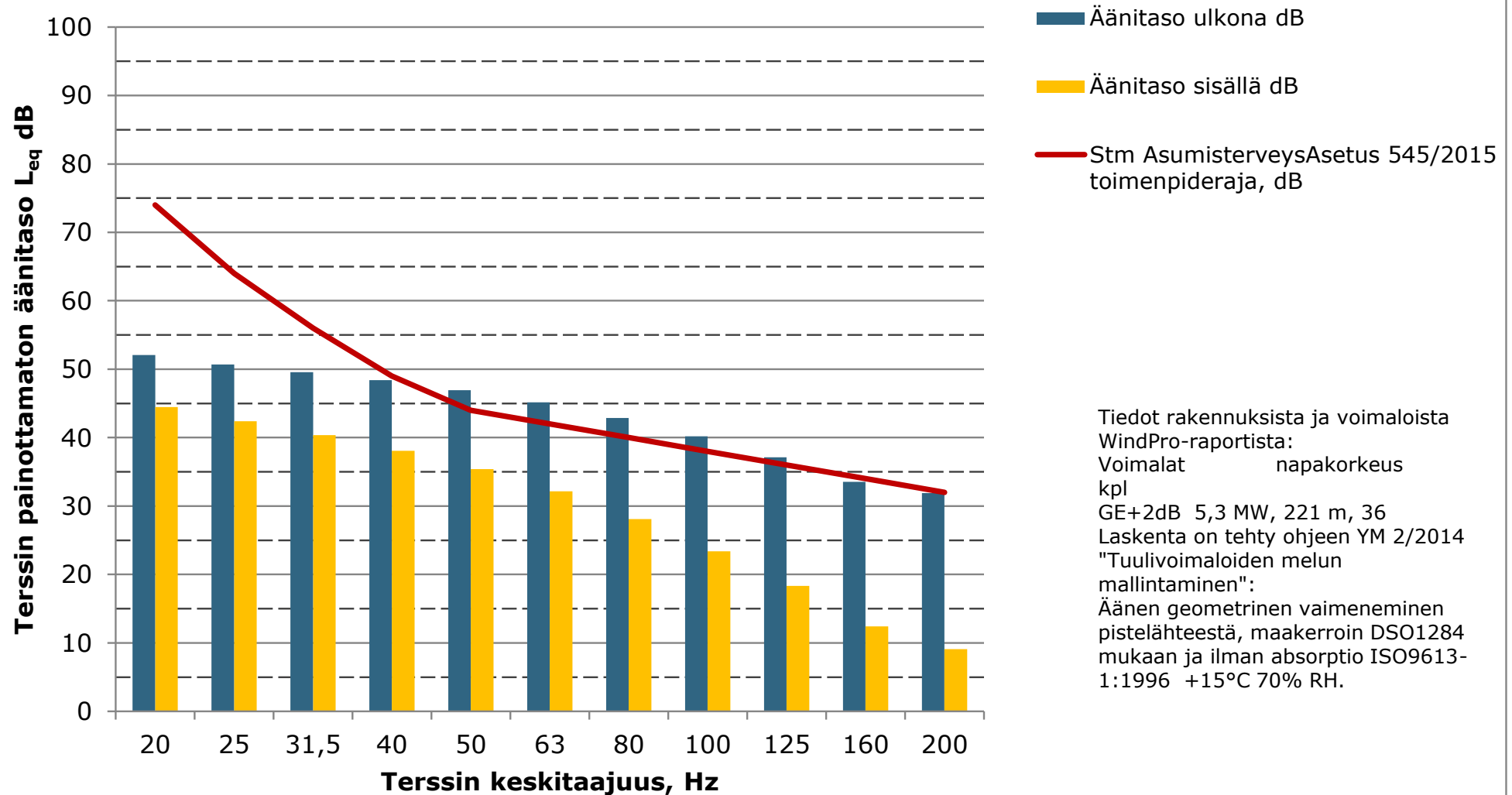




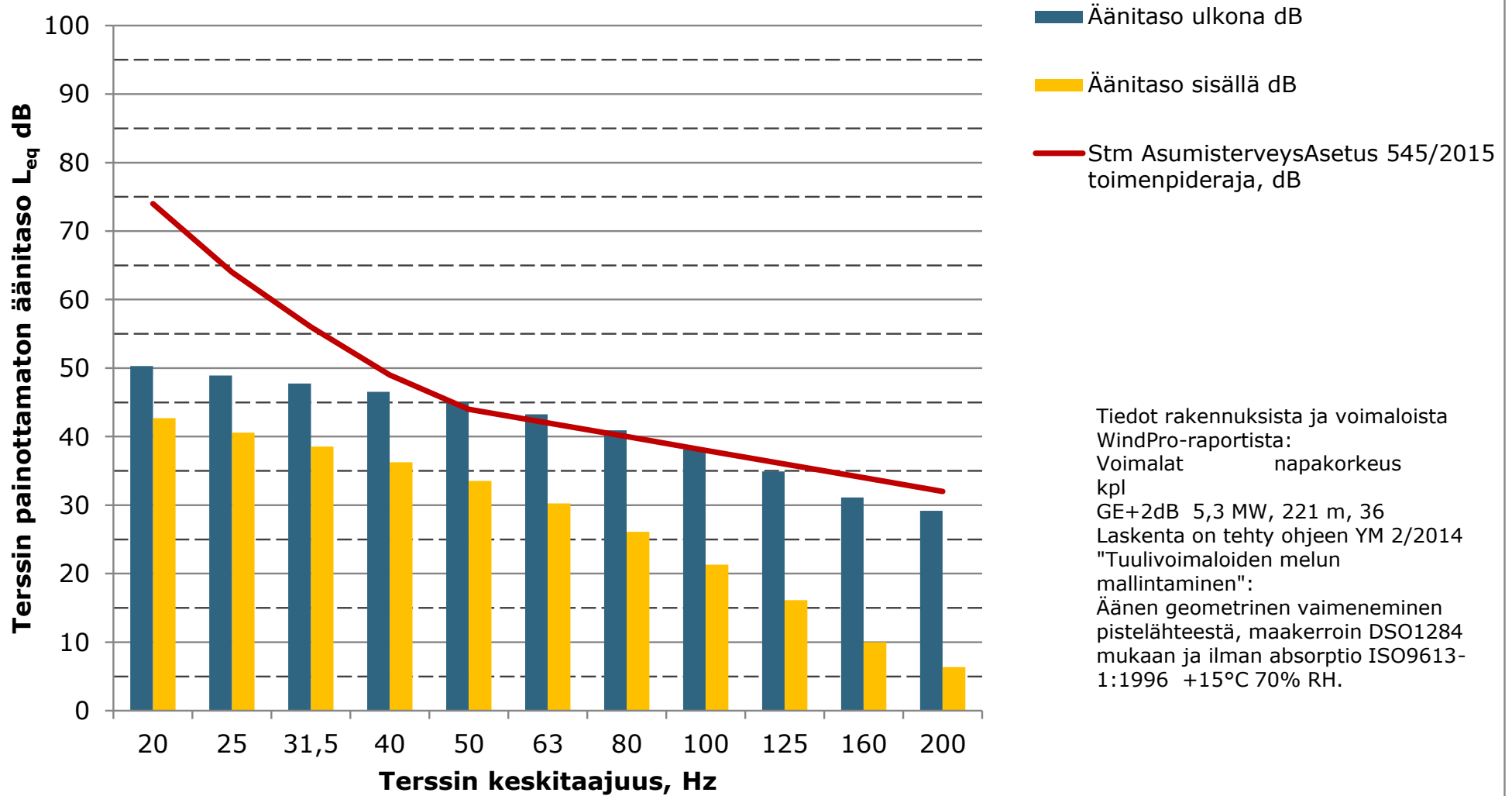
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus Q  
(Lemmistonrannantie), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

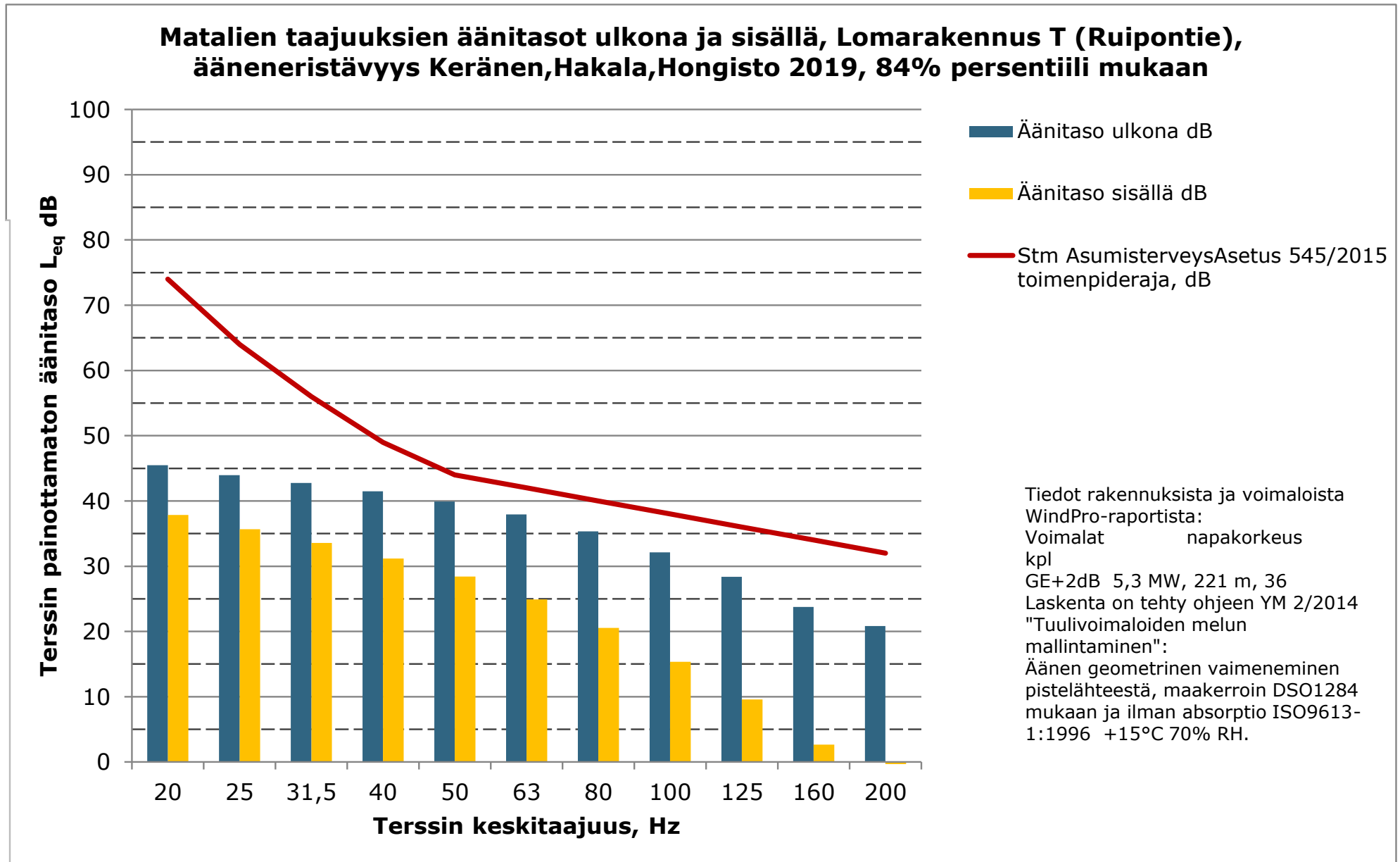


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R  
(Peuraneva,Valvatintie), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

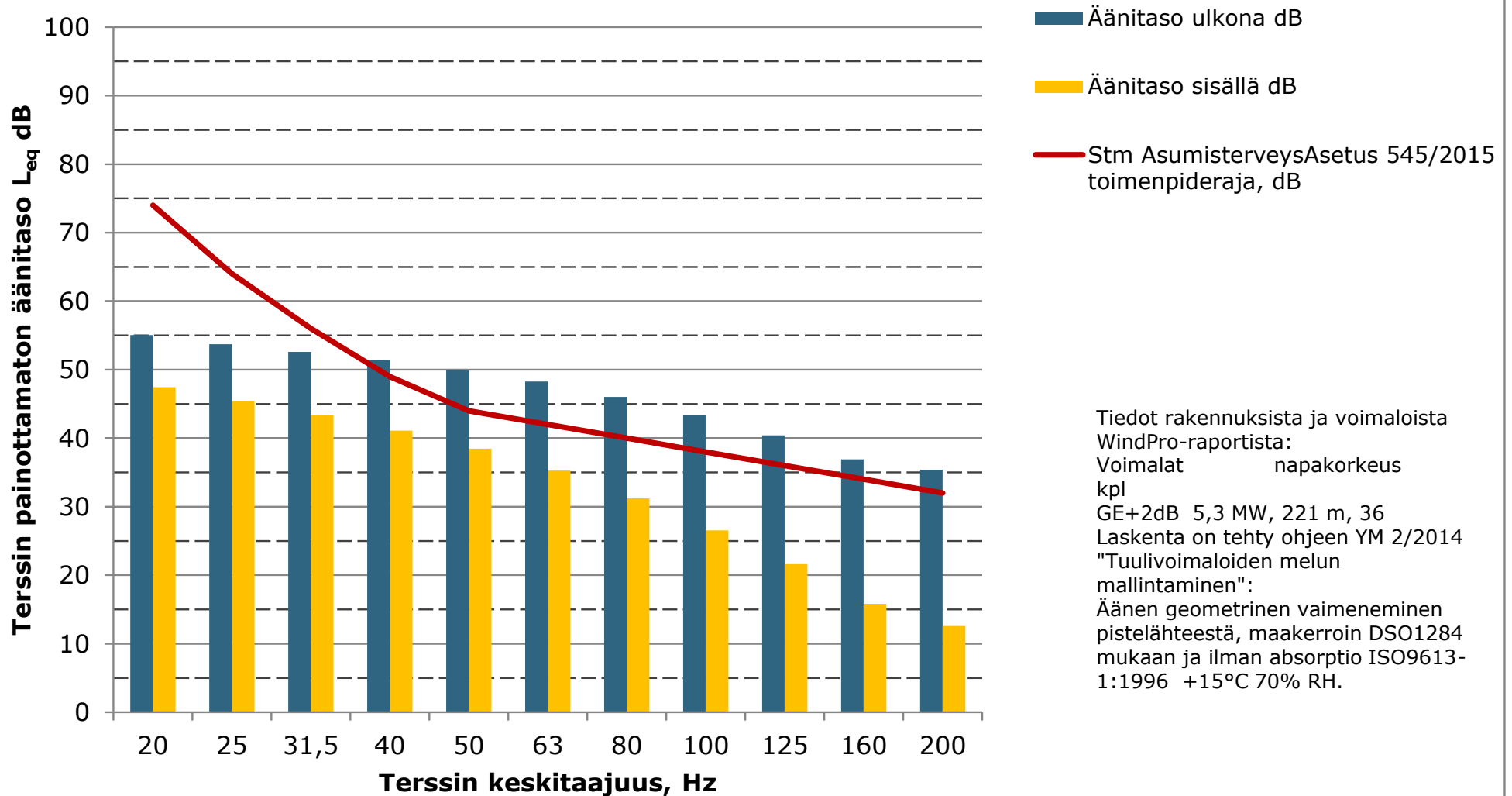


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus S  
(Talonpaikantie 141), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

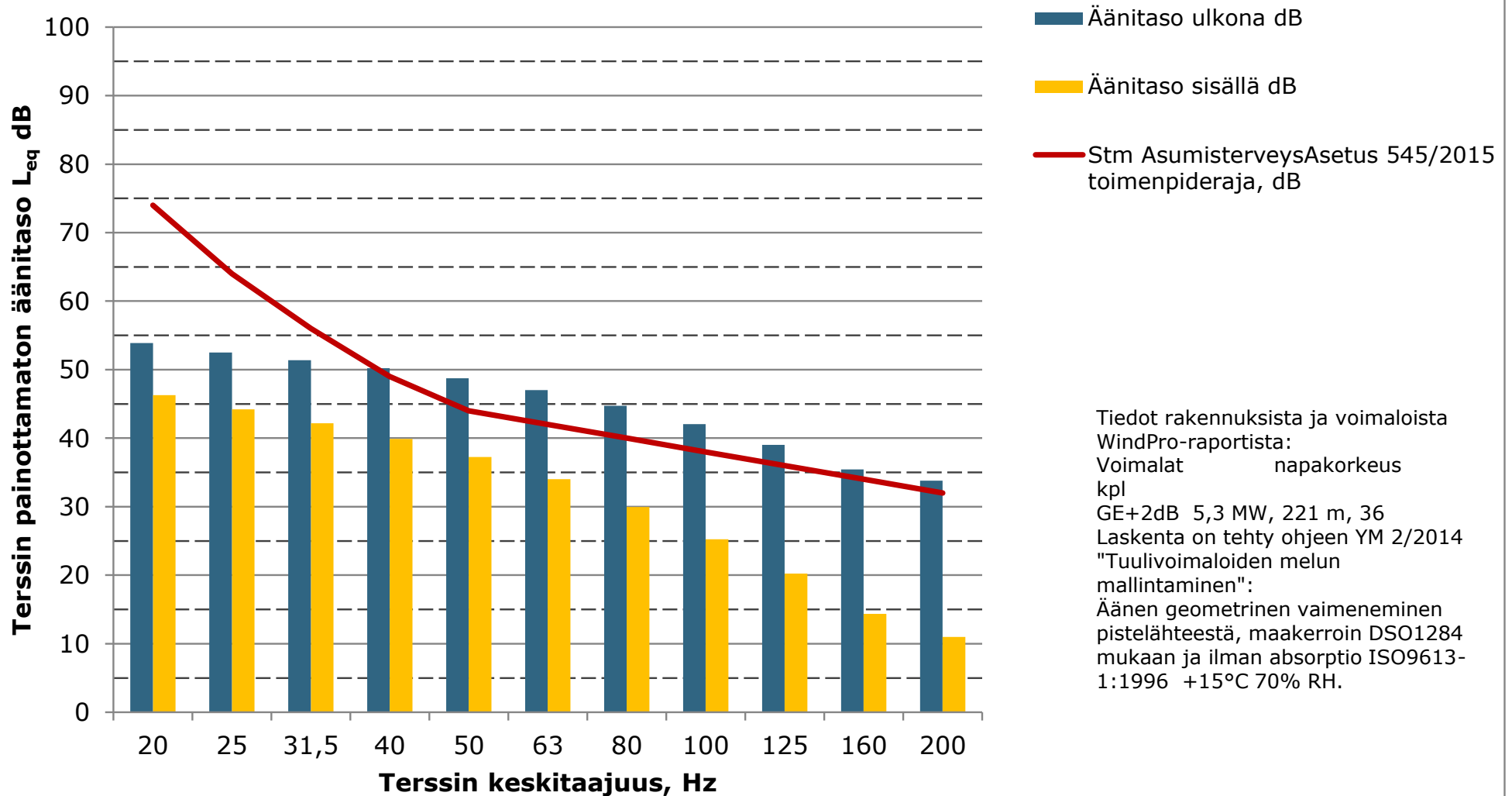


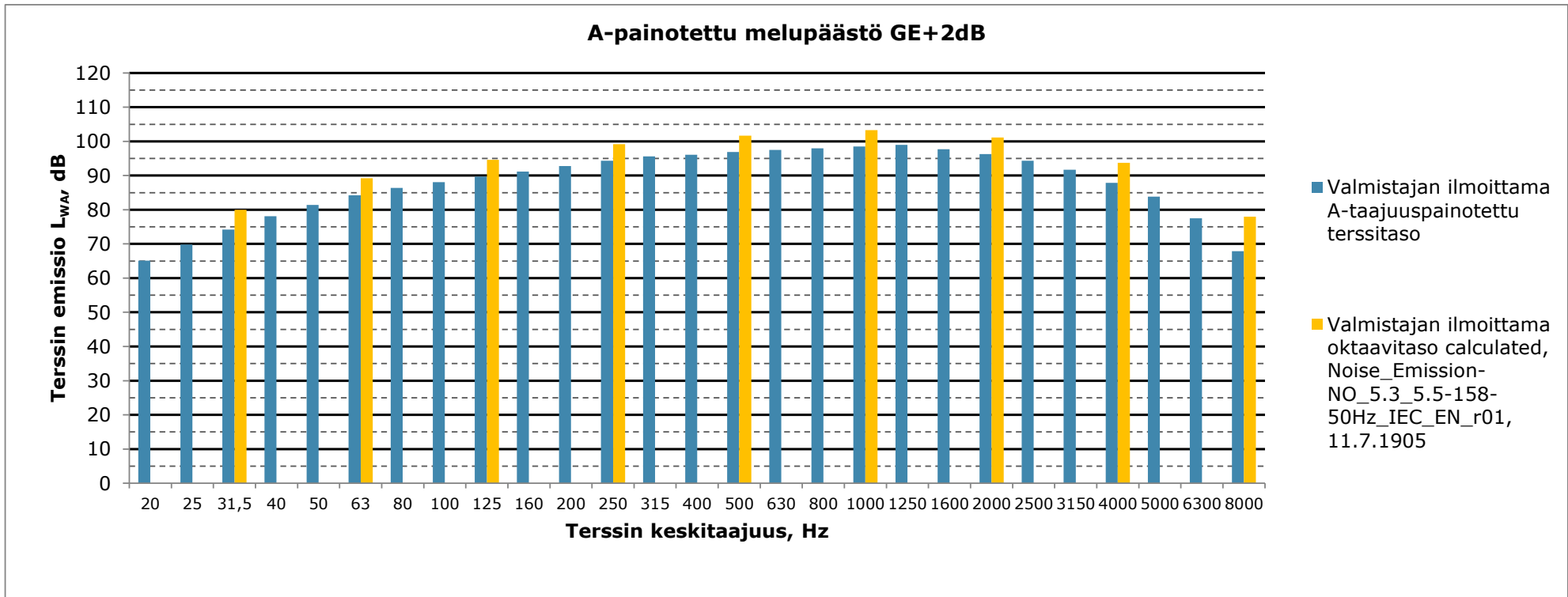


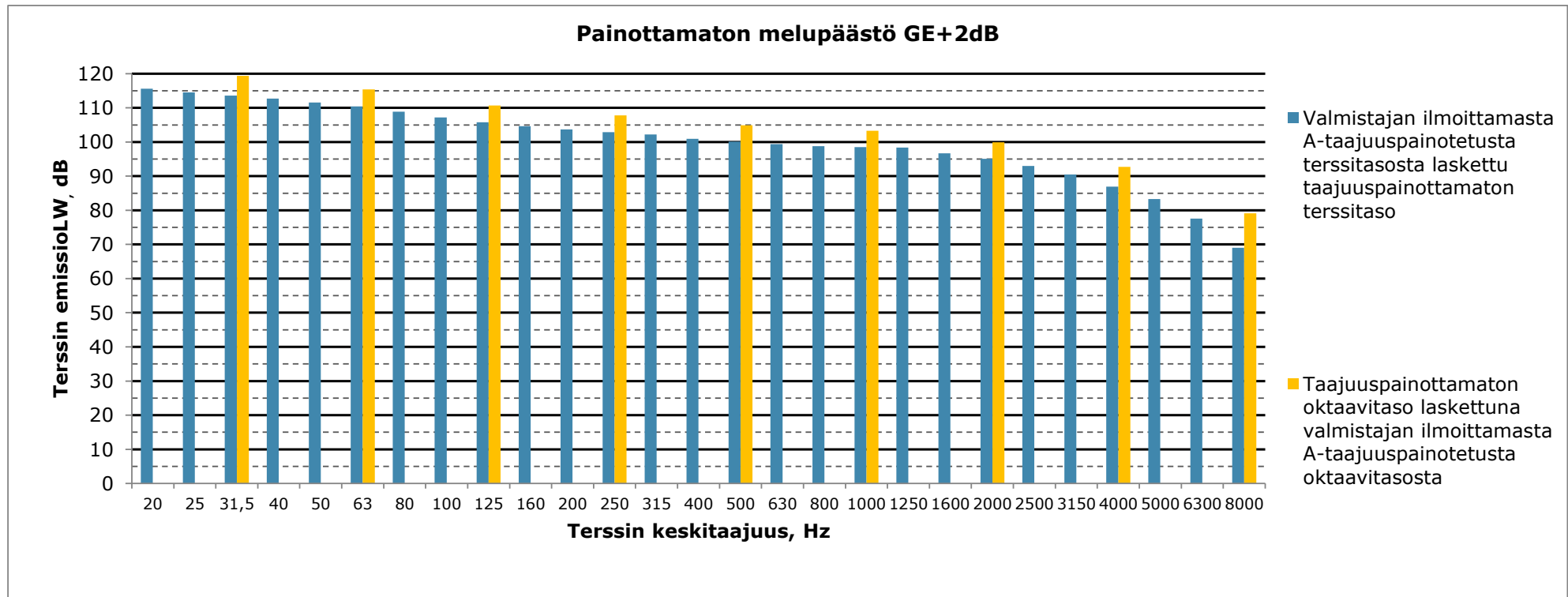
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus U  
(Kannistontie, Kivioja), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus V  
(Kannistontie 586), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**







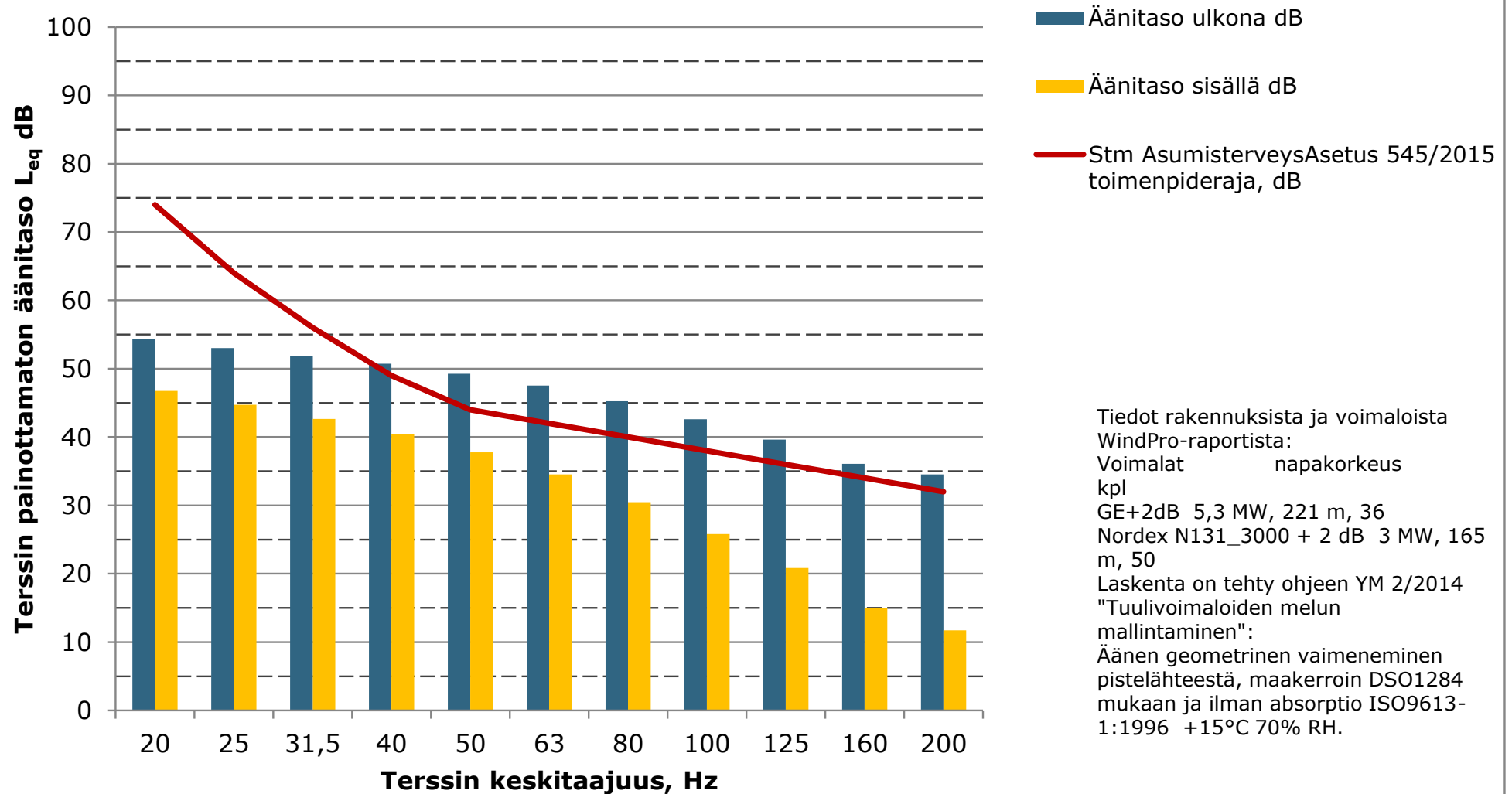


29.4.2021

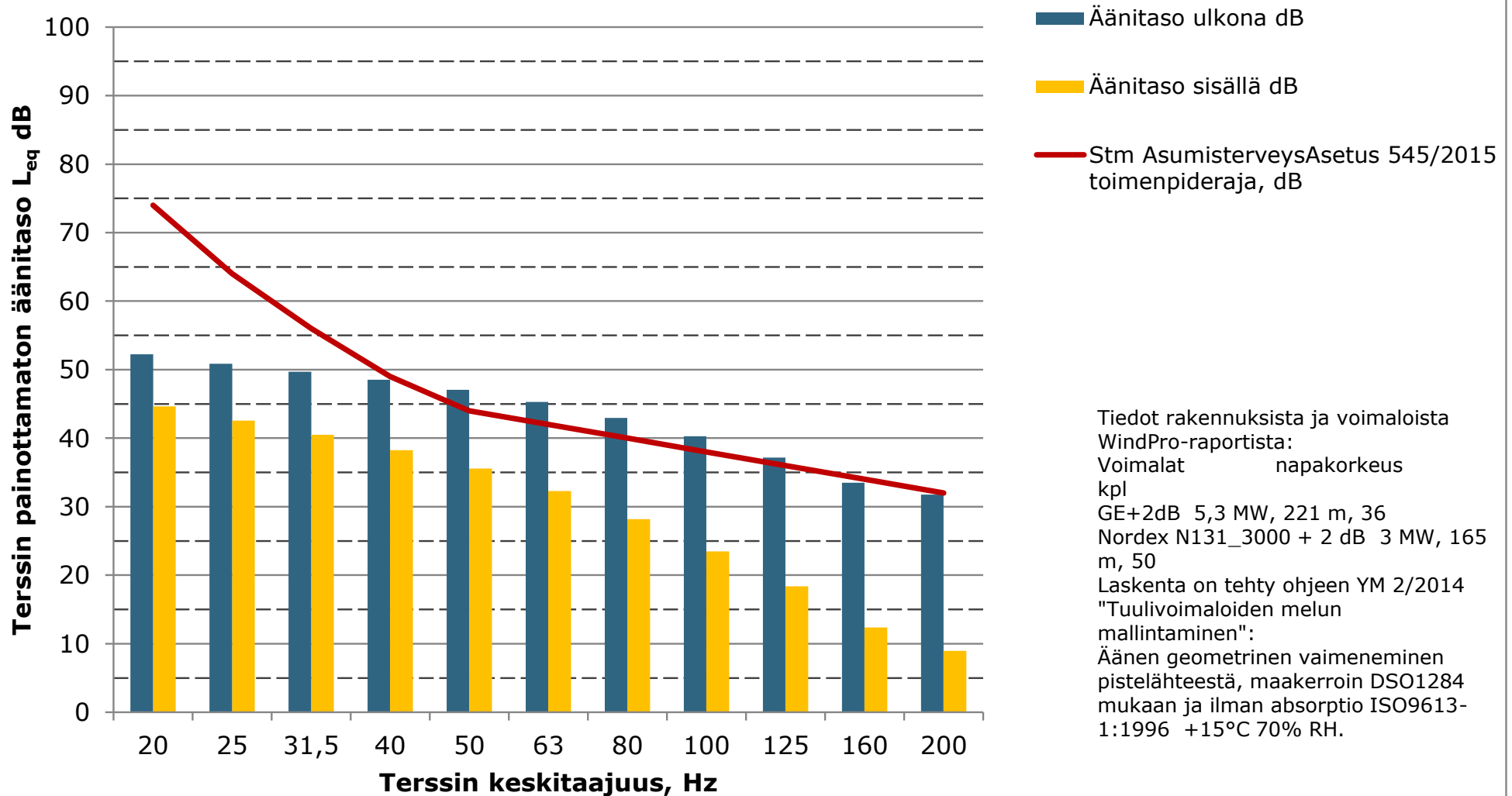
---

**Liite 4: Halsuan tuulivoimahanke – Matalataajuisen melun rakennuskohtaiset arvot yhteisvaikutushankkeiden kanssa**

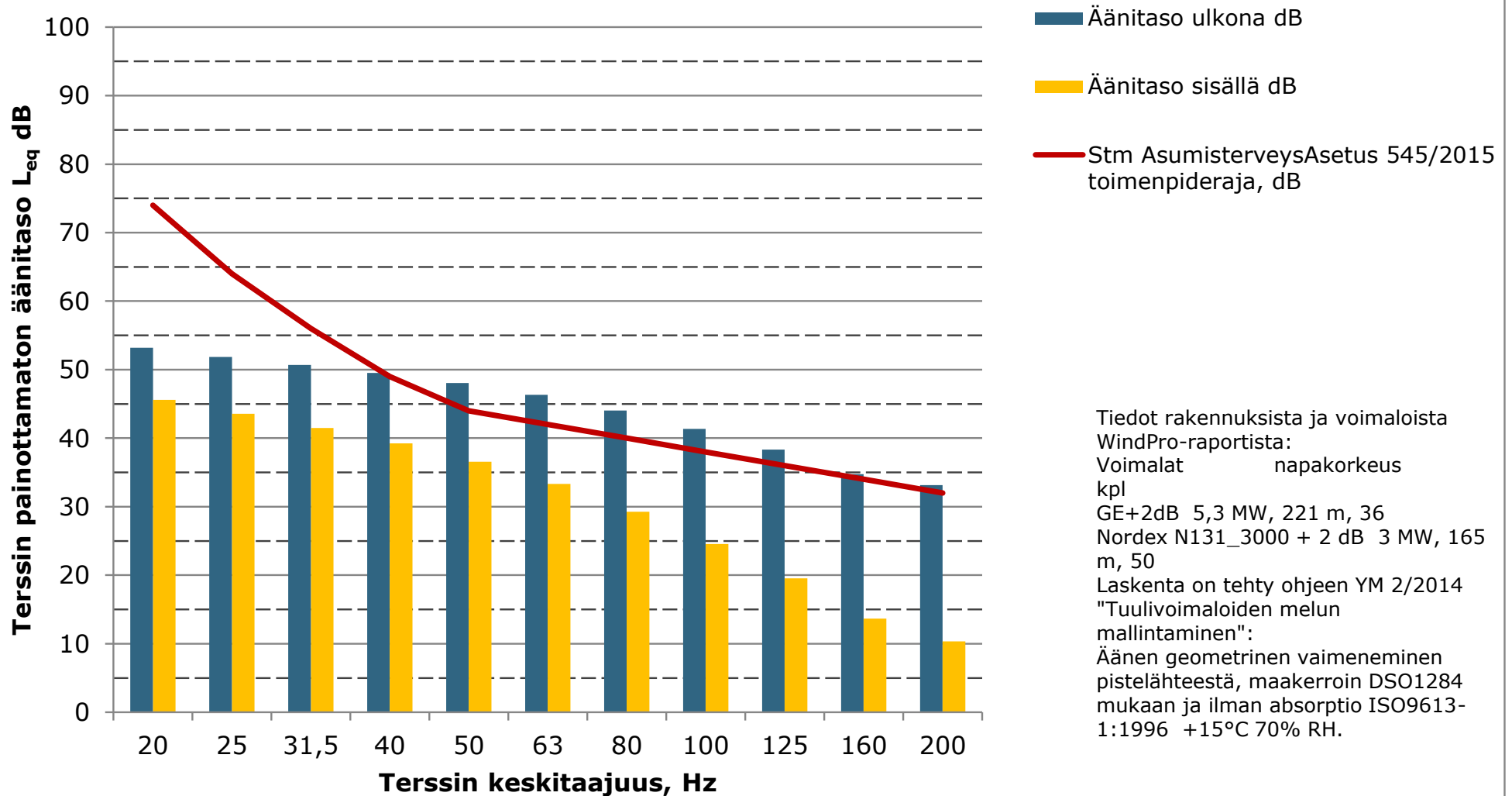
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus A  
(Kuuslammentie), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

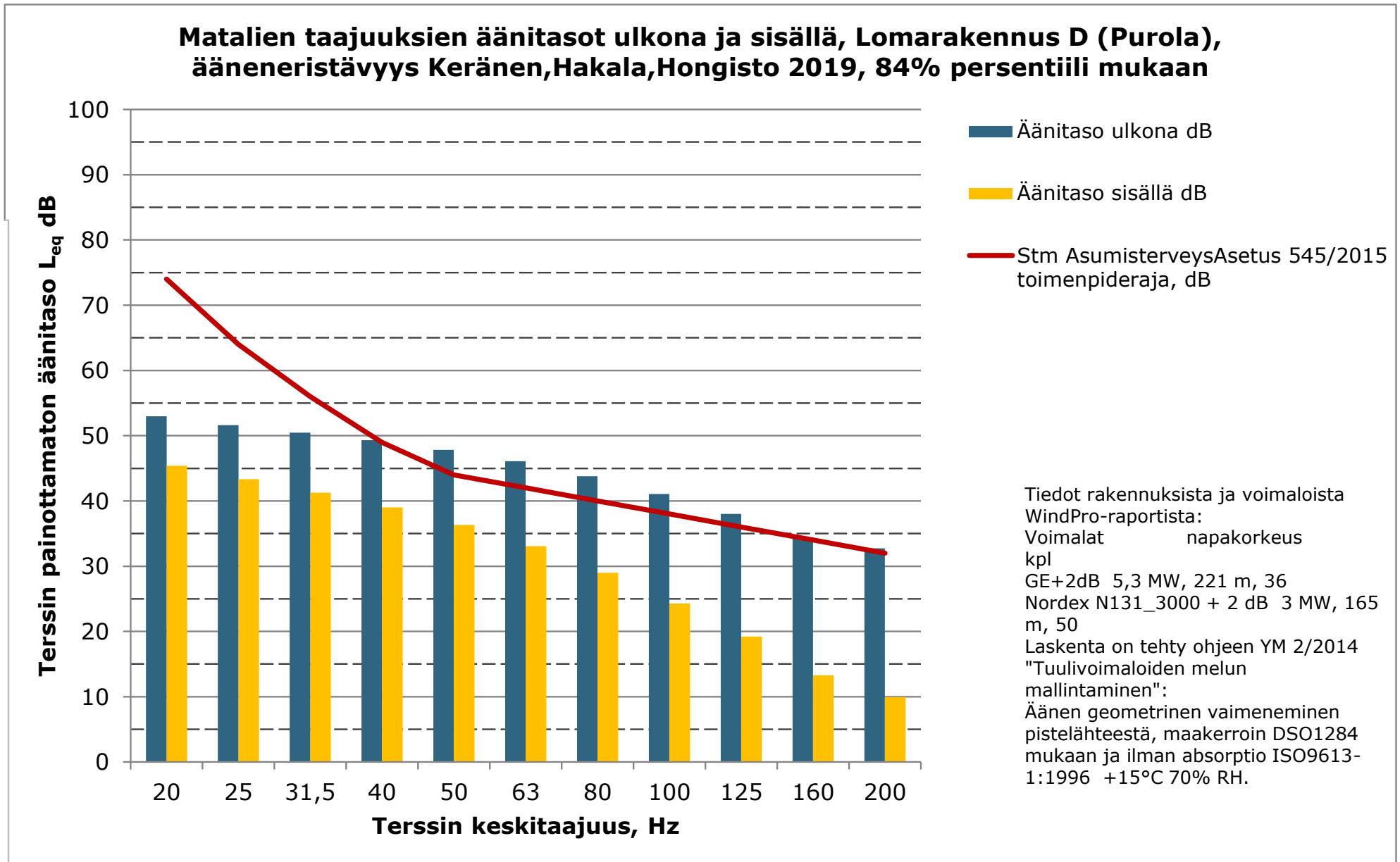


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus B  
(Loukkukoskentie 700), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

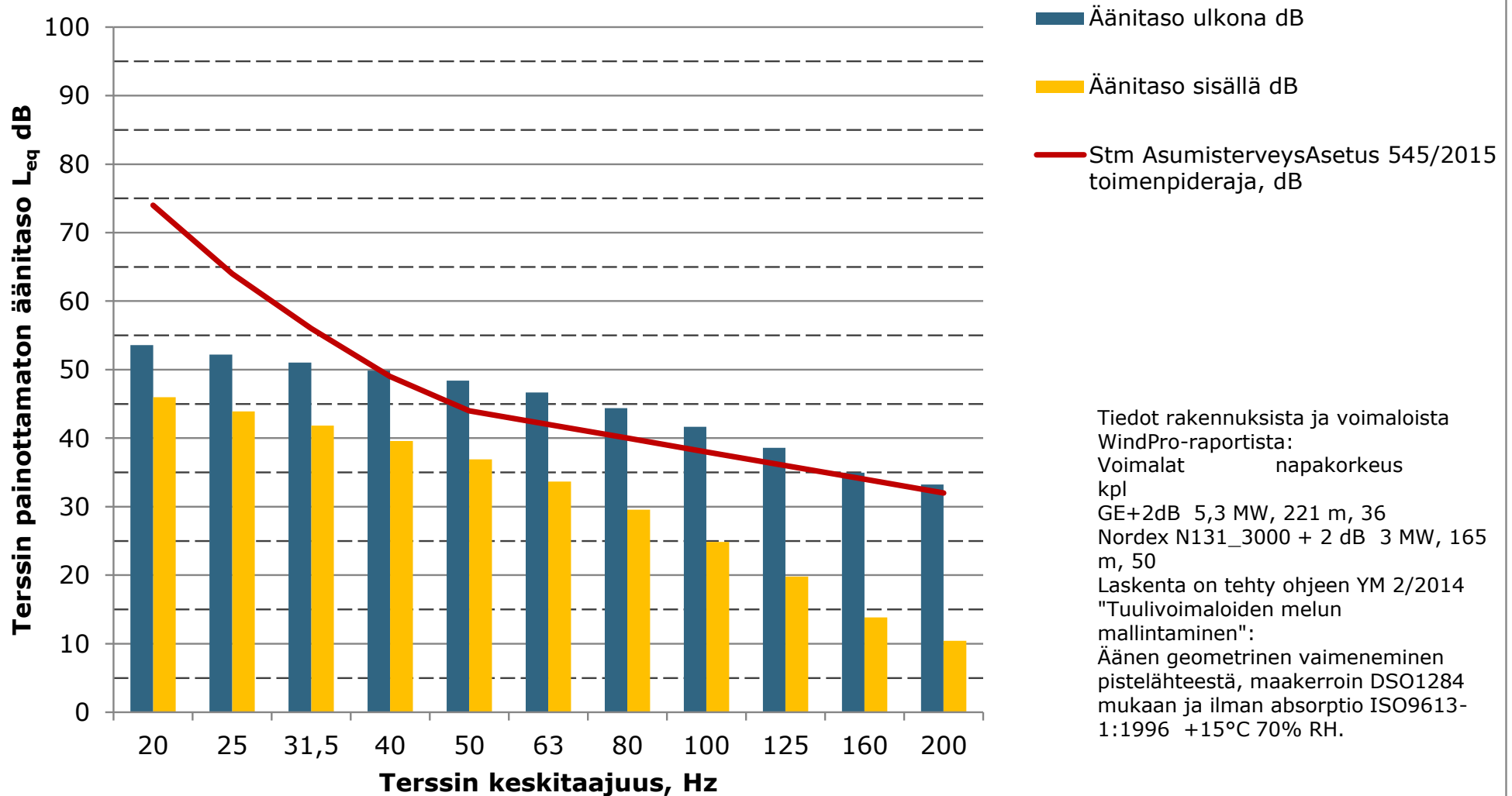


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C  
(Loukkukoskentie, Mantyla), ääneneristävyys Keränen, Hakala, Hongisto 2019,  
84% persentiili mukaan**

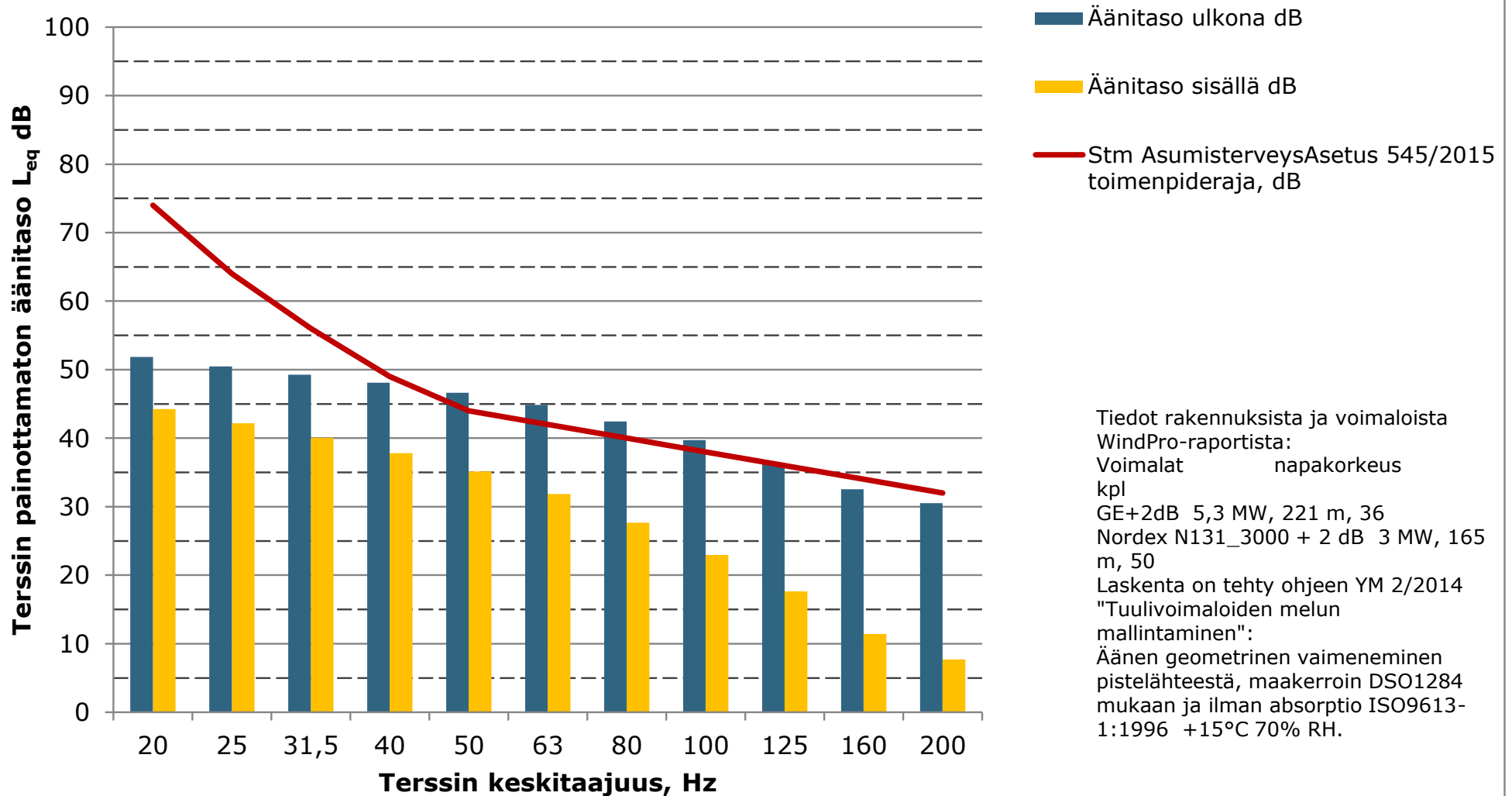




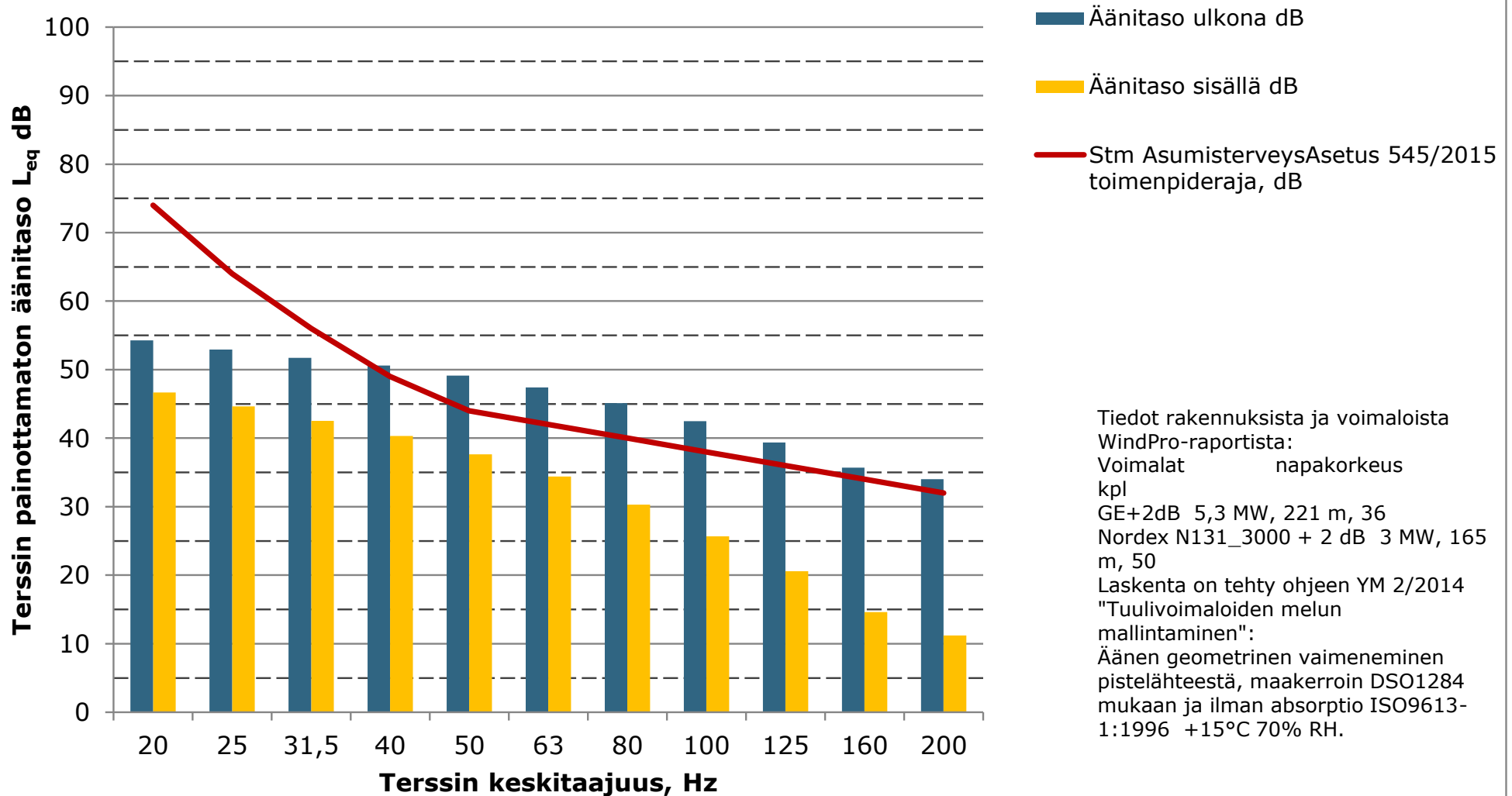
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E  
(Kannistontie 557), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**



**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F  
(Lestijarventie 1468), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

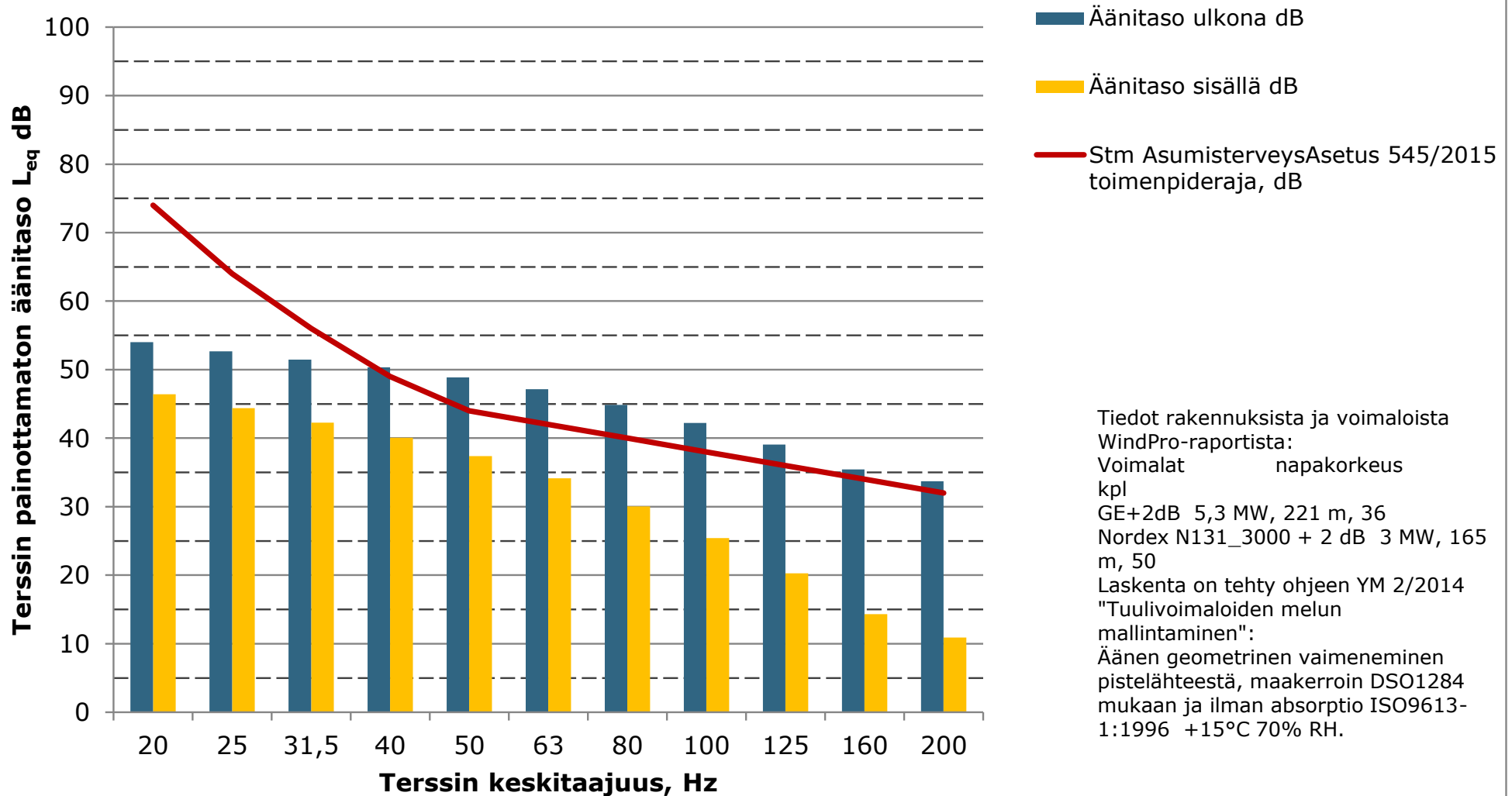


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus G  
(Hautakoskentie 455), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

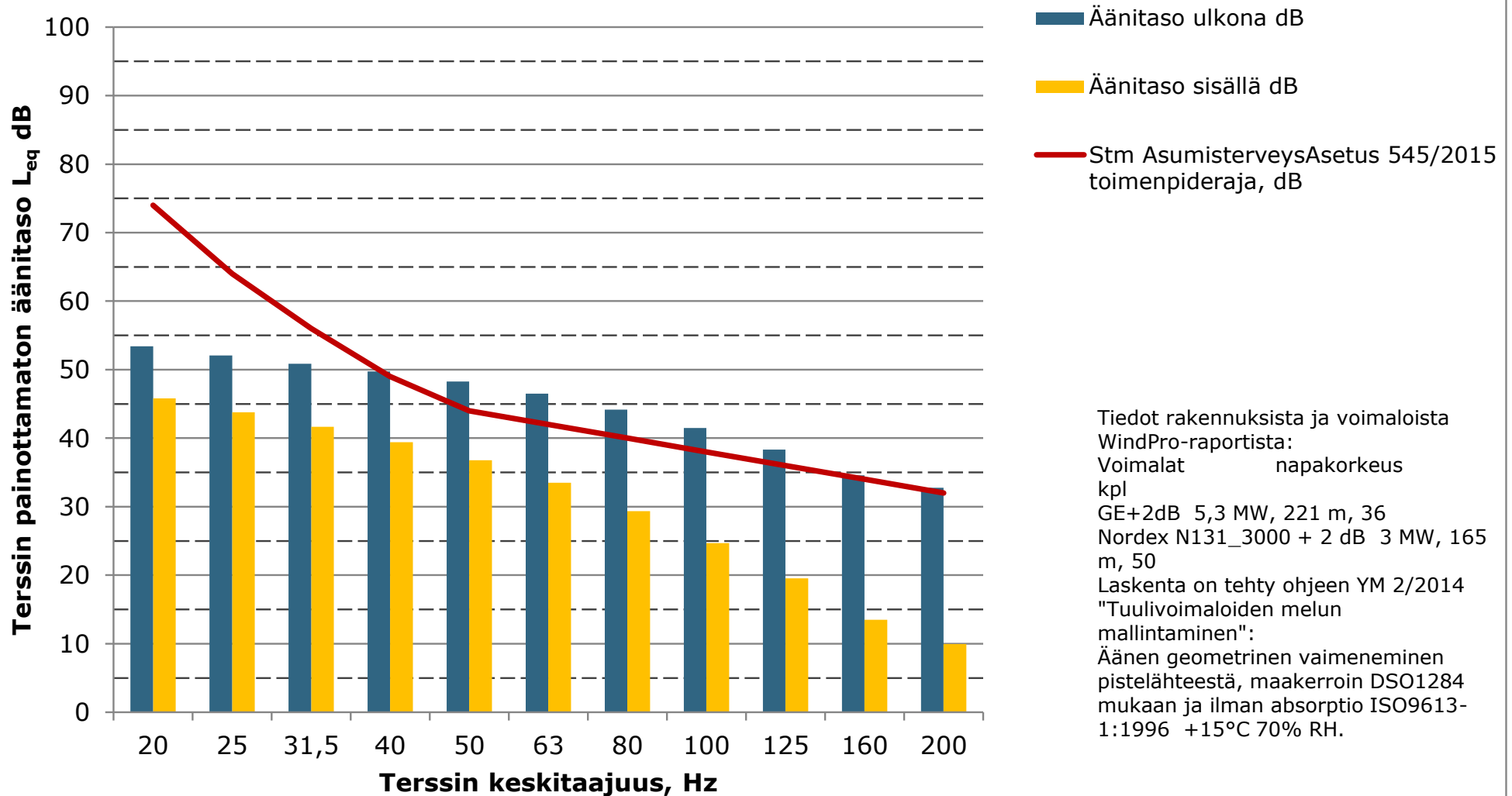




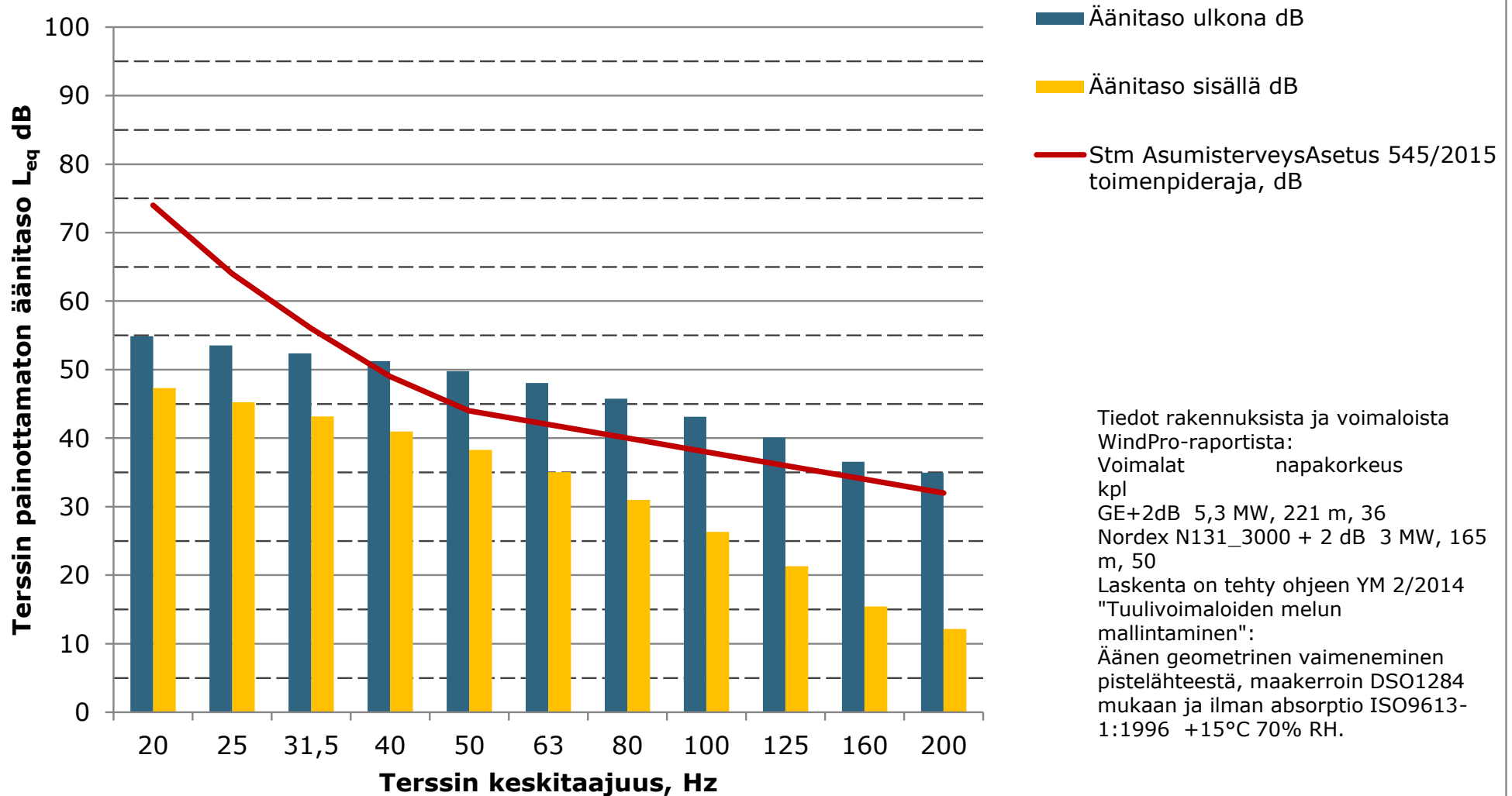
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H  
(Hautakoskentie 544), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



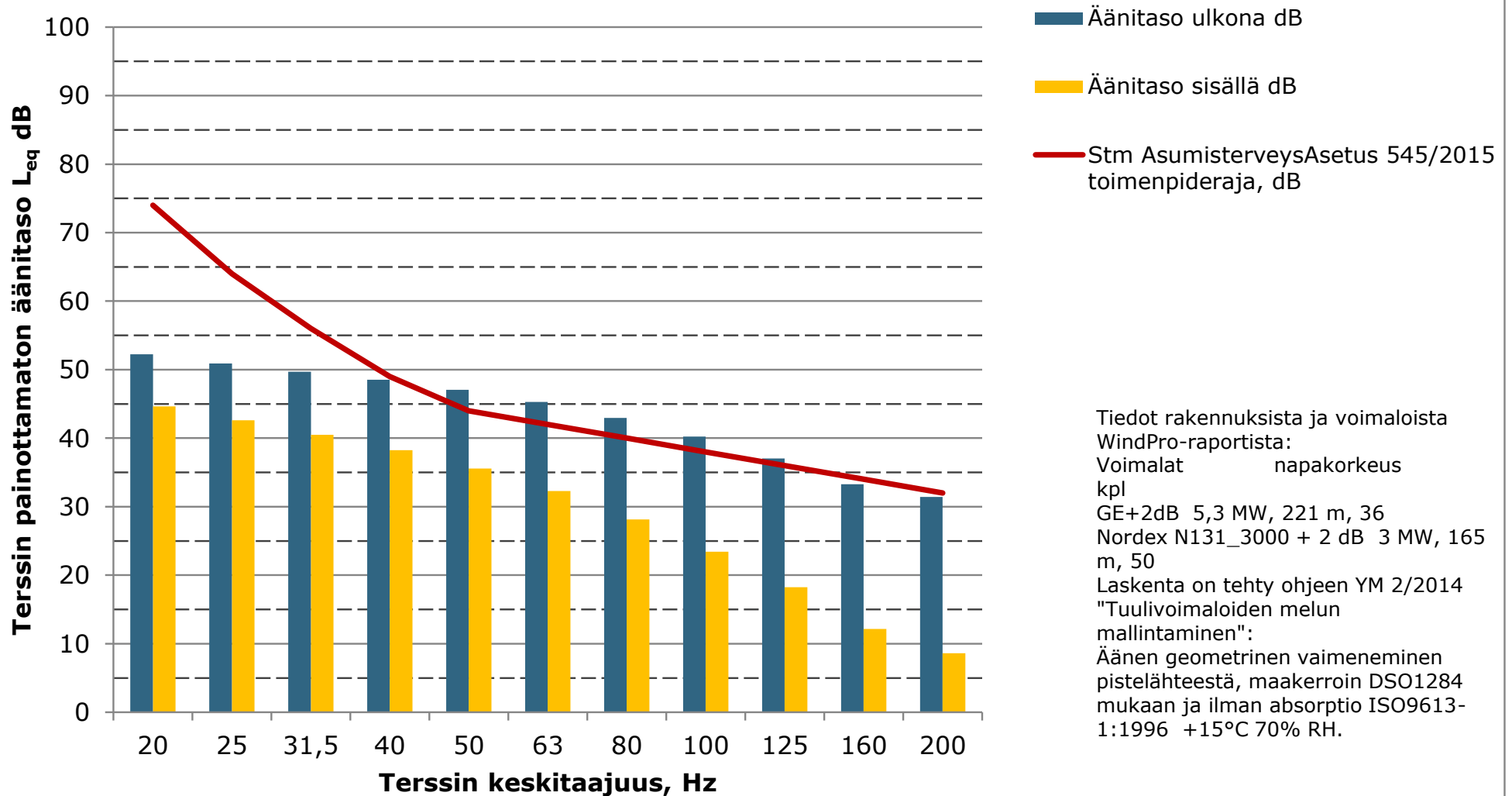
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus I  
(Hautakoskentie 289), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



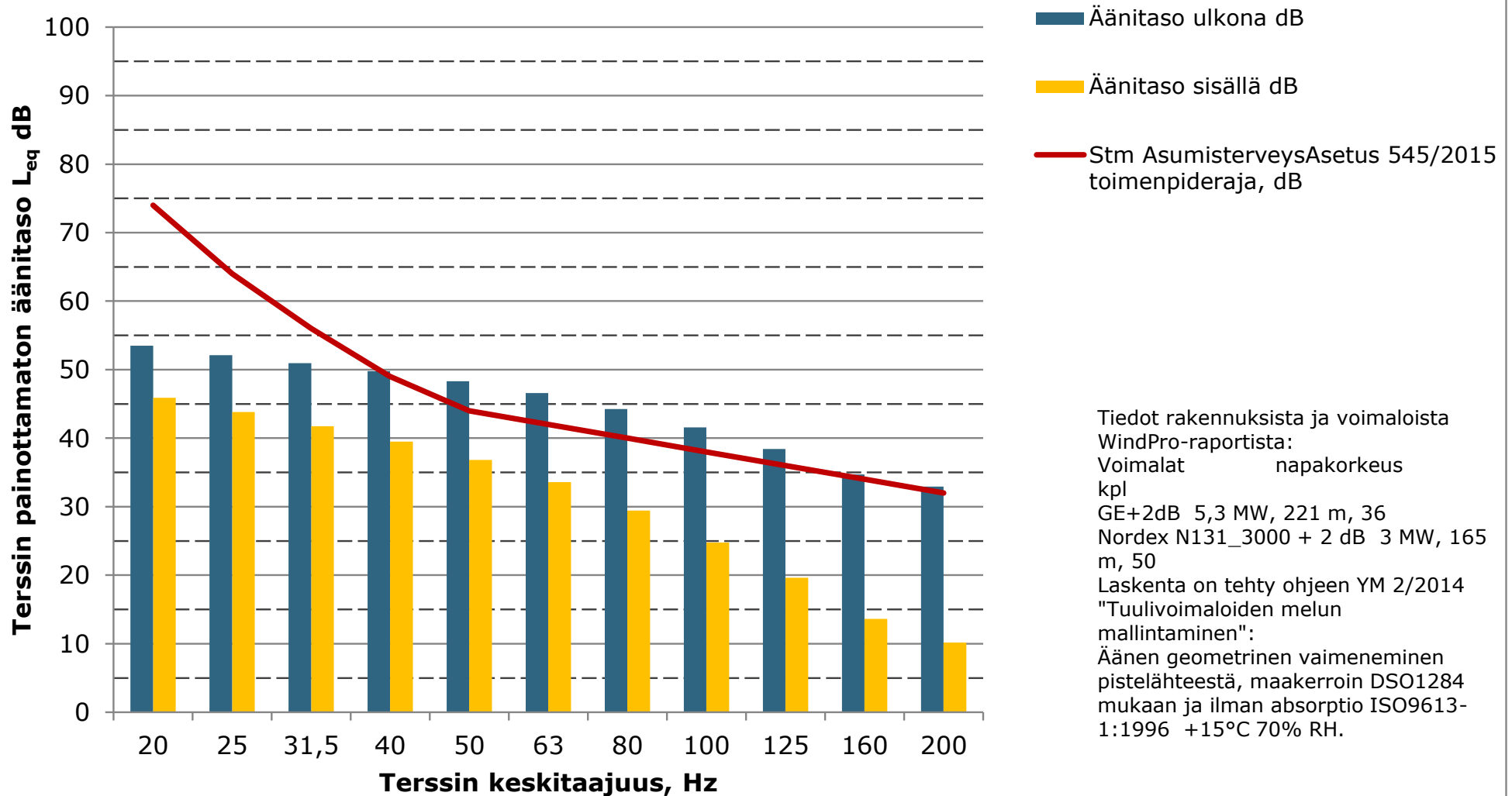
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J  
(Katajajarventie 49), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

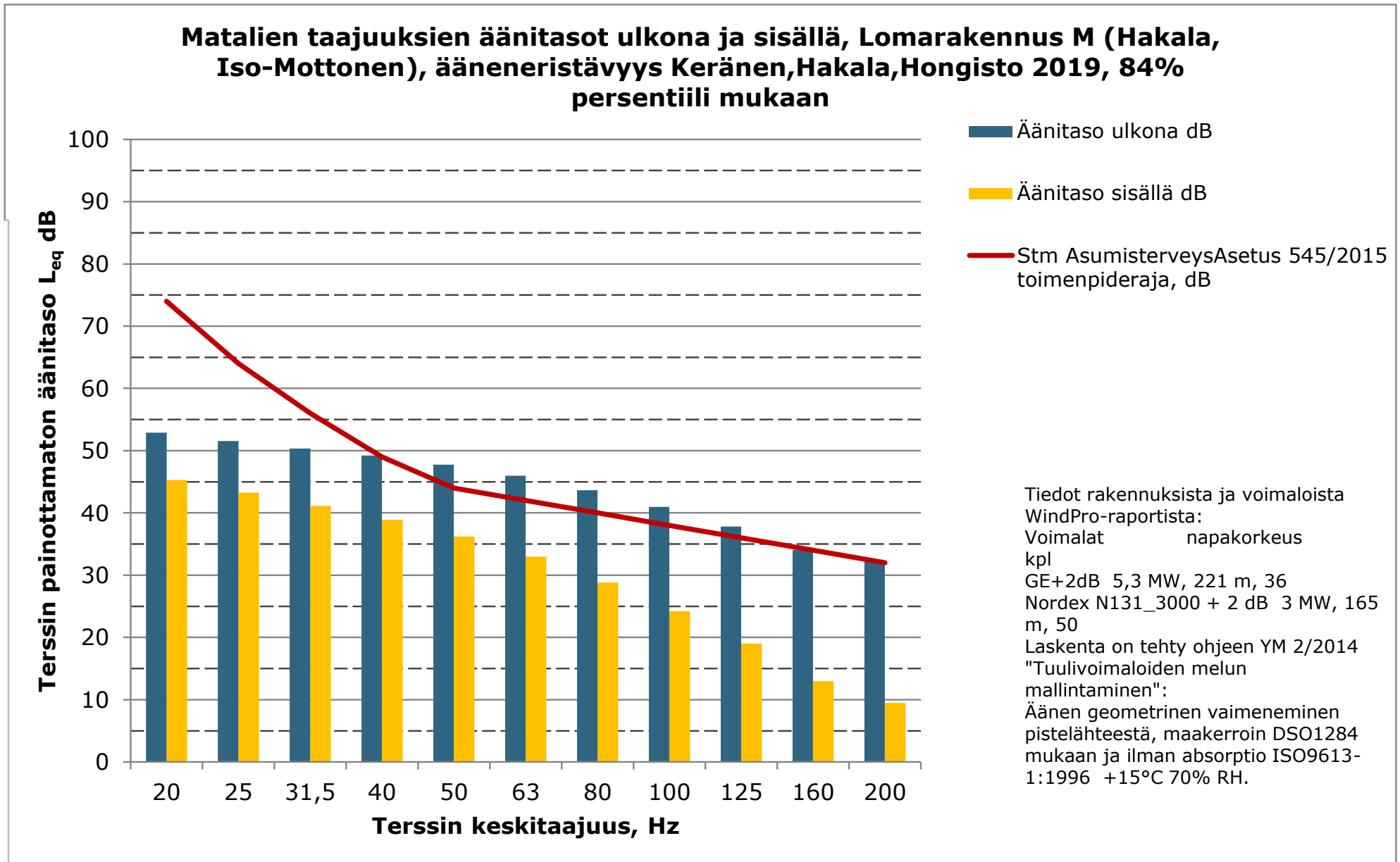


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus K  
(Silostenlampi), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persentiili mukaan**

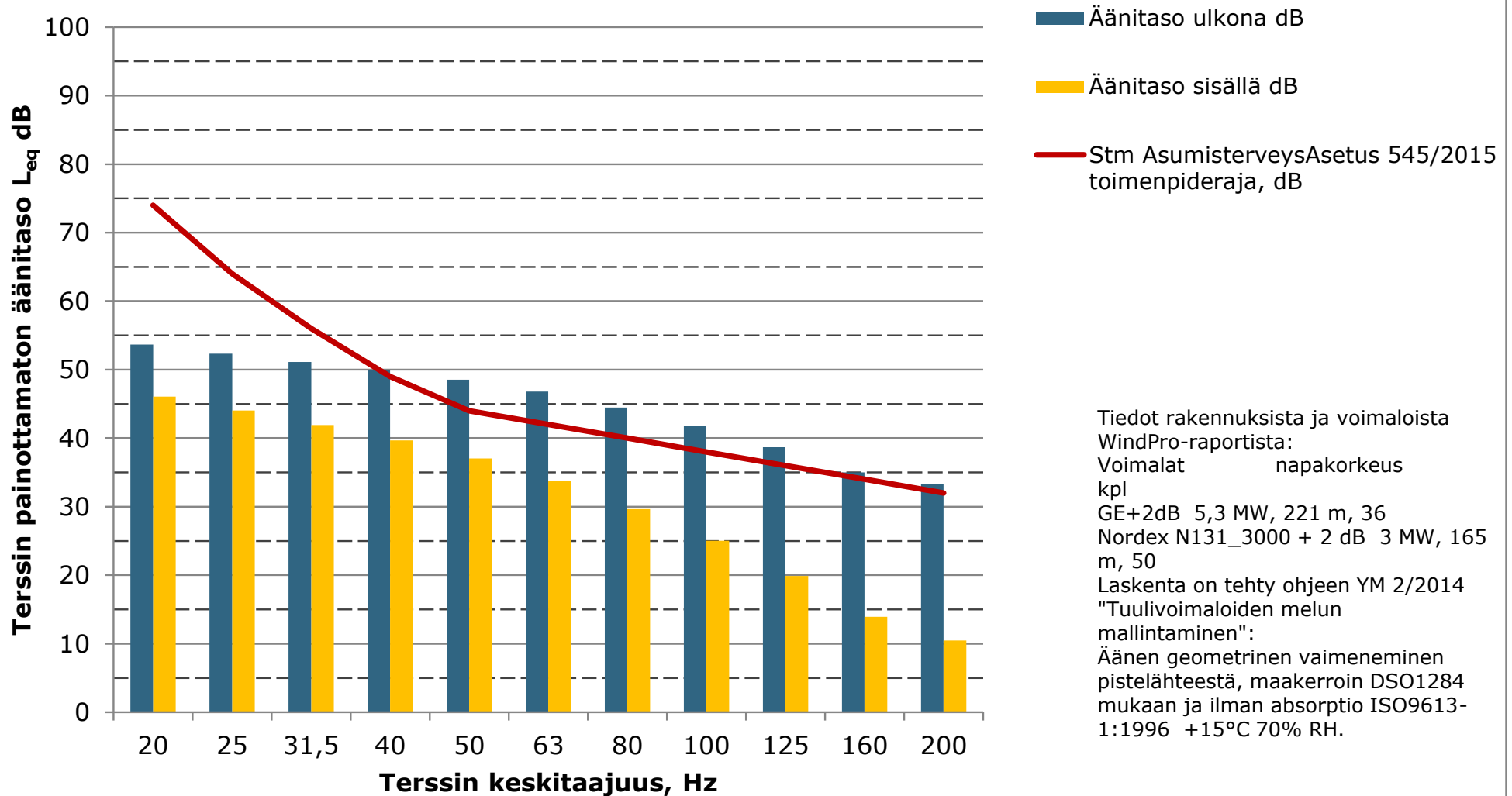


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus L  
(Harjunpaantie 215), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

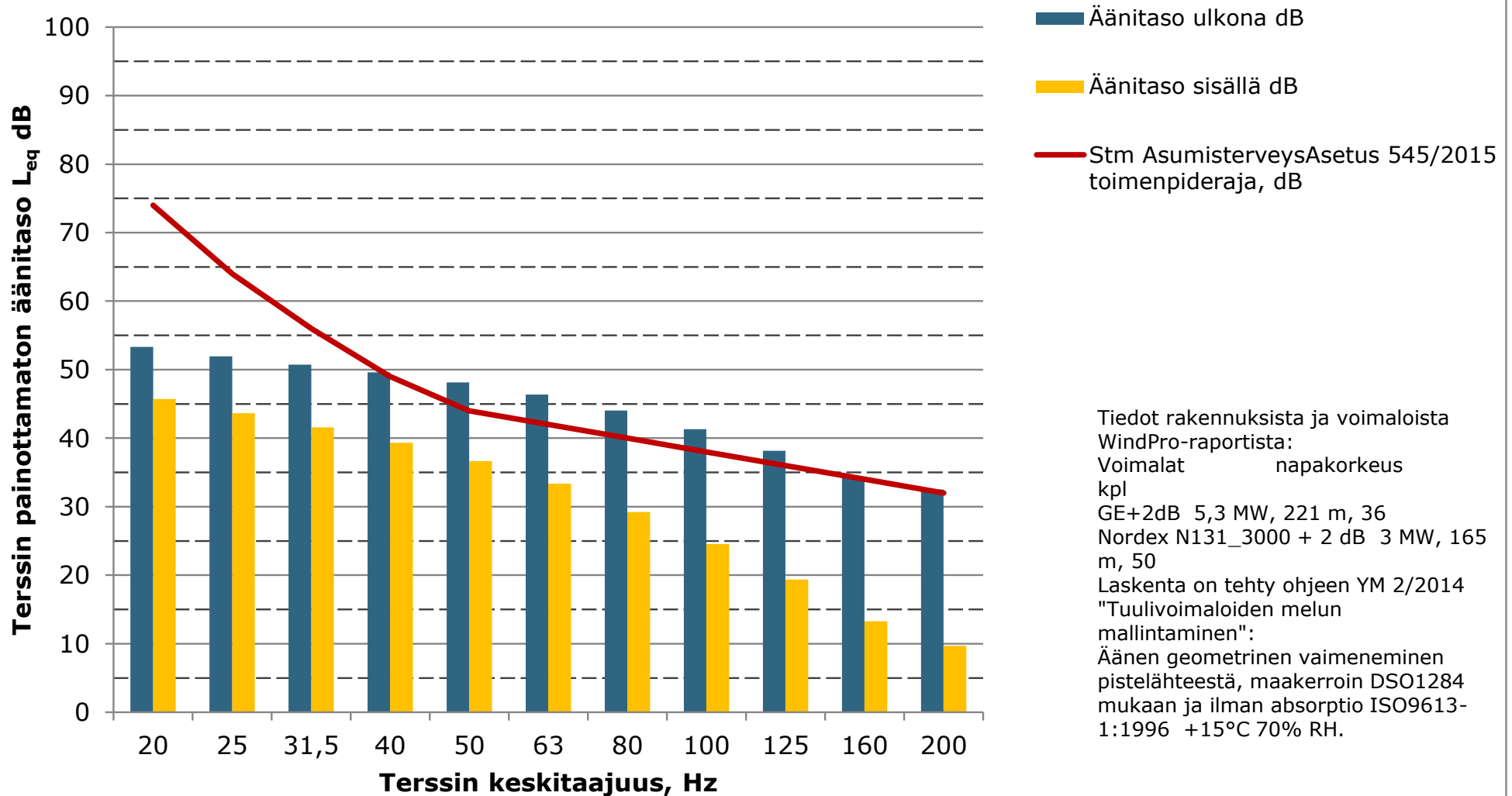




**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus N  
(Hautakoski), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili  
mukaan**

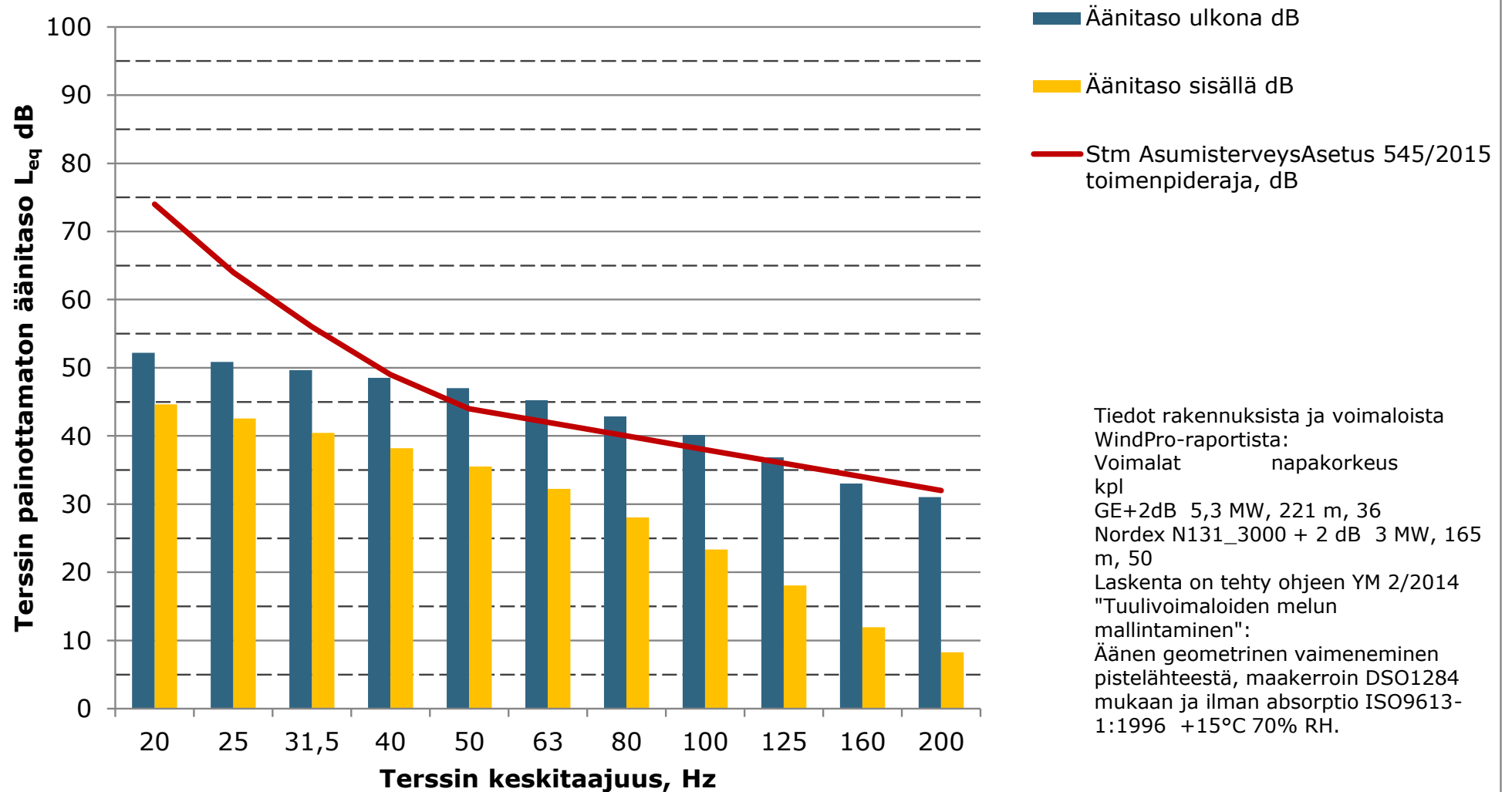


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus O  
(Harjunpaantie 398, ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

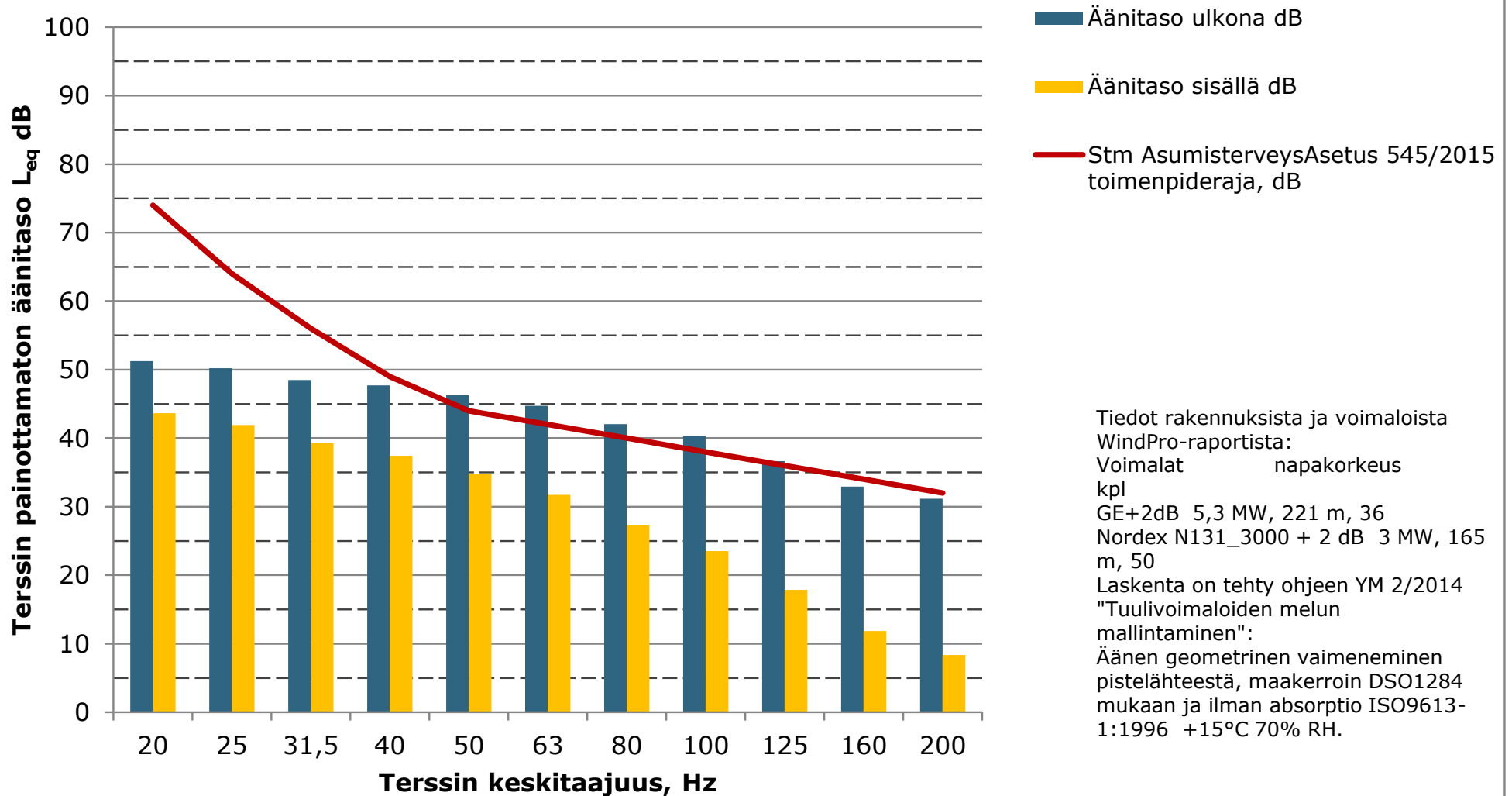




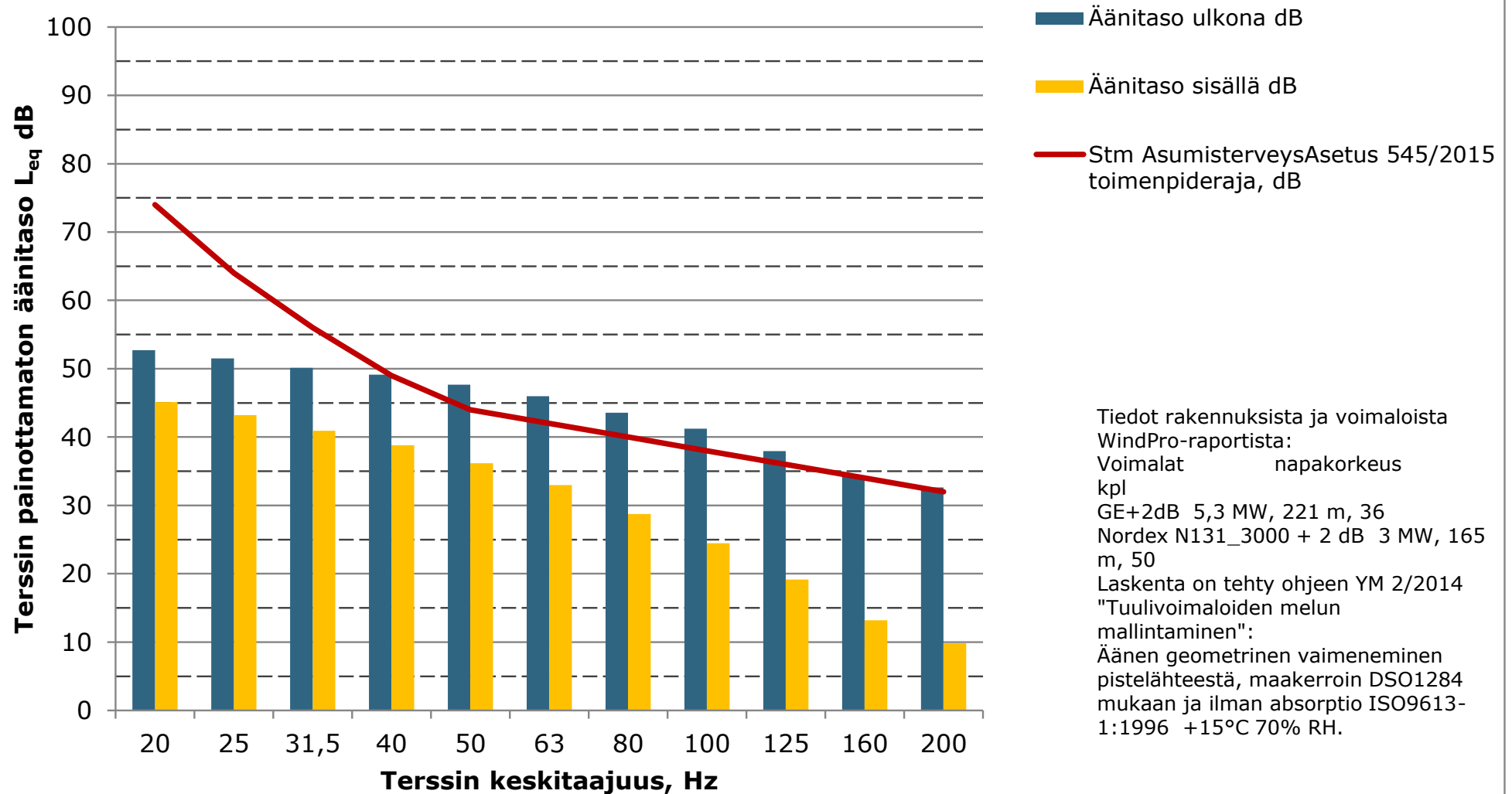
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus P  
(Hautakoskentie 135), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**



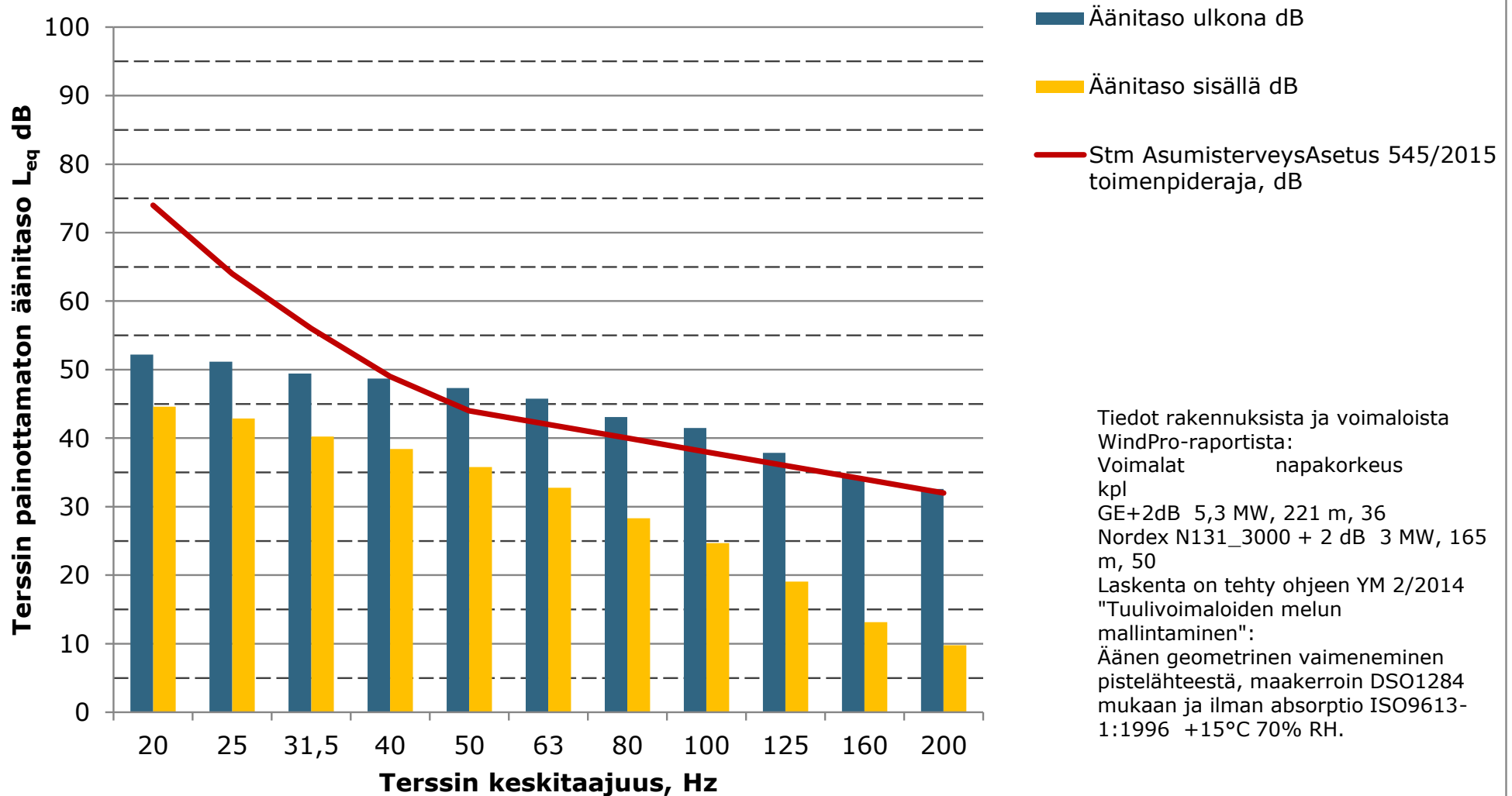
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus Q  
(Lemmistonrannantie), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

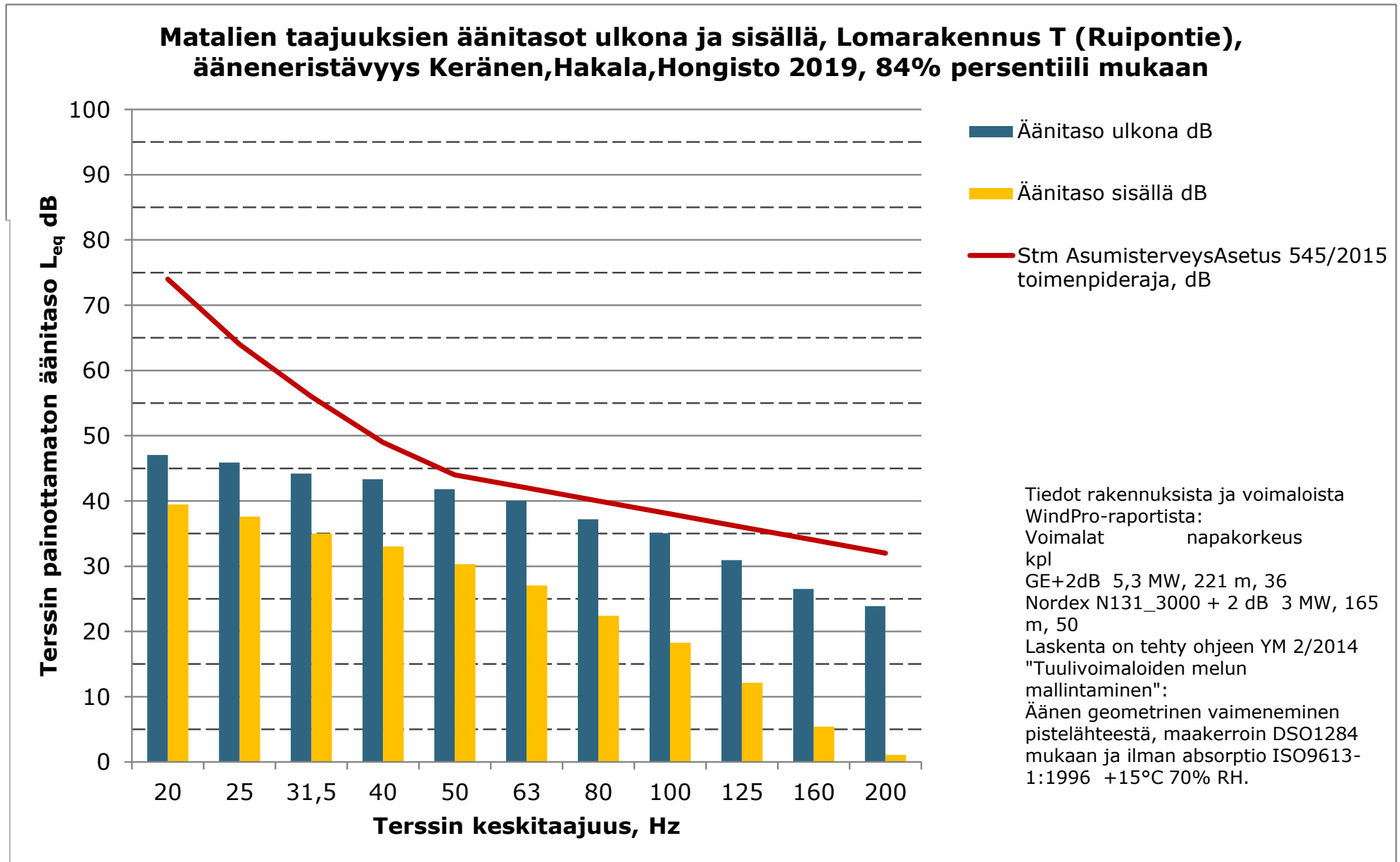


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R  
(Peuraneva, Valvatintie), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

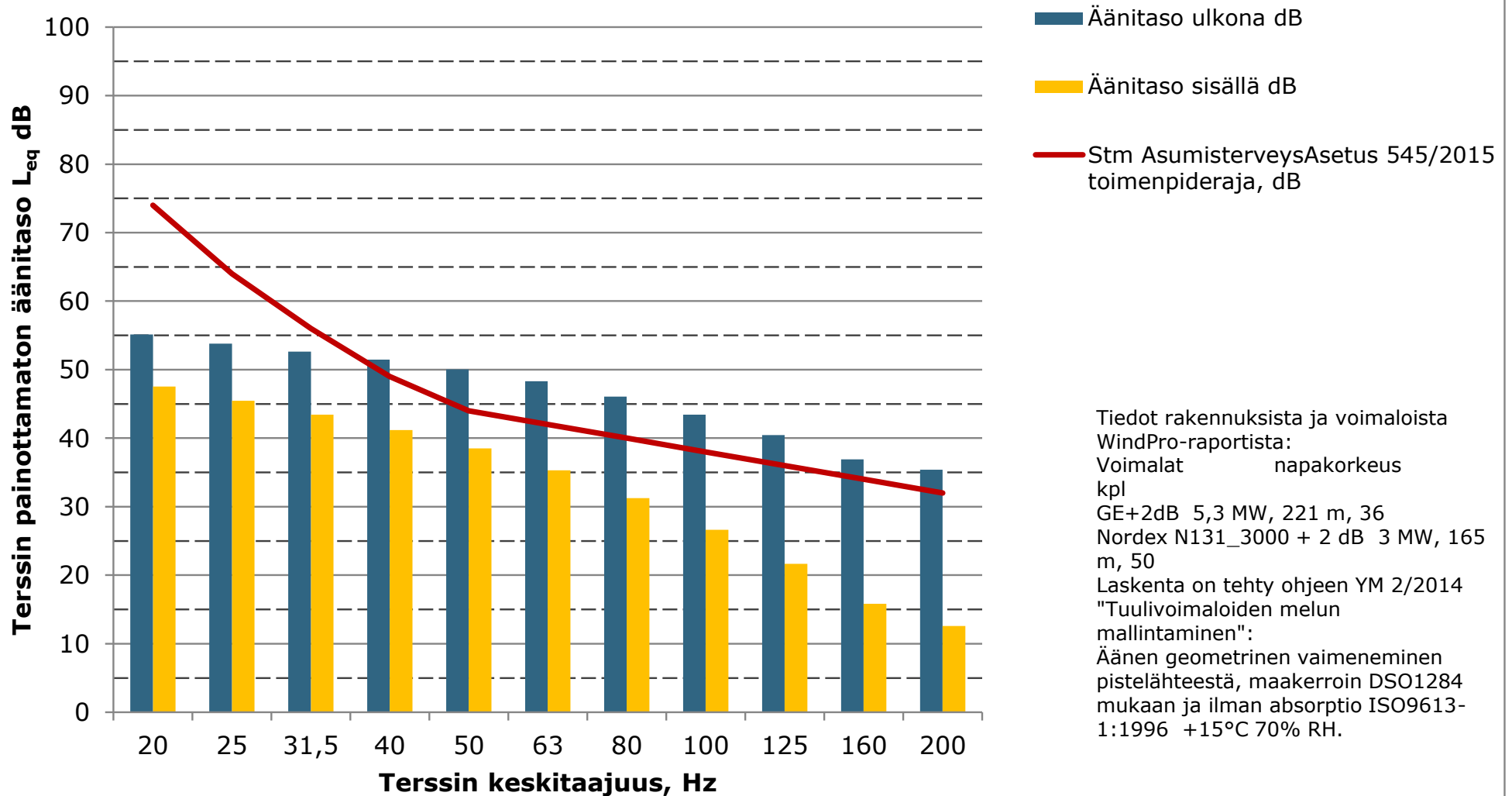


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus S  
(Talonpaikantie 141), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persenttiili mukaan**

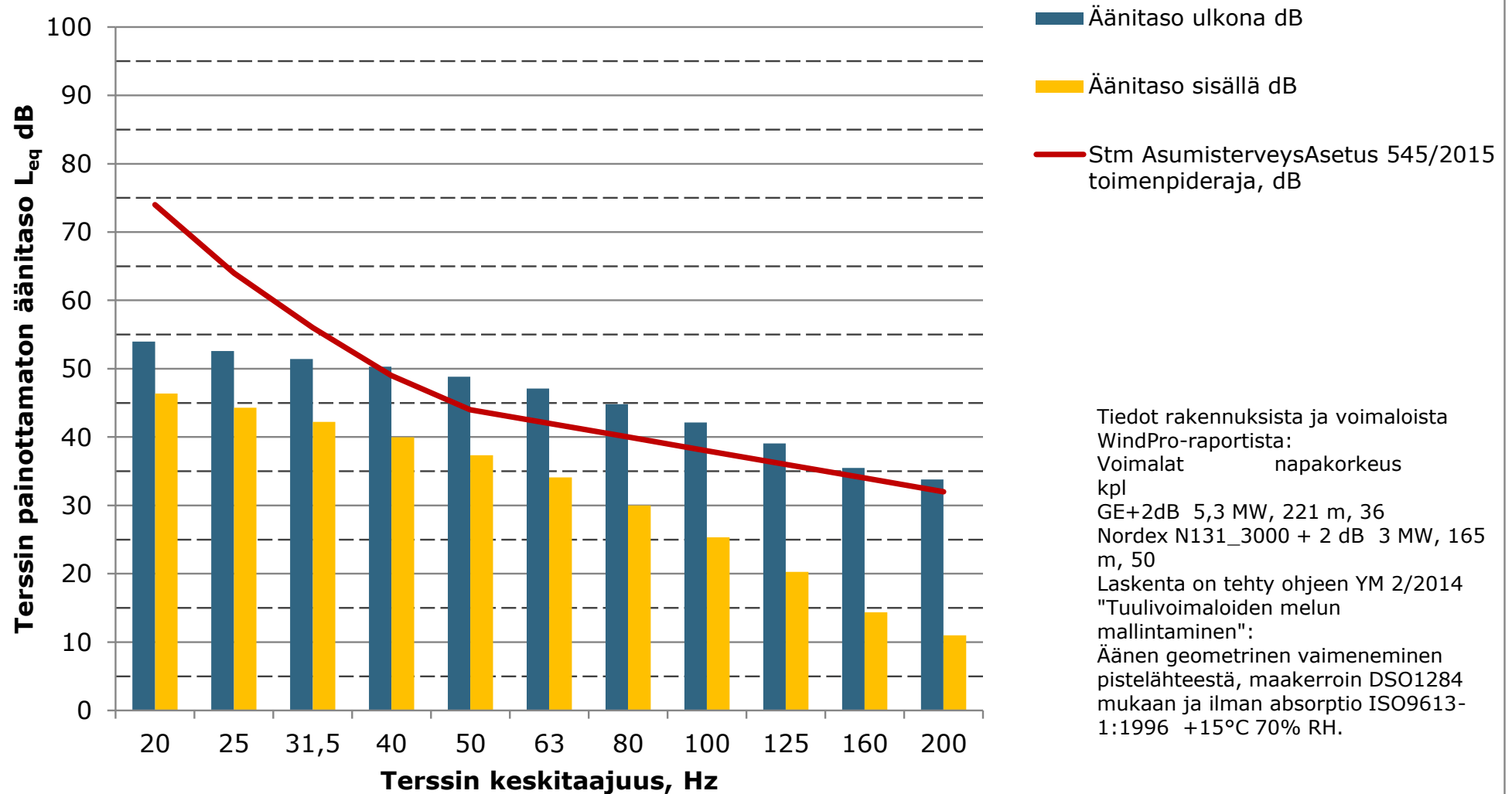


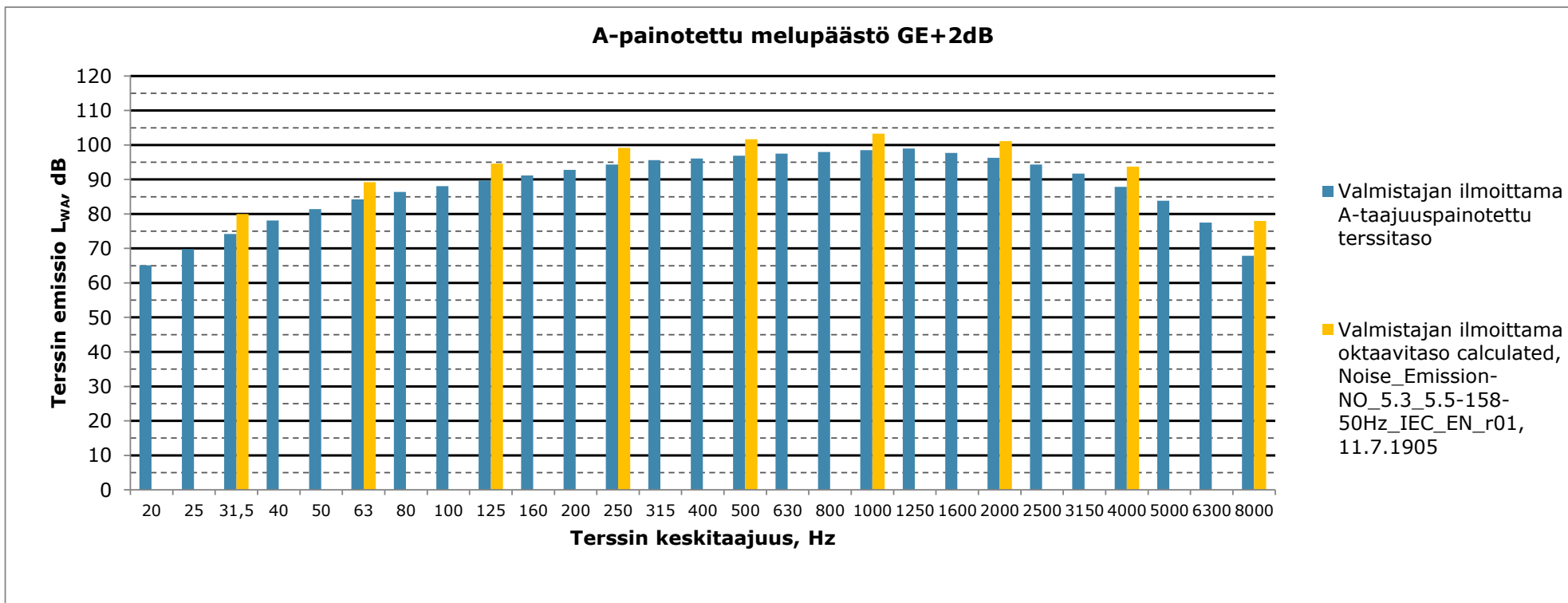


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus U  
(Kannistontie, Kivioja), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%  
persenttiili mukaan**

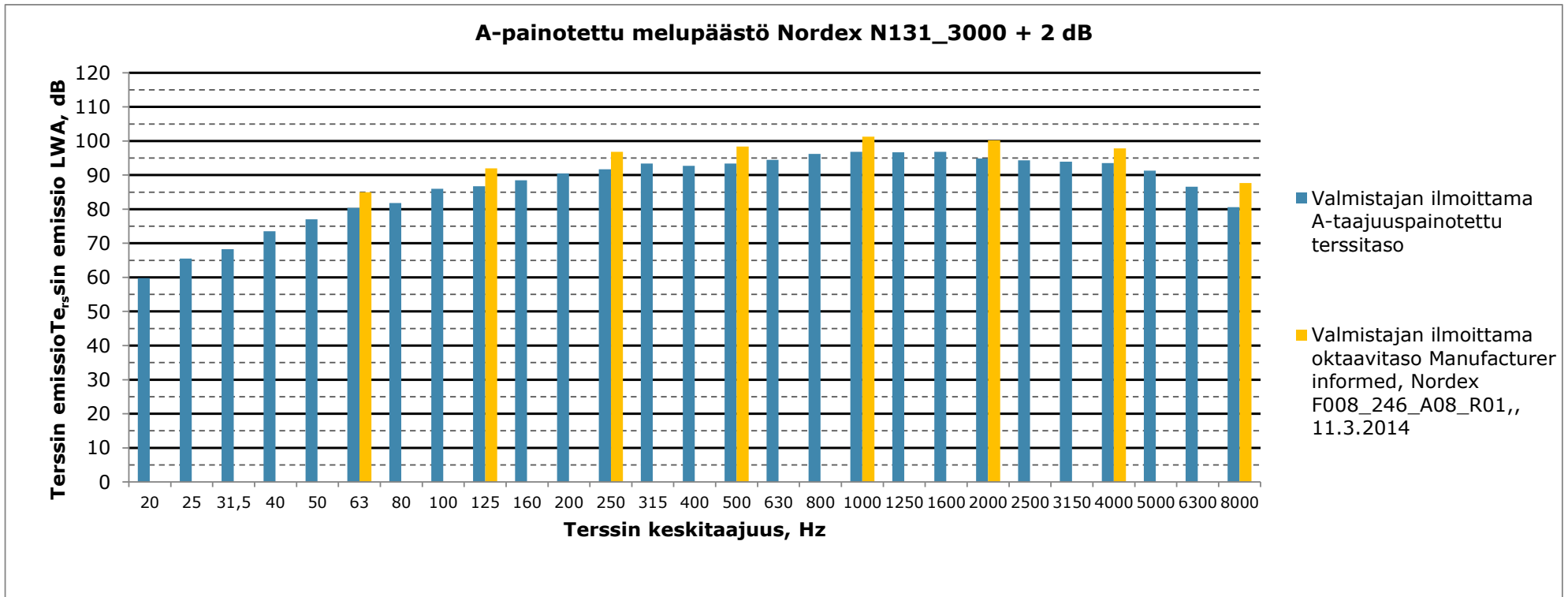


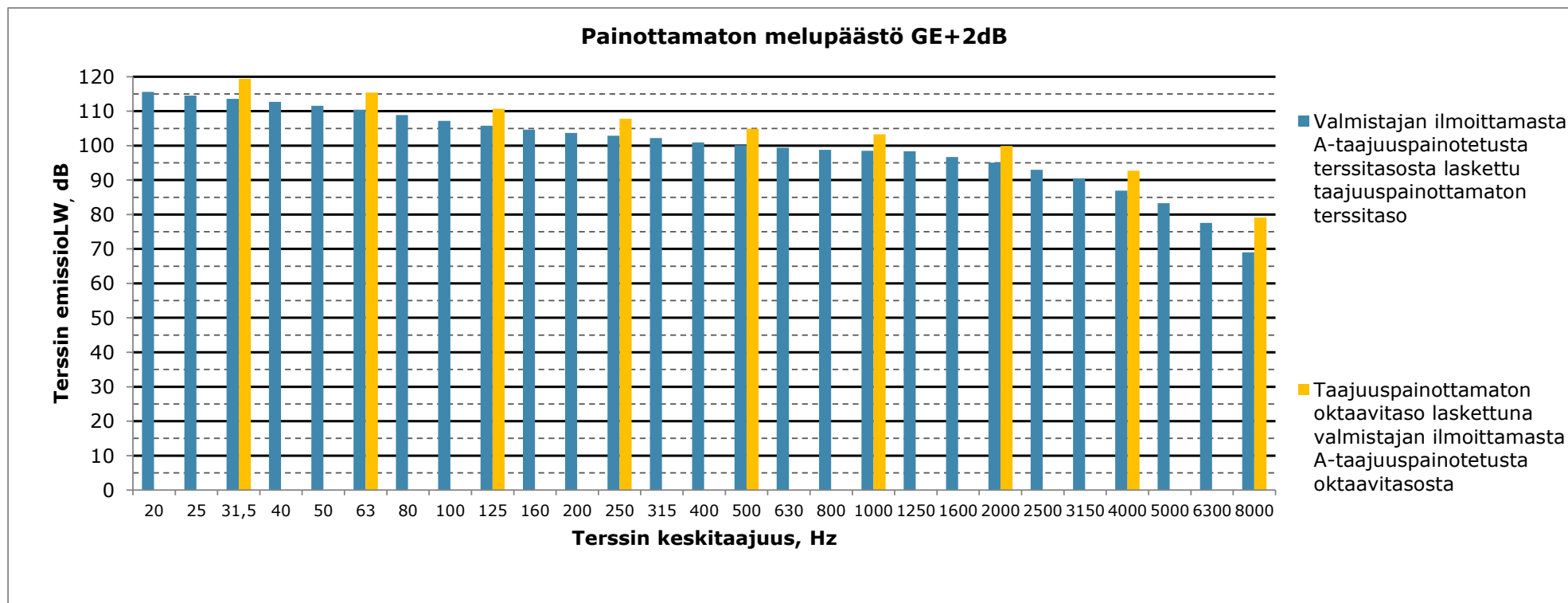
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus V  
(Kannistontie 586), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%  
persentiili mukaan**

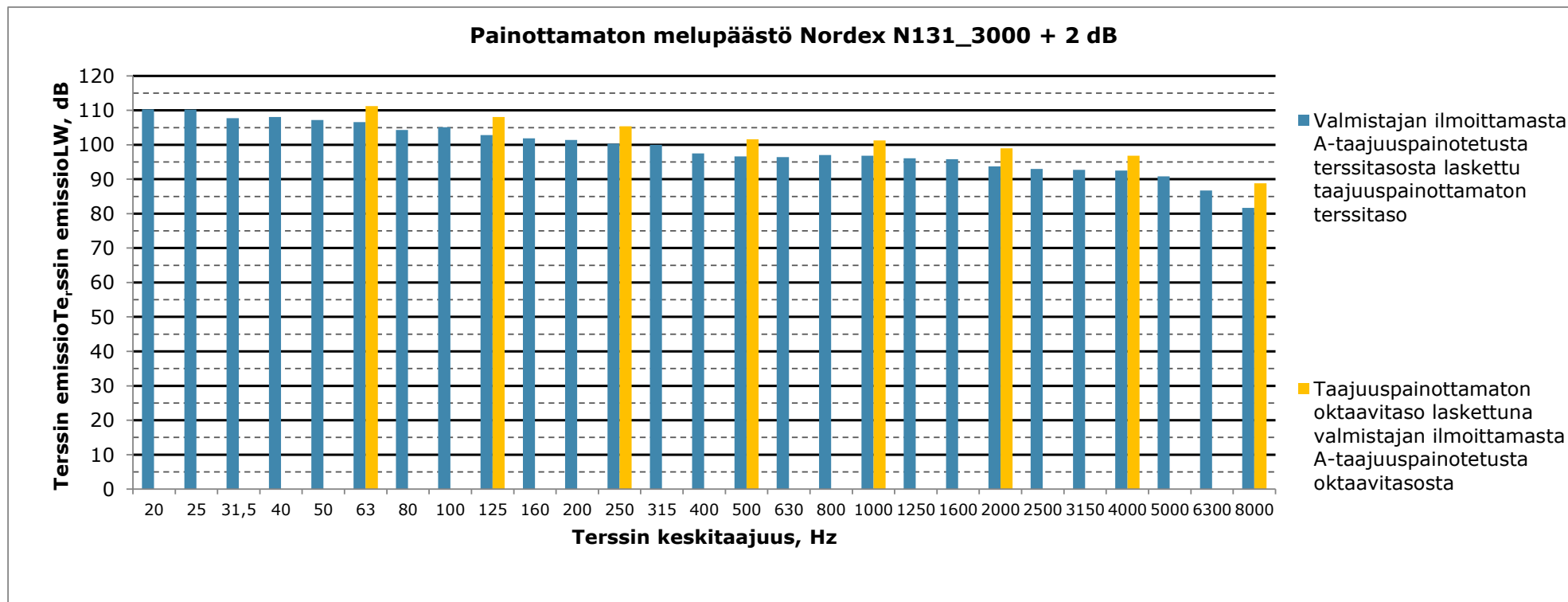












14.4.2021

---

**Liite 5: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset “real case, no forest”**

## SHADOW - Main Result

Calculation: Halsua\_Generic RD180x36xHH210\_no forest\_20210402

### Assumptions for shadow calculations

Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

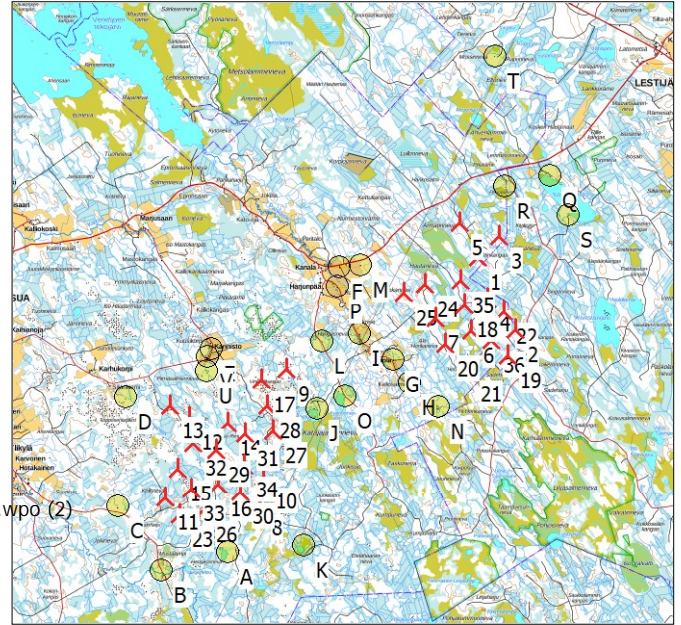
Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)  
 Obstacles used in calculation  
 Eye height for map: 1,5 m  
 Grid resolution: 10,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89



New WTG

Scale 1:250 000  
 Shadow receptor

### WTGs

	East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data		
					Valid	Manufact. Type-generator				Calculation distance [m]	RPM [RPM]	
	[m]											
1	376 145	7 040 853	169,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
2	377 373	7 038 465	172,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
3	376 837	7 041 535	170,2	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
4	376 444	7 039 476	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
5	375 536	7 041 980	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
6	375 916	7 038 416	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
7	374 748	7 038 849	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
8	368 911	7 032 725	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
9	369 826	7 037 147	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
10	369 062	7 033 588	162,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
11	365 799	7 032 897	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
12	366 591	7 035 576	153,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
13	365 986	7 035 968	147,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
14	367 861	7 035 366	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
15	366 214	7 033 846	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
16	367 557	7 033 342	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
17	369 000	7 036 800	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
18	375 673	7 039 283	164,1	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
19	377 129	7 037 609	175,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
20	375 066	7 037 992	164,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
21	375 806	7 037 151	168,9	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
22	376 995	7 039 070	171,8	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
23	366 276	7 032 332	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
24	374 380	7 039 957	161,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
25	373 695	7 039 683	159,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
26	367 076	7 032 483	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
27	369 380	7 035 142	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
28	369 173	7 035 951	160,4	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
29	367 493	7 034 489	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
30	368 275	7 033 089	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
31	368 432	7 039 039	155,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
32	366 741	7 034 702	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
33	366 662	7 033 192	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
34	368 431	7 033 972	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
35	375 546	7 040 069	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
36	376 570	7 038 123	172,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

### Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
A	Lomarakennus A (Kuuslammentie)	367 873	7 031 085	163,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243	7 032 622	153,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Purola)	364 501	7 036 228	143,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Kannistontie 557)	367 345	7 037 828	140,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Lestijarventie 1468)	371 569	7 040 539	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Hautakoskentie 455)	373 347	7 037 488	155,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Hautakoskentie 544)	373 867	7 036 728	157,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Hautakoskentie 289)	372 224	7 038 341	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Katajarventie 49)	370 829	7 035 870	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus K (Silostenlampi)	370 383	7 031 311	170,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Harjunpaantie 215)	370 996	7 038 086	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

## Calculation Results

### Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours
		per year
		[h/year]
A	Lomarakennus A (Kuuslammentie)	4:29
B	Lomarakennus B (Loukkukoskentie 700)	0:00
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	4:20
D	Lomarakennus D (Purola)	3:45
E	Asuinrakennus E (Kannistontie 557)	1:37
F	Asuinrakennus F (Lestijarventie 1468)	0:00
G	Asuinrakennus G (Hautakoskentie 455)	5:32
H	Asuinrakennus H (Hautakoskentie 544)	2:19
I	Asuinrakennus I (Hautakoskentie 289)	4:00
J	Lomarakennus J (Katajarventie 49)	7:14
K	Lomarakennus K (Silostenlampi)	5:46
L	Lomarakennus L (Harjunpaantie 215)	2:48
M	Lomarakennus M (Hakala, Iso-Mottonen)	3:15
N	Lomarakennus N (Hautakoski)	0:00
O	Lomarakennus O (Harjunpaantie 398)	1:56
P	Asuinrakennus P (Hautakoskentie 135)	1:14
Q	Lomarakennus Q (Lemmistonrannantie)	0:00
R	Lomarakennus R (Peuraneva,Valvatintie)	4:25
S	Lomarakennus S (Talonpaikantie 141)	0:00
T	Lomarakennus T (Ruipontie)	0:00
U	Lomarakennus U (Kannistontie, Kivioja)	8:36
V	Asuinrakennus V (Kannistontie 586)	4:48

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case	Expected
		[h/year]	[h/year]
1	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1175)	0:00	0:00
2	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1176)	0:00	0:00
3	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1177)	19:43	2:36
4	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1178)	0:00	0:00
5	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1179)	9:04	1:47
6	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1180)	0:00	0:00
7	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1181)	11:15	3:00
8	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1182)	21:42	5:46

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
9	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)	24:07	5:02
10	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184)	0:00	0:00
11	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)	14:28	2:58
12	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)	35:34	5:06
13	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)	36:09	6:41
14	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)	13:13	1:55
15	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)	0:00	0:00
16	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190)	0:00	0:00
17	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)	34:50	7:07
18	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)	0:00	0:00
19	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)	0:00	0:00
20	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)	14:03	3:04
21	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)	8:58	1:48
22	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1196)	0:00	0:00
23	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)	24:38	5:50
24	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1198)	6:09	1:07
25	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)	32:05	7:22
26	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200)	0:00	0:00
27	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1201)	11:38	2:15
28	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202)	11:28	2:24
29	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203)	0:00	0:00
30	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)	0:00	0:00
31	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)	0:00	0:00
32	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206)	0:00	0:00
33	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207)	0:00	0:00
34	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)	0:00	0:00
35	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)	0:00	0:00
36	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: A - Lomarakenus A (Kuuslammentie)  
 Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.04	09.01	07.32	06.46	05.04	03.33	21.11 (23)	03.15	04.34	21.25 (23)	06.05	07.28	07.59	09.29
2	14.49	16.14	17.41	20.10	21.39	23.10	18 21.29 (23)	23.37	22.23	8 21.33 (23)	20.40	18.56	16.13	14.54
3	10.04	08.58	07.29	06.43	05.01	03.31	21.13 (23)	03.17	21.25 (23)	04.37	06.08	07.31	08.02	09.32
4	14.50	16.17	17.44	20.13	21.42	23.13	17 21.30 (23)	23.36	4 21.29 (23)	22.19	20.36	18.53	16.10	14.52
5	10.03	08.55	07.25	06.39	04.57	03.29	21.13 (23)	03.19	21.24 (23)	04.40	06.11	07.34	08.05	09.34
6	14.52	16.20	17.46	20.16	21.45	23.15	16 21.29 (23)	23.34	7 21.31 (23)	22.16	20.33	18.49	16.07	14.50
7	10.02	08.52	07.22	06.36	04.54	03.27	21.14 (23)	03.20	21.23 (23)	04.43	06.14	07.37	08.08	09.37
8	14.54	16.23	17.49	20.19	21.48	23.18	15 21.29 (23)	23.33	8 21.31 (23)	22.13	20.29	18.46	16.04	14.49
9	10.00	08.49	07.19	06.32	04.51	03.25	21.15 (23)	03.22	21.23 (23)	04.46	06.16	07.40	08.11	09.39
10	14.56	16.26	17.52	20.22	21.51	23.20	14 21.29 (23)	23.31	10 21.33 (23)	22.10	20.26	18.42	16.01	14.47
11	09.59	08.46	07.15	06.29	04.48	03.23	21.16 (23)	03.24	21.22 (23)	04.49	06.19	07.43	08.14	09.42
12	14.59	16.29	17.55	20.25	21.54	23.22	12 21.28 (23)	23.30	12 21.34 (23)	22.07	20.22	18.39	15.58	14.46
13	09.58	08.43	07.12	06.25	04.44	03.21	21.16 (23)	03.26	21.22 (23)	04.52	06.22	07.45	08.18	09.44
14	15.01	16.33	17.58	20.28	21.57	23.24	11 21.27 (23)	23.28	13 21.35 (23)	22.04	20.19	18.36	15.55	14.44
15	09.56	08.40	07.09	06.22	04.41	03.19	21.17 (23)	03.28	21.21 (23)	04.55	06.25	07.48	08.21	09.46
16	15.03	16.36	18.01	20.30	22.00	23.26	9 21.26 (23)	23.26	14 21.35 (23)	22.00	20.16	18.32	15.52	14.43
17	09.55	08.37	07.05	06.18	04.38	03.17	21.19 (23)	03.30	21.21 (23)	04.58	06.28	07.51	08.24	09.48
18	15.06	16.39	18.04	20.33	22.03	23.28	8 21.27 (23)	23.24	15 21.36 (23)	21.57	20.12	18.29	15.49	14.42
19	09.53	08.34	07.02	06.15	04.35	03.16	21.20 (23)	03.33	21.20 (23)	05.01	06.30	07.54	08.27	09.50
20	15.08	16.42	18.07	20.36	22.06	23.30	6 21.26 (23)	23.22	17 21.37 (23)	21.54	20.09	18.25	15.46	14.41
21	09.51	08.31	06.58	06.12	04.32	21.19 (23)	03.15	03.35	21.19 (23)	05.04	06.33	07.57	08.30	09.52
22	15.11	16.45	18.10	20.39	22.09	2 21.21 (23)	23.32	23.20	18 21.37 (23)	21.51	20.05	18.22	15.43	14.40
23	09.50	08.27	06.55	06.08	04.29	21.14 (23)	03.13	03.38	21.19 (23)	05.07	06.36	08.00	08.33	09.54
24	15.13	16.48	18.13	20.42	22.13	10 21.24 (23)	23.33	23.18	19 21.38 (23)	21.47	20.02	18.19	15.40	14.39
25	09.48	08.24	06.51	06.05	04.26	21.12 (23)	03.12	03.40	21.19 (23)	05.10	06.39	08.02	08.36	09.56
26	15.16	16.52	18.16	20.45	22.16	13 21.25 (23)	23.35	23.15	19 21.38 (23)	21.44	19.58	18.15	15.38	14.38
27	09.46	08.21	06.48	06.01	04.22	21.12 (23)	03.11	03.43	21.19 (23)	05.13	06.41	08.05	08.39	09.57
28	15.19	16.55	18.19	20.48	22.19	15 21.27 (23)	23.36	23.13	20 21.39 (23)	21.41	19.55	18.12	15.35	14.37
29	09.44	08.18	06.45	05.58	04.19	21.10 (23)	03.10	03.45	21.19 (23)	05.16	06.44	08.08	08.42	09.59
30	15.22	16.58	18.22	20.51	22.22	18 21.28 (23)	23.37	23.11	20 21.39 (23)	21.37	19.51	18.09	15.32	14.37
31	09.42	08.15	06.41	05.54	04.16	21.10 (23)	03.09	03.48	21.19 (23)	05.19	06.47	08.11	08.45	10.00
1	15.24	17.01	18.24	20.54	22.25	19 21.29 (23)	23.39	23.08	21 21.40 (23)	21.34	19.48	18.05	15.29	14.37
2	09.39	08.12	06.38	05.51	04.13	21.10 (23)	03.09	03.51	21.18 (23)	05.22	06.50	08.14	08.49	10.01
3	15.27	17.04	18.27	20.57	22.28	20 21.30 (23)	23.39	23.06	22 21.40 (23)	21.31	19.44	18.02	15.27	14.36
4	09.37	08.08	06.34	05.48	04.10	21.09 (23)	03.08	03.53	21.18 (23)	05.25	06.52	08.17	08.52	10.02
5	15.30	17.07	18.30	21.00	22.31	21 21.30 (23)	23.40	23.03	22 21.40 (23)	21.27	19.41	17.59	15.24	14.36
6	09.35	08.05	06.31	05.44	04.07	21.09 (23)	03.08	03.56	21.19 (23)	05.28	06.55	08.20	08.55	10.03
7	15.33	17.10	18.33	21.03	22.34	21 21.30 (23)	23.41	23.00	22 21.41 (23)	21.24	19.37	17.55	15.21	14.36
8	09.32	08.02	06.27	05.41	04.05	21.09 (23)	03.08	03.59	21.19 (23)	05.31	06.58	08.23	08.58	10.04
9	15.36	17.13	18.36	21.06	22.37	22 21.31 (23)	23.41	22.58	22 21.41 (23)	21.21	19.34	17.52	15.19	14.36
10	09.30	07.59	06.24	05.37	04.02	21.08 (23)	03.08	04.02	21.18 (23)	05.34	07.01	08.26	09.01	10.05
11	15.39	17.16	18.39	21.09	22.40	22 21.30 (23)	23.42	22.55	23 21.41 (23)	21.17	19.31	17.49	15.16	14.37
12	09.28	07.55	06.21	05.34	03.59	21.08 (23)	03.08	04.05	21.18 (23)	05.36	07.04	08.29	09.04	10.06
13	15.42	17.19	18.42	21.12	22.43	23 21.31 (23)	23.42	22.52	23 21.41 (23)	21.14	19.27	17.45	15.14	14.37
14	09.25	07.52	06.17	05.31	03.56	21.09 (23)	03.08	04.07	21.19 (23)	05.39	07.06	08.32	09.07	10.06
15	15.45	17.22	18.44	21.15	22.46	22 21.31 (23)	23.42	22.49	22 21.41 (23)	21.10	19.24	17.42	15.11	14.38
16	09.23	07.49	06.14	05.27	03.53	21.09 (23)	03.08	04.10	21.19 (23)	05.42	07.09	08.35	09.10	10.06
17	15.48	17.25	18.47	21.18	22.49	22 21.31 (23)	23.42	22.47	22 21.41 (23)	21.07	19.20	17.39	15.09	14.38
18	09.20	07.45	06.10	05.24	03.51	21.09 (23)	03.09	04.13	21.19 (23)	05.45	07.12	07.38	09.13	10.07
19	15.51	17.29	18.50	21.21	22.51	22 21.31 (23)	23.42	22.44	21 21.40 (23)	21.04	19.17	16.36	15.07	14.39
20	09.17	07.42	06.07	05.21	03.48	21.09 (23)	03.10	04.16	21.20 (23)	05.48	07.15	07.41	09.15	10.07
21	15.55	17.32	18.53	21.24	22.54	22 21.31 (23)	23.41	22.41	21 21.41 (23)	21.00	19.13	16.32	15.04	14.40
22	09.15	07.39	06.03	05.17	03.45	21.09 (23)	03.11	04.19	21.20 (23)	05.51	07.17	07.44	09.18	10.07
23	15.58	17.35	18.56	21.27	22.57	22 21.31 (23)	23.41	22.38	20 21.40 (23)	20.57	19.10	16.29	15.02	14.41
24	09.12	07.35	06.00	05.14	03.43	21.10 (23)	03.12	04.22	21.21 (23)	05.54	07.20	07.47	09.21	10.06
25	16.01	17.38	18.59	21.30	23.00	20 21.30 (23)	23.40	22.35	19 21.40 (23)	20.53	19.06	16.26	15.00	14.42
26	09.09	07.32	06.00	05.11	03.40	21.10 (23)	03.13	04.25	21.22 (23)	05.57	07.23	07.50	09.24	10.06
27	16.04	17.41	19.02	21.33	23.03	20 21.30 (23)	23.39	22.32	16 21.38 (23)	20.50	19.03	16.23	14.58	14.44
28	09.06	07.30	06.00	05.07	03.38	21.11 (23)	03.14	04.28	21.22 (23)	05.59	07.26	07.53	09.27	10.06
29	16.07	17.44	19.05	21.36	23.05	20 21.31 (23)	23.38	22.29	15 21.37 (23)	20.47	19.00	16.20	14.56	14.45
30	09.03	07.28	06.00	05.05	03.35	21.11 (23)	03.13	04.31	21.24 (23)	06.02	07.26	07.56	09.27	10.05
31	16.10	17.47	19.08	21.37	23.06	19 21.30 (23)	23.39	22.26	12 21.36 (23)	20.43	19.03	16.17	14.47	14.47
Potential sun hours	179	241	363	448	561	609	597	504	392	307	204	148		
Total, worst case					395	126	519	8						
Sun reduction					0.48	0.49	0.39	0.32						
Oper. time red.					0.93	0.93	0.93	0.93						
Wind dir. red.					0.64	0.64	0.64	0.64						
Total reduction					0.28	0.29	0.23	0.19			</			



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: B - Lomarakenus B (Loukkukoskentie 700)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.01	07.32	06.46	05.04	03.33	03.16	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.14	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.51	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.58	03.29	03.19	04.40	06.11	07.34	08.05	09.34
	14.53	16.20	17.47	20.16	21.45	23.15	23.35	22.16	20.33	18.49	16.07	14.51
4	10.02	08.52	07.22	06.36	04.54	03.27	03.21	04.43	06.14	07.37	08.08	09.37
	14.55	16.23	17.50	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.00	08.49	07.19	06.32	04.51	03.25	03.22	04.46	06.17	07.40	08.11	09.39
	14.57	16.27	17.53	20.22	21.51	23.20	23.31	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.56	20.25	21.54	23.22	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.26	04.45	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.24	23.28	22.04	20.19	18.36	15.55	14.44
8	09.56	08.40	07.09	06.22	04.42	03.19	03.29	04.55	06.25	07.48	08.21	09.46
	15.04	16.36	18.01	20.31	22.00	23.26	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.18	03.31	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.03	23.28	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.31	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.26	15.46	14.41
11	09.51	08.31	06.58	06.12	04.32	03.15	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.46	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.14	03.38	05.07	06.36	08.00	08.33	09.54
	15.14	16.49	18.13	20.42	22.13	23.33	23.18	21.47	20.02	18.19	15.41	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.16	15.38	14.38
14	09.46	08.21	06.48	06.02	04.23	03.11	03.43	05.13	06.42	08.06	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.36	23.13	21.41	19.55	18.12	15.35	14.38
15	09.44	08.18	06.45	05.58	04.20	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.22	16.58	18.22	20.51	22.22	23.37	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.17	03.10	03.48	05.19	06.47	08.11	08.46	10.00
	15.25	17.01	18.25	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.37
17	09.39	08.12	06.38	05.51	04.14	03.09	03.51	05.22	06.50	08.14	08.49	10.01
	15.28	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.27	14.37
18	09.37	08.09	06.35	05.48	04.11	03.09	03.54	05.25	06.53	08.17	08.52	10.02
	15.30	17.07	18.30	21.00	22.31	23.40	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.08	03.08	03.56	05.28	06.55	08.20	08.55	10.03
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.56	15.21	14.36
20	09.33	08.02	06.28	05.41	04.05	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.14	18.36	21.06	22.37	23.41	22.58	21.21	19.34	17.52	15.19	14.37
21	09.30	07.59	06.24	05.38	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.17	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.37
22	09.28	07.55	06.21	05.34	03.59	03.08	04.05	05.37	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.08	05.40	07.06	08.32	09.07	10.06
	15.46	17.23	18.45	21.15	22.46	23.42	22.49	21.11	19.24	17.42	15.11	14.38
24	09.23	07.49	06.14	05.28	03.54	03.09	04.11	05.42	07.09	08.35	09.10	10.06
	15.49	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.14	05.45	07.12	07.38	09.13	10.07
	15.52	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.54	23.41	22.41	21.00	19.13	16.33	15.05	14.40
27	09.15	07.39	06.03	05.17	03.46	03.11	04.19	05.51	07.18	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.12	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	16.23	14.58	14.44
30	09.06		06.53	05.08	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.36		04.31	06.03		07.56		10.05
	16.11		20.08		23.08		22.26	20.43		16.17		14.47
Potential sun hours	180	241	363	448	561	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	07.32	06.46	07.50 (23)	05.04
	14.49	16.14	17.41	20.11	15 08.05 (23)	17 06.57 (11)
2	10.04	08.58	07.29	06.43	07.52 (23)	05.01
	14.51	16.17	17.44	20.13	11 08.03 (23)	12 06.54 (11)
3	10.03	08.55	07.26	06.39	07.55 (23)	04.58
	14.52	16.20	17.47	20.16	5 08.00 (23)	5 06.50 (11)
4	10.02	08.52	07.22	06.36		04.54
	14.54	16.23	17.50	20.19		21.48
5	10.01	08.49	07.19	06.33		04.51
	14.57	16.27	17.53	20.22		21.51
6	10.00	08.46	07.16	06.29		04.48
	14.59	16.30	17.56	20.25		21.55
7	09.58	08.43	07.12	06.26		04.45
	15.01	16.33	17.59	20.28		21.58
8	09.57	08.40	07.09	06.22		04.41
	15.03	16.36	18.01	20.31		22.01
9	09.55	08.37	07.05	06.19		04.38
	15.06	16.39	18.04	20.34		22.04
10	09.54	08.34	07.02	06.15		04.35
	15.08	16.42	18.07	20.37		22.07
11	09.52	08.31	06.59	06.12		04.32
	15.11	16.46	18.10	20.39		22.10
12	09.50	08.28	06.55	06.08		04.29
	15.14	16.49	18.13	20.42		22.13
13	09.48	08.25	06.52	06.05		04.26
	15.16	16.52	18.16	20.45		22.16
14	09.46	08.22	06.48	06.02	06.46 (11)	04.23
	15.19	16.55	18.19	20.48	12 06.58 (11)	22.19
15	09.44	08.18	06.45	05.58	06.44 (11)	04.20
	15.22	16.58	18.22	20.51	16 07.00 (11)	22.22
16	09.42	08.15	06.42	05.55	06.41 (11)	04.17
	15.25	17.01	18.25	20.54	20 07.01 (11)	22.25
17	09.40	08.12	06.38	05.51	06.40 (11)	04.14
	15.27	17.04	18.28	20.57	22 07.02 (11)	22.28
18	09.38	08.09	06.35	05.48	06.39 (11)	04.11
	15.30	17.07	18.30	21.00	24 07.03 (11)	22.31
19	09.35	08.05	06.31	05.44	06.38 (11)	04.08
	15.33	17.10	18.33	21.03	26 07.04 (11)	22.34
20	09.33	08.02	06.28	05.41	06.38 (11)	04.05
	15.36	17.14	18.36	21.06	26 07.04 (11)	22.37
21	09.30	07.59	06.24	07.01 (23)	05.38	06.36 (11)
	15.39	17.17	18.39	1 07.02 (23)	21.09	27 07.03 (11)
22	09.28	07.56	06.21	06.56 (23)	05.34	06.36 (11)
	15.42	17.20	18.42	11 07.07 (23)	21.12	27 07.03 (11)
23	09.25	07.52	06.17	06.53 (23)	05.31	06.36 (11)
	15.45	17.23	18.45	15 07.08 (23)	21.15	27 07.03 (11)
24	09.23	07.49	06.14	06.52 (23)	05.28	06.36 (11)
	15.49	17.26	18.48	17 07.09 (23)	21.18	27 07.03 (11)
25	09.20	07.46	06.11	06.50 (23)	05.24	06.36 (11)
	15.52	17.29	18.51	19 07.09 (23)	21.21	27 07.03 (11)
26	09.18	07.42	06.07	06.50 (23)	05.21	06.36 (11)
	15.55	17.32	18.53	20 07.10 (23)	21.24	26 07.02 (11)
27	09.15	07.39	06.04	06.50 (23)	05.18	06.37 (11)
	15.58	17.35	18.56	20 07.10 (23)	21.27	25 07.02 (11)
28	09.12	07.36	06.00	06.49 (23)	05.14	06.37 (11)
	16.01	17.38	18.59	20 07.09 (23)	21.30	24 07.01 (11)
29	09.10		06.57	07.49 (23)	05.11	06.38 (11)
	16.04		20.02	20 08.09 (23)	21.33	22 07.00 (11)
30	09.07		06.53	07.49 (23)	05.08	06.39 (11)
	16.07		20.05	19 08.08 (23)	21.36	19 06.58 (11)
31	09.04		06.50	07.50 (23)		03.36
	16.11		20.08	17 08.07 (23)		23.08
Potential sun hours	179	241	363	448	562	609
Total, worst case			179	428		34
Sun reduction			0,32	0,41		0,48
Oper. time red.			0,93	0,93		0,93
Wind dir. red.			0,61	0,60		0,60
Total reduction			0,18	0,23		0,27
Total, real			33	99		9

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 Shadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.14	09.30 14.54
2	03.17 23.36	04.37 22.20	06.08 20.37	07.32 18.53	08.02 16.11	09.32 14.52
3	03.19 23.35	04.40 22.17	06.11 20.33	07.34 18.50	08.06 16.07	09.35 14.51
4	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	09.37 14.49
5	03.22 23.32	04.46 22.10	06.17 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	03.26 23.28	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.44 14.44
8	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.47 14.43
9	03.31 23.25	04.58 21.57	06.28 20.12	07.49 (23) 07.53 (23)	07.51 18.29	08.24 15.49
10	03.33 23.23	05.01 21.54	06.31 20.09	07.45 (23) 07.56 (23)	07.54 18.26	08.27 15.46
11	03.35 23.20	05.04 21.51	06.33 20.05	07.43 (23) 07.58 (23)	07.57 18.22	08.30 15.43
12	03.38 23.18	05.07 21.48	06.36 20.02	07.41 (23) 07.58 (23)	08.00 18.19	08.33 15.41
13	03.40 23.16	05.10 21.44	06.39 19.59	07.40 (23) 07.59 (23)	08.03 18.16	08.37 15.38
14	03.43 23.14	05.13 21.41	06.42 (11) 19.55	07.40 (23) 08.00 (23)	08.06 18.12	08.40 15.35
15	03.45 23.11	05.16 21.38	06.44 (11) 19.52	07.38 (23) 07.59 (23)	08.09 18.09	08.43 15.32
16	03.48 23.09	05.19 21.34	06.47 (11) 19.48	07.38 (23) 07.59 (23)	08.11 18.06	08.46 15.29
17	03.51 23.06	05.22 21.31	06.43 (11) 19.45	07.38 (23) 07.59 (23)	08.14 18.02	08.49 15.27
18	03.53 23.04	05.25 21.28	06.42 (11) 19.41	07.38 (23) 07.57 (23)	08.17 17.59	08.52 15.24
19	03.56 23.01	05.28 21.24	06.42 (11) 19.38	07.38 (23) 07.56 (23)	08.20 17.56	08.55 15.21
20	03.59 22.58	05.31 21.21	06.41 (11) 19.34	07.39 (23) 07.55 (23)	08.23 17.52	08.58 15.19
21	04.02 22.55	05.34 21.18	06.42 (11) 19.31	07.41 (23) 07.53 (23)	08.26 17.49	09.01 15.16
22	04.05 22.53	05.37 21.14	06.41 (11) 19.27	07.43 (23) 07.49 (23)	08.29 17.46	09.04 15.14
23	04.08 22.50	05.40 21.11	06.41 (11) 19.24	08.32 17.42	09.07 15.11	10.07 14.38
24	04.10 22.47	05.43 21.07	06.42 (11) 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	04.13 22.44	05.45 21.04	06.42 (11) 19.17	07.38 16.36	09.13 15.07	10.07 14.39
26	04.16 22.41	05.48 21.01	06.43 (11) 19.15	07.41 16.33	09.16 15.04	10.07 14.40
27	04.19 22.38	05.51 20.57	06.44 (11) 19.10	07.44 16.29	09.19 15.02	10.07 14.41
28	04.22 22.35	05.54 20.54	06.45 (11) 19.07	07.47 16.26	09.21 15.00	10.07 14.42
29	04.25 22.32	05.57 20.50	06.47 (11) 19.03	07.50 16.23	09.24 14.58	10.07 14.44
30	04.28 22.29	06.00 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.45
31	04.31 22.26	06.03 20.43		07.56 16.17		10.06 14.47
Potential sun hours	597	504	392	307	204	148
Total, worst case		437	220			
Sun reduction		0,32	0,33			
Oper. time red.		0,93	0,93			
Wind dir. red.		0,60	0,61			
Total reduction		0,18	0,19			
Total, real		78	42			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: D - Lomarakenus D (Purola)  
 Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05 14.48	09.01 16.14	07.33 17.41	06.46 20.11	07.54 (13) 08.21 (13)	05.04 21.39	03.33 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	08.09 (12) 08.23 (12)	08.00 16.13	09.30 14.54
2	10.04 14.50	08.58 16.17	07.29 17.44	06.43 20.13	07.54 (13) 08.21 (13)	05.01 21.42	03.30 23.14	03.16 23.37	04.37 22.20	06.08 20.37	07.32 18.53	08.10 (12) 08.21 (12)	08.03 16.10	09.33 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	07.55 (13) 08.20 (13)	04.57 21.46	03.28 23.16	03.18 23.36	04.40 22.17	06.11 20.33	07.34 18.50	08.14 (12) 08.15 (12)	08.06 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	07.55 (13) 08.18 (13)	04.54 21.49	03.26 23.19	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.01 (13) 08.05 (13)	07.43 16.04	09.38 14.48
5	10.01 14.56	08.49 16.26	07.19 17.53	06.32 20.22	07.56 (13) 08.17 (13)	04.51 21.52	03.24 23.21	03.22 23.33	04.46 22.11	06.17 20.26	07.40 18.43	07.56 (13) 08.09 (13)	07.40 16.01	09.40 14.47
6	10.00 14.58	08.46 16.29	07.16 17.56	06.29 20.25	07.57 (13) 08.15 (13)	04.48 21.55	03.22 23.23	03.24 23.31	04.49 22.07	06.19 20.23	07.37 18.39	07.53 (13) 08.11 (13)	07.43 15.58	09.42 14.45
7	09.59 15.01	08.43 16.33	07.12 17.58	06.26 20.28	07.59 (13) 08.12 (13)	04.44 21.58	03.20 23.25	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	07.51 (13) 08.12 (13)	07.46 15.55	09.45 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	08.03 (13) 08.08 (13)	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.49 18.32	07.49 (13) 08.12 (13)	07.49 15.52	09.47 14.43
9	09.56 15.05	08.37 16.39	07.05 18.04	06.19 20.34	08.08 (13)	04.38	03.17	03.30	04.58	06.28	07.48 (13)	07.51	08.24	09.49
10	09.54 15.08	08.34 16.42	07.02 18.07	06.15 20.37	08.08 (13)	04.35	03.15	03.32	05.01	06.31	07.48 (13)	07.54	08.27	09.51
11	09.52 15.11	08.31 16.45	06.59 18.10	06.12 20.40	07.32 (12) 07.40 (12)	06.12 22.10	04.32 23.33	03.35 23.21	05.04 21.51	06.33 20.06	07.47 (13) 08.14 (13)	07.57	08.31	09.53
12	09.50 15.13	08.28 16.49	06.55 18.13	06.08 20.42	07.30 (12) 07.43 (12)	06.08 22.09	04.29 23.35	03.37 23.19	05.07 21.48	06.36 20.02	07.46 (13) 08.14 (13)	08.00	08.34	09.55
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	07.28 (12) 07.43 (12)	06.05 22.16	04.25 23.36	03.40 23.16	05.10 21.45	06.39 19.59	07.46 (13) 08.14 (13)	08.03	08.37	09.56
14	09.46 15.19	08.22 16.55	06.48 18.19	06.01 20.48	07.27 (12) 07.45 (12)	06.01 22.19	04.22 23.37	03.42 23.14	05.13 21.41	06.42 19.55	07.46 (13) 08.14 (13)	08.06	08.40	09.58
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	07.26 (12) 07.44 (12)	05.58 22.22	04.19 23.39	03.45 23.12	05.16 21.38	06.44 19.52	07.45 (13) 08.12 (13)	08.09	08.43	10.00
16	09.42 15.24	08.15 17.01	06.42 18.25	05.55 20.54	07.26 (12) 07.45 (12)	05.55 22.26	04.16 23.40	03.47 23.09	05.19 21.35	06.47 19.48	07.45 (13) 08.12 (13)	08.12	08.46	10.01
17	09.40 15.27	08.12 17.04	06.38 18.28	05.51 20.57	07.25 (12) 07.44 (12)	05.51 22.29	04.13 23.41	03.50 23.07	05.22 21.31	06.50 19.45	07.46 (13) 08.11 (13)	08.14	08.49	10.02
18	09.38 15.30	08.09 17.07	06.35 18.30	05.48 21.00	07.25 (12) 07.44 (12)	05.48 22.32	04.10 23.41	03.53 23.04	05.25 21.28	06.53 19.41	07.45 (13) 08.09 (13)	08.17	08.52	10.03
19	09.36 15.33	08.06 17.10	06.31 18.33	05.44 21.03	07.25 (12) 07.43 (12)	05.44 22.35	04.07 23.42	03.56 23.01	05.28 21.24	06.55 19.38	07.47 (13) 08.08 (13)	08.20	08.55	10.04
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	07.26 (12) 07.42 (12)	05.41 22.38	04.04 23.43	03.59 22.59	05.31 21.21	06.58 19.34	07.48 (13) 08.06 (13)	08.23	08.58	10.05
21	09.31 15.39	07.59 17.16	06.24 18.39	05.38 21.09	07.27 (12) 07.40 (12)	05.38 22.41	04.01 23.43	03.57 22.56	05.34 21.18	07.01 19.31	07.50 (13) 08.23 (12)	08.26	09.01	10.06
22	09.28 15.42	07.56 17.20	06.21 18.42	05.34 21.12	07.05 (13) 07.38 (12)	05.34 22.44	03.59 23.43	04.04 22.53	05.37 21.14	07.04 19.27	07.53 (13) 08.24 (12)	08.29	09.04	10.07
23	09.26 15.45	07.52 17.23	06.17 18.45	05.31 21.15	07.02 (13) 07.19 (13)	05.31 22.47	03.56 23.43	04.07 22.50	05.39 21.11	07.07 19.24	07.59 (12) 08.10 (12)	08.32	09.07	10.07
24	09.23 15.48	07.49 17.26	06.14 18.48	05.27 21.18	07.00 (13) 07.21 (13)	05.27 22.49	03.53 23.43	04.10 22.47	05.42 21.08	07.09 19.20	08.09 (12) 08.27 (12)	08.35	09.10	10.07
25	09.21 15.51	07.46 17.29	06.10 18.51	05.24 21.21	06.58 (13) 07.21 (13)	05.24 22.52	03.50 23.43	04.13 22.44	05.45 21.04	07.12 19.17	08.08 (12) 08.27 (12)	07.38	09.13	10.08
26	09.18 15.55	07.43 17.32	06.07 18.53	05.21 21.24	06.57 (13) 07.22 (13)	05.21 22.55	03.48 23.42	04.16 22.41	05.48 21.01	07.15 19.14	08.07 (12) 08.26 (12)	07.41	09.16	10.08
27	09.15 15.58	07.39 17.35	06.04 18.56	05.17 21.27	06.57 (13) 07.23 (13)	05.17 22.58	03.45 23.42	04.19 22.39	05.51 20.57	07.18 19.10	08.07 (12) 08.26 (12)	07.44	09.19	10.08
28	09.13 16.01	07.36 17.38	06.00 18.59	05.14 21.30	06.55 (13) 07.23 (13)	05.14 23.01	03.42 23.41	04.22 22.36	05.54 20.54	07.20 19.07	08.07 (12) 08.26 (12)	07.47	09.22	10.07
29	09.10 16.04	07.33 18.02	05.57 18.53	05.11 21.33	07.25 (13) 08.23 (13)	05.11 23.04	03.40 23.40	04.25 22.32	05.57 20.50	07.23 19.03	08.07 (12) 08.25 (12)	07.50	09.25	10.07
30	09.07 16.07	07.30 18.05	05.53 18.58	05.07 21.36	07.54 (13) 08.22 (13)	05.07 23.06	03.37 23.39	04.28 22.29	06.00 20.47	07.26 19.00	08.08 (12) 08.24 (12)	07.53	09.27	10.07
31	09.04 16.10	07.27 18.08	05.50 18.53	05.04 21.39	07.54 (13) 08.22 (13)	05.04 23.09	03.35 22.26	04.31 20.44	06.02 20.44	07.18 19.00	08.07 (12) 08.24 (12)	07.44	09.19	10.08
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147		
Total, worst case			421	159					566	26				
Sun reduction			0,32	0,41					0,33	0,35				
Oper. time red.			0,93	0,93					0,93	0,93				
Wind dir. red.			0,61	0,61					0,61	0,61				
Total reduction			0,18	0,23					0,19	0,20				
Total, real			77	37					106	5				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.06/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: E - Asuinrakennus E (Kannistontie 557)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1-31). Each cell contains a time value in hh:mm format. Includes summary rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: F - Asuinrakennus F (Lestijarventie 1468)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.03	03.32	03.13	04.33	06.05	07.28	07.59	09.30
	14.47	16.13	17.40	20.10	21.39	23.12	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.33
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.10	14.51
3	10.04	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.17	23.36	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.37	08.09	09.38
	14.53	16.22	17.49	20.19	21.48	23.19	23.34	22.14	20.29	18.45	16.03	14.47
5	10.01	08.49	07.19	06.32	04.50	03.23	03.20	04.45	06.16	07.40	08.12	09.40
	14.55	16.25	17.52	20.22	21.51	23.21	23.33	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.19	07.42	08.15	09.42
	14.57	16.29	17.55	20.25	21.55	23.23	23.31	22.07	20.22	18.39	15.57	14.44
7	09.59	08.43	07.12	06.25	04.44	03.19	03.24	04.51	06.22	07.45	08.18	09.45
	15.00	16.32	17.58	20.27	21.58	23.26	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.01	23.28	23.27	22.01	20.15	18.32	15.51	14.41
9	09.56	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.02	06.15	04.34	03.14	03.31	05.00	06.30	07.54	08.27	09.51
	15.07	16.41	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.33	05.03	06.33	07.57	08.30	09.53
	15.09	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.42	14.38
12	09.50	08.28	06.55	06.08	04.28	03.11	03.36	05.06	06.35	08.00	08.33	09.55
	15.12	16.48	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.18	15.39	14.37
13	09.48	08.25	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.37	09.57
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	08.05	08.40	09.58
	15.18	16.54	18.18	20.48	22.19	23.38	23.14	21.41	19.55	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.44	08.08	08.43	10.00
	15.20	16.57	18.21	20.51	22.22	23.39	23.12	21.38	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.47	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.48	18.05	15.28	14.35
17	09.40	08.12	06.38	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.07	21.31	19.44	18.01	15.26	14.35
18	09.38	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.07	18.30	21.00	22.32	23.42	23.04	21.28	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.04
	15.32	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.58	08.23	08.58	10.05
	15.35	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.51	15.18	14.35
21	09.31	07.59	06.24	05.37	04.00	03.06	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.16	18.39	21.09	22.41	23.43	22.56	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	08.29	09.04	10.07
	15.41	17.19	18.41	21.12	22.44	23.43	22.53	21.14	19.27	17.45	15.13	14.35
23	09.26	07.52	06.17	05.30	03.55	03.06	04.06	05.39	07.06	08.32	09.07	10.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.23	17.42	15.10	14.36
24	09.23	07.49	06.13	05.27	03.52	03.06	04.09	05.42	07.09	08.35	09.10	10.07
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.45	07.12	07.38	09.13	10.08
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.04	19.16	16.35	15.05	14.37
26	09.18	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.41	09.16	10.08
	15.54	17.31	18.53	21.24	22.55	23.43	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.39	06.03	05.17	03.44	03.09	04.18	05.50	07.17	07.44	09.19	10.08
	15.57	17.34	18.56	21.27	22.58	23.42	22.38	20.57	19.10	16.29	15.01	14.39
28	09.12	07.35	06.00	05.13	03.41	03.10	04.21	05.53	07.20	07.47	09.22	10.07
	16.00	17.37	18.59	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.10		06.56	05.10	03.39	03.11	04.24	05.56	07.23	07.50	09.25	10.07
	16.03		20.01	21.33	23.04	23.41	22.32	20.50	19.03	16.22	14.57	14.42
30	09.07		06.53	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.07
	16.06		20.04	21.36	23.06	23.40	22.29	20.47	18.59	16.19	14.55	14.43
31	09.04		06.49		03.34		04.30	06.02		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.16		14.45
Potential sun hours	178	241	363	448	562	611	599	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna.riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.06/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: H - Asuinrakennus H (Hautakoskentie 544)
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1-31). Includes sub-rows for sun hours, total, worst case, sun reduction, oper. time red., wind dir. red., total reduction, and total real.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)







Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: J - Lomarakennus J (Katajajarventie 49)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June						
1	10.05	09.01	07.32	16.26 (27)	06.46	19.06 (28)	05.04	20.28 (17)	03.32			
	14.48	16.13	17.40	23	16.49 (27)	20.10	20	19.26 (28)	21.39	20	20.48 (17)	23.11
2	10.04	08.58	07.29	16.26 (27)	06.42	19.04 (28)	05.00	20.27 (17)	03.30			
	14.50	16.16	17.43	24	16.50 (27)	20.13	22	19.26 (28)	21.42	21	20.48 (17)	23.13
3	10.03	08.55	07.25	16.25 (27)	06.39	19.03 (28)	04.57	20.27 (17)	03.28			
	14.52	16.19	17.46	25	16.50 (27)	20.16	24	19.27 (28)	21.45	21	20.48 (17)	23.16
4	10.02	08.52	07.22	16.25 (27)	06.35	19.02 (28)	04.54	20.28 (17)	03.26			
	14.54	16.23	17.49	26	16.51 (27)	20.19	25	19.27 (28)	21.48	21	20.49 (17)	23.18
5	10.01	08.49	07.19	16.24 (27)	06.32	19.01 (28)	04.50	20.28 (17)	03.24			
	14.56	16.26	17.52	26	16.50 (27)	20.22	26	19.27 (28)	21.51	21	20.49 (17)	23.21
6	09.59	08.46	07.15	16.24 (27)	06.28	19.01 (28)	04.47	20.27 (17)	03.22			
	14.58	16.29	17.55	26	16.50 (27)	20.25	26	19.27 (28)	21.54	21	20.48 (17)	23.23
7	09.58	08.43	07.12	16.24 (27)	06.25	19.01 (28)	04.44	20.28 (17)	03.20			
	15.00	16.32	17.58	26	16.50 (27)	20.27	26	19.27 (28)	21.57	20	20.48 (17)	23.25
8	09.57	08.40	07.08	16.24 (27)	06.22	19.01 (28)	04.41	20.28 (17)	03.18			
	15.02	16.35	18.01	24	16.48 (27)	20.30	25	19.26 (28)	22.00	19	20.47 (17)	23.27
9	09.55	08.37	07.05	16.25 (27)	06.18	19.01 (28)	04.38	20.29 (17)	03.16			
	15.05	16.39	18.04	23	16.48 (27)	20.33	24	19.25 (28)	22.04	18	20.47 (17)	23.29
10	09.53	08.34	07.02	16.25 (27)	06.15	19.02 (28)	04.34	20.30 (17)	03.15			
	15.07	16.42	18.07	21	16.46 (27)	20.36	23	19.25 (28)	22.07	16	20.46 (17)	23.31
11	09.52	08.31	06.58	16.26 (27)	06.11	19.02 (28)	04.31	20.30 (17)	03.13			
	15.10	16.45	18.10	19	16.45 (27)	20.39	21	19.23 (28)	22.10	14	20.44 (17)	23.32
12	09.50	08.27	06.55	16.28 (27)	06.08	19.03 (28)	04.28	20.33 (17)	03.12			
	15.13	16.48	18.13	15	16.43 (27)	20.42	19	19.22 (28)	22.13	11	20.44 (17)	23.34
13	09.48	08.24	06.51	16.31 (27)	06.04	19.05 (28)	04.25	20.35 (17)	03.11			
	15.15	16.51	18.16	10	16.41 (27)	20.45	15	19.20 (28)	22.16	6	20.41 (17)	23.36
14	09.46	08.21	06.48	16.30 (27)	06.01	19.06 (28)	04.22	20.36 (17)	03.10			
	15.18	16.54	18.18	11	16.42 (27)	20.48	11	19.17 (28)	22.19	11	20.42 (17)	23.37
15	09.44	08.18	06.44	16.31 (27)	05.58	19.07 (28)	04.19	20.37 (17)	03.09			
	15.21	16.57	18.21	11	16.43 (27)	20.51	11	19.18 (28)	22.22	11	20.43 (17)	23.38
16	09.42	08.15	06.41	16.32 (27)	05.54	19.08 (28)	04.16	20.38 (17)	03.08			22.17 (9)
	15.24	17.01	18.24	12	16.44 (27)	20.54	12	19.19 (28)	22.25	12	20.44 (17)	23.39
17	09.40	08.12	06.38	16.33 (27)	05.51	19.09 (28)	04.13	20.39 (17)	03.08		2	22.19 (9)
	15.27	17.04	18.27	13	16.45 (27)	20.57	13	19.20 (28)	22.28	13	20.45 (17)	23.40
18	09.37	08.08	06.34	16.34 (27)	05.47	19.10 (28)	04.10	20.40 (17)	03.07		4	22.19 (9)
	15.30	17.07	18.30	14	16.46 (27)	21.00	14	19.21 (28)	22.31	14	20.46 (17)	23.41
19	09.35	08.05	06.31	16.35 (27)	05.44	19.11 (28)	04.07	20.41 (17)	03.07		5	22.20 (9)
	15.33	17.10	18.33	15	16.47 (27)	21.03	15	19.22 (28)	22.34	15	20.47 (17)	23.42
20	09.33	08.02	06.27	16.36 (27)	05.40	19.12 (28)	04.04	20.42 (17)	03.07		6	22.21 (9)
	15.36	17.13	18.36	16	16.48 (27)	21.06	16	19.23 (28)	22.37	16	20.48 (17)	23.42
21	09.30	07.59	06.24	16.37 (27)	05.37	19.13 (28)	04.01	20.43 (17)	03.07		6	22.21 (9)
	15.39	17.16	18.39	17	16.49 (27)	21.09	17	19.24 (28)	22.40	17	20.49 (17)	23.42
22	09.28	07.55	06.20	16.38 (27)	05.34	19.14 (28)	03.58	20.44 (17)	03.07		7	22.22 (9)
	15.42	17.19	18.41	18	16.50 (27)	21.12	18	19.25 (28)	22.43	18	20.50 (17)	23.43
23	09.25	07.52	06.17	16.39 (27)	05.30	19.15 (28)	03.55	20.45 (17)	03.07		7	22.23 (9)
	15.45	17.22	18.44	19	16.51 (27)	21.15	19	19.26 (28)	22.46	19	20.51 (17)	23.43
24	09.23	07.49	06.13	16.40 (27)	05.27	19.16 (28)	03.53	20.46 (17)	03.07		6	22.22 (9)
	15.48	17.25	18.47	20	16.52 (27)	21.18	20	19.27 (28)	22.49	20	20.52 (17)	23.43
25	09.20	07.45	06.10	16.41 (27)	05.24	19.17 (28)	03.50	20.47 (17)	03.08		6	22.22 (9)
	15.51	17.28	6	16.41 (27)	18.50	21.21	21	19.28 (28)	22.52	21	20.53 (17)	23.42
26	09.17	07.42	06.07	16.42 (27)	05.20	19.18 (28)	03.47	20.48 (17)	03.09		5	22.22 (9)
	15.54	17.31	13	16.45 (27)	18.53	21.24	8	20.43 (17)	22.55	8	20.48 (17)	23.42
27	09.15	07.39	06.03	16.46 (27)	05.17	19.19 (28)	03.44	20.49 (17)	03.09		3	22.22 (9)
	15.57	17.34	18	16.47 (27)	18.56	21.27	13	20.45 (17)	22.57	13	20.49 (17)	23.41
28	09.12	07.35	06.00	16.48 (27)	05.13	19.20 (28)	03.42	20.50 (17)	03.10			
	16.00	17.37	20	16.48 (27)	18.59	21.30	15	20.46 (17)	23.00	15	20.50 (17)	23.41
29	09.09	07.32	05.56	16.49 (27)	05.10	19.21 (28)	03.39	20.51 (17)	03.12			
	16.03	17.40	21	16.49 (27)	18.62	21.33	17	20.47 (17)	23.03	17	20.51 (17)	23.40
30	09.06	07.27	05.53	16.50 (27)	05.07	19.22 (28)	03.37	20.52 (17)	03.13			
	16.07	17.43	22	16.50 (27)	18.65	21.36	19	20.48 (17)	23.06	19	20.52 (17)	23.39
31	09.04	07.24	05.49	16.51 (27)	05.04	19.23 (28)	03.35	20.53 (17)	03.13			
	16.10	17.46	23	16.51 (27)	18.68	21.39	21	20.49 (17)	23.08	21	20.53 (17)	23.39
Potential sun hours	179	241	363	448	562	610						
Total, worst case			57	322	379	229						57
Sun reduction			0,33	0,32	0,41	0,48						0,49
Oper. time red.			0,93	0,93	0,93	0,93						0,93
Wind dir. red.			0,62	0,62	0,62	0,63						0,65
Total reduction			0,19	0,19	0,24	0,28						0,30
Total, real			11	60	90	64						17

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: J - Lomarakennus J (Katajajarventie 49)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December			
1	03.14	04.33	20.42 (17)	06.05	19.01 (28)	07.28	17.08 (27)	07.59	09.30
	23.38	22.23	12 20.54 (17)	20.40	21 19.22 (28)	18.56	13 17.21 (27)	16.13	14.53
2	03.16	04.36	20.41 (17)	06.08	19.00 (28)	07.31	17.05 (27)	08.02	09.32
	23.36	22.20	15 20.56 (17)	20.36	23 19.23 (28)	18.52	18 17.23 (27)	16.10	14.51
3	03.17	04.39	20.39 (17)	06.10	18.59 (28)	07.34	17.04 (27)	08.05	09.35
	23.35	22.16	17 20.56 (17)	20.33	24 19.23 (28)	18.49	20 17.24 (27)	16.07	14.50
4	03.19	04.43	20.39 (17)	06.13	18.58 (28)	07.37	17.02 (27)	08.08	09.37
	23.34	22.13	18 20.57 (17)	20.29	25 19.23 (28)	18.46	23 17.25 (27)	16.04	14.48
5	03.21	04.46	20.38 (17)	06.16	18.57 (28)	07.40	17.01 (27)	08.11	09.40
	23.32	22.10	19 20.57 (17)	20.26	26 19.23 (28)	18.42	25 17.26 (27)	16.01	14.46
6	03.23	04.49	20.37 (17)	06.19	18.57 (28)	07.42	17.01 (27)	08.15	09.42
	23.30	22.07	21 20.58 (17)	20.22	26 19.23 (28)	18.39	25 17.26 (27)	15.58	14.45
7	03.25	04.52	20.36 (17)	06.22	18.56 (28)	07.45	17.00 (27)	08.18	09.44
	23.29	22.04	22 20.58 (17)	20.19	26 19.22 (28)	18.35	26 17.26 (27)	15.55	14.43
8	03.27	04.55	20.37 (17)	06.24	18.57 (28)	07.48	17.00 (27)	08.21	09.46
	23.27	22.00	21 20.58 (17)	20.15	25 19.22 (28)	18.32	26 17.26 (27)	15.52	14.42
9	03.30	04.58	20.37 (17)	06.27	18.57 (28)	07.51	16.59 (27)	08.24	09.49
	23.25	21.57	21 20.58 (17)	20.12	24 19.21 (28)	18.29	27 17.26 (27)	15.49	14.41
10	03.32	05.01	20.36 (17)	06.30	18.57 (28)	07.54	16.59 (27)	08.27	09.51
	23.23	21.54	22 20.58 (17)	20.08	22 19.19 (28)	18.25	26 17.25 (27)	15.46	14.40
11	03.34	05.04	20.37 (17)	06.33	18.58 (28)	07.57	17.00 (27)	08.30	09.52
	23.20	21.51	21 20.58 (17)	20.05	20 19.18 (28)	18.22	24 17.24 (27)	15.43	14.39
12	03.37	05.07	20.36 (17)	06.36	18.59 (28)	07.59	17.00 (27)	08.33	09.54
	23.18	21.47	20 20.56 (17)	20.02	18 19.17 (28)	18.18	23 17.23 (27)	15.40	14.38
13	03.39	05.10	20.37 (17)	06.38	19.00 (28)	08.02	17.00 (27)	08.36	09.56
	23.16	21.44	19 20.56 (17)	19.58	14 19.14 (28)	18.15	22 17.22 (27)	15.37	14.37
14	03.42	05.13	20.38 (17)	06.41	19.03 (28)	08.05	17.01 (27)	08.39	09.58
	23.14	21.41	17 20.55 (17)	19.55	7 19.10 (28)	18.12	20 17.21 (27)	15.34	14.37
15	03.44	05.15	20.38 (17)	06.44	18.57 (28)	08.08	17.02 (27)	08.43	09.59
	23.11	21.37	15 20.53 (17)	19.51	18.08	17 17.19 (27)	15.31	14.36	14.36
16	03.47	05.18	20.40 (17)	06.47	18.11	17.04 (27)	08.46	10.00	14.36
	23.09	21.34	12 20.52 (17)	19.48	18.05	12 17.16 (27)	15.29	14.36	14.36
17	03.50	05.21	20.43 (17)	06.49	18.14	08.14	08.49	10.02	14.35
	23.06	21.31	6 20.49 (17)	19.44	18.02	15.26	14.35	10.03	14.35
18	03.52	05.24	19.41	06.52	08.17	08.52	10.03	14.35	10.04
	23.03	21.27	19.41	17.58	15.23	14.35	10.04	14.35	10.04
19	03.55	05.27	19.37	06.55	08.20	08.55	10.04	14.35	10.05
	23.01	21.24	19.37	17.55	15.21	14.35	10.05	14.35	10.05
20	03.58	05.30	19.34	06.58	08.23	08.58	10.05	14.35	10.05
	22.58	21.21	19.34	17.52	15.18	14.35	10.05	14.35	10.05
21	04.01	05.33	19.30	07.00	08.26	09.01	10.05	14.35	10.06
	22.55	21.17	19.30	17.48	15.16	14.36	10.06	14.36	10.06
22	04.04	05.36	19.27	07.03	08.29	09.04	10.06	14.36	10.06
	22.53	21.14	19.27	17.45	15.13	14.36	10.06	14.36	10.06
23	04.07	05.39	19.23	07.06	08.32	09.07	10.06	14.36	10.07
	22.50	21.10	19.23	17.42	15.11	14.37	10.07	14.37	10.07
24	04.10	05.42	19.09	07.09	08.35	09.10	10.07	14.37	10.07
	22.47	21.07	19.20	17.39	15.08	14.37	10.07	14.37	10.07
25	04.13	05.45	19.12	07.12	07.38	09.13	10.07	14.38	10.07
	22.44	21.04	19.17	16.35	15.06	14.38	10.07	14.38	10.07
26	04.15	05.48	19.13	07.14	07.41	09.16	10.07	14.39	10.07
	22.41	21.00	19.13	16.32	15.04	14.39	10.07	14.39	10.07
27	04.18	05.51	19.10	07.17	07.44	09.19	10.07	14.40	10.07
	22.38	20.57	19.10	16.29	15.01	14.40	10.07	14.40	10.07
28	04.21	05.53	19.06	07.20	07.47	09.21	10.07	14.41	10.07
	22.35	20.53	19.06	16.26	14.59	14.41	10.07	14.41	10.07
29	04.24	05.56	19.07 (28)	07.23	07.50	09.24	10.07	14.42	10.07
	22.32	20.50	11 19.18 (28)	19.03	16.22	14.57	14.43	10.06	10.06
30	04.27	05.59	19.04 (28)	07.25	17.12 (27)	07.53	09.27	14.44	10.06
	22.29	20.46	16 19.20 (28)	18.59	6 17.18 (27)	16.19	14.55	10.06	10.06
31	04.30	06.02	19.03 (28)	07.28	07.56	09.30	10.06	14.46	10.06
	22.26	8 20.44 (17)	20.43	19 19.22 (28)	16.16	14.46	10.06	14.46	10.06
	22.26	8 20.52 (17)	20.43	19 19.22 (28)	16.16	14.46	10.06	14.46	10.06
Potential sun hours	598	504	392	307	204	147			
Total, worst case	8	344	307	347					
Sun reduction	0,38	0,32	0,33	0,35					
Oper. time red.	0,93	0,93	0,93	0,93					
Wind dir. red.	0,63	0,63	0,62	0,62					
Total reduction	0,23	0,19	0,19	0,20					
Total, real	2	64	58	69					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.06/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: L - Lomarakenus L (Harjunpaantie 215)
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1-31), containing shadow calculation data such as sun hours, sun rise/set times, and reduction percentages.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapaistu, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.06/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: M - Lomarakenus M (Hakala, Iso-Mottonen)
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months and rows for days 1-31. Includes columns for sun hours and various reduction factors (Sun, Oper, Wind, Total).

Table layout: For each day in each month the following matrix apply

Matrix with 4 columns: Day in month, Sun rise/set times, Minutes with flicker, First/Last time with flicker.



## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 Shadow receptor: N - Lomarakenus N (Hautakoski)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1009	1106	957	759	614	627	8175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.32	06.45	05.03	03.32	03.14	04.33	06.04	07.28	07.59	09.29
	14.47	16.13	17.40	20.10	21.39	23.11	23.37	22.22	20.39	18.56	16.13	14.53
2	10.04	08.58	07.28	06.42	05.00	03.30	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.34
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.19	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.48
5	10.00	08.49	07.18	06.32	04.50	03.23	03.21	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.23	04.48	06.19	07.42	08.14	09.42
	14.57	16.29	17.55	20.24	21.54	23.22	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.44	03.19	03.25	04.51	06.21	07.45	08.17	09.44
	15.00	16.32	17.58	20.27	21.57	23.25	23.28	22.03	20.19	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.18	03.27	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.48
	15.05	16.38	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.28	15.48	14.41
10	09.53	08.33	07.01	06.14	04.34	03.15	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.30	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.34	05.03	06.32	07.56	08.30	09.52
	15.10	16.45	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.28	03.12	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.48	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.38
13	09.48	08.24	06.51	06.04	04.25	03.11	03.39	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.10	03.41	05.12	06.41	08.05	08.39	09.57
	15.18	16.54	18.18	20.48	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.09	03.44	05.15	06.44	08.08	08.42	09.59
	15.21	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.36
16	09.41	08.14	06.41	05.54	04.15	03.08	03.47	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.05	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.26	14.35
18	09.37	08.08	06.34	05.47	04.09	03.07	03.52	05.24	06.52	08.17	08.51	10.02
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.03
	15.32	17.10	18.32	21.02	22.34	23.41	23.00	21.24	19.37	17.55	15.20	14.35
20	09.32	08.02	06.27	05.40	04.04	03.06	03.58	05.30	06.57	08.22	08.58	10.04
	15.35	17.13	18.35	21.05	22.37	23.42	22.58	21.20	19.34	17.51	15.18	14.35
21	09.30	07.58	06.23	05.37	04.01	03.06	04.01	05.33	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.27	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.42	22.52	21.13	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.55	03.07	04.06	05.39	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.42	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.27	03.52	03.07	04.09	05.42	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.08	04.12	05.44	07.11	07.37	09.12	10.07
	15.51	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.06	14.38
26	09.17	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.54	17.31	18.53	21.23	22.54	23.42	22.41	21.00	19.13	16.32	15.03	14.39
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.40
28	09.12	07.35	05.59	05.13	03.42	03.10	04.21	05.53	07.20	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.06
	16.03		20.01	21.32	23.03	23.39	22.32	20.50	19.02	16.22	14.57	14.42
30	09.06		06.52	05.06	03.37	03.13	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.35	23.05	23.38	22.29	20.46	18.59	16.19	14.55	14.44
31	09.03		06.49		03.34		04.30	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------







Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: Q - Lomarakenus Q (Lemmistonrannantie)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.02	03.31	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.28	03.14	04.35	06.07	07.31	08.02	09.32
	14.48	16.15	17.42	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.16	04.38	06.10	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.35	04.53	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.22	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.17	09.45
	14.59	16.31	17.57	20.27	21.57	23.26	23.29	22.04	20.18	18.35	15.53	14.42
8	09.57	08.40	07.08	06.21	04.40	03.16	03.25	04.53	06.24	07.48	08.21	09.47
	15.01	16.34	18.00	20.30	22.00	23.28	23.27	22.00	20.15	18.31	15.50	14.41
9	09.55	08.37	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.24	09.49
	15.03	16.38	18.03	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.47	14.39
10	09.54	08.34	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.24	15.45	14.38
11	09.52	08.30	06.58	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.55
	15.11	16.47	18.12	20.42	22.13	23.35	23.19	21.47	20.01	18.18	15.39	14.36
13	09.48	08.24	06.51	06.04	04.24	03.09	03.37	05.08	06.38	08.02	08.36	09.56
	15.14	16.50	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.48	22.19	23.38	23.14	21.41	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.57	04.17	03.07	03.43	05.14	06.43	08.08	08.42	09.59
	15.20	16.56	18.21	20.50	22.22	23.39	23.12	21.37	19.51	18.07	15.30	14.34
16	09.42	08.15	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.01
	15.22	17.00	18.24	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.14	08.49	10.02
	15.25	17.03	18.26	20.56	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.38	08.08	06.34	05.46	04.08	03.05	03.51	05.23	06.52	08.17	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.34
19	09.35	08.05	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.02	06.27	05.40	04.02	03.05	03.57	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.56	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.33	03.57	03.05	04.02	05.35	07.03	08.28	09.04	10.07
	15.40	17.18	18.41	21.11	22.43	23.44	22.53	21.14	19.26	17.44	15.12	14.34
23	09.25	07.52	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.44	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.47	17.24	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.08
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.05	14.36
26	09.17	07.42	06.06	05.19	03.46	03.07	04.14	05.47	07.14	07.40	09.16	10.08
	15.53	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.16	03.43	03.07	04.17	05.50	07.17	07.43	09.19	10.08
	15.56	17.33	18.55	21.27	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.47	09.22	10.07
	15.59	17.36	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.50	09.24	10.07
	16.02		20.01	21.33	23.03	23.41	22.32	20.50	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.53	09.27	10.07
	16.06		20.04	21.36	23.06	23.40	22.29	20.46	18.59	16.18	14.54	14.42
31	09.04		06.49		03.33		04.29	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		



## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: S - Lomarakenus S (Talonspaikantie 141)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.02	03.31	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.28	03.14	04.35	06.07	07.31	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.16	04.38	06.10	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.35	04.53	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.22	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.35	15.53	14.42
8	09.57	08.40	07.08	06.21	04.40	03.16	03.26	04.53	06.24	07.47	08.20	09.47
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.41
9	09.55	08.37	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.24	15.45	14.38
11	09.52	08.30	06.58	06.10	04.30	03.12	03.33	05.02	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.04	18.21	15.42	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.42	22.13	23.35	23.18	21.47	20.01	18.18	15.39	14.36
13	09.48	08.24	06.51	06.04	04.24	03.09	03.38	05.08	06.38	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.57	04.18	03.07	03.43	05.14	06.43	08.08	08.42	09.59
	15.20	16.56	18.21	20.50	22.22	23.39	23.11	21.37	19.51	18.07	15.30	14.35
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.45	10.01
	15.22	17.00	18.24	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.14	08.49	10.02
	15.25	17.03	18.26	20.56	22.28	23.41	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.34
19	09.35	08.05	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.01	06.27	05.40	04.03	03.05	03.57	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.33	03.57	03.05	04.02	05.35	07.03	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.53	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.47	17.24	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.07	04.14	05.47	07.14	07.40	09.16	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.38
27	09.15	07.38	06.02	05.16	03.43	03.08	04.17	05.50	07.16	07.43	09.19	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.39
28	09.12	07.35	05.59	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.18	14.54	14.43
31	09.03		06.48		03.33		04.29	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: T - Lomarakenus T (Ruipontie)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.06	09.01	07.32	06.45	05.02	03.30	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.12	23.39	22.23	20.40	18.55	16.12	14.52
2	10.05	08.58	07.28	06.42	04.59	03.28	03.13	04.35	06.07	07.31	08.02	09.33
	14.48	16.15	17.42	20.13	21.42	23.15	23.38	22.20	20.36	18.52	16.09	14.50
3	10.04	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.10	07.34	08.05	09.36
	14.50	16.18	17.45	20.16	21.45	23.17	23.37	22.17	20.33	18.48	16.06	14.48
4	10.03	08.52	07.22	06.35	04.52	03.23	03.17	04.41	06.12	07.36	08.09	09.38
	14.52	16.21	17.48	20.19	21.48	23.20	23.35	22.14	20.29	18.45	16.03	14.46
5	10.02	08.49	07.18	06.31	04.49	03.21	03.19	04.44	06.15	07.39	08.12	09.41
	14.54	16.25	17.51	20.21	21.52	23.22	23.33	22.11	20.26	18.42	15.59	14.45
6	10.00	08.46	07.15	06.28	04.46	03.19	03.21	04.47	06.18	07.42	08.15	09.43
	14.56	16.28	17.54	20.24	21.55	23.24	23.32	22.07	20.22	18.38	15.56	14.43
7	09.59	08.43	07.12	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.18	09.45
	14.58	16.31	17.57	20.27	21.58	23.26	23.30	22.04	20.19	18.35	15.53	14.42
8	09.58	08.40	07.08	06.21	04.39	03.16	03.25	04.53	06.24	07.48	08.21	09.47
	15.01	16.34	18.00	20.30	22.01	23.28	23.28	22.01	20.15	18.31	15.50	14.40
9	09.56	08.37	07.05	06.17	04.36	03.14	03.27	04.56	06.27	07.51	08.24	09.50
	15.03	16.37	18.03	20.33	22.04	23.30	23.26	21.58	20.12	18.28	15.47	14.39
10	09.54	08.34	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.54	08.27	09.52
	15.06	16.41	18.06	20.36	22.07	23.32	23.24	21.54	20.08	18.24	15.44	14.38
11	09.53	08.31	06.58	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.54
	15.08	16.44	18.09	20.39	22.10	23.34	23.22	21.51	20.05	18.21	15.41	14.37
12	09.51	08.28	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.34	09.55
	15.11	16.47	18.12	20.42	22.13	23.36	23.19	21.48	20.01	18.18	15.39	14.36
13	09.49	08.24	06.51	06.04	04.23	03.09	03.37	05.08	06.38	08.02	08.37	09.57
	15.14	16.50	18.15	20.45	22.16	23.37	23.17	21.44	19.58	18.14	15.36	14.35
14	09.47	08.21	06.48	06.00	04.20	03.07	03.40	05.11	06.41	08.05	08.40	09.59
	15.16	16.53	18.18	20.48	22.20	23.39	23.15	21.41	19.54	18.11	15.33	14.35
15	09.45	08.18	06.44	05.57	04.17	03.06	03.42	05.14	06.43	08.08	08.43	10.00
	15.19	16.56	18.21	20.51	22.23	23.40	23.12	21.38	19.51	18.08	15.30	14.34
16	09.43	08.15	06.41	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.02
	15.22	17.00	18.24	20.54	22.26	23.41	23.10	21.34	19.47	18.04	15.27	14.34
17	09.40	08.12	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.14	08.49	10.03
	15.25	17.03	18.27	20.57	22.29	23.42	23.07	21.31	19.44	18.01	15.25	14.33
18	09.38	08.08	06.34	05.46	04.08	03.05	03.51	05.23	06.52	08.17	08.52	10.04
	15.28	17.06	18.29	21.00	22.32	23.43	23.04	21.27	19.40	17.57	15.22	14.33
19	09.36	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.20	08.55	10.05
	15.31	17.09	18.32	21.03	22.35	23.43	23.02	21.24	19.37	17.54	15.19	14.33
20	09.33	08.02	06.27	05.39	04.02	03.04	03.56	05.29	06.57	08.23	08.58	10.06
	15.34	17.12	18.35	21.06	22.38	23.44	22.59	21.21	19.33	17.51	15.17	14.33
21	09.31	07.59	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.26	09.01	10.07
	15.37	17.15	18.38	21.09	22.41	23.44	22.56	21.17	19.30	17.48	15.14	14.34
22	09.28	07.55	06.20	05.33	03.56	03.04	04.02	05.35	07.03	08.29	09.04	10.07
	15.40	17.18	18.41	21.12	22.44	23.44	22.53	21.14	19.27	17.44	15.12	14.34
23	09.26	07.52	06.16	05.29	03.54	03.04	04.05	05.38	07.06	08.32	09.08	10.08
	15.43	17.21	18.44	21.15	22.47	23.44	22.51	21.10	19.23	17.41	15.09	14.35
24	09.23	07.49	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.35	09.10	10.08
	15.46	17.24	18.47	21.18	22.50	23.44	22.48	21.07	19.20	17.38	15.07	14.35
25	09.21	07.45	06.09	05.22	03.48	03.05	04.11	05.44	07.11	07.38	09.13	10.08
	15.50	17.27	18.50	21.21	22.53	23.44	22.45	21.04	19.16	16.34	15.04	14.36
26	09.18	07.42	06.06	05.19	03.45	03.06	04.14	05.47	07.14	07.41	09.16	10.08
	15.53	17.30	18.53	21.24	22.56	23.44	22.42	21.00	19.13	16.31	15.02	14.37
27	09.15	07.39	06.03	05.16	03.43	03.07	04.17	05.50	07.17	07.44	09.19	10.08
	15.56	17.33	18.55	21.27	22.59	23.43	22.39	20.57	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.53	07.20	07.47	09.22	10.08
	15.59	17.36	18.58	21.30	23.01	23.42	22.36	20.53	19.06	16.25	14.58	14.39
29	09.10		06.56	05.09	03.37	03.09	04.23	05.55	07.22	07.50	09.25	10.08
	16.02		20.01	21.33	23.04	23.41	22.33	20.50	19.02	16.21	14.56	14.41
30	09.07		06.52	05.06	03.35	03.10	04.26	05.58	07.25	07.53	09.28	10.07
	16.05		20.04	21.36	23.07	23.40	22.30	20.46	18.59	16.18	14.53	14.42
31	09.04		06.49		03.33		04.29	06.01		07.56		10.07
	16.09		20.07		23.10		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	612	600	505	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: U - Lomarakenus U (Kannistontie, Kivioja)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05	09.01	10.43 (14)	07.32	06.46	07.52 (17)	05.04	03.32
	14.48	16.13	51 14.07 (12)	17.40	20 20.10	08.12 (17)	21.39	23.11
2	10.04	08.58	10.43 (14)	07.29	06.43	07.53 (17)	05.00	03.30
	14.50	16.16	50 14.07 (12)	17.43	20 20.13	08.11 (17)	21.42	23.14
3	10.03	08.55	10.43 (14)	07.26	06.39	07.54 (17)	04.57	03.28
	14.52	16.20	49 14.06 (12)	17.46	20 20.16	08.09 (17)	21.45	23.16
4	10.02	08.52	10.44 (14)	07.22	06.36	07.56 (17)	04.54	03.26
	14.54	16.23	47 14.06 (12)	17.49	20 20.19	08.07 (17)	21.48	23.19
5	10.01	08.49	10.45 (14)	07.19	06.32		04.51	03.24
	14.56	16.26	43 14.05 (12)	17.52	20 20.22		21.52	23.21
6	10.00	08.46	10.47 (14)	07.15	06.29		04.47	03.22
	14.58	16.29	39 14.05 (12)	17.55	20 20.25		21.55	23.23
7	09.59	08.43	10.48 (14)	07.12	06.25		04.44	03.20
	15.00	16.32	35 14.04 (12)	17.58	20 20.28		21.58	23.25
8	09.57	08.40	10.50 (14)	07.09	06.22		04.41	03.18
	15.03	16.36	28 14.03 (12)	18.01	20 20.31		22.01	23.27
9	09.55	08.37	13.48 (12)	07.05	06.18		04.38	03.17
	15.05	16.39	23 15.42 (13)	18.04	20 20.34		22.04	23.29
10	09.54	08.34	15.28 (13)	07.02	06.15		04.35	03.15
	15.08	16.42	16 15.44 (13)	18.07	20 20.36		22.07	23.31
11	09.52	08.31	15.27 (13)	06.58	06.12		04.31	03.14
	15.10	16.45	19 15.46 (13)	18.10	20 20.39		22.10	23.33
12	09.50	08.28	15.26 (13)	06.55	06.08		04.28	03.12
	15.13	16.48	21 15.47 (13)	18.13	20 20.42		22.13	23.35
13	09.48	08.25	15.25 (13)	06.52	06.05		04.25	03.11
	15.16	16.51	23 15.48 (13)	18.16	20 20.45		22.16	23.36
14	09.46	08.22	15.24 (13)	06.48	06.01		04.22	03.10
	15.18	16.55	25 15.49 (13)	18.19	20 20.48		22.19	23.37
15	09.44	08.18	15.23 (13)	06.45	05.58		04.19	03.09
	15.21	16.58	26 15.49 (13)	18.22	20 20.51		22.22	23.39
16	09.42	08.15	15.24 (13)	06.41	05.54		04.16	03.08
	15.24	17.01	26 15.50 (13)	18.24	20 20.54		22.25	23.40
17	09.40	13.46 (12)	08.12	06.38	05.51		04.13	03.08
	15.27	5 13.51 (12)	17.04	18.27	20 20.57		22.28	23.41
18	09.38	13.44 (12)	08.09	06.34	05.47		04.10	03.07
	15.30	11 13.55 (12)	17.07	18.30	20 21.00		22.32	23.41
19	09.35	10.50 (14)	08.05	06.31	05.44		04.07	03.07
	15.33	18 13.57 (12)	17.10	18.33	20 21.03		22.35	23.42
20	09.33	10.47 (14)	08.02	06.28	05.41		04.04	03.07
	15.36	27 13.59 (12)	17.13	18.36	20 21.06		22.38	23.43
21	09.31	10.45 (14)	07.59	06.24	05.37		04.01	03.07
	15.39	33 14.00 (12)	17.16	18.39	20 21.09		22.41	23.43
22	09.28	10.45 (14)	07.56	06.21	07.01 (17)	05.34	03.58	03.07
	15.42	37 14.02 (12)	17.19	18.42	10 07.11 (17)	21.12	22.43	23.43
23	09.26	10.44 (14)	07.52	06.17	06.58 (17)	05.31	03.55	03.07
	15.45	41 14.03 (12)	17.22	18.45	14 07.12 (17)	21.15	22.46	23.43
24	09.23	10.43 (14)	07.49	06.14	06.56 (17)	05.27	03.53	03.07
	15.48	43 14.03 (12)	17.25	18.47	18 07.14 (17)	21.18	22.49	23.43
25	09.20	10.43 (14)	07.46	06.10	06.54 (17)	05.24	03.50	03.08
	15.51	45 14.04 (12)	17.28	18.50	20 07.14 (17)	21.21	22.52	23.43
26	09.18	10.42 (14)	07.42	06.07	06.54 (17)	05.20	03.47	03.09
	15.54	48 14.05 (12)	17.31	18.53	21 07.15 (17)	21.24	22.55	23.42
27	09.15	10.43 (14)	07.39	06.03	06.52 (17)	05.17	03.45	03.10
	15.57	48 14.06 (12)	17.34	18.56	23 07.15 (17)	21.27	22.58	23.42
28	09.12	10.42 (14)	07.36	06.00	06.52 (17)	05.14	03.42	03.11
	16.01	50 14.06 (12)	17.37	18.59	23 07.15 (17)	21.30	23.01	23.41
29	09.10	10.42 (14)		06.56	07.51 (17)	05.10	03.40	03.12
	16.04	50 14.06 (12)		20.02	23 08.14 (17)	21.33	23.03	23.40
30	09.07	10.42 (14)		06.53	07.52 (17)	05.07	03.37	03.13
	16.07	52 14.07 (12)		20.05	22 08.14 (17)	21.36	23.06	23.39
31	09.04	10.42 (14)		06.49	07.52 (17)		03.35	
	16.10	51 14.06 (12)		20.08	22 08.14 (17)		23.09	
Potential sun hours	179	241	363	448	562	610		
Total, worst case	559	737	196	64				
Sun reduction	0,18	0,33	0,32	0,41				
Oper. time red.	0,93	0,93	0,93	0,93				
Wind dir. red.	0,66	0,64	0,61	0,61				
Total reduction	0,11	0,20	0,18	0,24				
Total, real	61	145	36	15				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: U - Lomarakennus U (Kannistontie, Kivioja)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14	04.34	06.05	07.29	07.59	13.21 (12) 09.30
	23.38	22.23	20.40	18.56	16.13	20 15.13 (13) 14.53
2	03.16	04.37	06.08	07.31	08.02	10.23 (14) 09.33
	23.37	22.20	20.36	18.53	16.10	26 15.11 (13) 14.52
3	03.18	04.40	06.11	07.34	08.06	10.19 (14) 09.35
	23.36	22.17	20.33	18.49	16.07	29 13.33 (12) 14.50
4	03.19	04.43	06.14	07.37	08.09	10.17 (14) 09.38
	23.34	22.14	20.30	18.46	16.04	35 13.33 (12) 14.48
5	03.21	04.46	06.16	07.40	08.12	10.16 (14) 09.40
	23.32	22.10	20.26	18.42	16.01	40 13.35 (12) 14.47
6	03.23	04.49	06.19	07.43	08.15	10.15 (14) 09.42
	23.31	22.07	20.23	18.39	15.58	44 13.36 (12) 14.45
7	03.25	04.52	06.22	07.46	08.18	10.14 (14) 09.45
	23.29	22.04	20.19	18.36	15.55	46 13.36 (12) 14.44
8	03.27	04.55	06.25	07.50 (17) 07.48	08.21	10.14 (14) 09.47
	23.27	22.01	20.16	18.32	15.52	48 13.37 (12) 14.42
9	03.30	04.58	06.28	07.51	08.24	10.14 (14) 09.49
	23.25	21.58	20.12	18.29	15.49	49 13.37 (12) 14.41
10	03.32	05.01	06.30	07.47 (17) 07.54	08.27	10.14 (14) 09.51
	23.23	21.54	20.09	18.25	15.46	50 13.38 (12) 14.40
11	03.34	05.04	06.33	07.45 (17) 07.57	08.30	10.14 (14) 09.53
	23.21	21.51	20.05	18.22	15.43	51 13.38 (12) 14.39
12	03.37	05.07	06.36	07.44 (17) 08.00	08.34	10.14 (14) 09.55
	23.19	21.48	20.02	18.19	15.40	52 13.39 (12) 14.38
13	03.39	05.10	06.39	07.43 (17) 08.03	08.37	10.13 (14) 09.56
	23.16	21.44	19.58	18.15	15.37	51 13.38 (12) 14.37
14	03.42	05.13	06.41	07.42 (17) 08.06	08.40	10.14 (14) 09.58
	23.14	21.41	19.55	18.12	15.34	50 13.38 (12) 14.37
15	03.44	05.16	06.44	07.42 (17) 08.08	08.43	10.14 (14) 09.59
	23.12	21.38	19.51	18.09	15.32	50 13.38 (12) 14.36
16	03.47	05.19	06.47	07.42 (17) 08.11	16.03 (13) 08.46	10.15 (14) 10.01
	23.09	21.34	19.48	18.05	11 16.14 (13) 15.29	48 13.38 (12) 14.36
17	03.50	05.22	06.50	07.41 (17) 08.14	16.00 (13) 08.49	10.16 (14) 10.02
	23.06	21.31	19.45	18.02	16 16.16 (13) 15.26	45 13.37 (12) 14.36
18	03.53	05.25	06.52	07.42 (17) 08.17	15.58 (13) 08.52	10.17 (14) 10.03
	23.04	21.28	19.41	17.59	19 16.17 (13) 15.23	43 13.37 (12) 14.35
19	03.55	05.28	06.55	07.43 (17) 08.20	15.56 (13) 08.55	10.18 (14) 10.04
	23.01	21.24	19.38	17.55	22 16.18 (13) 15.21	41 13.37 (12) 14.35
20	03.58	05.30	06.58	07.44 (17) 08.23	15.55 (13) 08.58	10.19 (14) 10.05
	22.58	21.21	19.34	17.52	23 16.18 (13) 15.18	37 13.36 (12) 14.36
21	04.01	05.33	07.01	07.45 (17) 08.26	15.55 (13) 09.01	10.21 (14) 10.06
	22.56	21.18	19.31	17.49	25 16.20 (13) 15.16	33 13.36 (12) 14.36
22	04.04	05.36	07.04	08.29	15.54 (13) 09.04	10.23 (14) 10.06
	22.53	21.14	19.27	17.45	26 16.20 (13) 15.13	27 13.35 (12) 14.36
23	04.07	05.39	07.06	08.32	15.53 (13) 09.07	10.26 (14) 10.07
	22.50	21.11	19.24	17.42	26 16.19 (13) 15.11	19 13.34 (12) 14.37
24	04.10	05.42	07.09	08.35	15.53 (13) 09.10	13.21 (12) 10.07
	22.47	21.07	19.20	17.39	27 16.20 (13) 15.08	12 13.33 (12) 14.37
25	04.13	05.45	07.12	07.38	14.53 (13) 09.13	13.24 (12) 10.07
	22.44	21.04	19.17	16.36	26 15.19 (13) 15.06	6 13.30 (12) 14.38
26	04.16	05.48	07.15	07.41	14.53 (13) 09.16	10.08
	22.41	21.01	19.13	16.32	26 15.19 (13) 15.04	14.39
27	04.19	05.51	07.17	07.44	14.54 (13) 09.19	10.08
	22.38	20.57	19.10	16.29	25 15.19 (13) 15.02	14.40
28	04.22	05.54	07.20	07.47	14.54 (13) 09.22	10.07
	22.35	20.54	19.06	16.26	24 15.18 (13) 14.59	14.41
29	04.25	05.56	07.23	07.50	14.55 (13) 09.25	10.07
	22.32	20.50	19.03	16.23	23 15.18 (13) 14.57	14.43
30	04.28	05.59	07.26	07.53	14.55 (13) 09.27	10.07
	22.29	20.47	19.00	16.19	21 15.16 (13) 14.55	14.44
31	04.31	06.02		07.56	14.57 (13)	10.06
	22.26	20.43		16.16	18 15.15 (13)	14.46
Potential sun hours	598	504	392	307	204	147
Total, worst case			263	358	952	
Sun reduction			0,33	0,35	0,23	
Oper. time red.			0,93	0,93	0,93	
Wind dir. red.			0,61	0,62	0,66	
Total reduction			0,19	0,20	0,14	
Total, real			50	72	137	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: V - Asuinrakennus V (Kannistontie 586)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	14.49 (13)	07.32	06.46	05.04
	14.48	16.13	19 15.08 (13)	17.40	20.10	21.39
2	10.04	08.58	14.48 (13)	07.29	06.43	05.00
	14.50	16.16	21 15.09 (13)	17.43	20.13	21.42
3	10.03	08.55	14.47 (13)	07.26	06.39	04.57
	14.52	16.20	22 15.09 (13)	17.46	20.16	21.45
4	10.02	08.52	14.48 (13)	07.22	06.36	04.54
	14.54	16.23	22 15.10 (13)	17.49	20.19	21.48
5	10.01	08.49	14.48 (13)	07.19	08.00 (17)	06.32
	14.56	16.26	21 15.09 (13)	17.52	2 08.02 (17)	20.22
6	10.00	08.46	14.48 (13)	07.15	07.56 (17)	06.29
	14.58	16.29	22 15.10 (13)	17.55	11 08.07 (17)	20.25
7	09.59	08.43	14.48 (13)	07.12	07.53 (17)	06.25
	15.00	16.32	21 15.09 (13)	17.58	15 08.08 (17)	20.28
8	09.57	13.26 (12)	08.40	14.49 (13)	07.09	07.52 (17)
	15.03	6 13.32 (12)	16.36	21 15.10 (13)	18.01	18 08.10 (17)
9	09.56	13.25 (12)	08.37	14.49 (13)	07.05	07.50 (17)
	15.05	8 13.33 (12)	16.39	20 15.09 (13)	18.04	20 08.10 (17)
10	09.54	13.23 (12)	08.34	14.50 (13)	07.02	07.50 (17)
	15.08	12 13.35 (12)	16.42	18 15.08 (13)	18.07	21 08.11 (17)
11	09.52	13.23 (12)	08.31	14.52 (13)	06.58	07.49 (17)
	15.10	14 13.37 (12)	16.45	15 15.07 (13)	18.10	22 08.11 (17)
12	09.50	13.22 (12)	08.28	14.53 (13)	06.55	07.49 (17)
	15.13	15 13.37 (12)	16.48	12 15.05 (13)	18.13	22 08.11 (17)
13	09.48	13.23 (12)	08.25	14.57 (13)	06.52	07.49 (17)
	15.15	16 13.39 (12)	16.51	5 15.02 (13)	18.16	21 08.10 (17)
14	09.46	13.22 (12)	08.22	06.48	07.49 (17)	06.01
	15.18	17 13.39 (12)	16.55	18.19	21 08.10 (17)	20.48
15	09.44	13.22 (12)	08.18	06.45	07.49 (17)	05.58
	15.21	19 13.41 (12)	16.58	18.22	19 08.08 (17)	20.51
16	09.42	13.22 (12)	08.15	06.41	07.51 (17)	05.54
	15.24	19 13.41 (12)	17.01	18.24	17 08.08 (17)	20.54
17	09.40	13.23 (12)	08.12	06.38	07.51 (17)	05.51
	15.27	20 13.43 (12)	17.04	18.27	14 08.05 (17)	20.57
18	09.38	13.22 (12)	08.09	06.34	07.54 (17)	05.47
	15.30	21 13.43 (12)	17.07	18.30	9 08.03 (17)	21.00
19	09.35	13.22 (12)	08.05	06.31	05.44	04.07
	15.33	21 13.43 (12)	17.10	18.33	21.03	22.35
20	09.33	13.23 (12)	08.02	06.28	05.41	04.04
	15.36	21 13.44 (12)	17.13	18.36	21.06	22.38
21	09.31	13.22 (12)	07.59	06.24	05.37	04.01
	15.39	22 13.44 (12)	17.16	18.39	21.09	22.41
22	09.28	13.23 (12)	07.56	06.21	05.34	03.58
	15.42	22 13.45 (12)	17.19	18.42	21.12	22.44
23	09.26	13.23 (12)	07.52	06.17	05.30	03.55
	15.45	22 13.45 (12)	17.22	18.45	21.15	22.46
24	09.23	13.23 (12)	07.49	06.14	05.27	03.53
	15.48	21 13.44 (12)	17.25	18.47	21.18	22.49
25	09.21	13.25 (12)	07.46	06.10	05.24	03.50
	15.51	20 13.45 (12)	17.28	18.50	21.21	22.52
26	09.18	13.25 (12)	07.42	06.07	05.20	03.47
	15.54	19 13.44 (12)	17.31	18.53	21.24	22.55
27	09.15	13.26 (12)	07.39	06.03	05.17	03.45
	15.57	23 15.00 (13)	17.34	18.56	21.27	22.58
28	09.12	13.27 (12)	07.36	06.00	05.14	03.42
	16.01	27 15.03 (13)	17.37	18.59	21.30	23.01
29	09.10	13.28 (12)	07.33	06.56	05.10	03.39
	16.04	28 15.04 (13)	17.30	18.56	21.33	23.03
30	09.07	13.30 (12)	07.30	06.53	05.07	03.37
	16.07	27 15.06 (13)	17.27	18.53	21.36	23.06
31	09.04	13.33 (12)	07.27	06.49	05.04	03.35
	16.10	24 15.07 (13)	17.24	18.50	21.39	23.09
Potential sun hours	179	241	363	448	562	610
Total, worst case	464	239	232			
Sun reduction	0,18	0,33	0,32			
Oper. time red.	0,93	0,93	0,93			
Wind dir. red.	0,65	0,64	0,62			
Total reduction	0,11	0,20	0,19			
Total, real	50	47	44			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402Shadow receptor: V - Asuinrakennus V (Kannistontie 586)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

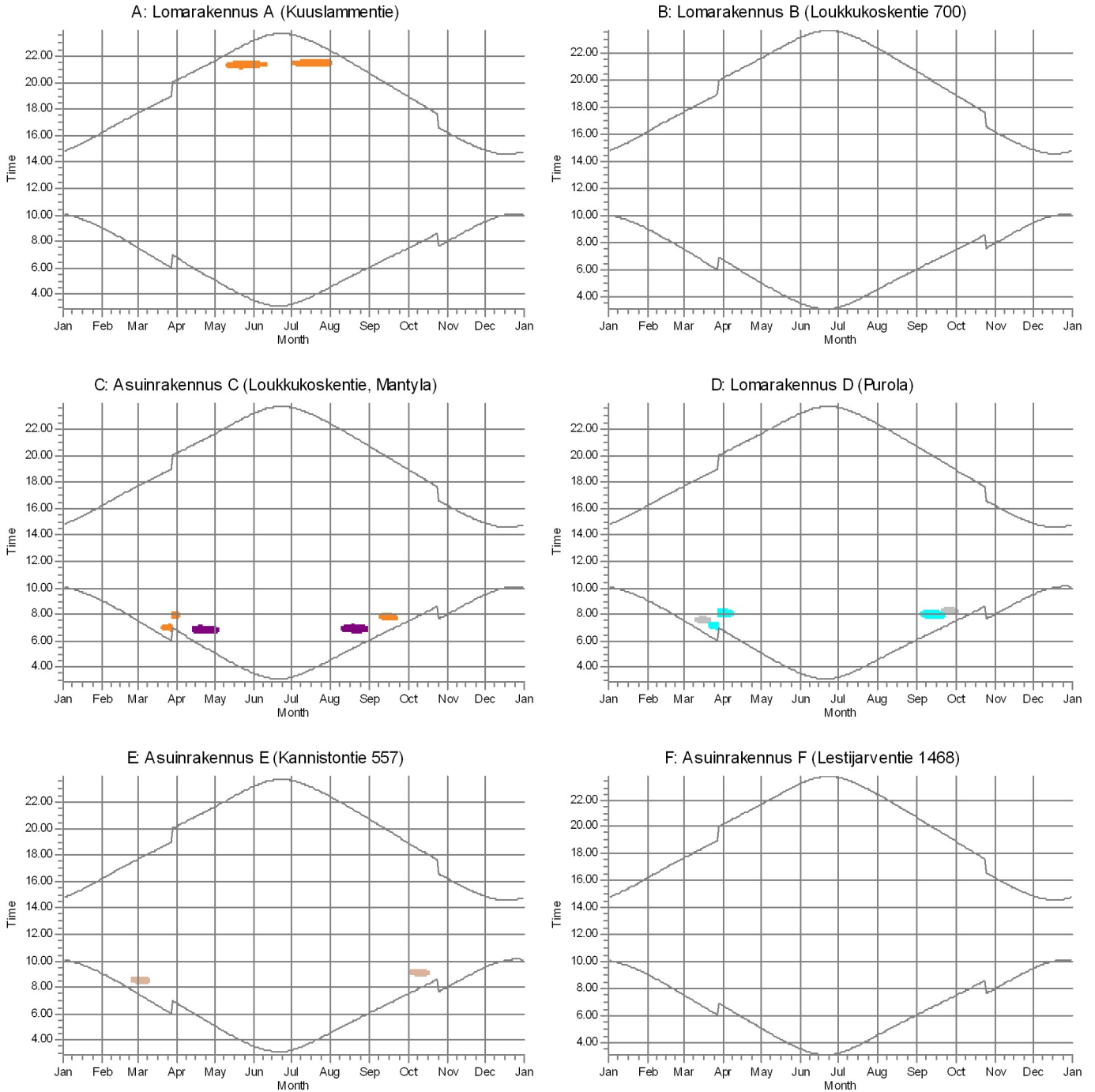
	July	August	September	October	November	December			
1	03.14	04.34	06.05	07.29	08.28 (17)	07.59	14.19 (13)	09.30	13.06 (12)
	23.38	22.23	20.40	18.56	21 08.49 (17)	16.13	18 14.37 (13)	14.53	13 13.19 (12)
2	03.16	04.37	06.08	07.31	08.27 (17)	08.02	14.19 (13)	09.33	13.07 (12)
	23.37	22.20	20.36	18.53	22 08.49 (17)	16.10	19 14.38 (13)	14.52	11 13.18 (12)
3	03.18	04.40	06.11	07.34	08.27 (17)	08.06	14.19 (13)	09.35	13.08 (12)
	23.36	22.17	20.33	18.49	22 08.49 (17)	16.07	20 14.39 (13)	14.50	9 13.17 (12)
4	03.19	04.43	06.14	07.37	08.28 (17)	08.09	14.18 (13)	09.38	13.11 (12)
	23.34	22.14	20.30	18.46	20 08.48 (17)	16.04	21 14.39 (13)	14.48	5 13.16 (12)
5	03.21	04.46	06.16	07.40	08.28 (17)	08.12	14.18 (13)	09.40	
	23.33	22.11	20.26	18.42	19 08.47 (17)	16.01	22 14.40 (13)	14.46	
6	03.23	04.49	06.19	07.43	08.29 (17)	08.15	14.18 (13)	09.42	
	23.31	22.07	20.23	18.39	17 08.46 (17)	15.58	22 14.40 (13)	14.45	
7	03.25	04.52	06.22	07.46	08.30 (17)	08.18	14.18 (13)	09.45	
	23.29	22.04	20.19	18.36	14 08.44 (17)	15.55	21 14.39 (13)	14.44	
8	03.27	04.55	06.25	07.48	08.33 (17)	08.21	14.18 (13)	09.47	
	23.27	22.01	20.16	18.32	8 08.41 (17)	15.52	21 14.39 (13)	14.42	
9	03.30	04.58	06.28	07.51		08.24	14.19 (13)	09.49	
	23.25	21.58	20.12	18.29		15.49	20 14.39 (13)	14.41	
10	03.32	05.01	06.30	07.54		08.27	14.20 (13)	09.51	
	23.23	21.54	20.09	18.25		15.46	19 14.39 (13)	14.40	
11	03.34	05.04	06.33	07.57		08.30	13.04 (12)	09.53	
	23.21	21.51	20.05	18.22		15.43	25 14.39 (13)	14.39	
12	03.37	05.07	06.36	08.00		08.34	13.02 (12)	09.55	
	23.19	21.48	20.02	18.19		15.40	27 14.38 (13)	14.38	
13	03.39	05.10	06.39	08.03		08.37	12.59 (12)	09.56	
	23.16	21.44	19.58	18.15		15.37	29 14.36 (13)	14.37	
14	03.42	05.13	06.41	08.06		08.40	12.59 (12)	09.58	
	23.14	21.41	19.55	18.12		15.34	26 14.34 (13)	14.37	
15	03.44	05.16	06.44	08.08		08.43	12.58 (12)	10.00	
	23.12	21.38	19.51	18.09		15.32	22 14.31 (13)	14.36	
16	03.47	05.19	06.47	08.11		08.46	12.58 (12)	10.01	
	23.09	21.34	19.48	18.05		15.29	19 13.17 (12)	14.36	
17	03.50	05.22	06.50	08.14		08.49	12.57 (12)	10.02	
	23.07	21.31	19.45	18.02		15.26	21 13.18 (12)	14.35	
18	03.53	05.25	06.52	08.17		08.52	12.57 (12)	10.03	
	23.04	21.28	19.41	17.59		15.23	21 13.18 (12)	14.35	
19	03.55	05.28	06.55	08.20		08.55	12.57 (12)	10.04	
	23.01	21.24	19.38	17.55		15.21	22 13.19 (12)	14.35	
20	03.58	05.30	06.58	08.23		08.58	12.58 (12)	10.05	
	22.59	21.21	19.34	17.52		15.18	22 13.20 (12)	14.36	
21	04.01	05.33	07.01	08.26		09.01	12.59 (12)	10.06	
	22.56	21.18	19.31	17.49		15.16	21 13.20 (12)	14.36	
22	04.04	05.36	07.04	08.29		09.04	12.59 (12)	10.07	
	22.53	21.14	19.27	17.45		15.13	21 13.20 (12)	14.36	
23	04.07	05.39	07.06	08.32		09.07	12.59 (12)	10.07	
	22.50	21.11	19.24	17.42		15.11	21 13.20 (12)	14.37	
24	04.10	05.42	07.09	08.35		09.10	12.59 (12)	10.07	
	22.47	21.07	19.20	17.39		15.08	21 13.20 (12)	14.37	
25	04.13	05.45	07.12	08.37 (17)	07.38		09.13	13.00 (12)	10.08
	22.44	21.04	19.17	7 08.44 (17)	16.36		15.06	20 13.20 (12)	14.38
26	04.16	05.48	07.15	08.34 (17)	07.41		09.16	13.00 (12)	10.08
	22.41	21.01	19.13	13 08.47 (17)	16.32		15.04	20 13.20 (12)	14.39
27	04.19	05.51	07.17	08.32 (17)	07.44		09.19	13.02 (12)	10.08
	22.38	20.57	19.10	16 08.48 (17)	16.29		15.02	18 13.20 (12)	14.40
28	04.22	05.54	07.20	08.31 (17)	07.47		09.22	13.02 (12)	10.07
	22.35	20.54	19.06	18 08.49 (17)	16.26		14.59	18 13.20 (12)	14.41
29	04.25	05.56	07.23	08.30 (17)	07.50	14.25 (13)	09.25	13.03 (12)	10.07
	22.32	20.50	19.03	20 08.50 (17)	16.23	8 14.33 (13)	14.57	16 13.19 (12)	14.43
30	04.28	05.59	07.26	08.29 (17)	07.53	14.22 (13)	09.27	13.04 (12)	10.07
	22.29	20.47	19.00	21 08.50 (17)	16.19	13 14.35 (13)	14.55	15 13.19 (12)	14.44
31	04.31	06.02		07.56		14.21 (13)			10.06
	22.26	20.43		16.16	16 14.37 (13)				14.46
Potential sun hours	598	504	392	307	204			147	
Total, worst case			95	180		628		38	
Sun reduction			0,33	0,35		0,23		0,20	
Oper. time red.			0,93	0,93		0,93		0,93	
Wind dir. red.			0,62	0,63		0,65		0,65	
Total reduction			0,19	0,20		0,14		0,12	
Total, real			18	37		88		5	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402



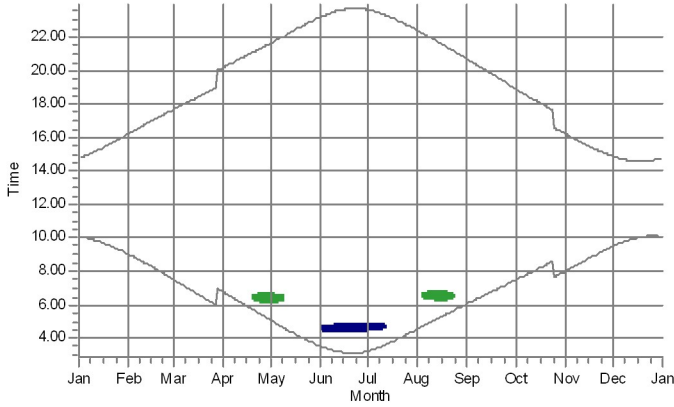
WTGs

- |  |  |   |
|--|--|---|
| <ul style="list-style-type: none"> <li>11: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1185)</li> <li>12: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1186)</li> </ul> | <ul style="list-style-type: none"> <li>13: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1187)</li> <li>17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)</li> </ul> | <ul style="list-style-type: none"> <li>23: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1197)</li> </ul> |
|--|--|---|

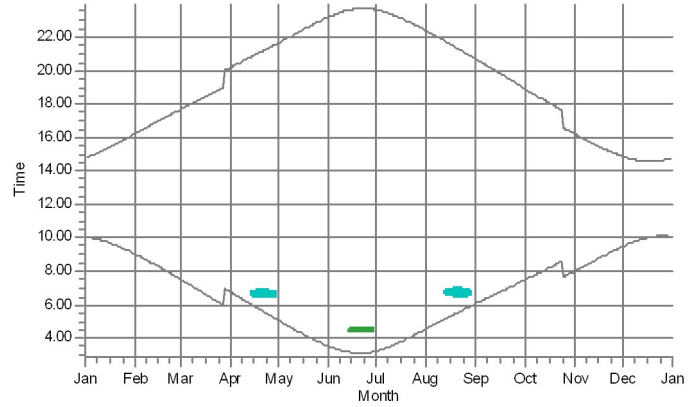
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

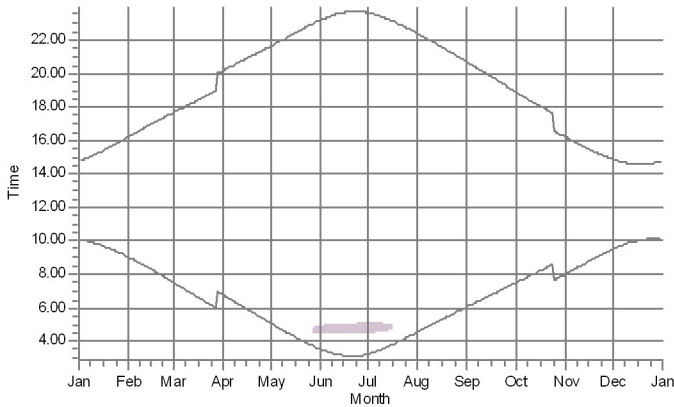
G: Asuinrakennus G (Hautakoskentie 455)



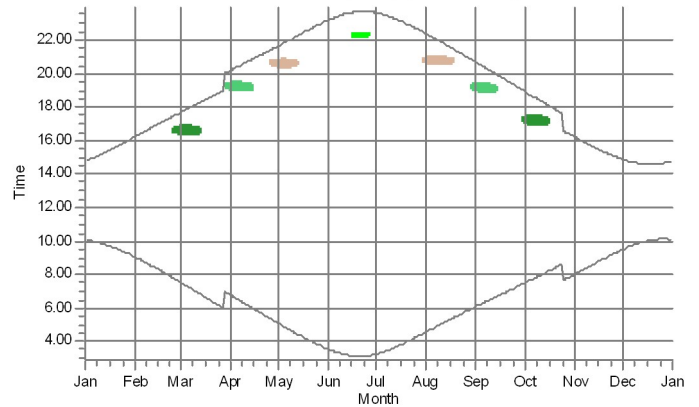
H: Asuinrakennus H (Hautakoskentie 544)



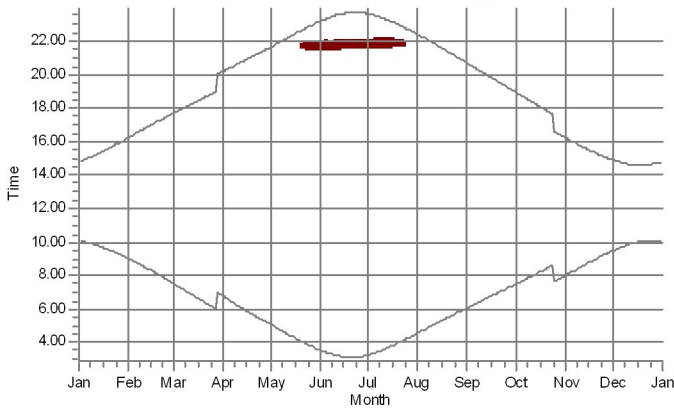
I: Asuinrakennus I (Hautakoskentie 289)



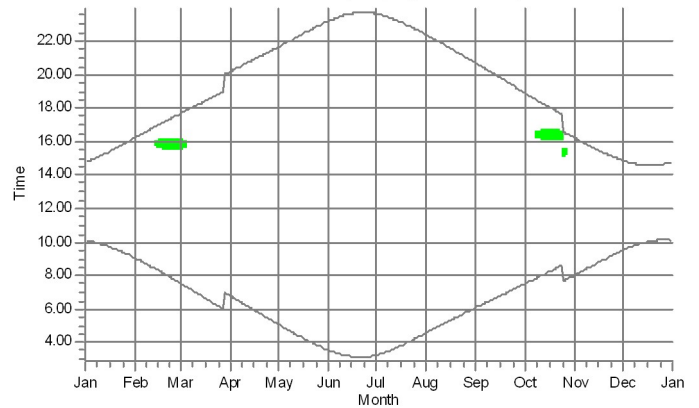
J: Lomarakenus J (Katajarventie 49)



K: Lomarakenus K (Silostenlampi)



L: Lomarakenus L (Harjunpaantie 215)



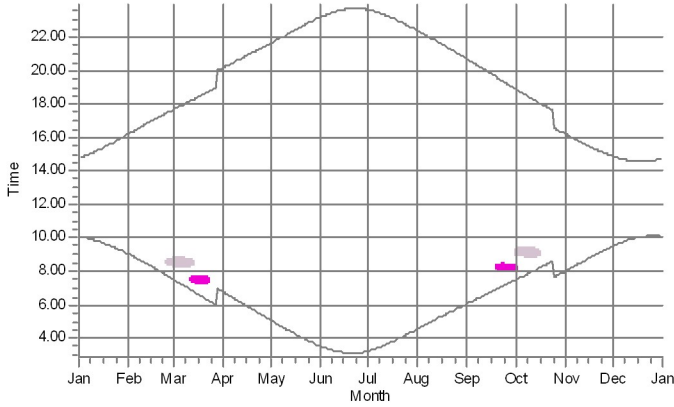
WTGs

- |   |   |  |
|---|---|--|
| <ul style="list-style-type: none"> <li><span style="color: blue;">■</span> 7: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1181)</li> <li><span style="color: darkblue;">■</span> 8: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1182)</li> <li><span style="color: green;">■</span> 9: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: orange;">■</span> 17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)</li> <li><span style="color: purple;">■</span> 20: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1194)</li> <li><span style="color: cyan;">■</span> 21: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1195)</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: purple;">■</span> 25: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)</li> <li><span style="color: green;">■</span> 27: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1201)</li> <li><span style="color: darkblue;">■</span> 28: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1202)</li> </ul> |
|---|---|--|

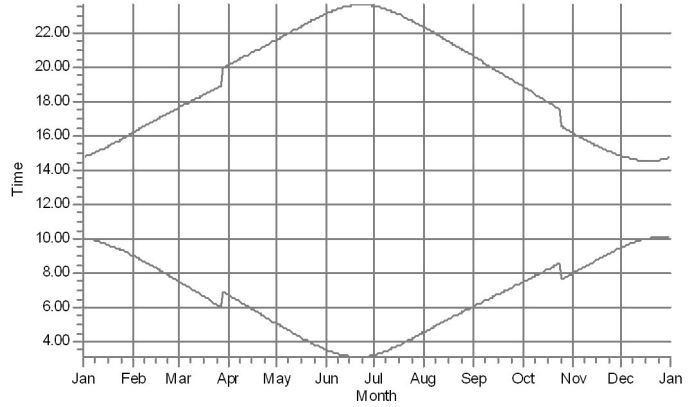
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

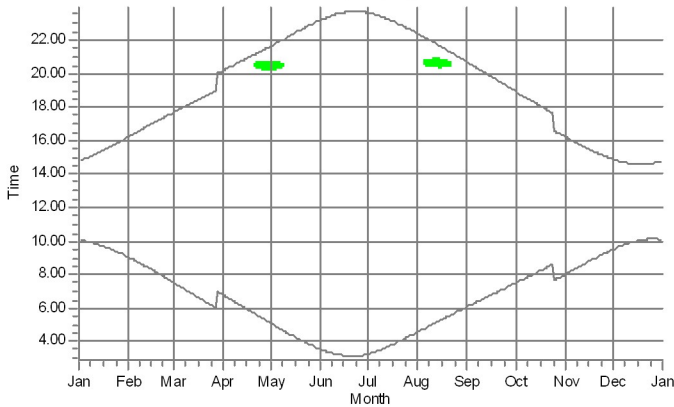
M: Lomarakenus M (Hakala, Iso-Mottonen)



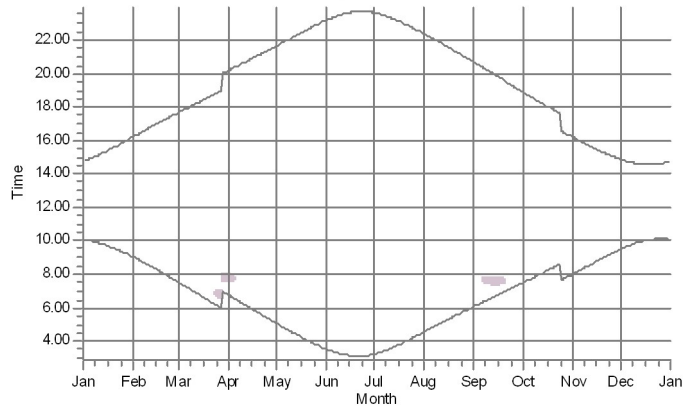
N: Lomarakenus N (Hautakoski)



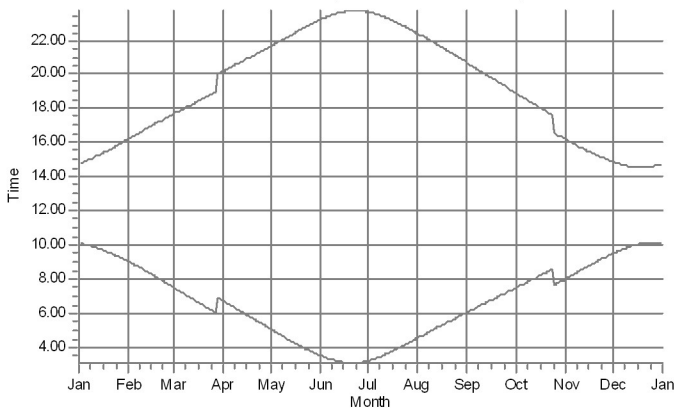
O: Lomarakenus O (Harjunpaantie 398)



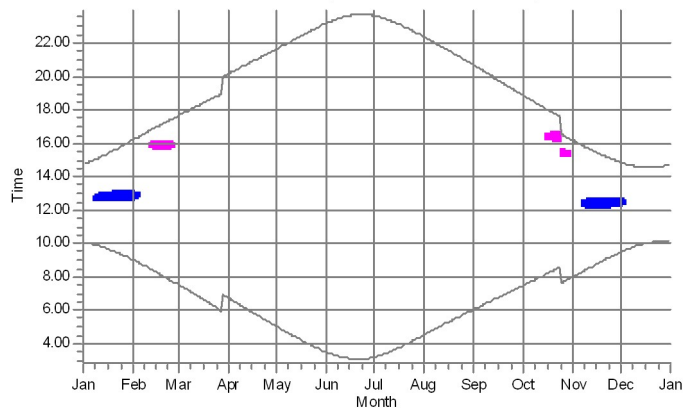
P: Asuinrakenus P (Hautakoskentie 135)



Q: Lomarakenus Q (Lemmistonrannantie)



R: Lomarakenus R (Peuraneva, Valvatintie)



WTGs

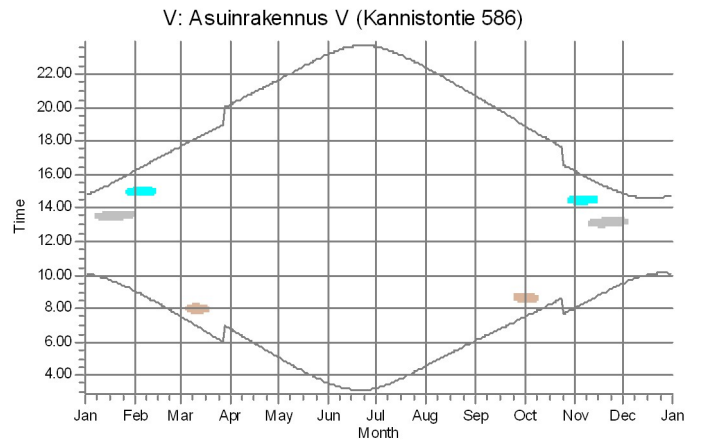
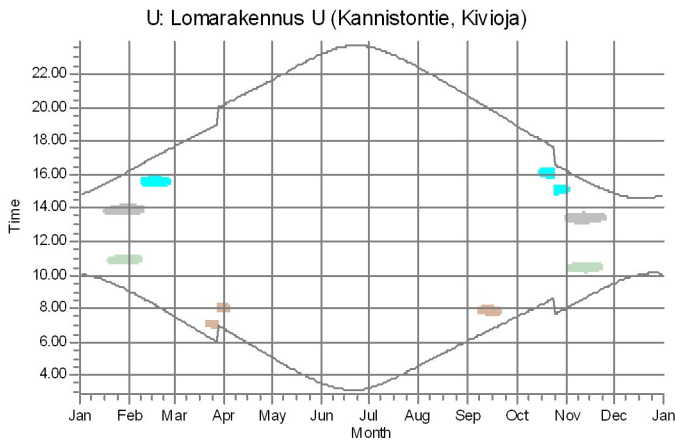
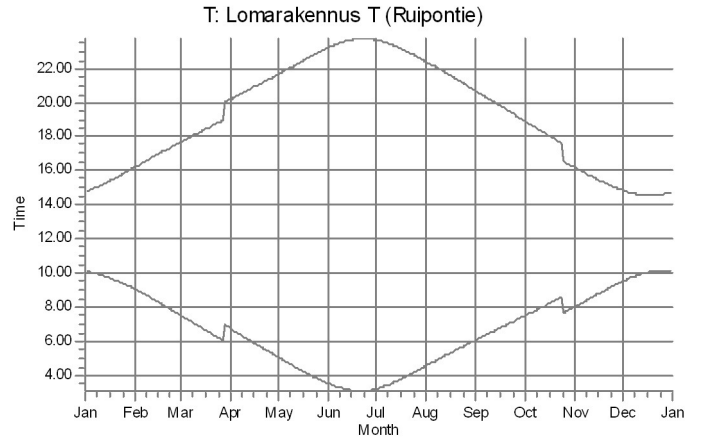
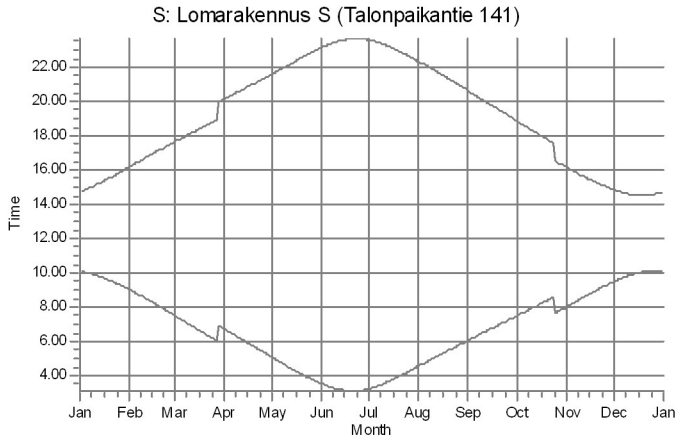
3: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1177)  
5: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1179)

9: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)  
24: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1198)

25: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)

## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402



### WTGs

	12: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1186)		14: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1188)
	13: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1187)		17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1191)

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 1 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1175)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.15	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.50	16.19	17.46	20.16	21.45	23.16	23.36	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.24	03.18	04.42	06.13	07.36	08.08	09.37
	14.52	16.22	17.49	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.22	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.26	18.42	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.18	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.42
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.01	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.35	05.06	06.35	07.59	08.33	09.55
	15.12	16.47	18.12	20.42	22.13	23.35	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.14	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.48	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.51	22.22	23.39	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.06	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.56	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.51	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.04	21.27	19.40	17.58	15.22	14.34
19	09.35	08.05	06.30	05.43	04.06	03.05	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.32	07.00	08.26	09.01	10.06
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.05	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.53	21.14	19.27	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.07	04.15	05.47	07.14	07.41	09.16	10.07
	15.53	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.43	03.08	04.18	05.50	07.17	07.44	09.19	10.07
	15.56	17.34	18.55	21.27	22.58	23.42	22.38	20.57	19.09	16.28	15.00	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.38	03.10	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.04		06.49		03.33		04.30	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.15		14.45
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 2 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1176)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.33	08.05	09.34
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.21	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.15	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.54	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.36	07.04	06.18	04.37	03.15	03.29	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.29	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.30	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.44	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.16	08.51	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.32	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.21	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.35	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 3 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1177)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 12.43-13.04/21 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.32 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.30 12.22-12.37/15 14.52
2	10.04 14.48	08.58 12.45-13.03/18 16.15	07.28 17.43	06.42 20.13	04.59 21.42	03.29 23.14	03.14 23.37	04.36 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 12.24-12.37/13 14.50
3	10.03 14.50	08.55 12.46-13.02/16 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.26 23.16	03.16 23.36	04.39 22.16	06.10 20.32	07.33 18.48	08.05 16.06	09.35 12.26-12.36/10 14.48
4	10.02 14.52	08.52 12.50-13.00/10 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.24 23.19	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 12.28-12.34/6 14.47
5	10.01 14.54	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.22 23.21	03.20 23.32	04.45 22.10	06.15 20.25	07.39 18.42	08.11 16.00	09.40 14.45
6	10.00 14.57	08.46 16.28	07.15 17.54	06.28 20.24	04.46 21.54	03.20 23.23	03.22 23.31	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.31	07.11 17.57	06.24 20.27	04.43 21.57	03.18 23.25	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35	08.18 12.19-12.30/11 15.54	09.44 14.42
8	09.57 12.43-12.49/6 15.01	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.21 12.17-12.32/15 15.51	09.47 14.41
9	09.55 12.42-12.52/10 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.15 23.29	03.28 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 12.16-12.34/18 15.48	09.49 14.40
10	09.54 12.41-12.54/13 15.06	08.34 16.41	07.01 18.06	06.14 20.36	04.33 22.07	03.13 23.31	03.30 23.23	05.00 21.54	06.29 20.08	07.53 18.25	08.27 12.15-12.36/21 15.45	09.51 14.39
11	09.52 12.40-12.55/15 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.30 22.10	03.12 23.33	03.33 23.21	05.03 21.51	06.32 20.05	07.56 18.21	08.30 12.14-12.37/23 15.42	09.53 14.38
12	09.50 12.40-12.57/17 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.35	03.35 23.19	05.06 21.47	06.35 20.01	07.59 18.18	08.33 12.13-12.37/24 15.39	09.55 14.37
13	09.48 12.39-12.58/19 15.14	08.24 16.50	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.14	08.36 12.12-12.37/25 15.36	09.56 14.36
14	09.46 12.39-12.59/20 15.17	08.21 16.54	06.47 18.18	06.00 20.48	04.21 22.19	03.08 23.37	03.40 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 12.12-12.38/26 15.33	09.58 14.35
15	09.44 12.39-13.00/21 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.39	03.43 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 12.12-12.38/26 15.30	09.59 14.35
16	09.42 12.38-13.01/23 15.23	08.15 17.00	06.41 18.24	05.53 20.53	04.15 22.25	03.07 23.40	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.46 12.12-12.39/27 15.28	10.01 14.34
17	09.40 12.39-13.02/23 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.06 23.41	03.48 23.06	05.21 21.31	06.49 19.44	08.14 18.01	08.49 12.12-12.39/27 15.25	10.02 14.34
18	09.37 12.38-13.03/25 15.29	08.08 17.06	06.34 18.29	05.47 20.59	04.09 22.31	03.06 23.42	03.51 23.04	05.24 21.27	06.52 19.40	08.17 17.58	08.52 12.12-12.39/27 15.22	10.03 14.34
19	09.35 12.38-13.03/25 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.05 23.42	03.54 23.01	05.27 21.24	06.54 19.37	08.20 17.54	08.55 12.13-12.39/26 15.20	10.04 14.34
20	09.33 12.38-13.04/26 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.05 23.43	03.57 22.58	05.29 21.20	06.57 19.33	08.23 17.51	08.58 12.14-12.40/26 15.17	10.05 14.34
21	09.30 12.38-13.04/26 15.38	07.58 17.15	06.23 18.38	05.36 21.08	04.00 22.40	03.05 23.43	04.00 22.56	05.32 21.17	07.00 19.30	08.25 17.48	09.01 12.14-12.40/26 15.15	10.06 14.34
22	09.28 12.39-13.05/26 15.41	07.55 17.18	06.20 18.41	05.33 21.11	03.57 22.43	03.05 23.43	04.03 22.53	05.35 21.14	07.03 19.26	08.28 17.44	09.04 12.14-12.40/26 15.12	10.06 14.35
23	09.25 12.39-13.05/26 15.44	07.52 17.21	06.16 18.44	05.30 21.14	03.54 22.46	03.05 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 12.15-12.40/25 15.10	10.07 14.35
24	09.23 12.38-13.05/27 15.47	07.48 17.24	06.13 18.47	05.26 21.17	03.51 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 12.15-12.40/25 15.07	10.07 14.36
25	09.20 12.39-13.06/27 15.50	07.45 17.28	06.09 18.50	05.23 21.20	03.49 22.52	03.06 23.43	04.11 22.44	05.44 21.03	07.11 19.16	07.37 16.35	09.13 12.16-12.39/23 15.05	10.07 14.37
26	09.17 12.39-13.06/27 15.53	07.42 17.31	06.06 18.52	05.19 21.23	03.46 22.55	03.07 23.42	04.14 22.41	05.47 21.00	07.14 19.13	07.40 16.31	09.16 12.17-12.40/23 15.03	10.07 14.38
27	09.15 12.40-13.07/27 15.56	07.38 17.34	06.03 18.55	05.16 21.27	03.43 22.58	03.08 23.42	04.17 22.38	05.50 20.57	07.17 19.09	07.44 16.28	09.19 12.18-12.39/21 15.00	10.07 14.39
28	09.12 12.40-13.06/26 15.59	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.01	03.09 23.41	04.20 22.35	05.53 20.53	07.19 19.06	07.47 16.25	09.21 12.19-12.39/20 14.58	10.07 14.40
29	09.09 12.41-13.06/25 16.03	07.32 17.40	05.56 19.01	05.09 21.33	03.38 23.03	03.10 23.40	04.23 22.32	05.56 20.50	07.22 19.02	07.50 16.22	09.24 12.20-12.39/19 14.56	10.07 14.41
30	09.06 12.42-13.06/24 16.06	07.29 17.43	05.52 19.04	05.06 21.36	03.36 23.06	03.11 23.39	04.26 22.29	05.58 20.46	07.25 18.59	07.53 16.19	09.27 12.21-12.38/17 14.54	10.06 14.43
31	09.04 12.42-13.05/23 16.09	07.26 17.46	05.49 19.07	05.03 21.39	03.33 23.09	03.09 23.40	04.29 22.26	06.01 20.43	07.56 16.15	07.56 16.15	09.27 12.21-12.38/17 14.54	10.06 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	527	65	0	0	0	0	0	0	0	0	547	44

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 4 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1178) Sunshine probability S (Average daily sunshine hours) [UMEA]

#### Assumptions for shadow calculations

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.14	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.07	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.47	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.38	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 5 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210,0 m (TOT: 300,0 m) (1179)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.30 14.52	
2	10.04 14.48	08.58 16.15	07.28 17.43	06.42 20.13	04.59 21.42	03.29 23.14	03.14 23.37	04.36 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.50	
3	10.03 14.50	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.26 23.16	03.16 23.36	04.39 22.17	06.10 20.33	07.34 18.49	08.05 16.06	09.35 14.49	
4	10.02 14.52	08.52 16.22	07.22 17.49	06.35 20.19	04.53 21.48	03.24 23.19	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.38 14.47	
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.22 23.21	03.20 23.33	04.45 22.10	06.16 20.26	07.39 18.42	08.11 16.00	09.40 14.45	
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.46 21.54	03.20 23.23	03.22 23.31	04.48 22.07	06.18 20.22	07.42 18.38	08.15 15.57	09.42 14.44	
7	09.58 14.59	08.43 16.31	07.12 17.58	06.25 20.27	04.43 21.57	03.18 23.26	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35	08.18 15.54	09.45 14.42	
8	09.57 15.01	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.01	03.17 23.28	03.26 23.27	04.54 22.01	06.24 20.15	07.48 18.31	08.21 15.51	09.47 14.41	
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.04	03.15 23.30	03.28 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40	
10	09.54 15.06	08.34 16.41	07.01 18.06	06.14 20.36	04.33 22.07	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39	
11	09.52 15.09	08.31 16.44	06.58 18.09	06.11 20.39	04.30 22.10	03.12 23.33	03.33 23.21	05.03 21.51	06.32 20.05	07.56 18.21	08.30 15.42	09.53 14.38	
12	09.50 15.12	08.27 16.47	15.50-16.01/11 18.12	06.54 20.42	06.07 22.13	04.27 23.35	03.11 23.19	03.35 23.27	05.06 20.01	06.35 18.18	07.59 15.39	09.55 14.37	
13	09.48 15.14	08.24 16.51	15.48-16.03/15 18.15	06.51 20.45	06.04 22.16	04.24 23.36	03.10 23.16	03.38 21.44	05.09 19.58	06.38 18.15	08.02 15.36	09.56 14.36	
14	09.46 15.17	08.21 16.54	15.47-16.05/18 18.18	06.48 20.48	06.00 22.19	04.21 23.38	03.08 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 15.33	09.58 14.35	
15	09.44 15.20	08.18 16.57	15.46-16.05/19 18.21	06.44 20.51	05.57 22.22	04.18 23.39	03.08 23.12	05.15 21.37	06.43 19.51	08.08 18.08	08.43 15.31	10.00 14.35	
16	09.42 15.23	08.15 17.00	15.46-16.06/20 18.24	06.41 20.54	05.53 22.25	04.15 23.40	03.07 23.09	03.46 21.34	05.18 19.47	06.46 18.04	08.11 15.28	16.21-16.32/11 14.34	
17	09.40 15.26	08.11 17.03	15.45-16.06/21 18.27	06.37 20.57	05.50 22.28	04.12 23.41	03.06 23.06	03.49 21.31	05.21 19.44	06.49 18.01	08.14 15.25	16.19-16.34/15 14.34	
18	09.38 15.29	08.08 17.06	15.44-16.06/22 18.30	06.34 21.00	05.47 22.31	04.09 23.42	03.06 23.04	05.24 21.27	06.52 19.40	08.17 17.58	16.17-16.35/18 15.22	08.52 14.34	
19	09.35 15.32	08.05 17.09	15.44-16.07/23 18.32	06.30 21.03	05.43 22.34	04.06 23.42	03.05 23.01	03.54 21.24	05.27 19.37	06.55 17.54	08.20 15.20	16.16-16.36/20 14.34	
20	09.33 15.35	08.02 17.12	15.44-16.06/22 18.35	06.27 21.06	05.40 22.37	04.03 23.43	03.05 22.58	03.57 21.21	05.30 19.34	06.57 17.51	08.23 15.17	16.15-16.36/21 14.34	
21	09.30 15.38	07.58 17.15	15.45-16.06/21 18.38	06.23 21.09	05.36 22.40	04.00 23.43	03.05 22.56	04.00 21.17	05.32 19.30	07.00 17.48	08.26 15.15	16.14-16.36/22 14.34	
22	09.28 15.41	07.55 17.18	15.45-16.05/20 18.41	06.20 21.12	05.33 22.43	03.57 23.43	03.05 22.53	04.03 21.14	05.35 19.27	07.03 17.44	08.29 15.12	16.15-16.37/22 14.35	
23	09.25 15.44	07.52 17.22	15.45-16.04/19 18.44	06.16 21.15	05.30 22.46	03.54 23.43	03.05 22.50	04.06 21.10	05.38 19.23	07.06 17.41	08.32 15.10	16.14-16.37/23 14.35	
24	09.23 15.47	07.49 17.25	15.46-16.04/18 18.47	06.13 21.18	05.26 22.49	03.51 23.43	03.06 22.47	04.09 21.07	05.41 19.20	07.08 17.38	08.35 15.07	16.14-16.36/22 14.36	
25	09.20 15.50	07.45 17.28	15.48-16.02/14 18.50	06.10 21.21	05.23 22.52	03.49 23.43	03.06 22.44	04.12 21.03	05.44 19.16	07.11 16.35	07.38 15.05	15.15-15.36/21 14.37	
26	09.18 15.53	07.42 17.31	15.51-15.59/8 18.53	06.06 21.24	05.19 22.55	03.46 23.43	03.07 22.41	04.15 21.00	05.47 19.13	07.14 16.31	07.41 15.03	15.15-15.35/20 14.38	
27	09.15 15.56	07.39 17.34	06.03 18.55	05.16 21.27	03.43 22.58	03.08 23.42	04.17 22.38	05.50 20.57	07.17 19.09	07.44 16.28	15.16-15.35/19 15.00	09.19 14.39	
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.01	03.09 23.41	04.20 22.35	05.53 20.53	07.20 19.06	07.47 16.25	15.17-15.33/16 14.58	09.22 14.40	
29	09.09 16.03	07.33 17.37	06.56 20.01	05.09 21.33	03.38 23.03	03.10 23.41	04.23 22.32	05.56 20.50	07.22 19.02	07.50 16.22	15.17-15.31/14 14.56	09.24 14.41	
30	09.07 16.06	07.31 17.35	06.52 20.04	05.06 21.36	03.36 23.06	03.11 23.40	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	15.20-15.29/9 14.54	09.27 14.43	
31	09.04 16.09	07.29 17.33	06.49 20.07	05.04 21.36	03.33 23.09	03.09 23.43	04.30 22.26	06.01 20.43	07.56 16.15	16.15 15.15	14.44 14.44	10.06 14.44	
Potential sun hours	178	241	363	449	563	611	599	504	392	307	273	203	146
Sum of minutes with flicker	0	271	0	0	0	0	0	0	0	273	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 6 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1180)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.29 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.13	03.15 23.36	04.36 22.19	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.17 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.25	07.39 18.42	08.11 16.00	09.40 14.46
6	09.59 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	03.22 23.30	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.11 17.58	06.25 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.03	06.21 20.19	07.45 18.35	08.17 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.20 15.51	09.46 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.16 23.29	03.29 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.48 14.40
10	09.53 15.07	08.33 16.41	07.01 18.06	06.14 20.36	04.34 22.06	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.50 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.09	03.13 23.33	03.33 23.20	05.03 21.50	06.32 20.05	07.56 18.21	08.30 15.42	09.52 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.47 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.13	05.12 21.40	06.41 19.54	08.05 18.11	08.39 15.34	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.50	04.18 22.22	03.08 23.38	03.44 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.14 17.00	06.41 18.24	05.54 20.53	04.15 22.25	03.07 23.39	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.45 15.28	10.00 14.35
17	09.39 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.07 23.40	03.49 23.06	05.21 21.30	06.49 19.44	08.14 18.01	08.48 15.25	10.02 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	03.52 23.03	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.35
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.06 23.42	03.55 23.01	05.27 21.24	06.55 19.37	08.20 17.54	08.55 15.20	10.04 14.35
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.06 23.42	03.57 22.58	05.30 21.20	06.57 19.33	08.22 17.51	08.58 15.17	10.05 14.35
21	09.30 15.38	07.58 17.15	06.23 18.38	05.37 21.08	04.00 22.40	03.06 23.43	03.53 22.55	05.33 21.17	07.00 19.30	08.25 17.48	09.01 15.15	10.05 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.03 22.52	05.36 21.14	07.03 19.27	08.28 17.45	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.55 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.06 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.08	10.07 14.37
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.42	03.55 22.44	05.27 21.03	06.55 19.16	08.20 17.35	08.55 15.05	10.04 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.23	03.46 22.55	03.08 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.40 16.32	09.16 15.03	10.07 14.38
27	09.15 15.57	07.38 17.34	06.03 18.55	05.16 21.26	03.44 22.57	03.09 23.41	04.18 22.38	05.50 20.56	07.17 19.09	07.43 16.28	09.18 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.29	03.41 23.00	03.10 23.41	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.25	09.21 14.59	10.07 14.41
29	09.09 16.03		06.56 20.01	05.10 21.33	03.39 23.03	03.11 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 16.22	09.24 14.56	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.54	10.06 14.43
31	09.03 16.09		06.49 20.07		03.34 23.08		04.30 22.26	06.01 20.43		07.56 16.16		10.06 14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 7 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1181)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.13	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.32-04.51/19 22.23	06.04 20.39	07.28 18.56	07.59 16.12	09.30 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	04.32-04.39/7 23.37	04.32-04.50/18 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	04.30-04.40/10 23.35	04.33-04.50/17 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	04.30-04.41/11 23.34	04.33-04.50/17 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.32 20.21	04.50 21.51	03.23 23.21	04.29-04.43/14 23.32	04.34-04.50/16 22.10	06.16 20.26	07.39 18.42	08.11 16.00	09.40 14.46
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	04.29-04.44/15 23.30	04.34-04.49/15 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.12 17.58	06.25 20.27	04.43 21.57	03.19 23.25	04.28-04.43/15 23.29	04.36-04.49/13 22.04	06.21 20.19	07.45 18.35	08.18 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.01	06.21 20.30	04.40 22.00	03.17 23.27	04.28-04.44/16 23.27	04.36-04.48/12 22.00	06.24 20.15	07.48 18.32	08.21 15.51	09.46 14.41
9	09.55 15.04	08.37 16.38	07.05 18.04	06.18 20.33	04.37 22.03	03.16 23.29	04.27-04.45/18 23.25	04.37-04.48/11 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40
10	09.53 15.07	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.07	03.14 23.31	04.28-04.46/18 23.23	04.39-04.47/8 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.10	03.13 23.33	04.28-04.46/18 23.21	04.41-04.44/3 21.51	06.32 20.05	07.56 18.21	08.30 15.42	09.53 14.38
12	09.50 15.12	08.27 16.48	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	04.27-04.46/19 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	04.28-04.47/19 23.16	05.09 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	04.21 22.19	03.09 23.37	04.28-04.47/19 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 15.34	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.38	04.28-04.48/20 23.11	05.15 21.37	06.44 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.54	04.15 22.25	03.07 23.39	04.27-04.48/21 23.09	05.18 21.34	06.46 19.47	08.11 18.05	08.46 15.28	10.01 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.57	04.12 22.28	03.07 23.40	04.28-04.48/20 23.06	05.21 21.31	06.49 19.44	08.14 18.01	08.49 15.25	10.02 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	04.28-04.49/21 23.03	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.35
19	09.35 15.32	08.05 17.09	06.30 18.33	05.43 21.02	04.06 22.34	03.06 23.42	04.28-04.49/21 23.01	05.27 21.24	06.55 19.37	08.20 17.55	08.55 15.20	10.04 14.35
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.06 23.42	04.28-04.49/21 22.58	05.30 21.20	06.57 19.34	08.23 17.51	08.58 15.17	10.05 14.35
21	09.30 15.38	07.58 17.16	06.23 18.38	05.37 21.08	04.00 22.40	03.06 23.43	04.28-04.49/21 22.55	05.33 21.17	07.00 19.30	08.26 17.48	09.01 15.15	10.06 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.28-04.49/21 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.17 18.44	05.30 21.14	03.55 22.46	03.06 23.43	04.29-04.50/21 22.50	05.39 21.10	07.06 19.23	08.32 17.41	09.07 15.10	10.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.29-04.50/21 22.47	05.41 21.07	07.08 19.20	08.35 17.38	09.10 15.08	10.07 14.37
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	04.30-04.50/20 22.44	05.44 21.03	07.11 19.16	07.38 17.35	09.13 15.05	10.07 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.23	03.46 22.55	03.08 23.42	04.30-04.50/20 22.41	05.47 21.00	07.14 19.13	07.41 17.32	09.16 15.03	10.07 14.38
27	09.15 15.57	07.38 17.34	06.03 18.55	05.16 21.27	03.44 22.58	03.09 23.42	04.30-04.50/20 22.38	05.50 20.57	07.17 19.09	07.44 17.28	09.19 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.00	03.10 23.41	04.31-04.51/20 22.35	05.53 20.53	07.20 19.06	07.47 17.25	09.21 14.59	10.07 14.41
29	09.09 16.03		06.56 20.01	05.10 21.33	03.39 23.03	03.11 23.40	04.31-04.51/20 22.32	05.56 20.50	07.22 19.02	07.50 17.22	09.24 14.57	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.32-04.51/19 22.29	05.59 20.46	07.25 18.59	07.53 17.19	09.27 14.55	10.06 14.43
31	09.04 16.09		06.49 20.07		03.34 23.08		04.30 22.26	06.02 20.43		07.56 17.16		10.06 14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	526	149	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 9 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	15.40-16.03/23 17.40	06.46 20.10	05.04 21.39	20.19-20.40/21 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	15.41-16.02/21 17.43	06.42 20.13	05.00 21.42	20.20-20.39/19 23.14
3	10.03 14.51	08.55 16.19	07.25 17.46	15.42-16.00/18 17.46	06.39 20.16	04.57 21.45	20.20-20.39/19 23.16
4	10.02 14.53	08.52 16.23	07.22 17.49	15.45-15.58/13 17.49	06.35 20.19	04.54 21.48	20.20-20.38/18 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52		06.32 20.22	04.50 21.51	20.22-20.38/16 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55		06.29 20.25	04.47 21.54	20.23-20.36/13 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58		06.25 20.28	04.44 21.58	20.25-20.34/9 23.25
8	09.57 15.02	08.40 16.35	07.08 18.01		06.22 20.30	04.41 22.01	20.28-20.30/2 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04		06.18 20.33	04.37 22.04	23.29
10	09.54 15.07	08.34 16.42	07.02 18.07		06.15 20.36	04.34 22.07	23.31
11	09.52 15.10	08.31 16.45	06.58 18.10		06.11 20.39	04.31 22.10	23.33
12	09.50 15.13	08.28 16.48	06.55 18.13		06.08 20.42	04.28 22.13	23.34
13	09.48 15.15	08.24 16.51	06.51 18.16		06.04 20.45	04.25 22.16	23.36
14	09.46 15.18	08.21 16.54	15.51-15.55/4 18.18	06.48 18.18	06.01 20.48	04.22 22.19	23.37
15	09.44 15.21	08.18 16.57	15.46-15.59/13 18.21	06.45 18.21	05.58 20.51	04.19 22.22	23.38
16	09.42 15.24	08.15 17.01	15.44-16.02/18 18.24	06.41 18.24	05.54 20.54	04.16 22.25	23.39
17	09.40 15.27	08.12 17.04	15.42-16.03/21 18.27	06.38 18.27	05.51 20.57	04.13 22.28	23.40
18	09.38 15.30	08.08 17.07	15.42-16.05/23 18.30	06.34 18.30	05.47 21.00	04.10 22.31	23.41
19	09.35 15.32	08.05 17.10	15.40-16.05/25 18.33	06.31 18.33	05.44 21.03	04.07 22.34	23.42
20	09.33 15.35	08.02 17.13	15.39-16.06/27 18.36	06.27 18.36	05.40 21.06	04.04 22.37	23.42
21	09.30 15.39	07.59 17.16	15.39-16.07/28 18.39	06.24 18.39	05.37 21.09	04.01 22.40	23.43
22	09.28 15.42	07.55 17.19	15.38-16.06/28 18.42	06.20 18.42	05.34 21.12	20.29-20.33/4 22.43	23.43
23	09.25 15.45	07.52 17.22	15.39-16.07/28 18.44	06.17 18.44	05.30 21.15	20.25-20.35/10 22.46	23.43
24	09.23 15.48	07.49 17.25	15.38-16.07/29 18.47	06.14 18.47	05.27 21.18	20.23-20.38/15 22.49	23.43
25	09.20 15.51	07.45 17.28	15.38-16.07/29 18.50	06.10 18.50	05.24 21.21	20.22-20.39/17 22.52	23.43
26	09.18 15.54	07.42 17.31	15.38-16.06/28 18.53	06.07 18.53	05.20 21.24	20.21-20.40/19 22.55	23.42
27	09.15 15.57	07.39 17.34	15.38-16.05/27 18.56	06.03 18.56	05.17 21.27	20.20-20.40/20 22.58	23.42
28	09.12 16.00	07.35 17.37	15.39-16.05/26 18.59	06.00 18.59	05.13 21.30	20.20-20.40/20 23.00	23.41
29	09.09 16.03			06.56 20.02	05.10 21.33	20.20-20.40/20 23.03	23.40
30	09.07 16.07			06.53 20.04	05.07 21.36	20.19-20.40/21 23.06	23.39
31	09.04 16.10			06.49 20.07		03.34 23.09	
Potential sun hours	179	241	363	448	562	610	57
Sum of minutes with flicker	0	354	75	146	117		

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 9 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.33 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.36 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.39 22.17	06.10 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 22.13	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	03.21 23.32	04.46 22.10	20.36-20.42/6 20.26	06.16 18.42	07.40 16.01	08.12 14.46
6	03.23 23.31	04.49 22.07	20.34-20.45/11 20.22	06.19 18.39	07.42 15.58	08.15 14.45
7	03.25 23.29	04.52 22.04	20.32-20.46/14 20.19	06.22 18.35	07.45 15.55	08.18 14.43
8	03.27 23.27	04.55 22.01	20.31-20.47/16 20.16	06.25 18.32	07.48 15.52	08.21 14.42
9	03.29 23.25	04.58 21.57	20.29-20.47/18 20.12	06.27 18.29	07.51 15.49	16.22-16.31/9 14.41
10	03.32 23.23	05.01 21.54	20.29-20.48/19 20.09	06.30 18.25	07.54 15.46	16.18-16.34/16 14.40
11	03.34 23.21	05.04 21.51	20.29-20.49/20 20.05	06.33 18.22	07.57 15.43	16.16-16.35/19 14.39
12	03.37 23.18	05.07 21.47	20.28-20.48/20 20.02	06.36 18.18	08.00 15.40	16.14-16.36/22 14.38
13	03.39 23.16	05.10 21.44	20.28-20.49/21 19.58	06.38 18.15	08.02 15.37	16.13-16.37/24 14.37
14	03.42 23.14	05.13 21.41	20.28-20.49/21 19.55	06.41 18.12	08.05 15.34	16.12-16.37/25 14.36
15	03.44 23.11	05.16 21.38	20.27-20.48/21 19.51	06.44 18.08	08.08 15.31	16.11-16.38/27 14.36
16	03.47 23.09	05.18 21.34	20.28-20.47/19 19.48	06.47 18.05	08.11 15.29	16.10-16.38/28 14.36
17	03.50 23.06	05.21 21.31	20.29-20.47/18 19.44	06.50 18.02	08.14 15.26	16.10-16.39/29 14.35
18	03.52 23.04	05.24 21.27	20.29-20.45/16 19.41	06.52 17.58	08.17 15.23	16.10-16.38/28 14.35
19	03.55 23.01	05.27 21.24	20.30-20.44/14 19.37	06.55 17.55	08.20 15.21	16.09-16.38/29 14.35
20	03.58 22.58	05.30 21.21	20.31-20.40/9 19.34	06.58 17.52	08.23 15.18	16.09-16.37/28 14.35
21	04.01 22.56	05.33 21.17	20.34-20.37/3 19.30	07.01 17.48	08.26 15.15	16.09-16.36/27 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	16.10-16.36/26 15.13	09.04 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	16.11-16.35/24 15.11	09.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	16.11-16.34/23 15.08	09.10 14.37
25	04.12 22.44	05.45 21.04	07.12 19.17	07.38 16.35	15.13-15.33/20 15.06	09.13 14.38
26	04.15 22.41	05.48 21.00	07.14 19.13	07.41 16.32	15.14-15.31/17 15.04	09.16 14.39
27	04.18 22.38	05.51 20.57	07.17 19.10	07.44 16.29	15.17-15.28/11 15.01	09.19 14.40
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.43
30	04.27 22.29	05.59 20.47	07.26 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	266	0	432	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 10 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.13	07.32 17.40	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.37	04.34 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.29 14.54
2	10.04 14.50	08.58 16.17	07.29 17.43	06.42 20.13	05.00 21.42	03.30 23.13	03.16 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.25 17.46	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.16	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.18	03.20 23.33	04.43 22.13	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.20	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.11 16.01	09.39 14.47
6	09.59 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.47 21.54	03.22 23.23	03.24 23.30	04.49 22.07	06.19 20.22	07.42 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.32	07.12 17.58	06.25 20.27	04.44 21.57	03.20 23.25	03.26 23.28	04.52 22.04	06.22 20.19	07.45 18.35	08.18 15.55	09.44 14.44
8	09.56 15.03	08.40 16.36	07.08 18.01	06.22 20.30	04.41 22.00	03.19 23.27	03.28 23.26	04.55 22.00	06.25 20.15	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.18 20.33	04.38 22.03	03.17 23.29	03.30 23.24	04.58 21.57	06.27 20.12	07.51 18.29	08.24 15.49	09.48 14.41
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.15 23.30	03.32 23.22	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	09.50 14.40
11	09.52 15.10	08.31 16.45	06.58 18.10	06.11 20.39	04.31 22.10	03.14 23.32	03.35 23.20	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	03.37 23.18	05.07 21.47	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.38
13	09.48 15.16	08.24 16.51	06.51 18.16	06.05 20.45	04.25 22.16	03.12 23.35	03.40 23.16	05.10 21.44	06.39 19.58	08.02 18.15	08.36 15.37	09.56 14.38
14	09.46 15.18	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.37	03.42 23.13	05.13 21.41	06.41 19.55	08.05 18.12	08.39 15.34	09.57 14.37
15	09.44 15.21	08.18 16.58	06.45 18.21	05.58 20.51	04.19 22.22	03.10 23.38	03.45 23.11	05.16 21.37	06.44 19.51	08.08 18.08	08.42 15.32	09.59 14.36
16	09.42 15.24	08.15 17.01	06.41 18.24	05.54 20.54	04.16 22.25	03.09 23.39	03.47 23.08	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.00 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.44	08.14 18.02	08.49 15.26	10.01 14.36
18	09.37 15.30	08.08 17.07	06.34 18.30	05.47 21.00	04.10 22.31	03.08 23.41	03.53 23.03	05.25 21.27	06.52 19.41	08.17 17.58	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.41	03.56 23.01	05.28 21.24	06.55 19.37	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.27 18.36	05.41 21.06	04.04 22.37	03.07 23.42	03.58 22.58	05.30 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.04 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.42	04.01 22.55	05.33 21.17	07.01 19.30	08.26 17.49	09.01 15.16	10.05 14.36
22	09.28 15.42	07.55 17.19	06.20 18.42	05.34 21.12	03.58 22.43	03.07 23.42	04.04 22.52	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.37
23	09.25 15.45	07.52 17.22	06.17 18.44	05.31 21.15	03.56 22.46	03.08 23.42	04.07 22.50	05.39 21.10	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.37
24	09.23 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.42	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.45 17.28	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.42	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.35	09.13 15.06	10.07 14.39
26	09.17 15.54	07.42 17.31	06.07 18.53	05.20 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.14 19.13	07.41 17.32	09.16 15.04	10.07 14.40
27	09.15 15.57	07.39 17.34	06.03 18.56	05.17 21.27	03.45 22.57	03.10 23.41	04.19 22.38	05.51 20.57	07.17 19.10	07.44 17.29	09.18 15.02	10.07 14.41
28	09.12 16.01	07.35 17.37	06.00 18.59	05.14 21.30	03.42 23.00	03.11 23.40	04.22 22.35	05.54 20.53	07.20 19.06	07.47 17.26	09.21 15.00	10.07 14.42
29	09.09 16.04	09.09 16.04	06.56 20.02	05.10 21.33	03.40 23.03	03.12 23.39	04.25 22.32	05.56 20.50	07.23 19.03	07.50 17.23	09.24 14.58	10.06 14.43
30	09.06 16.07	09.06 16.07	06.53 20.04	05.07 21.36	03.37 23.05	03.13 23.38	04.28 22.29	05.59 20.47	07.26 18.59	07.53 17.19	09.27 14.56	10.06 14.45
31	09.04 16.10	09.04 16.10	06.49 20.07	05.07 23.08	03.35 23.08	03.35 23.08	04.31 22.26	06.02 20.43	07.56 17.16	07.56 16.16	10.05 14.46	10.05 14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 11 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.01	07.32	06.46	05.04	06.40-06.57/17	03.33	03.15	04.34	06.05	07.29	07.59	09.30	
	14.49	16.14	17.41	20.10	21.39		23.11	23.37	22.23	20.40	18.56	16.13	14.54	
2	10.04	08.58	07.29	06.43	05.01	06.42-06.54/12	03.31	03.17	04.37	06.08	07.31	08.02	09.32	
	14.50	16.17	17.44	20.13	21.42		23.13	23.36	22.20	20.36	18.53	16.10	14.52	
3	10.03	08.55	07.26	06.39	04.58	06.45-06.50/5	03.29	03.18	04.40	06.11	07.34	08.05	09.35	
	14.52	16.20	17.47	20.16	21.45		23.16	23.35	22.17	20.33	18.49	16.07	14.50	
4	10.02	08.52	07.22	06.36	04.54		03.27	03.20	04.43	06.14	07.37	08.09	09.37	
	14.54	16.23	17.50	20.19	21.48		23.18	23.33	22.13	20.30	18.46	16.04	14.49	
5	10.01	08.49	07.19	06.32	04.51		03.24	03.22	04.46	06.17	07.40	08.12	09.40	
	14.56	16.26	17.53	20.22	21.51		23.20	23.32	22.10	20.26	18.43	16.01	14.47	
6	09.59	08.46	07.16	06.29	04.48		03.23	03.24	04.49	06.19	07.43	08.15	09.42	
	14.59	16.30	17.55	20.25	21.54		23.23	23.30	22.07	20.23	18.39	15.58	14.46	
7	09.58	08.43	07.12	06.25	04.45		03.21	03.26	04.52	06.22	07.46	08.18	09.44	
	15.01	16.33	17.58	20.28	21.57		23.25	23.28	22.04	20.19	18.36	15.55	14.44	
8	09.57	08.40	07.09	06.22	04.41		03.19	03.28	04.55	06.25	07.48	08.21	09.46	
	15.03	16.36	18.01	20.31	22.01		23.27	23.27	22.01	20.16	18.32	15.52	14.43	
9	09.55	08.37	07.05	06.19	04.38		03.17	03.30	04.58	06.28	07.51	08.24	09.49	
	15.06	16.39	18.04	20.34	22.04		23.29	23.25	21.57	20.12	18.29	15.49	14.42	
10	09.53	08.34	07.02	06.15	04.35		03.16	03.33	05.01	06.53-07.01/8	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07		23.31	23.22	21.54	20.09	18.26	15.46	14.41	
11	09.52	08.31	06.59	06.12	04.32		03.14	03.35	05.04	06.49-07.03/14	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10		23.32	23.20	21.51	20.05	18.22	15.43	14.40	
12	09.50	08.28	06.55	06.08	04.29		03.13	03.37	05.07	06.48-07.05/17	06.36	08.00	08.33	09.54
	15.13	16.49	18.13	20.42	22.13		23.34	23.18	21.48	20.02	18.19	15.40	14.39	
13	09.48	08.25	06.52	06.05	04.26		03.12	03.40	05.10	06.47-07.07/20	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16		23.35	23.16	21.44	19.58	18.15	15.38	14.38	
14	09.46	08.21	06.48	06.01	06.46-06.58/12	04.22	03.11	03.43	05.13	06.45-07.07/22	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19		23.37	23.13	21.41	19.55	18.12	15.35	14.37	
15	09.44	08.18	06.45	05.58	06.44-07.00/16	04.19	03.10	03.45	05.16	06.45-07.08/23	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22		23.38	23.11	21.38	19.52	18.09	15.32	14.37	
16	09.42	08.15	06.41	05.55	06.41-07.01/20	04.16	03.09	03.48	05.19	06.44-07.09/25	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25		23.39	23.09	21.34	19.48	18.05	15.29	14.36	
17	09.40	08.12	06.38	05.51	06.40-07.02/22	04.13	03.09	03.51	05.22	06.43-07.09/26	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28		23.40	23.06	21.31	19.45	18.02	15.27	14.36	
18	09.37	08.09	06.35	05.48	06.39-07.03/24	04.10	03.08	03.53	05.25	06.42-07.09/27	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31		23.41	23.03	21.28	19.41	17.59	15.24	14.36	
19	09.35	08.05	06.31	05.44	06.38-07.04/26	04.07	03.08	03.56	05.28	06.42-07.10/28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34		23.41	23.01	21.24	19.38	17.55	15.21	14.36	
20	09.33	08.02	06.28	05.41	06.38-07.04/26	04.05	03.08	03.59	05.31	06.41-07.09/28	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37		23.42	22.58	21.21	19.34	17.52	15.19	14.36	
21	09.30	07.59	06.24	05.38	06.36-07.03/27	04.02	03.08	04.02	05.34	06.42-07.09/27	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40		23.42	22.55	21.17	19.31	17.49	15.16	14.37	
22	09.28	07.56	06.21	05.34	06.36-07.03/27	03.59	03.08	04.05	05.37	06.41-07.08/27	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43		23.42	22.53	21.14	19.27	17.46	15.14	14.37	
23	09.25	07.52	06.17	05.31	06.36-07.03/27	03.56	03.08	04.07	05.39	06.41-07.08/27	07.06	08.32	09.07	10.06
	15.45	17.23	18.45	21.15	22.46		23.42	22.50	21.11	19.24	17.42	15.11	14.37	
24	09.23	07.49	06.14	05.27	06.36-07.03/27	03.53	03.08	04.10	05.42	06.42-07.07/25	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49		23.42	22.47	21.07	19.20	17.39	15.09	14.38	
25	09.20	07.46	06.10	05.24	06.36-07.03/27	03.51	03.09	04.13	05.45	06.42-07.05/23	07.12	07.38	09.13	10.07
	15.52	17.29	18.50	21.21	22.52		23.42	22.44	21.04	19.17	16.36	15.07	14.39	
26	09.18	07.42	06.07	05.21	06.36-07.02/26	03.48	03.10	04.16	05.48	06.43-07.05/22	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55		23.42	22.41	21.00	19.13	16.33	15.04	14.40	
27	09.15	07.39	06.03	05.17	06.37-07.02/25	03.45	03.10	04.19	05.51	06.44-07.04/20	07.18	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57		23.41	22.38	20.57	19.10	16.29	15.02	14.41	
28	09.12	07.36	06.00	05.14	06.37-07.01/24	03.43	03.11	04.22	05.54	06.45-07.01/16	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00		23.40	22.35	20.54	19.07	16.26	15.00	14.42	
29	09.09	07.33	06.00	05.11	06.38-07.00/22	03.40	03.13	04.25	05.57	06.47-06.59/12	07.23	07.50	09.24	10.07
	16.04	17.41	19.02	21.33	23.03		23.40	22.32	20.50	19.03	16.23	14.58	14.43	
30	09.07	07.30	06.00	05.07	06.39-06.58/19	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06	
	16.07	17.48	19.09	21.36	23.06		23.39	22.29	20.47	19.00	16.20	14.56	14.45	
31	09.04	07.27	06.00	05.00	06.39-06.58/19	03.35	03.11	04.31	06.02	07.56	08.23	09.57	10.06	
	16.10	17.50	19.11	21.39	23.08		23.38	22.26	20.43	19.00	16.17	14.56	14.46	
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148	0	
Sum of minutes with flicker	0	0	0	397	34	0	0	437	392	0	0	0	0	

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 12 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.48	09.01 13.40-14.07/27 16.13	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11
2	10.04 14.50	08.58 13.40-14.07/27 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.30 23.14
3	10.03 14.52	08.55 13.40-14.06/26 16.20	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16
4	10.02 14.54	08.52 13.41-14.06/25 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.19
5	10.01 14.56	08.49 13.42-14.05/23 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.21
6	10.00 14.58	08.46 13.43-14.05/22 16.29	07.15 17.55	06.29 20.25	04.48 21.55	03.22 23.23
7	09.58 15.01	08.43 13.44-14.04/20 16.33	07.12 17.58	06.25 20.28	04.44 21.58	03.20 23.25
8	09.57 13.26-13.32/6 15.03	08.40 13.46-14.03/17 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27
9	09.55 13.25-13.33/8 15.05	08.37 13.48-14.00/12 16.39	07.05 18.04	06.18 20.34	04.38 22.04	03.17 23.29
10	09.54 13.23-13.35/12 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.15 23.31
11	09.52 13.23-13.37/14 15.10	08.31 16.45	06.58 07.32-07.40/8 18.10	06.12 20.39	04.32 22.10	03.14 23.33
12	09.50 13.22-13.37/15 15.13	08.28 16.48	06.55 07.30-07.43/13 18.13	06.08 20.42	04.28 22.13	03.13 23.34
13	09.48 13.23-13.39/16 15.16	08.25 16.52	06.52 07.28-07.43/15 18.16	06.05 20.45	04.25 22.16	03.11 23.36
14	09.46 13.22-13.39/17 15.18	08.21 16.55	06.48 07.27-07.45/18 18.19	06.01 20.48	04.22 22.19	03.10 23.37
15	09.44 13.22-13.41/19 15.21	08.18 16.58	06.45 07.26-07.44/18 18.22	05.58 20.51	04.19 22.22	03.09 23.38
16	09.42 13.22-13.41/19 15.24	08.15 17.01	06.41 07.26-07.45/19 18.25	05.54 20.54	04.16 22.25	03.09 23.39
17	09.40 13.23-13.43/20 15.27	08.12 17.04	06.38 07.25-07.44/19 18.27	05.51 20.57	04.13 22.28	03.08 23.40
18	09.38 13.22-13.43/21 15.30	08.09 17.07	06.34 07.25-07.44/19 18.30	05.48 21.00	04.10 22.31	03.08 23.41
19	09.35 13.22-13.57/35 15.33	08.05 17.10	06.31 07.25-07.43/18 18.33	05.44 21.03	04.07 22.34	03.07 23.42
20	09.33 13.23-13.59/36 15.36	08.02 17.13	06.28 07.26-07.42/16 18.36	05.41 21.06	04.04 22.37	03.07 23.42
21	09.31 13.22-14.00/38 15.39	07.59 17.16	06.24 07.27-07.40/13 18.39	05.37 21.09	04.01 22.40	03.07 23.43
22	09.28 13.23-14.02/39 15.42	07.56 17.19	06.21 07.29-07.38/9 18.42	05.34 21.12	03.58 22.43	03.07 23.43
23	09.26 13.23-14.03/40 15.45	07.52 17.22	06.17 18.45	05.31 21.15	03.56 22.46	03.07 23.43
24	09.23 13.23-14.03/40 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.43
25	09.20 13.25-14.04/39 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.43
26	09.18 13.25-14.05/40 15.54	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42
27	09.15 13.26-14.06/40 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.58	03.10 23.42
28	09.12 13.27-14.06/39 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.42 23.01	03.11 23.41
29	09.10 13.28-14.06/38 16.04		06.56 20.02	05.10 21.33	03.40 23.03	03.12 23.40
30	09.07 13.30-14.07/37 16.07		06.53 20.05	05.07 21.36	03.37 23.06	03.13 23.39
31	09.04 13.33-14.06/33 16.10		06.50 20.08		03.35 23.09	
Potential sun hours	179	241	363	448	562	610
Sum of minutes with flicker	677	199	185	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 12 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	08.09-08.23/14 16.13	07.59 13.21-13.26/5 14.54
2	03.16 23.37	04.37 22.20	06.08 20.36	07.31 18.53	08.10-08.21/11 16.10	08.02 13.17-13.30/13 14.52
3	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.14-08.15/1 16.07	08.06 13.16-13.33/17 14.50
4	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	13.13-13.33/20 09.37 13.11-13.16/5 14.48
5	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.12 16.01	13.13-13.35/22 09.40 14.47
6	03.23 23.31	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	13.12-13.36/24 09.42 14.45
7	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	13.11-13.36/25 09.45 14.44
8	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	13.11-13.37/26 09.47 14.43
9	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	13.11-13.37/26 09.49 14.41
10	03.32 23.23	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	13.11-13.38/27 09.51 14.40
11	03.35 23.21	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	13.04-13.38/34 09.53 14.39
12	03.37 23.18	05.07 21.48	06.36 20.02	08.00 18.19	08.34 15.40	13.02-13.39/37 09.55 14.38
13	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.37 15.37	12.59-13.38/39 09.56 14.38
14	03.42 23.14	05.13 21.41	06.41 19.55	08.06 18.12	08.40 15.35	12.59-13.38/39 09.58 14.37
15	03.45 23.11	05.16 21.38	06.44 19.51	08.08 18.09	08.43 15.32	12.58-13.38/40 09.59 14.36
16	03.47 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	12.58-13.38/40 10.01 14.36
17	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	12.57-13.37/40 10.02 14.36
18	03.53 23.04	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	12.57-13.37/40 10.03 14.36
19	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	12.57-13.37/40 10.04 14.36
20	03.58 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	12.58-13.36/38 10.05 14.36
21	04.01 22.56	05.33 21.18	07.01 19.31	08.26 17.49	09.01 15.16	12.59-13.36/37 10.06 14.36
22	04.04 22.53	05.36 21.14	07.04 19.27	08.29 17.45	09.04 15.13	12.59-13.35/36 10.06 14.37
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	12.59-13.34/35 10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	12.59-13.20/21 10.07 13.21-13.33/12 14.38
25	04.13 22.44	05.45 21.04	07.12 19.17	08.38 16.36	09.13 15.06	13.00-13.20/20 10.07 13.24-13.30/6 14.39
26	04.16 22.41	05.48 21.00	07.15 19.13	08.41 16.32	09.16 15.04	13.00-13.20/20 10.07 14.39
27	04.19 22.38	05.51 20.57	07.17 19.10	08.44 16.29	09.19 15.02	13.02-13.20/18 10.07 14.41
28	04.22 22.35	05.54 20.54	07.20 19.07	08.47 16.26	09.22 15.00	13.02-13.20/18 10.07 14.42
29	04.25 22.32	05.57 20.50	07.23 19.03	08.50 16.23	09.24 14.58	13.03-13.19/16 10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 19.00	08.53 16.20	09.27 14.56	13.04-13.19/15 10.06 14.44
31	04.31 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	0	163	26	846	38

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 13 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.48	09.01 14.49-15.08/19 16.13	07.32 17.41	06.46 07.54-08.21/27 20.10	05.04 21.39	03.33 23.11
2	10.04 14.50	08.58 14.48-15.09/21 16.17	07.29 17.44	06.43 07.54-08.21/27 20.13	05.01 21.42	03.30 23.14
3	10.03 14.52	08.55 14.47-15.09/22 16.20	07.26 17.47	06.39 07.55-08.20/25 20.16	04.57 21.45	03.28 23.16
4	10.02 14.54	08.52 14.48-15.10/22 16.23	07.22 17.50	06.36 07.55-08.18/23 20.19	04.54 21.48	03.26 23.19
5	10.01 14.56	08.49 14.48-15.09/21 16.26	07.19 17.52	06.32 07.56-08.17/21 20.22	04.51 21.52	03.24 23.21
6	10.00 14.58	08.46 14.48-15.10/22 16.29	07.16 17.55	06.29 07.57-08.15/18 20.25	04.48 21.55	03.22 23.23
7	09.58 15.01	08.43 14.48-15.09/21 16.33	07.12 17.58	06.25 07.59-08.12/13 20.28	04.44 21.58	03.20 23.25
8	09.57 15.03	08.40 14.49-15.10/21 16.36	07.09 18.01	06.22 08.03-08.08/5 20.31	04.41 22.01	03.18 23.27
9	09.55 15.05	08.37 14.49-15.09/20 16.39 15.31-15.42/11	07.05 18.04	06.19 20.34	04.38 22.04	03.17 23.29
10	09.54 15.08	08.34 14.50-15.08/18 16.42 15.28-15.44/16	07.02 18.07	06.15 20.37	04.35 22.07	03.15 23.31
11	09.52 15.10	08.31 14.52-15.07/15 16.45 15.27-15.46/19	06.59 18.10	06.12 20.39	04.32 22.10	03.14 23.33
12	09.50 15.13	08.28 14.53-15.05/12 16.48 15.26-15.47/21	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34
13	09.48 15.16	08.25 14.57-15.02/5 16.52 15.25-15.48/23	06.52 18.16	06.05 20.45	04.25 22.16	03.11 23.36
14	09.46 15.18	08.22 15.24-15.49/25 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.10 23.37
15	09.44 15.21	08.18 15.23-15.49/26 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.09 23.38
16	09.42 15.24	08.15 15.24-15.50/26 17.01	06.41 18.25	05.54 20.54	04.16 22.25	03.09 23.40
17	09.40 15.27	08.12 15.23-15.49/26 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40
18	09.38 15.30	08.09 15.23-15.50/27 17.07	06.35 18.30	05.48 21.00	04.10 22.31	03.08 23.41
19	09.35 15.33	08.05 15.23-15.49/26 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.42
20	09.33 15.36	08.02 15.24-15.49/25 17.13	06.28 18.36	05.41 21.06	04.04 22.38	03.07 23.42
21	09.31 15.39	07.59 15.24-15.48/24 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.43
22	09.28 15.42	07.56 15.25-15.48/23 17.19	06.21 07.05-07.17/12 18.42	05.34 21.12	03.59 22.43	03.07 23.43
23	09.26 15.45	07.52 15.25-15.47/22 17.22	06.17 07.02-07.19/17 18.45	05.31 21.15	03.56 22.46	03.07 23.43
24	09.23 15.48	07.49 15.26-15.45/19 17.26	06.14 07.00-07.21/21 18.48	05.27 21.18	03.53 22.49	03.08 23.43
25	09.20 15.51	07.46 15.29-15.44/15 17.29	06.10 06.58-07.21/23 18.50	05.24 21.21	03.50 22.52	03.08 23.43
26	09.18 15.54	07.42 15.31-15.40/9 17.32	06.07 06.57-07.22/25 18.53	05.21 21.24	03.48 22.55	03.09 23.42
27	09.15 15.58	14.55-15.00/5 17.35	06.03 06.57-07.23/26 18.56	05.17 21.27	03.45 22.58	03.10 23.42
28	09.12 16.01	14.52-15.03/11 17.38	06.00 06.55-07.23/28 18.59	05.14 21.30	03.42 23.01	03.11 23.41
29	09.10 16.04	14.50-15.04/14 17.41	06.57 07.55-08.23/28 20.02	05.11 21.33	03.40 23.03	03.12 23.40
30	09.07 16.07	14.50-15.06/16 17.44	06.53 07.54-08.22/28 20.05	05.07 21.36	03.37 23.06	03.13 23.39
31	09.04 16.10	14.49-15.07/18 17.47	06.50 07.54-08.22/28 20.08	05.04 21.39	03.35 23.09	03.13 23.39
Potential sun hours	179	241	363	448	562	610
Sum of minutes with flicker	64	622	236	159	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 13 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 14.19-14.37/18 16.13 14.58-15.13/15	09.30 14.54
2	03.16 23.37	04.37 22.20	06.08 20.37	07.31 18.53	08.03 14.19-14.38/19 16.10 15.01-15.11/10	09.33 14.52
3	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.06 14.19-14.39/20 16.07	09.35 14.50
4	03.20 23.34	04.43 22.14	06.14 08.01-08.05/4 20.30	07.37 18.46	08.09 14.18-14.39/21 16.04	09.38 14.48
5	03.22 23.32	04.46 22.10	06.16 07.56-08.09/13 20.26	07.40 18.43	08.12 14.18-14.40/22 16.01	09.40 14.47
6	03.23 23.31	04.49 22.07	06.19 07.53-08.11/18 20.23	07.43 18.39	08.15 14.18-14.40/22 15.58	09.42 14.45
7	03.26 23.29	04.52 22.04	06.22 07.51-08.12/21 20.19	07.46 18.36	08.18 14.18-14.39/21 15.55	09.45 14.44
8	03.28 23.27	04.55 22.01	06.25 07.49-08.12/23 20.16	07.48 18.32	08.21 14.18-14.39/21 15.52	09.47 14.43
9	03.30 23.25	04.58 21.58	06.28 07.48-08.13/25 20.12	07.51 18.29	08.24 14.19-14.39/20 15.49	09.49 14.41
10	03.32 23.23	05.01 21.54	06.30 07.48-08.14/26 20.09	07.54 18.26	08.27 14.20-14.39/19 15.46	09.51 14.40
11	03.35 23.21	05.04 21.51	06.33 07.47-08.14/27 20.05	07.57 18.22	08.30 14.21-14.39/18 15.43	09.53 14.39
12	03.37 23.19	05.07 21.48	06.36 07.46-08.14/28 20.02	08.00 18.19	08.34 14.22-14.38/16 15.40	09.55 14.38
13	03.40 23.16	05.10 21.44	06.39 07.46-08.14/28 19.58	08.03 18.15	08.37 14.22-14.36/14 15.37	09.56 14.38
14	03.42 23.14	05.13 21.41	06.42 07.46-08.14/28 19.55	08.06 18.12	08.40 14.24-14.34/10 15.35	09.58 14.37
15	03.45 23.11	05.16 21.38	06.44 07.45-08.12/27 19.52	08.09 18.09	08.43 14.27-14.31/4 15.32	09.59 14.36
16	03.47 23.09	05.19 21.34	06.47 07.45-08.12/27 19.48	08.11 16.03-16.14/11 18.05	08.46 15.29	10.01 14.36
17	03.50 23.06	05.22 21.31	06.50 07.46-08.11/25 19.45	08.14 16.00-16.16/16 18.02	08.49 15.26	10.02 14.36
18	03.53 23.04	05.25 21.28	06.53 07.45-08.09/24 19.41	08.17 15.58-16.17/19 17.59	08.52 15.24	10.03 14.36
19	03.56 23.01	05.28 21.24	06.55 07.47-08.08/21 19.38	08.20 15.56-16.18/22 17.55	08.55 15.21	10.04 14.36
20	03.58 22.58	05.31 21.21	06.58 07.48-08.06/18 19.34	08.23 15.55-16.18/23 17.52	08.58 15.18	10.05 14.36
21	04.01 22.56	05.34 21.18	07.01 07.50-08.04/14 19.31	08.26 15.55-16.20/25 17.49	09.01 15.16	10.06 14.36
22	04.04 22.53	05.36 21.14	07.04 07.53-07.59/6 19.27	08.29 15.54-16.20/26 17.45	09.04 15.13	10.06 14.37
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 15.53-16.19/26 17.42	09.07 15.11	10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 15.53-16.20/27 17.39	09.10 15.09	10.07 14.38
25	04.13 22.44	05.45 21.04	07.12 19.17	07.38 14.53-15.19/26 16.36	09.13 15.06	10.07 14.39
26	04.16 22.41	05.48 21.01	07.15 19.13	07.41 14.53-15.19/26 16.32	09.16 15.04	10.08 14.39
27	04.19 22.38	05.51 20.57	07.18 19.10	07.44 14.54-15.19/25 16.29	09.19 15.02	10.07 14.41
28	04.22 22.35	05.54 20.54	07.20 19.07	07.47 14.54-15.18/24 16.26	09.22 15.00	10.07 14.42
29	04.25 22.32	05.57 20.50	07.23 19.03	07.50 14.25-14.33/8 16.23	09.24 14.58	10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 19.00	07.53 14.22-14.35/13 16.20	09.27 14.56	10.07 14.44
31	04.31 22.26	06.02 20.43		07.56 14.21-14.37/16 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	0	403	395	290	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 14 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December					
1	10.05	09.01	10.43-11.07/24	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30				
	14.48	16.13		17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54				
2	10.04	08.58	10.43-11.06/23	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	10.23-10.26/3	09.32			
	14.50	16.16		17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.52				
3	10.03	08.55	10.43-11.06/23	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	10.19-10.31/12	09.35			
	14.52	16.20		17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50				
4	10.02	08.52	10.44-11.06/22	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	10.17-10.32/15	09.37			
	14.54	16.23		17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48				
5	10.01	08.49	10.45-11.05/20	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	10.16-10.34/18	09.40			
	14.56	16.26		17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47				
6	10.00	08.46	10.47-11.04/17	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	10.15-10.35/20	09.42			
	14.58	16.29		17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45				
7	09.58	08.43	10.48-11.03/15	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	10.14-10.35/21	09.44			
	15.00	16.32		17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44				
8	09.57	08.40	10.50-11.01/11	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	10.14-10.36/22	09.47			
	15.03	16.36		18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42				
9	09.55	08.37		07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	10.14-10.37/23	09.49			
	15.05	16.39		18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41				
10	09.54	08.34		07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	10.14-10.37/23	09.51			
	15.08	16.42		18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40				
11	09.52	08.31		06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	10.14-10.38/24	09.53			
	15.10	16.45		18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.43	14.39				
12	09.50	08.28		06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	10.14-10.38/24	09.54			
	15.13	16.48		18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.38				
13	09.48	08.25		06.52	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	10.13-10.37/24	09.56			
	15.16	16.51		18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38				
14	09.46	08.21		06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	10.14-10.37/23	09.58			
	15.18	16.55		18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37				
15	09.44	08.18		06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	10.14-10.37/23	09.59			
	15.21	16.58		18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.36				
16	09.42	08.15		06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.15-10.37/22	10.01			
	15.24	17.01		18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36				
17	09.40	08.12		06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.16-10.37/21	10.02			
	15.27	17.04		18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36				
18	09.38	08.09		06.34	05.48	04.10	03.07	03.53	05.25	06.52	08.17	08.52	10.17-10.36/19	10.03			
	15.30	17.07		18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36				
19	09.35	10.50-10.53/3	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.18-10.36/18	10.04			
	15.33	17.10		18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36				
20	09.33	10.47-10.57/10	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.19-10.35/16	10.05			
	15.36	17.13		18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36				
21	09.30	10.45-10.59/14	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.21-10.35/14	10.06			
	15.39	17.16		18.39	21.09	22.40	23.43	22.55	21.17	19.31	17.49	15.16	14.36				
22	09.28	10.45-11.01/16	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.04	08.29	09.04	10.23-10.33/10	10.06			
	15.42	17.19		18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36				
23	09.25	10.44-11.02/18	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.26-10.30/4	10.07			
	15.45	17.22		18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37				
24	09.23	10.43-11.02/19	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07	10.07			
	15.48	17.25		18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38				
25	09.20	10.43-11.04/21	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07	10.07			
	15.51	17.28		18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.06	14.38				
26	09.18	10.42-11.04/22	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07	10.07			
	15.54	17.31		18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32	15.04	14.39				
27	09.15	10.43-11.05/22	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07	10.07			
	15.57	17.34		18.56	21.27	22.58	23.41	22.38	20.57	19.10	16.29	15.02	14.40				
28	09.12	10.42-11.05/23	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07	10.07			
	16.01	17.37		18.59	21.30	23.00	23.41	22.35	20.54	19.06	16.26	15.00	14.42				
29	09.09	10.42-11.05/23		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07	10.07			
	16.04			20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.57	14.43				
30	09.07	10.42-11.06/24		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06	10.06			
	16.07			20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.19	14.55	14.44				
31	09.04	10.42-11.06/24		06.49		03.35		04.31	06.02		07.56		10.06	10.06			
	16.10			20.07		23.08		22.26	20.43		16.16		14.46	14.46			
Potential sun hours	179																
Sum of minutes with flicker	239	241	155	0	0	0	610	0	598	0	392	0	307	0	204	399	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 15 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.14	17.41	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.34	22.13	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.43	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.54	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.26	15.47	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.07	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 16 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.48	16.13	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.16	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 17 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	08.23-08.43/20 20.10	06.46 20.10	07.52-08.12/20 21.39	05.04 20.28-20.48/20 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	08.22-08.43/21 20.13	06.42 20.13	07.53-08.11/18 21.42	05.00 20.27-20.48/21 23.14
3	10.03 14.52	08.55 16.20	07.25 17.46	08.22-08.44/22 20.16	06.39 20.16	07.54-08.09/15 21.45	04.57 20.27-20.48/21 23.16
4	10.02 14.54	08.52 16.23	07.22 17.49	08.21-08.43/22 20.19	06.36 20.19	07.56-08.07/11 21.48	04.54 20.28-20.49/21 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52	08.00-08.02/2 20.22	06.32 20.22	04.50 21.51	20.28-20.49/21 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55	07.56-08.07/11 20.25	06.29 20.25	04.47 21.54	20.27-20.48/21 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58	07.53-08.08/15 20.28	06.25 20.28	04.44 21.58	20.28-20.48/20 23.25
8	09.57 15.03	08.40 16.35	07.09 18.01	07.52-08.10/18 20.30	06.22 20.30	04.41 22.01	20.28-20.47/19 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04	07.50-08.10/20 20.33	06.18 20.33	04.38 22.04	20.29-20.47/18 23.29
10	09.54 15.07	08.34 16.42	07.02 18.07	07.50-08.11/21 20.36	06.15 20.36	04.34 22.07	20.30-20.46/16 23.31
11	09.52 15.10	08.31 16.45	06.58 18.10	07.49-08.11/22 20.39	06.11 20.39	04.31 22.10	20.30-20.44/14 23.33
12	09.50 15.13	08.28 16.48	06.55 18.13	07.49-08.11/22 20.42	06.08 20.42	04.28 22.13	20.33-20.44/11 23.34
13	09.48 15.15	08.25 16.51	06.51 18.16	07.49-08.10/21 20.45	06.04 20.45	04.25 22.16	20.35-20.41/6 23.36
14	09.46 15.18	08.21 16.54	06.48 18.19	07.49-08.10/21 20.48	06.01 20.48	04.22 22.19	20.37-20.48/10 23.37
15	09.44 15.21	08.18 16.58	06.45 18.21	07.49-08.08/19 20.51	05.58 20.51	04.19 22.22	20.39-20.47/18 23.38
16	09.42 15.24	08.15 17.01	06.41 18.24	07.51-08.08/17 20.54	05.54 20.54	04.16 22.25	20.41-20.48/17 23.39
17	09.40 15.27	08.12 17.04	06.38 18.27	07.51-08.05/14 20.57	05.51 20.57	04.13 22.28	20.43-20.48/14 23.40
18	09.38 15.30	08.09 17.07	06.34 18.30	07.54-08.03/9 21.00	05.47 21.00	04.10 22.31	20.45-20.48/9 23.41
19	09.35 15.33	08.05 17.10	06.31 18.33	21.03	05.44 21.03	04.07 22.34	20.47-20.48/7 23.42
20	09.33 15.36	08.02 17.13	06.27 18.36	21.06	05.41 21.06	04.04 22.37	20.49-20.48/5 23.43
21	09.30 15.39	07.59 17.16	06.24 18.39	21.09	05.37 21.09	04.01 22.40	20.51-20.48/3 23.44
22	09.28 15.42	07.55 17.19	06.20 18.42	21.12	05.34 21.12	03.58 22.43	20.53-20.48/1 23.45
23	09.25 15.45	07.52 17.22	06.17 18.44	21.15	05.30 21.15	03.55 22.46	20.55-20.48/1 23.46
24	09.23 15.48	07.49 17.25	06.14 18.47	21.18	05.27 21.18	03.53 22.49	20.57-20.48/1 23.47
25	09.20 15.51	07.46 17.28	06.10 18.50	21.21	05.24 21.21	03.50 22.52	20.59-20.48/1 23.48
26	09.18 15.54	07.42 17.31	06.07 18.53	21.24	05.20 21.24	03.47 22.55	20.61-20.48/1 23.49
27	09.15 15.57	07.39 17.34	06.03 18.56	21.27	05.17 21.27	03.45 22.58	20.63-20.48/1 23.50
28	09.12 16.00	07.36 17.37	06.00 18.59	21.30	05.14 21.30	03.42 23.01	20.65-20.48/1 23.51
29	09.09 16.04	07.33 17.40	05.57 19.02	21.33	05.10 21.33	03.39 23.03	20.67-20.48/1 23.52
30	09.07 16.07	07.31 17.43	05.55 19.05	21.36	05.07 21.36	03.37 23.06	20.69-20.48/1 23.53
31	09.04 16.10	07.28 17.46	05.52 19.08	21.39	05.04 21.39	03.35 23.09	20.71-20.48/1 23.54
Potential sun hours	179	241	363	448	562	610	0
Sum of minutes with flicker	0	59	612	136	229	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 17 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.34 20.42-20.54/12 22.23	06.05 20.40	07.28 08.28-08.49/21 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.37 20.41-20.56/15 22.20	06.08 20.36	07.31 08.27-08.49/22 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.40 20.39-20.56/17 22.17	06.11 20.33	07.34 08.27-08.49/22 18.49 09.08-09.09/1	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 20.39-20.57/18 22.13	06.13 20.29	07.37 08.28-08.48/20 18.46 09.03-09.14/11	08.09 16.04	09.37 14.48
5	03.21 23.32	04.46 20.38-20.57/19 22.10	06.16 20.26	07.40 08.28-08.47/19 18.42 09.00-09.16/16	08.12 16.01	09.40 14.46
6	03.23 23.31	04.49 20.37-20.58/21 22.07	06.19 20.22	07.43 08.29-08.46/17 18.39 08.59-09.17/18	08.15 15.58	09.42 14.45
7	03.25 23.29	04.52 20.36-20.58/22 22.04	06.22 20.19	07.45 08.30-08.44/14 18.35 08.58-09.18/20	08.18 15.55	09.44 14.43
8	03.27 23.27	04.55 20.37-20.58/21 22.01	06.25 07.50-08.01/11 20.16	07.48 08.33-08.41/8 18.32 08.57-09.18/21	08.21 15.52	09.47 14.42
9	03.30 23.25	04.58 20.37-20.58/21 21.57	06.27 07.48-08.03/15 20.12	07.51 08.56-09.18/22 18.29	08.24 15.49	09.49 14.41
10	03.32 23.23	05.01 20.36-20.58/22 21.54	06.30 07.47-08.05/18 20.09	07.54 08.56-09.18/22 18.25	08.27 15.46	09.51 14.40
11	03.34 23.21	05.04 20.37-20.58/21 21.51	06.33 07.45-08.05/20 20.05	07.57 08.56-09.17/21 18.22	08.30 15.43	09.53 14.39
12	03.37 23.18	05.07 20.36-20.56/20 21.48	06.36 07.44-08.05/21 20.02	08.00 08.56-09.17/21 18.19	08.33 15.40	09.55 14.38
13	03.39 23.16	05.10 20.37-20.56/19 21.44	06.39 07.43-08.06/23 19.58	08.03 08.56-09.16/20 18.15	08.37 15.37	09.56 14.37
14	03.42 23.14	05.13 20.38-20.55/17 21.41	06.41 07.42-08.05/23 19.55	08.05 08.56-09.15/19 18.12	08.40 15.34	09.58 14.37
15	03.44 23.11	05.16 20.38-20.53/15 21.38	06.44 07.42-08.05/23 19.51	08.08 08.57-09.13/16 18.08	08.43 15.31	09.59 14.36
16	03.47 23.09	05.19 20.40-20.52/12 21.34	06.47 07.42-08.04/22 19.48	08.11 09.00-09.12/12 18.05	08.46 15.29	10.01 14.36
17	03.50 23.06	05.22 20.43-20.49/6 21.31	06.50 07.41-08.03/22 19.44	08.14 09.02-09.09/7 18.02	08.49 15.26	10.02 14.35
18	03.53 23.04	05.24 21.28	06.52 07.42-08.02/20 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	03.55 23.01	05.27 21.24	06.55 07.43-08.01/18 19.37	08.20 17.55	08.55 15.21	10.04 14.35
20	03.58 22.58	05.30 21.21	06.58 07.44-08.00/16 19.34	08.23 17.52	08.58 15.18	10.05 14.35
21	04.01 22.56	05.33 21.17	07.01 07.45-07.56/11 19.31	08.26 17.48	09.01 15.16	10.06 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.08	10.07 14.37
25	04.13 22.44	05.45 21.04	07.12 08.37-08.44/7 19.17	07.38 16.35	09.13 15.06	10.07 14.38
26	04.16 22.41	05.48 21.00	07.15 08.34-08.47/13 19.13	07.41 16.32	09.16 15.04	10.07 14.39
27	04.19 22.38	05.51 20.57	07.17 08.32-08.48/16 19.10	07.44 16.29	09.19 15.01	10.07 14.40
28	04.22 22.35	05.53 20.54	07.20 08.31-08.49/18 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.25 22.32	05.56 20.50	07.23 08.30-08.50/20 19.03	07.50 16.23	09.24 14.57	10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 08.29-08.50/21 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.31 20.44-20.52/8 22.26	06.02 20.43	 	07.56 16.16	 	10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	8	298	358	390	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 18 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	06.48	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.01
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.06
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.36	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.53	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.53	21.23	22.55	23.42	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.44	09.18	10.07
	15.57	17.34	18.55	21.26	22.58	23.42	22.38	20.57	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.00	23.41	22.35	20.53	19.06	16.25	14.59	14.40
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 19 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.38	23.11	23.37	22.22	20.39	18.55	16.12	14.53
2	10.04	08.57	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.34
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.21	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.47
5	10.00	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.26	22.00	20.15	18.31	15.51	14.41
9	09.55	08.36	07.04	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.23	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.24	21.57	20.11	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.44	22.16	23.35	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.41	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.16	08.51	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.43	04.06	03.06	03.55	05.27	06.54	08.19	08.54	10.04
	15.32	17.09	18.32	21.02	22.34	23.41	23.00	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.04
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.27	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.19	17.38	15.08	14.37
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.12	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.52	09.27	10.06
	16.06		20.04	21.35	23.05	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 20 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December			
1	10.05	09.01	07.32	06.45	05.03	06.12-06.36/24	03.32	03.14	04.33	06.04	07.28	07.59	09.29		
	14.47	16.13	17.40	20.10	21.39		23.11	23.38	22.23	20.39	18.56	16.12	14.53		
2	10.04	08.58	07.28	06.42	05.00	06.12-06.35/23	03.29	03.15	04.36	06.07	07.31	08.02	09.32		
	14.49	16.16	17.43	20.13	21.42		23.13	23.36	22.19	20.36	18.52	16.09	14.51		
3	10.03	08.55	07.25	06.38	04.56	06.12-06.34/22	03.27	03.17	04.39	06.10	07.34	08.05	09.35		
	14.51	16.19	17.46	20.16	21.45		23.16	23.35	22.16	20.32	18.49	16.06	14.49		
4	10.02	08.52	07.22	06.35	04.53	06.13-06.33/20	03.25	03.19	04.42	06.30-06.35/5	06.13	07.36	08.08	09.37	
	14.53	16.22	17.49	20.18	21.48		23.18	23.34	22.13	20.29	18.45	16.03	14.47		
5	10.01	08.49	07.18	06.32	04.50	06.13-06.32/19	03.23	03.20	04.45	06.27-06.39/12	06.16	07.39	08.11	09.40	
	14.55	16.25	17.52	20.21	21.51		23.21	23.32	22.10	20.26	18.42	16.00	14.46		
6	09.59	08.46	07.15	06.28	04.47	06.15-06.32/17	03.21	03.22	04.48	06.25-06.40/15	06.18	07.42	08.14	09.42	
	14.57	16.29	17.55	20.24	21.54		23.23	23.30	22.07	20.22	18.38	15.57	14.44		
7	09.58	08.43	07.11	06.25	04.43	06.16-06.30/14	03.19	03.24	04.51	06.24-06.41/17	06.21	07.45	08.17	09.44	
	15.00	16.32	17.58	20.27	21.57		23.25	23.29	22.03	20.19	18.35	15.54	14.43		
8	09.57	08.40	07.08	06.21	04.40	06.18-06.28/10	03.17	03.27	04.54	06.23-06.43/20	06.24	07.48	08.21	09.46	
	15.02	16.35	18.01	20.30	22.00		23.27	23.27	22.00	20.15	18.32	15.51	14.42		
9	09.55	08.37	07.05	06.18	04.37		03.16	03.29	04.57	06.22-06.43/21	06.27	07.51	08.24	09.48	
	15.04	16.38	18.03	20.33	22.03		23.29	23.25	21.57	20.12	18.28	15.48	14.40		
10	09.53	08.34	07.01	06.14	04.34		03.14	03.31	05.00	06.21-06.44/23	06.30	07.53	08.27	09.50	
	15.07	16.41	18.06	20.36	22.06		23.31	23.23	21.54	20.08	18.25	15.45	14.39		
11	09.52	08.30	06.58	06.11	04.31		03.13	03.34	05.03	06.21-06.44/23	06.32	07.56	08.30	09.52	
	15.09	16.44	18.09	20.39	22.10		23.33	23.20	21.50	20.05	18.21	15.42	14.38		
12	09.50	08.27	06.54	06.07	04.28		03.11	03.36	05.06	06.20-06.44/24	06.35	07.59	08.33	09.54	
	15.12	16.48	18.12	20.42	22.13		23.34	23.18	21.47	20.01	18.18	15.39	14.37		
13	09.48	08.24	06.51	06.04	04.24		03.10	03.38	05.09	06.20-06.44/24	06.38	08.02	08.36	09.56	
	15.15	16.51	18.15	20.45	22.16		23.36	23.16	21.44	19.58	18.15	15.36	14.37		
14	09.46	08.21	06.48	06.01	04.21	03.09	04.27-04.31/4	03.41	05.12	06.19-06.44/25	06.41	08.05	08.39	09.58	
	15.18	16.54	18.18	20.48	22.19		23.37	23.13	21.40	19.54	18.11	15.34	14.36		
15	09.44	08.18	06.44	05.57	04.18	03.08	04.27-04.32/5	03.44	05.15	06.19-06.44/25	06.44	08.08	08.42	09.59	
	15.20	16.57	18.21	20.51	22.22		23.38	23.11	21.37	19.51	18.08	15.31	14.35		
16	09.42	08.15	06.41	05.54	04.15	03.08	04.26-04.33/7	03.46	05.18	06.20-06.44/24	06.46	08.11	08.45	10.00	
	15.23	17.00	18.24	20.53	22.25		23.39	23.09	21.34	19.47	18.05	15.28	14.35		
17	09.39	08.11	06.37	05.50	04.12	03.07	04.26-04.34/8	03.49	05.21	06.19-06.42/23	06.49	08.14	08.49	10.02	
	15.26	17.03	18.27	20.56	22.28		23.40	23.06	21.30	19.44	18.01	15.25	14.35		
18	09.37	08.08	06.34	05.47	04.09	03.06	04.26-04.34/8	03.52	05.24	06.20-06.42/22	06.52	08.17	08.52	10.03	
	15.29	17.06	18.30	20.59	22.31		23.41	23.03	21.27	19.40	17.58	15.23	14.35		
19	09.35	08.05	06.30	05.43	04.06	03.06	04.26-04.35/9	03.55	05.27	06.21-06.41/20	06.55	08.20	08.55	10.04	
	15.32	17.09	18.32	21.02	22.34		23.42	23.01	21.24	19.37	17.55	15.20	14.35		
20	09.33	08.02	06.27	05.40	06.24-06.29/5	04.03	03.06	04.26-04.35/9	03.57	05.30	06.21-06.39/18	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37		23.42	22.58	21.20	19.34	17.51	15.18	14.35		
21	09.30	07.58	06.23	05.37	06.20-06.32/12	04.00	03.06	04.26-04.35/9	04.00	05.33	06.23-06.38/15	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40		23.43	22.55	21.17	19.30	17.48	15.15	14.35		
22	09.28	07.55	06.20	05.33	06.17-06.33/16	03.58	03.06	04.26-04.35/9	04.03	05.36	06.25-06.36/11	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43		23.43	22.52	21.14	19.27	17.45	15.12	14.35		
23	09.25	07.52	06.17	05.30	06.15-06.34/19	03.55	03.06	04.27-04.36/9	04.06	05.39	06.29-06.31/2	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46		23.43	22.50	21.10	19.23	17.41	15.10	14.36		
24	09.23	07.48	06.13	05.26	06.14-06.35/21	03.52	03.07	04.27-04.35/8	04.09	05.41	07.08	08.34	09.10	10.07	
	15.47	17.25	18.47	21.17	22.49		23.43	22.47	21.07	19.20	17.38	15.08	14.37		
25	09.20	07.45	06.10	05.23	06.13-06.36/23	03.49	03.07	04.28-04.36/8	04.12	05.44	07.11	07.37	09.13	10.07	
	15.50	17.28	18.50	21.20	22.52		23.42	22.44	21.03	19.16	16.35	15.05	14.37		
26	09.17	07.42	06.06	05.20	06.13-06.36/23	03.47	03.08	04.28-04.35/7	04.15	05.47	07.14	07.40	09.16	10.07	
	15.54	17.31	18.53	21.23	22.55		23.42	22.41	21.00	19.13	16.32	15.03	14.38		
27	09.15	07.38	06.03	05.16	06.12-06.36/24	03.44	03.09	04.29-04.35/6	04.18	05.50	07.17	07.44	09.18	10.07	
	15.57	17.34	18.55	21.26	22.57		23.41	22.38	20.57	19.09	16.28	15.01	14.40		
28	09.12	07.35	05.59	05.13	06.12-06.36/24	03.41	03.10	04.30-04.34/4	04.21	05.53	07.20	07.47	09.21	10.07	
	16.00	17.37	18.58	21.30	23.00		23.41	22.35	20.53	19.02	16.25	14.59	14.41		
29	09.09		06.56	05.10	06.12-06.36/24	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.07		
	16.03		20.01	21.33	23.03		23.40	22.32	20.50	19.02	16.22	14.57	14.42		
30	09.06		06.52	05.06	06.12-06.36/24	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06		
	16.06		20.04	21.36	23.06		23.39	22.29	20.46	18.59	16.19	14.55	14.43		
31	09.03		06.49		03.34			04.30	06.02		07.56		10.06		
	16.09		20.07		23.08			22.26	20.43		16.16		14.45		
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	0	147		
Sum of minutes with flicker	0	0	0	215	149	110	0	369	0	0	0	0	0		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 21 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Assumptions for shadow calculations  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.00	07.32	06.45	05.03	03.32	03.14	04.33	06.04	07.28	07.59	09.29		
	14.47	16.13	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.53		
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32		
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51		
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.34	08.05	09.34		
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49		
4	10.02	08.52	07.22	06.35	04.53	03.25	03.19	04.42	06.13	07.36	08.08	09.37		
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.47		
5	10.01	08.49	07.18	06.32	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39		
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46		
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42		
	14.57	16.29	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44		
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44		
	15.00	16.32	17.58	20.27	21.57	23.25	23.28	22.03	20.19	18.35	15.54	14.43		
8	09.56	08.40	07.08	06.21	04.40	03.17	03.27	04.54	06.24	07.48	08.20	09.46		
	15.02	16.35	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.51	14.42		
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.48		
	15.04	16.38	18.03	20.33	22.03	23.29	23.24	21.57	20.12	18.28	15.48	14.40		
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50		
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39		
11	09.51	08.30	06.58	06.11	04.31	03.13	03.34	05.03	06.32	07.56	08.30	09.52		
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38		
12	09.50	08.27	06.54	06.07	04.28	03.12	03.36	05.06	06.35	07.59	08.33	09.54		
	15.12	16.48	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37		
13	09.48	08.24	06.51	06.04	04.24	03.10	03.39	05.09	06.34-06.48/5	06.38	08.02	08.36	09.56	
	15.15	16.51	18.15	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.36	14.37		
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.39-06.50/11	06.41	08.05	08.39	09.57	
	15.18	16.54	18.18	20.48	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36		
15	09.44	08.18	06.44	05.57	06.36-06.46/10	04.18	03.08	03.44	05.15	06.38-06.52/14	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35		
16	09.42	08.14	06.41	05.54	06.34-06.48/14	04.15	03.08	03.46	05.18	06.37-06.54/17	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.05	15.28	14.35		
17	09.39	08.11	06.37	05.50	06.31-06.48/17	04.12	03.07	03.49	05.21	06.35-06.54/19	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35		
18	09.37	08.08	06.34	05.47	06.30-06.49/19	04.09	03.06	03.52	05.24	06.35-06.55/20	06.52	08.17	08.51	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35		
19	09.35	08.05	06.30	05.43	06.29-06.50/21	04.06	03.06	03.55	05.27	06.34-06.55/21	06.55	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.41	23.01	21.24	19.37	17.55	15.20	14.35		
20	09.32	08.01	06.27	05.40	06.29-06.50/21	04.03	03.06	03.57	05.30	06.33-06.55/22	06.57	08.22	08.58	10.04
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.18	14.35		
21	09.30	07.58	06.23	05.37	06.29-06.50/21	04.00	03.06	04.00	05.33	06.33-06.55/22	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35		
22	09.28	07.55	06.20	05.33	06.28-06.49/21	03.58	03.06	04.03	05.36	06.33-06.55/22	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.42	22.52	21.13	19.27	17.45	15.12	14.36		
23	09.25	07.52	06.16	05.30	06.28-06.49/21	03.55	03.06	04.06	05.38	06.33-06.54/21	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36		
24	09.22	07.48	06.13	05.26	06.28-06.49/21	03.52	03.07	04.09	05.41	06.33-06.53/20	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.20	17.38	15.08	14.37		
25	09.20	07.45	06.10	05.23	06.28-06.48/20	03.49	03.07	04.12	05.44	06.34-06.53/19	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.38		
26	09.17	07.42	06.06	05.20	06.29-06.47/18	03.47	03.08	04.15	05.47	06.34-06.51/17	07.14	07.40	09.15	10.07
	15.54	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.32	15.03	14.38		
27	09.14	07.38	06.03	05.16	06.30-06.46/16	03.44	03.09	04.18	05.50	06.35-06.50/15	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.40		
28	09.12	07.35	05.59	05.13	06.31-06.45/14	03.41	03.10	04.21	05.53	06.37-06.47/10	07.20	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41		
29	09.09		06.56	05.10	06.33-06.42/9	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.06	
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.57	14.42		
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06		
	16.06		20.04	21.36	23.05	23.39	22.29	20.46	18.59	16.19	14.55	14.44		
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05		
	16.09		20.07		23.08		22.26	20.43		16.16		14.45		
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147		
Sum of minutes with flicker	0	0	0	263	0	0	0	275	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 22 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1196)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.37	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.15	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.29	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.33	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.14	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.22	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.01	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.32	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.08	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.38	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 23 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.49	09.01 16.14	07.32 17.41	06.46 20.10	07.50-08.05/15 20.10	05.04 21.39
2	10.04 14.50	08.58 16.17	07.29 17.44	06.43 20.13	07.52-08.03/11 20.13	05.01 21.42
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	07.55-08.00/5 20.16	04.58 21.45
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	06.36 20.19	04.54 21.48
5	10.01 14.56	08.49 16.26	07.19 17.53	06.32 20.22	06.32 20.22	04.51 21.51
6	09.59 14.59	08.46 16.30	07.15 17.55	06.29 20.25	06.29 20.25	04.48 21.54
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	06.25 20.28	04.45 21.57
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	06.22 20.31	04.41 22.00
9	09.55 15.06	08.37 16.39	07.05 18.04	06.19 20.33	06.19 20.33	04.38 22.04
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	06.15 20.36	04.35 22.07
11	09.52 15.11	08.31 16.45	06.58 18.10	06.12 20.39	06.12 20.39	21.19-21.21/2 22.10
12	09.50 15.13	08.28 16.49	06.55 18.13	06.08 20.42	06.08 20.42	21.14-21.24/10 22.13
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	06.05 20.45	21.12-21.25/13 22.16
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	06.01 20.48	21.12-21.27/15 22.19
15	09.44 15.22	08.18 16.58	06.45 18.22	05.58 20.51	05.58 20.51	21.10-21.28/18 22.22
16	09.42 15.24	08.15 17.01	06.41 18.25	05.55 20.54	05.55 20.54	21.10-21.29/19 22.25
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	05.51 20.57	21.10-21.30/20 22.28
18	09.37 15.30	08.09 17.07	06.34 18.30	05.48 21.00	05.48 21.00	21.09-21.30/21 22.31
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	05.44 21.03	21.09-21.30/21 22.34
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	05.41 21.06	21.09-21.31/22 22.37
21	09.30 15.39	07.59 17.16	06.24 18.39	05.38 21.09	05.38 21.09	21.08-21.30/22 22.40
22	09.28 15.42	07.56 17.20	06.21 18.42	05.34 21.12	05.34 21.12	21.08-21.31/23 22.43
23	09.25 15.45	07.52 17.23	06.17 18.45	05.31 21.15	05.31 21.15	21.09-21.31/22 22.46
24	09.23 15.48	07.49 17.26	06.14 18.47	05.27 21.18	05.27 21.18	21.09-21.31/22 22.49
25	09.20 15.52	07.46 17.29	06.10 18.50	05.24 21.21	05.24 21.21	21.09-21.31/22 22.52
26	09.18 15.55	07.42 17.32	06.07 18.53	05.21 21.24	05.21 21.24	21.09-21.31/22 22.55
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	05.17 21.27	21.09-21.31/22 22.57
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	05.14 21.30	21.10-21.30/20 23.00
29	09.09 16.04		06.57 20.02	05.11 21.33	05.11 21.33	21.10-21.30/20 23.03
30	09.07 16.07		06.53 20.05	05.07 21.36	05.07 21.36	21.11-21.31/20 23.06
31	09.04 16.10		06.50 20.08	07.50-08.07/17 21.36	07.50-08.07/17 21.36	21.11-21.30/19 23.08
Potential sun hours	179	241	363	448	562	609
Sum of minutes with flicker	0	0	179	31	395	126

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 23 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.37	04.34 22.23	21.25-21.33/8 06.05 20.40	07.29 18.56	07.59 16.13	09.29 14.54
2	03.17 23.36	21.25-21.29/4 04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	03.18 23.35	21.24-21.31/7 04.40 22.17	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.20 23.33	21.23-21.31/8 04.43 22.13	06.14 20.29	07.37 18.46	08.08 16.04	09.37 14.49
5	03.22 23.32	21.23-21.33/10 04.46 22.10	06.17 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	03.24 23.30	21.22-21.34/12 04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	03.26 23.28	21.22-21.35/13 04.52 22.04	06.22 20.19	07.45 18.36	08.18 15.55	09.44 14.44
8	03.28 23.26	21.21-21.35/14 04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	03.30 23.24	21.21-21.36/15 04.58 21.57	06.28 20.12	07.49-07.53/4 18.29	07.51 15.49	08.24 14.42
10	03.33 23.22	21.20-21.37/17 05.01 21.54	06.30 20.09	07.45-07.56/11 18.26	07.54 15.46	08.27 14.41
11	03.35 23.20	21.19-21.37/18 05.04 21.51	06.33 20.05	07.43-07.58/15 18.22	07.57 15.43	08.30 14.40
12	03.38 23.18	21.19-21.38/19 05.07 21.47	06.36 20.02	07.41-07.58/17 18.19	08.00 15.40	08.33 14.39
13	03.40 23.16	21.19-21.38/19 05.10 21.44	06.39 19.58	07.40-07.59/19 18.15	08.03 15.38	08.36 14.38
14	03.43 23.13	21.19-21.39/20 05.13 21.41	06.42 19.55	07.40-08.00/20 18.12	08.06 15.35	08.39 14.37
15	03.45 23.11	21.19-21.39/20 05.16 21.38	06.44 19.51	07.38-07.59/21 18.09	08.08 15.32	08.43 14.37
16	03.48 23.08	21.19-21.40/21 05.19 21.34	06.47 19.48	07.38-07.59/21 18.05	08.11 15.29	08.46 14.36
17	03.51 23.06	21.18-21.40/22 05.22 21.31	06.50 19.45	07.38-07.59/21 18.02	08.14 15.27	08.49 14.36
18	03.53 23.03	21.18-21.40/22 05.25 21.27	06.53 19.41	07.38-07.57/19 17.59	08.17 15.24	08.52 14.36
19	03.56 23.01	21.19-21.41/22 05.28 21.24	06.55 19.38	07.38-07.56/18 17.55	08.20 15.21	08.55 14.36
20	03.59 22.58	21.19-21.41/22 05.31 21.21	06.58 19.34	07.39-07.55/16 17.52	08.23 15.19	08.58 14.36
21	04.02 22.55	21.18-21.41/23 05.34 21.17	07.01 19.31	07.41-07.53/12 17.49	08.26 15.16	09.01 14.37
22	04.05 22.52	21.18-21.41/23 05.37 21.14	07.04 19.27	07.43-07.49/6 17.46	08.29 15.14	09.04 14.37
23	04.07 22.50	21.19-21.41/22 05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.38
24	04.10 22.47	21.19-21.41/22 05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	04.13 22.44	21.19-21.40/21 05.45 21.04	07.12 19.17	07.38 16.36	09.13 15.07	10.07 14.39
26	04.16 22.41	21.20-21.41/21 05.48 21.00	07.15 19.13	07.41 16.33	09.16 15.04	10.07 14.40
27	04.19 22.38	21.20-21.40/20 05.51 20.57	07.17 19.10	07.44 16.29	09.19 15.02	10.07 14.41
28	04.22 22.35	21.21-21.40/19 05.54 20.54	07.20 19.07	07.47 16.26	09.21 15.00	10.07 14.42
29	04.25 22.32	21.22-21.38/16 05.57 20.50	07.23 19.03	07.50 16.23	09.24 14.58	10.06 14.43
30	04.28 22.29	21.22-21.37/15 06.00 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.45
31	04.31 22.26	21.24-21.36/12 06.02 20.43		07.56 16.17		10.05 14.46
Potential sun hours	597	504	392	307	204	148
Sum of minutes with flicker	519	8	220	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 24 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1198)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	08.07-08.16/9	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.56		16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31		08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52		16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34		08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49		16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36		08.08	09.37
	14.53	16.22	17.49	20.19	21.48	23.19	23.34	22.13	20.29	18.45		16.03	14.47
5	10.01	08.49	07.18	06.32	04.50	03.23	03.20	04.45	06.16	07.39		08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.26	18.42		16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42		08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38		15.57	14.44
7	09.58	08.43	07.12	06.25	04.43	03.19	03.24	04.51	06.21	07.45		08.18	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35		15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48		08.21	09.47
	15.02	16.35	18.01	20.30	22.00	23.27	23.27	22.00	20.15	18.32		15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.29	04.57	06.27	07.51		08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.28		15.48	14.40
10	09.54	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.54		08.27	09.51
	15.07	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25		15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56		08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21		15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59		08.33	09.55
	15.12	16.48	18.12	20.42	22.13	23.35	23.18	21.47	20.01	18.18		15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02		08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15		15.36	14.36
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	08.05		08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11		15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.44	08.08		08.43	09.59
	15.20	16.57	18.21	20.51	22.22	23.39	23.11	21.37	19.51	18.08		15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11		08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.05		15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14		08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.01		15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17		08.52	10.03
	15.29	17.06	18.30	21.00	22.31	23.41	23.04	21.27	19.41	17.58		15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20		08.55	10.04
	15.32	17.09	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55		15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.11-08.19/8		08.23	09.58
	15.35	17.12	18.35	21.06	22.37	23.43	22.58	21.21	19.34	17.51		15.17	14.35
21	09.30	07.58	06.24	05.37	04.00	03.06	04.00	05.33	07.00	08.08-08.21/13		08.26	09.01
	15.38	17.16	18.38	21.09	22.40	23.43	22.56	21.17	19.30	17.48		15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.36	07.03	08.07-08.23/16		08.29	09.04
	15.41	17.19	18.41	21.12	22.43	23.43	22.53	21.14	19.27	17.45		15.12	14.35
23	09.25	07.52	06.17	05.30	03.55	03.06	04.06	05.38	07.06	08.06-08.24/18		08.32	09.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.10	19.23	17.41		15.10	14.36
24	09.23	07.49	06.13	05.26	03.52	03.06	04.09	05.41	07.09	08.04-08.23/19		08.35	09.10
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38		15.08	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	08.04-08.23/19		07.38	09.13
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.03	19.16	16.35		15.05	14.37
26	09.18	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	08.04-08.23/19		07.41	09.16
	15.53	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32		15.03	14.38
27	09.15	07.39	06.03	05.16	03.44	03.08	04.18	05.50	07.17	08.04-08.22/18		07.44	09.19
	15.57	17.34	18.56	21.27	22.58	23.42	22.38	20.57	19.09	16.28		15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	08.04-08.22/18		07.47	09.21
	16.00	17.37	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25		14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	08.04-08.20/16		07.50	09.24
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22		14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	08.05-08.18/13		07.53	09.27
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19		14.54	14.43
31	09.04		06.49		03.34		04.30	06.02		07.56			10.06
	16.09		20.07		23.09		22.26	20.43		16.16			14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147	0
Sum of minutes with flicker	0	0	183	0	0	0	0	0	177	9	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 25 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05 14.47	09.01 16.13	07.32 17.40	08.23-08.45/22 17.40	06.45 20.10	07.38-07.57/19 21.39	05.03 21.39	03.31 23.11
2	10.04 14.49	08.58 16.16	07.29 17.43	08.23-08.46/23 17.43	06.42 20.13	07.38-07.55/17 21.42	05.00 21.42	03.29 23.14
3	10.03 14.51	08.55 16.19	07.25 17.46	08.22-08.46/24 17.46	06.39 20.16	07.39-07.54/15 21.45	04.56 21.45	03.27 23.16
4	10.02 14.53	08.52 16.22	07.22 17.49	08.22-08.47/25 17.49	06.35 20.19	07.41-07.53/12 21.48	04.53 21.48	03.25 23.19
5	10.01 14.55	08.49 16.25	07.18 17.52	08.21-08.46/25 17.52	06.32 20.21	07.43-07.49/6 21.51	04.50 21.51	03.23 23.21
6	10.00 14.57	08.46 16.29	07.15 17.55	08.21-08.46/25 17.55	06.28 20.24	04.47 21.54	04.47 21.54	03.21 23.23
7	09.58 14.59	08.43 16.32	07.12 17.58	08.21-08.45/24 17.58	06.25 20.27	04.43 21.57	04.43 21.57	03.19 23.25
8	09.57 15.02	08.40 16.35	07.08 18.01	08.21-08.44/23 18.01	06.21 20.30	04.40 22.00	04.40 22.00	03.17 23.27
9	09.55 15.04	08.37 16.38	07.05 18.04	08.22-08.44/22 18.04	06.18 20.33	04.37 22.04	04.37 22.04	03.16 23.29
10	09.54 15.07	08.34 16.41	07.01 18.07	08.22-08.42/20 18.07	06.14 20.36	04.34 22.07	04.34 22.07	03.14 23.31
11	09.52 15.09	08.31 16.44	06.58 18.09	08.23-08.41/18 18.09	06.11 20.39	04.31 22.10	04.31 22.10	03.13 23.33
12	09.50 15.12	08.27 16.48	06.55 18.12	08.25-08.38/13 18.12	06.07 20.42	04.27 22.13	04.27 22.13	03.11 23.35
13	09.48 15.15	08.24 16.51	06.51 18.15	08.29-08.34/5 18.15	06.04 20.45	04.24 22.16	04.24 22.16	03.10 23.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.48 18.18	06.01 20.48	04.21 22.19	04.21 22.19	03.09 23.37
15	09.44 15.20	08.18 16.57	06.44 18.21	06.44 18.21	05.57 20.51	04.18 22.22	04.18 22.22	03.08 23.39
16	09.42 15.23	08.15 17.00	06.41 18.24	06.41 18.24	05.54 20.54	04.15 22.25	04.15 22.25	03.07 23.40
17	09.40 15.26	08.11 17.03	06.37 18.27	06.37 18.27	05.50 20.57	04.12 22.28	04.12 22.28	03.07 23.41
18	09.38 15.29	08.08 17.06	06.34 18.30	06.34 18.30	05.47 21.00	04.09 22.31	04.09 22.31	03.06 23.41
19	09.35 15.32	08.05 17.09	06.30 18.33	06.30 18.33	05.43 21.03	04.06 22.34	04.06 22.34	03.06 23.42
20	09.33 15.35	08.02 17.13	06.27 18.35	06.27 18.35	05.40 21.06	04.03 22.37	04.03 22.37	03.06 23.43
21	09.30 15.38	07.58 17.16	06.24 18.38	06.24 18.38	05.37 21.09	04.00 22.40	04.00 22.40	03.06 23.43
22	09.28 15.41	07.55 17.19	06.20 18.41	06.20 18.41	05.33 21.12	03.57 22.43	03.57 22.43	03.06 23.43
23	09.25 15.44	07.52 17.22	06.17 18.44	06.17 18.44	05.30 21.15	03.55 22.46	03.55 22.46	03.06 23.43
24	09.23 15.47	07.49 17.25	06.13 18.47	06.49-06.50/1 18.47	05.26 21.18	03.52 22.49	03.52 22.49	03.06 23.43
25	09.20 15.50	07.45 17.28	06.10 18.50	06.45-06.55/10 18.50	05.23 21.21	03.49 22.52	03.49 22.52	03.07 23.43
26	09.18 15.54	07.42 17.31	06.06 18.53	08.29-08.41/12 18.53	05.20 21.24	03.46 22.55	03.46 22.55	03.08 23.42
27	09.15 15.57	07.39 17.34	06.03 18.56	08.26-08.42/16 18.56	05.16 21.27	03.44 22.58	03.44 22.58	03.09 23.42
28	09.12 16.00	07.35 17.37	05.59 18.58	08.25-08.44/19 18.58	05.13 21.30	03.41 23.01	03.41 23.01	03.10 23.41
29	09.09 16.03		05.56 20.01	07.39-07.58/19 20.01	05.10 21.33	03.39 23.03	04.38-04.45/7 23.03	03.11 23.40
30	09.07 16.06		05.52 20.04	07.39-07.58/19 20.04	05.06 21.36	03.36 23.06	04.37-04.48/11 23.06	03.12 23.39
31	09.04 16.09		05.49 20.07	07.38-07.57/19 20.07		03.34 23.09	04.36-04.49/13 23.09	
Potential sun hours	179	241	363	448	562	611		626
Sum of minutes with flicker	0	48	385	69	31			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 25 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.13 04.38-04.59/21 23.38	04.33 22.23	06.04 20.39	07.28 09.05-09.16/11 18.56	07.59 16.13	09.30 14.53
2	03.15 04.38-04.59/21 23.37	04.36 22.20	06.07 20.36	07.31 09.03-09.18/15 18.52	08.02 16.09	09.32 14.51
3	03.17 04.38-04.59/21 23.35	04.39 22.17	06.10 20.33	07.34 09.01-09.20/19 18.49	08.05 16.06	09.35 14.49
4	03.18 04.38-04.59/21 23.34	04.42 22.13	06.13 20.29	07.37 08.59-09.21/22 18.45	08.08 16.03	09.37 14.47
5	03.20 04.39-04.59/20 23.32	04.45 22.10	06.16 20.26	07.39 08.58-09.21/23 18.42	08.11 16.00	09.40 14.46
6	03.22 04.39-04.59/20 23.31	04.48 22.07	06.19 20.22	07.42 08.58-09.22/24 18.38	08.15 15.57	09.42 14.44
7	03.24 04.40-04.59/19 23.29	04.51 22.04	06.21 07.38-07.44/6 20.19	07.45 08.57-09.22/25 18.35	08.18 15.54	09.44 14.43
8	03.26 04.40-04.58/18 23.27	04.54 22.00	06.24 07.35-07.47/12 20.15	07.48 08.56-09.22/26 18.32	08.21 15.51	09.47 14.41
9	03.29 04.41-04.59/18 23.25	04.57 21.57	06.27 07.34-07.49/15 20.12	07.51 08.56-09.21/25 18.28	08.24 15.48	09.49 14.40
10	03.31 04.42-04.58/16 23.23	05.00 21.54	06.30 07.32-07.49/17 20.08	07.54 08.56-09.21/25 18.25	08.27 15.45	09.51 14.39
11	03.33 04.42-04.57/15 23.21	05.03 21.51	06.33 07.31-07.49/18 20.05	07.56 08.56-09.20/24 18.21	08.30 15.42	09.53 14.38
12	03.36 04.43-04.57/14 23.19	05.06 21.47	06.35 07.30-07.49/19 20.01	07.59 08.57-09.19/22 18.18	08.33 15.39	09.55 14.37
13	03.38 04.44-04.56/12 23.16	05.09 21.44	06.38 07.29-07.49/20 19.58	08.02 08.57-09.18/21 18.15	08.36 15.36	09.56 14.36
14	03.41 04.46-04.55/9 23.14	05.12 21.41	06.41 07.29-07.48/19 19.54	08.05 08.58-09.16/18 18.11	08.39 15.34	09.58 14.36
15	03.44 04.48-04.53/5 23.11	05.15 21.37	06.44 07.30-07.48/18 19.51	08.08 08.59-09.14/15 18.08	08.43 15.31	09.59 14.35
16	03.46 23.09	05.18 21.34	06.46 07.29-07.46/17 19.48	08.11 09.02-09.11/9 18.05	08.46 15.28	10.01 14.35
17	03.49 23.06	05.21 21.31	06.49 07.30-07.45/15 19.44	08.14 18.01	08.49 15.25	10.02 14.35
18	03.52 23.04	05.24 21.27	06.52 07.32-07.43/11 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	03.55 23.01	05.27 21.24	06.55 07.35-07.40/5 19.37	08.20 17.55	08.55 15.20	10.04 14.35
20	03.57 22.58	05.30 21.21	06.57 19.34	08.23 17.51	08.58 15.17	10.05 14.35
21	04.00 22.56	05.33 21.17	07.00 19.30	08.26 17.48	09.01 15.15	10.06 14.35
22	04.03 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.12	10.06 14.35
23	04.06 22.50	05.39 21.10	07.06 19.23	08.32 17.41	09.07 15.10	10.07 14.36
24	04.09 22.47	05.41 21.07	07.09 19.20	08.35 17.38	09.10 15.08	10.07 14.37
25	04.12 22.44	05.44 21.04	07.11 19.16	07.38 16.35	09.13 15.05	10.07 14.37
26	04.15 22.41	05.47 21.00	07.14 19.13	07.41 16.32	09.16 15.03	10.07 14.38
27	04.18 22.38	05.50 20.57	07.17 19.09	07.44 16.28	09.19 15.01	10.07 14.39
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.25	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.42
30	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.55	10.06 14.43
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.45
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	250	0	192	324	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 26 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.29	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.41
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.38	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.09	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.08	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.41	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 -  
 Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
 FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 19.06/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 27 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1201)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32 16.26-16.49/23	06.46	05.04	03.32	03.15	04.34	06.05	07.28 17.08-17.21/13	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29 16.26-16.50/24	06.42	05.00	03.30	03.16	04.37	06.08	07.31 17.05-17.23/18	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25 16.25-16.50/25	06.39	04.57	03.28	03.18	04.40	06.11	07.34 17.04-17.24/20	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22 16.25-16.51/26	06.36	04.54	03.26	03.19	04.43	06.13	07.37 17.02-17.25/23	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19 16.24-16.50/26	06.32	04.51	03.24	03.21	04.46	06.16	07.40 17.01-17.26/25	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15 16.24-16.50/26	06.29	04.47	03.22	03.23	04.49	06.19	07.42 17.01-17.26/25	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12 16.24-16.50/26	06.25	04.44	03.20	03.25	04.52	06.22	07.45 17.00-17.26/26	08.18	09.44
	15.00	16.32	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.35	15.55	14.44
8	09.57	08.40	07.08 16.24-16.48/24	06.22	04.41	03.18	03.28	04.55	06.25	07.48 17.00-17.26/26	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.27	22.00	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05 16.25-16.48/23	06.18	04.38	03.17	03.30	04.58	06.27	07.51 16.59-17.26/27	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02 16.25-16.46/21	06.15	04.35	03.15	03.32	05.01	06.30	07.54 16.59-17.25/26	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58 16.26-16.45/19	06.11	04.31	03.14	03.34	05.04	06.33	07.57 17.00-17.24/24	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55 16.28-16.43/15	06.08	04.28	03.12	03.37	05.07	06.36	08.00 17.00-17.23/23	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.18	15.40	14.38
13	09.48	08.24	06.51 16.31-16.41/10	06.05	04.25	03.11	03.39	05.10	06.38	08.02 17.00-17.22/22	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05 17.01-17.21/20	08.39	09.58
	15.18	16.54	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08 17.02-17.19/17	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11 17.04-17.16/12	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.07	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.07	03.07	03.55	05.27	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.21	14.35
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.30	17.48	15.16	14.36
22	09.28	07.55	06.20	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.55	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.44	21.15	22.46	23.43	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.45 16.35-16.41/6	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.35	15.06	14.38
26	09.17	07.42 16.32-16.45/13	06.07	05.20	03.47	03.09	04.16	05.48	07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32	15.04	14.39
27	09.15	07.39 16.29-16.47/18	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	16.29	15.02	14.40
28	09.12	07.35 16.28-16.48/20	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.00	17.37	18.59	21.30	23.00	23.41	22.35	20.53	19.06	16.26	14.59	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26 17.12-17.18/6	07.53	09.27	10.06
	16.07		20.04	21.36	23.06	23.39	22.29	20.47	18.59	16.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	57	288	0	0	0	0	0	6	347	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 19.06/3.4.388

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 28 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.01	07.32	06.46	19.06-19.26/20	05.04	03.32	03.14	04.34	06.05	19.01-19.22/21	07.28	07.59	09.30
	14.48	16.13	17.40	20.10		21.39	23.11	23.38	22.23	20.40		18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	19.04-19.26/22	05.00	03.30	03.16	04.37	06.08	19.00-19.23/23	07.31	08.02	09.32
	14.50	16.16	17.43	20.13		21.42	23.14	23.37	22.20	20.36		18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	19.03-19.27/24	04.57	03.28	03.18	04.40	06.11	18.59-19.23/24	07.34	08.05	09.35
	14.52	16.20	17.46	20.16		21.45	23.16	23.35	22.17	20.33		18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	19.02-19.27/25	04.54	03.26	03.19	04.43	06.13	18.58-19.23/25	07.37	08.08	09.37
	14.54	16.23	17.49	20.19		21.48	23.18	23.34	22.13	20.29		18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	19.01-19.27/26	04.51	03.24	03.21	04.46	06.16	18.57-19.23/26	07.40	08.12	09.40
	14.56	16.26	17.52	20.22		21.51	23.21	23.32	22.10	20.26		18.42	16.01	14.46
6	10.00	08.46	07.15	06.29	19.01-19.27/26	04.47	03.22	03.23	04.49	06.19	18.57-19.23/26	07.42	08.15	09.42
	14.58	16.29	17.55	20.25		21.54	23.23	23.30	22.07	20.22		18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	19.01-19.27/26	04.44	03.20	03.25	04.52	06.22	18.56-19.22/26	07.45	08.18	09.44
	15.00	16.32	17.58	20.28		21.57	23.25	23.29	22.04	20.19		18.35	15.55	14.44
8	09.57	08.40	07.09	06.22	19.01-19.26/25	04.41	03.18	03.27	04.55	06.25	18.57-19.22/25	07.48	08.21	09.47
	15.03	16.35	18.01	20.30		22.01	23.27	23.27	22.01	20.16		18.32	15.52	14.42
9	09.55	08.37	07.05	06.18	19.01-19.25/24	04.38	03.17	03.30	04.58	06.27	18.57-19.21/24	07.51	08.24	09.49
	15.05	16.39	18.04	20.33		22.04	23.29	23.25	21.57	20.12		18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	19.02-19.25/23	04.34	03.15	03.32	05.01	06.30	18.57-19.19/22	07.54	08.27	09.51
	15.08	16.42	18.07	20.36		22.07	23.31	23.23	21.54	20.09		18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	19.02-19.23/21	04.31	03.14	03.34	05.04	06.33	18.58-19.18/20	07.57	08.30	09.53
	15.10	16.45	18.10	20.39		22.10	23.33	23.21	21.51	20.05		18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	19.03-19.22/19	04.28	03.12	03.37	05.07	06.36	18.59-19.17/18	08.00	08.33	09.54
	15.13	16.48	18.13	20.42		22.13	23.34	23.18	21.47	20.02		18.19	15.40	14.38
13	09.48	08.24	06.51	06.04	19.05-19.20/15	04.25	03.11	03.39	05.10	06.39	19.00-19.14/14	08.02	08.36	09.56
	15.15	16.51	18.16	20.45		22.16	23.36	23.16	21.44	19.58		18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	19.06-19.17/11	04.22	03.10	03.42	05.13	06.41	19.03-19.10/7	08.05	08.40	09.58
	15.18	16.54	18.19	20.48		22.19	23.37	23.14	21.41	19.55		18.12	15.34	14.37
15	09.44	08.18	06.45	05.58		04.19	03.09	03.44	05.16	06.44		08.08	08.43	09.59
	15.21	16.58	18.21	20.51		22.22	23.38	23.11	21.38	19.51		18.08	15.31	14.36
16	09.42	08.15	06.41	05.54		04.16	03.08	03.47	05.19	06.47		08.11	08.46	10.01
	15.24	17.01	18.24	20.54		22.25	23.39	23.09	21.34	19.48		18.05	15.29	14.36
17	09.40	08.12	06.38	05.51		04.13	03.08	03.50	05.22	06.50		08.14	08.49	10.02
	15.27	17.04	18.27	20.57		22.28	23.40	23.06	21.31	19.44		18.02	15.26	14.36
18	09.37	08.08	06.34	05.47		04.10	03.07	03.53	05.24	06.52		08.17	08.52	10.03
	15.30	17.07	18.30	21.00		22.31	23.41	23.04	21.27	19.41		17.58	15.23	14.35
19	09.35	08.05	06.31	05.44		04.07	03.07	03.55	05.27	06.55		08.20	08.55	10.04
	15.33	17.10	18.33	21.03		22.34	23.42	23.01	21.24	19.37		17.55	15.21	14.35
20	09.33	08.02	06.27	05.41		04.04	03.07	03.58	05.30	06.58		08.23	08.58	10.05
	15.36	17.13	18.36	21.06		22.37	23.42	22.58	21.21	19.34		17.52	15.18	14.36
21	09.30	07.59	06.24	05.37		04.01	03.07	04.01	05.33	07.01		08.26	09.01	10.06
	15.39	17.16	18.39	21.09		22.40	23.43	22.55	21.17	19.30		17.48	15.16	14.36
22	09.28	07.55	06.20	05.34		03.58	03.07	04.04	05.36	07.03		08.29	09.04	10.06
	15.42	17.19	18.42	21.12		22.43	23.43	22.53	21.14	19.27		17.45	15.13	14.36
23	09.25	07.52	06.17	05.30		03.55	03.07	04.07	05.39	07.06		08.32	09.07	10.07
	15.45	17.22	18.44	21.15		22.46	23.43	22.50	21.11	19.24		17.42	15.11	14.37
24	09.23	07.49	06.14	05.27		03.53	03.07	04.10	05.42	07.09		08.35	09.10	10.07
	15.48	17.25	18.47	21.18		22.49	23.43	22.47	21.07	19.20		17.39	15.08	14.37
25	09.20	07.46	06.10	05.24		03.50	03.08	04.13	05.45	07.12		07.38	09.13	10.07
	15.51	17.28	18.50	21.21		22.52	23.42	22.44	21.04	19.17		16.35	15.06	14.38
26	09.18	07.42	06.07	05.20		03.47	03.09	04.16	05.48	07.14		07.41	09.16	10.07
	15.54	17.31	18.53	21.24		22.55	23.42	22.41	21.00	19.13		16.32	15.04	14.39
27	09.15	07.39	06.03	05.17		03.45	03.10	04.19	05.51	07.17		07.44	09.19	10.07
	15.57	17.34	18.56	21.27		22.58	23.41	22.38	20.57	19.10		16.29	15.02	14.40
28	09.12	07.36	06.00	05.14		03.42	03.11	04.22	05.54	07.20		07.47	09.21	10.07
	16.00	17.37	18.59	21.30		23.00	23.41	22.35	20.53	19.06		16.26	14.59	14.41
29	09.09		06.56	19.14-19.18/4	05.10	03.40	03.12	04.25	05.56	19.07-19.18/11	07.23	07.50	09.24	10.07
	16.04		20.02		21.33	23.03	23.40	22.32	20.50	19.03		16.23	14.57	14.43
30	09.07		06.53	19.10-19.23/13	05.07	03.37	03.13	04.28	05.59	19.04-19.20/16	07.26	07.53	09.27	10.06
	16.07		20.04		21.36	23.06	23.39	22.29	20.47	18.59		16.19	14.55	14.44
31	09.04		06.49	19.07-19.24/17		03.35		04.31	06.02	19.03-19.22/19		07.56		10.06
	16.10		20.07		23.08	23.26	22.26	20.43				16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	301	307	204	147	0
Sum of minutes with flicker	0	0	34	307	0	0	0	46	301	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 29 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		17.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 30 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.56	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.16	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.58	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.35	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.38	03.14	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 31 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	09.44
	15.00	16.32	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	09.58
	15.18	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.38	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.35	15.06	14.38
26	09.18	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.39
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.40
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.41	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 32 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.41	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.14	20.30	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.01
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.06
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 33 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.26	15.47	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.37	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.07	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.08	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.53	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.23	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 34 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.47	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.32	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.18	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.20	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 35 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.26	18.42	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.18	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.07	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	06.48	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.51	22.22	23.39	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.06	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.04	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.05	04.03	05.35	07.03	08.29	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.53	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.38	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	17.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.07	04.15	05.47	07.14	07.41	09.16	10.07
	15.53	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.44	09.19	10.07
	15.56	17.34	18.55	21.27	22.58	23.42	22.38	20.57	19.09	17.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.10	03.38	03.10	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.04		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402WTG: 36 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

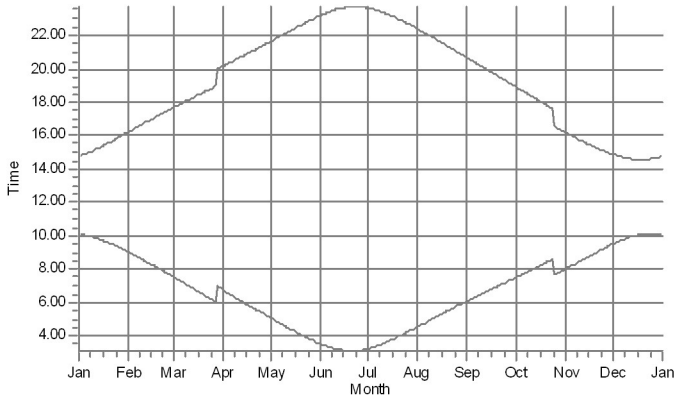
Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

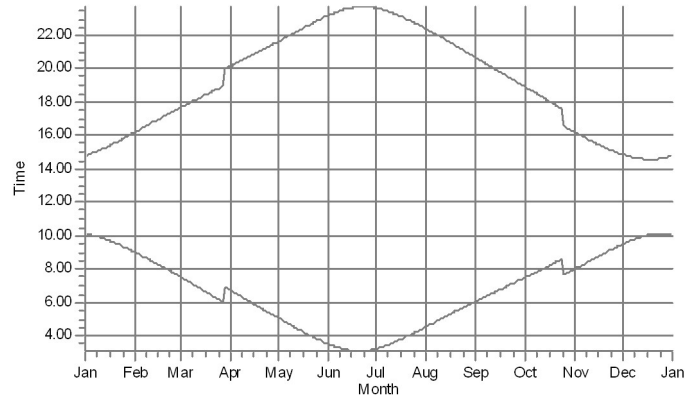
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

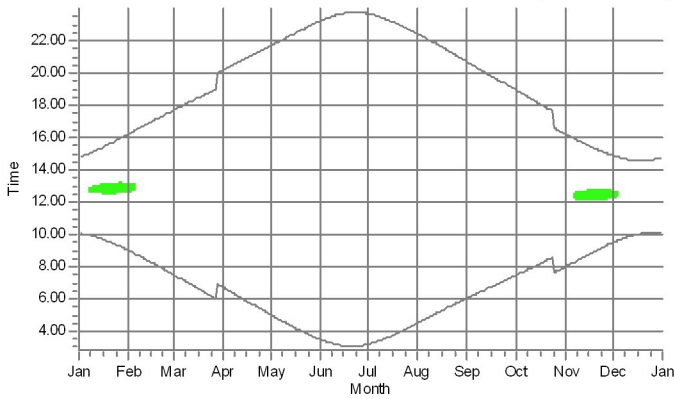
1: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



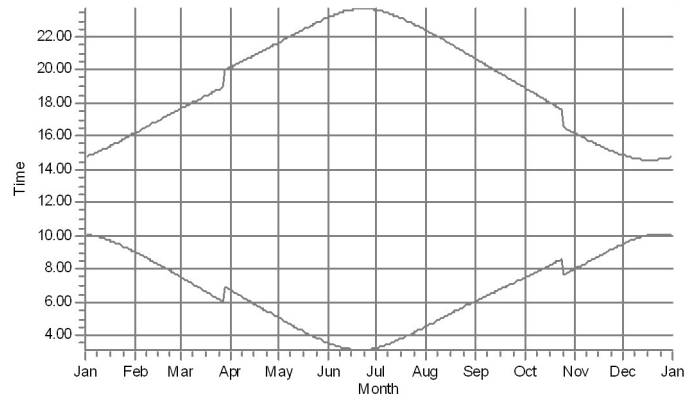
2: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



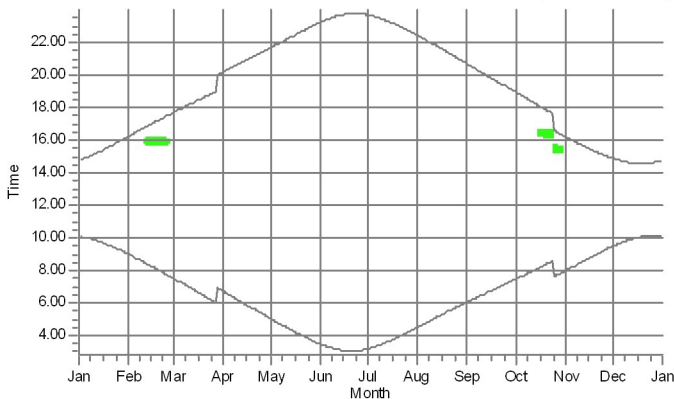
3: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



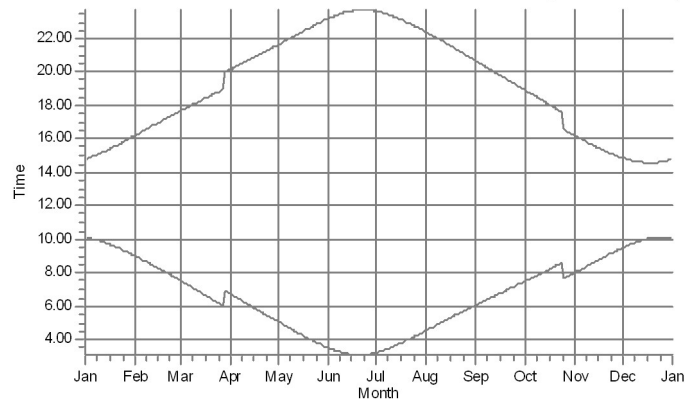
4: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



5: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



6: VESTAS V162-5.6 HH210 5600 180.0 !O!hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

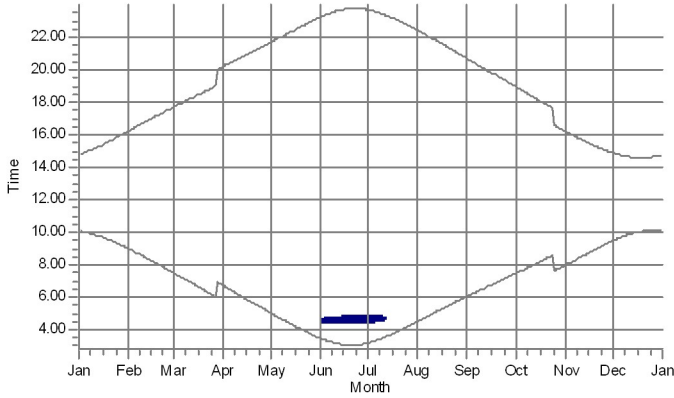
 R: Lomarakenus R (Peuraneva,Valvatintie)



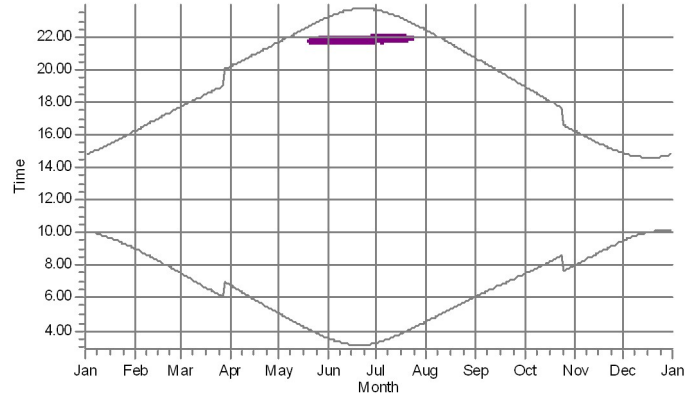
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

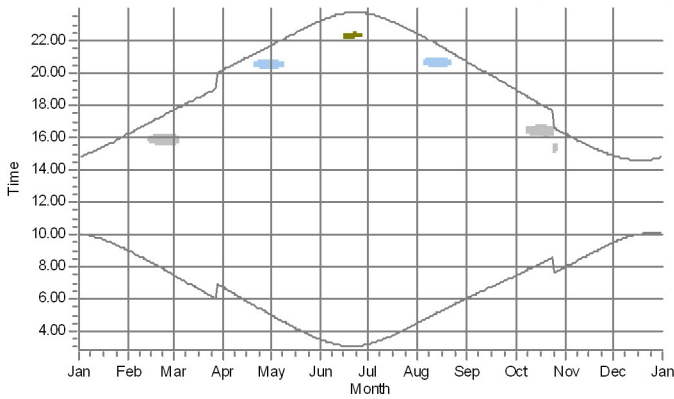
7: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



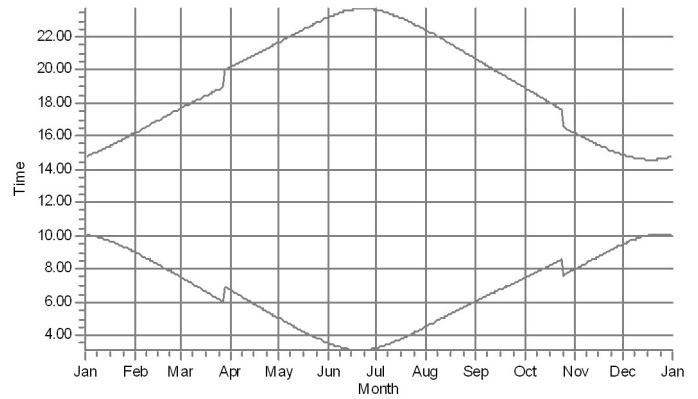
8: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



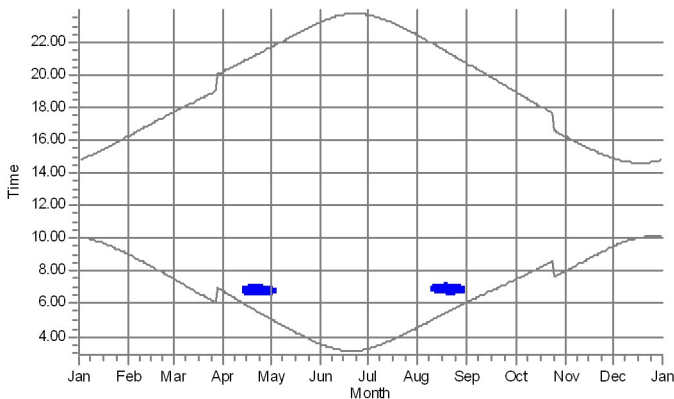
9: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



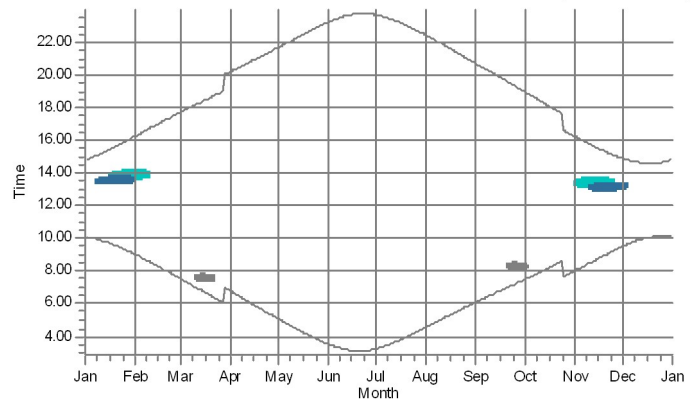
10: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



11: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



12: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



### Shadow receptors

C: Asuinrakennus C (Loukkukoskentie, Mantyla)  
D: Lomarakenus D (Purola)  
G: Asuinrakennus G (Hautakoskentie 455)

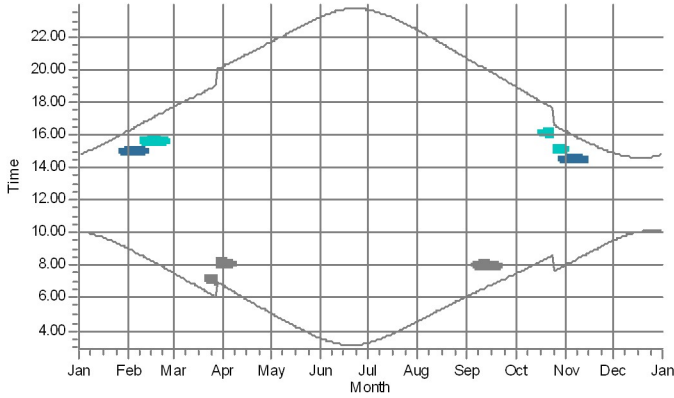
J: Lomarakenus J (Katajajarventie 49)  
K: Lomarakenus K (Silostenlampi)  
L: Lomarakenus L (Harjunpaantie 215)

O: Lomarakenus O (Harjunpaantie 398)  
U: Lomarakenus U (Kannistontie, Kivioja)  
V: Asuinrakennus V (Kannistontie 586)

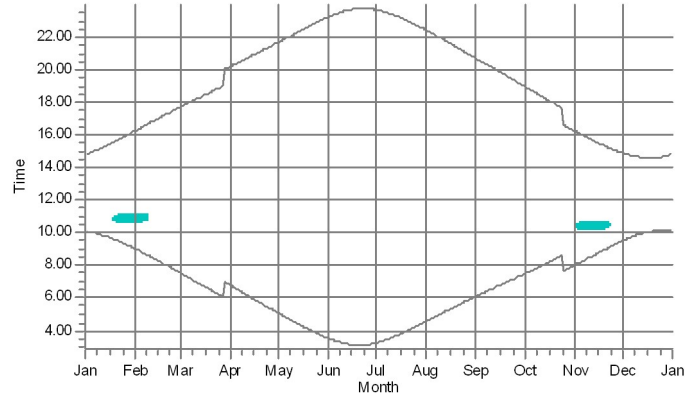
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

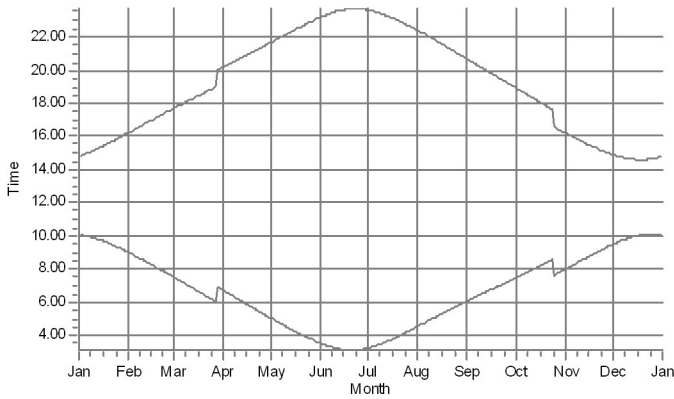
13: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



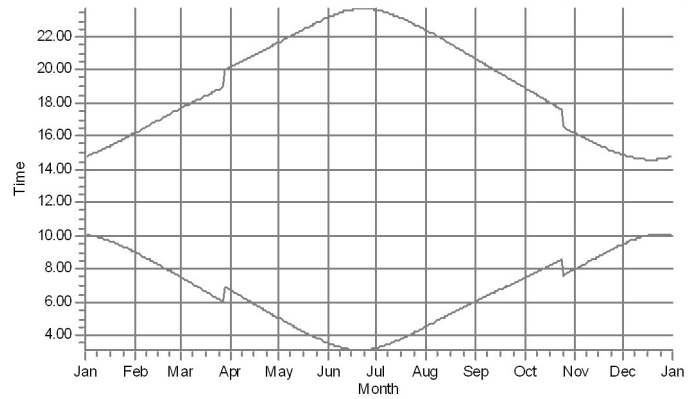
14: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



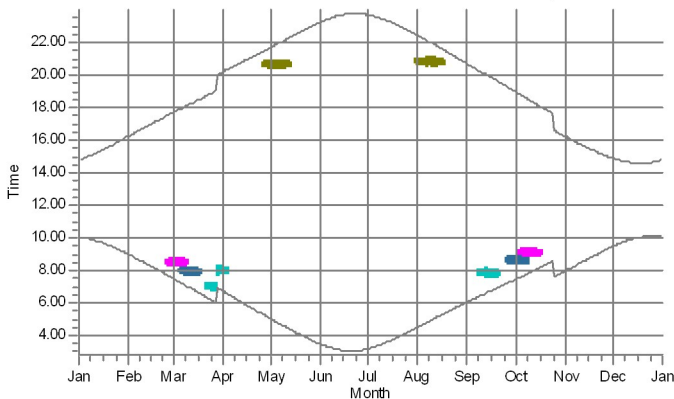
15: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



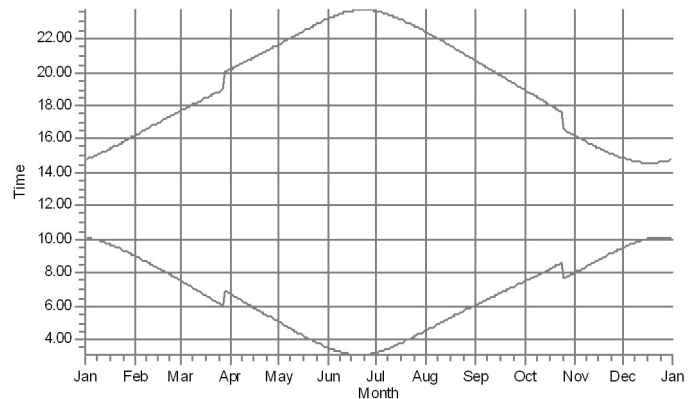
16: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)








17: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



18: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



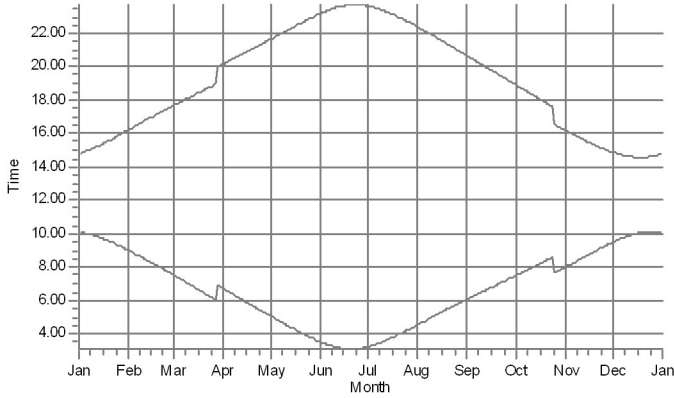
### Shadow receptors

 D: Lomarakenus D (Purola)	 J: Lomarakenus J (Katajajarventie 49)	 V: Asuinrakenus V (Kannistontie 586)
 E: Asuinrakenus E (Kannistontie 557)	 U: Lomarakenus U (Kannistontie, Kivioja)	

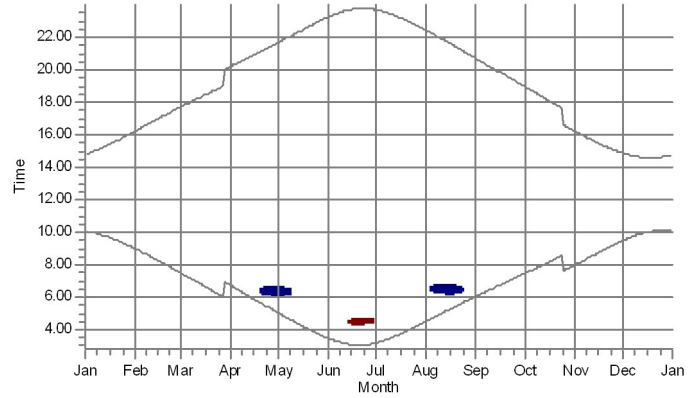
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

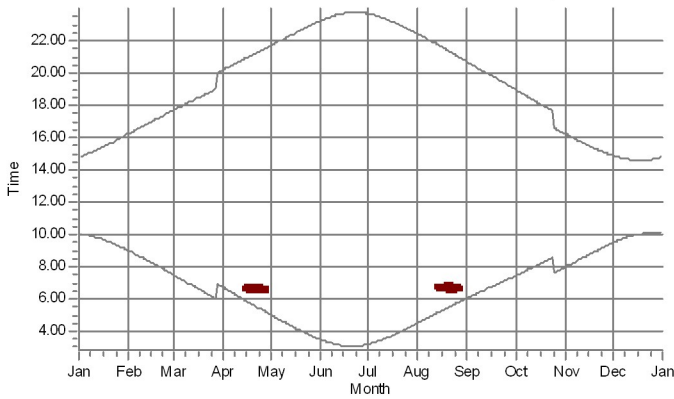
19: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



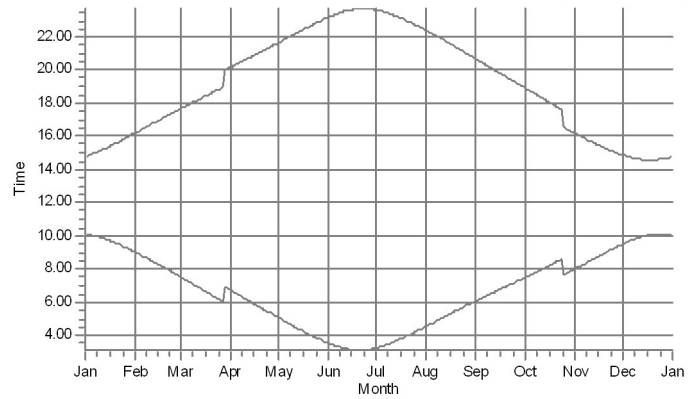
20: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



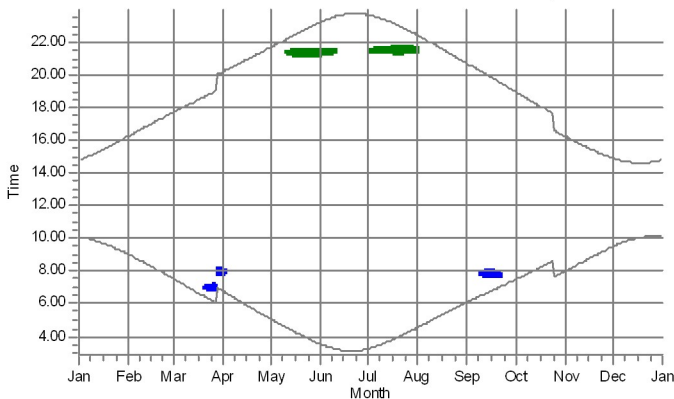
21: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



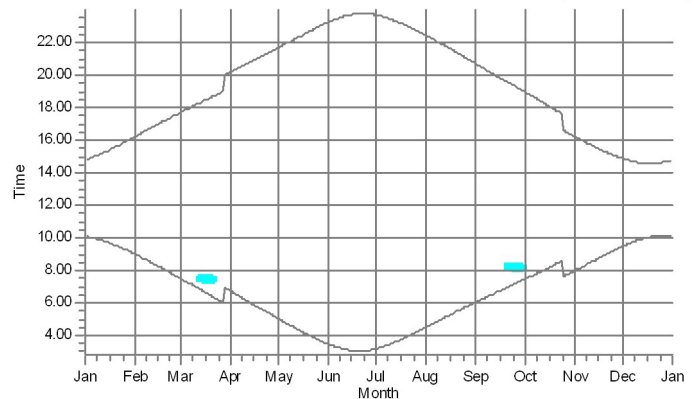
22: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)








23: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



24: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



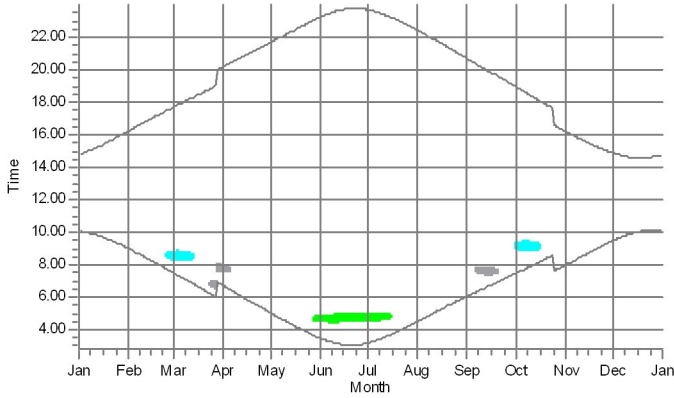
### Shadow receptors

 A: Lomarakenus A (Kuuslammentie)	 G: Asuinrakenus G (Hautakoskentie 455)	 M: Lomarakenus M (Hakala, Iso-Mottonen)
 C: Asuinrakenus C (Loukkukoskentie, Mantyla)	 H: Asuinrakenus H (Hautakoskentie 544)	

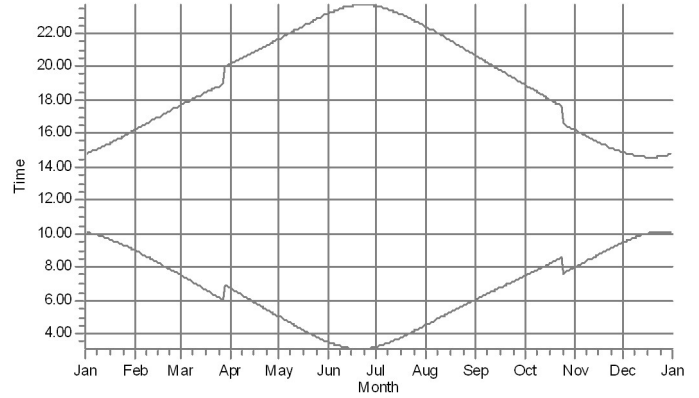
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

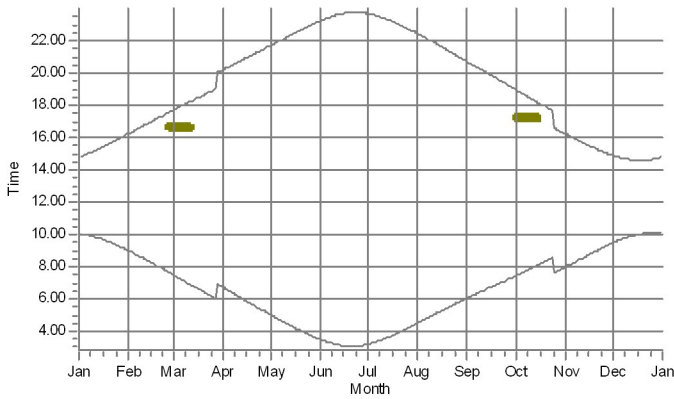
25: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



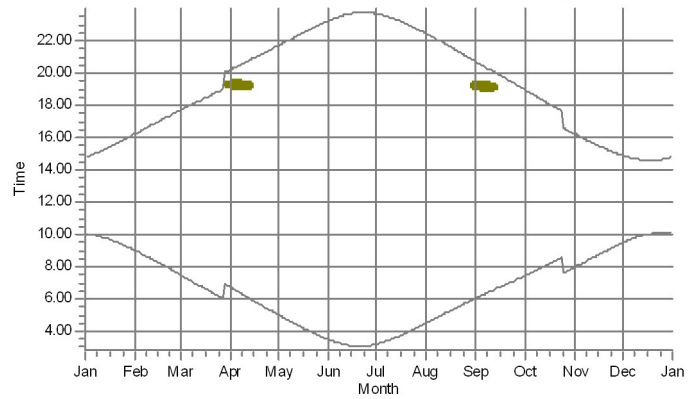
26: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



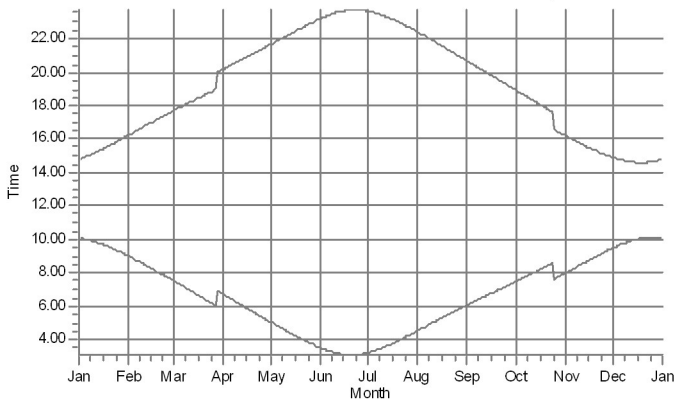
27: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



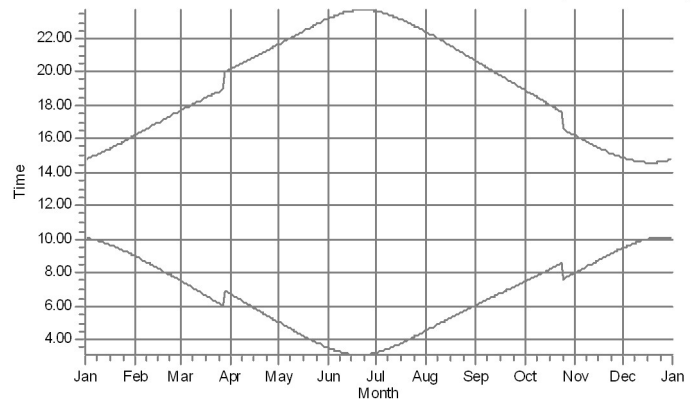
28: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



29: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



30: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

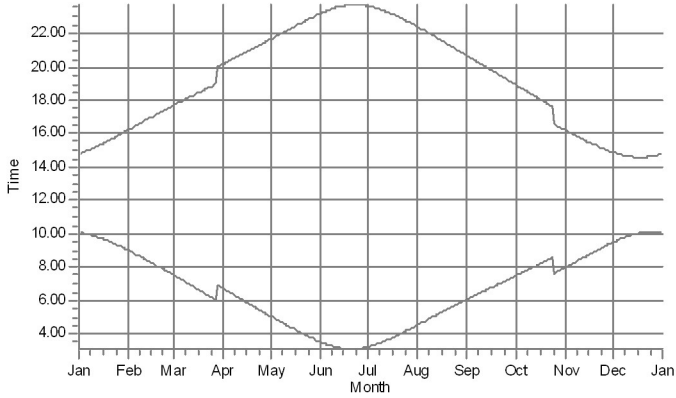
I: Asuinrakennus I (Hautakoskentie 289)  
 J: Lomarakennus J (Katajarventie 49)

M: Lomarakennus M (Hakala, Iso-Mottonen)  
 P: Asuinrakennus P (Hautakoskentie 135)

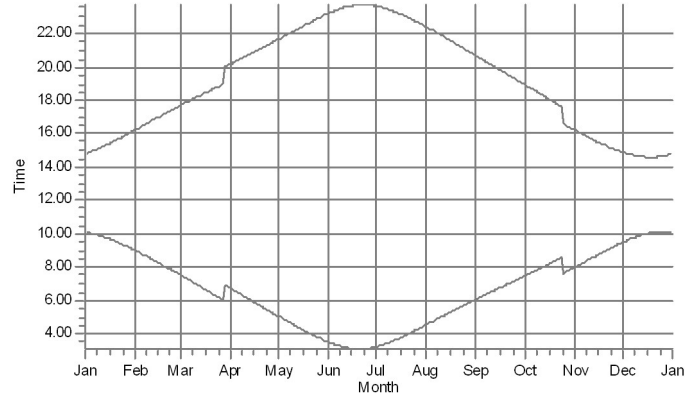
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402

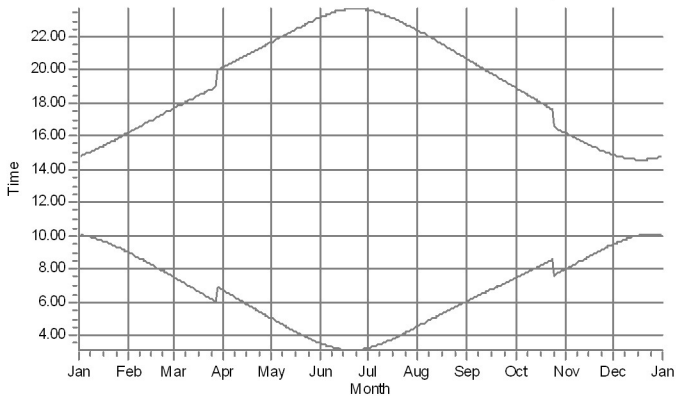
31: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



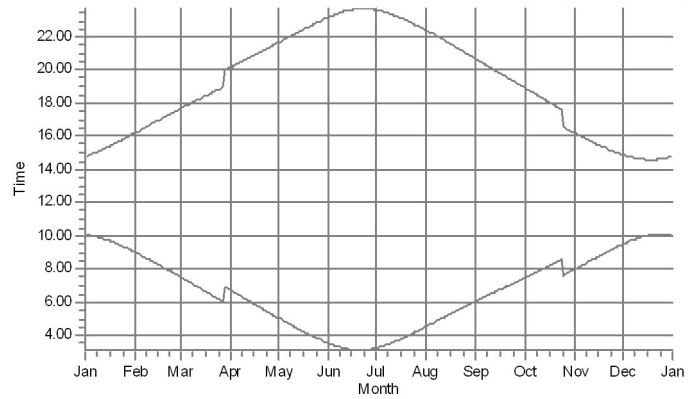
32: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



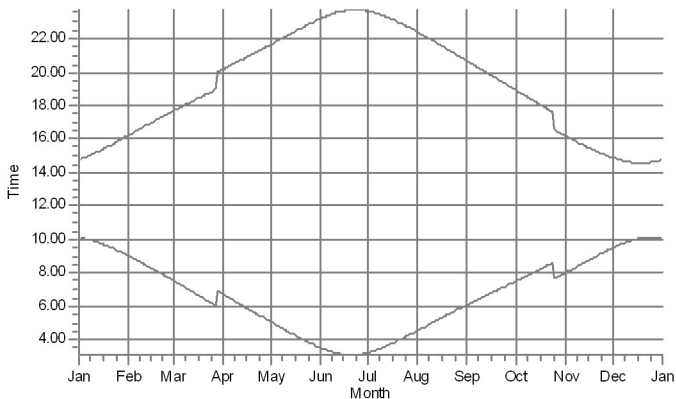
33: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



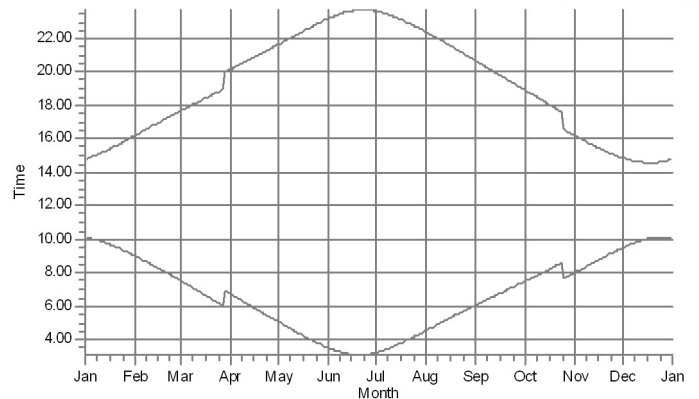
34: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



35: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



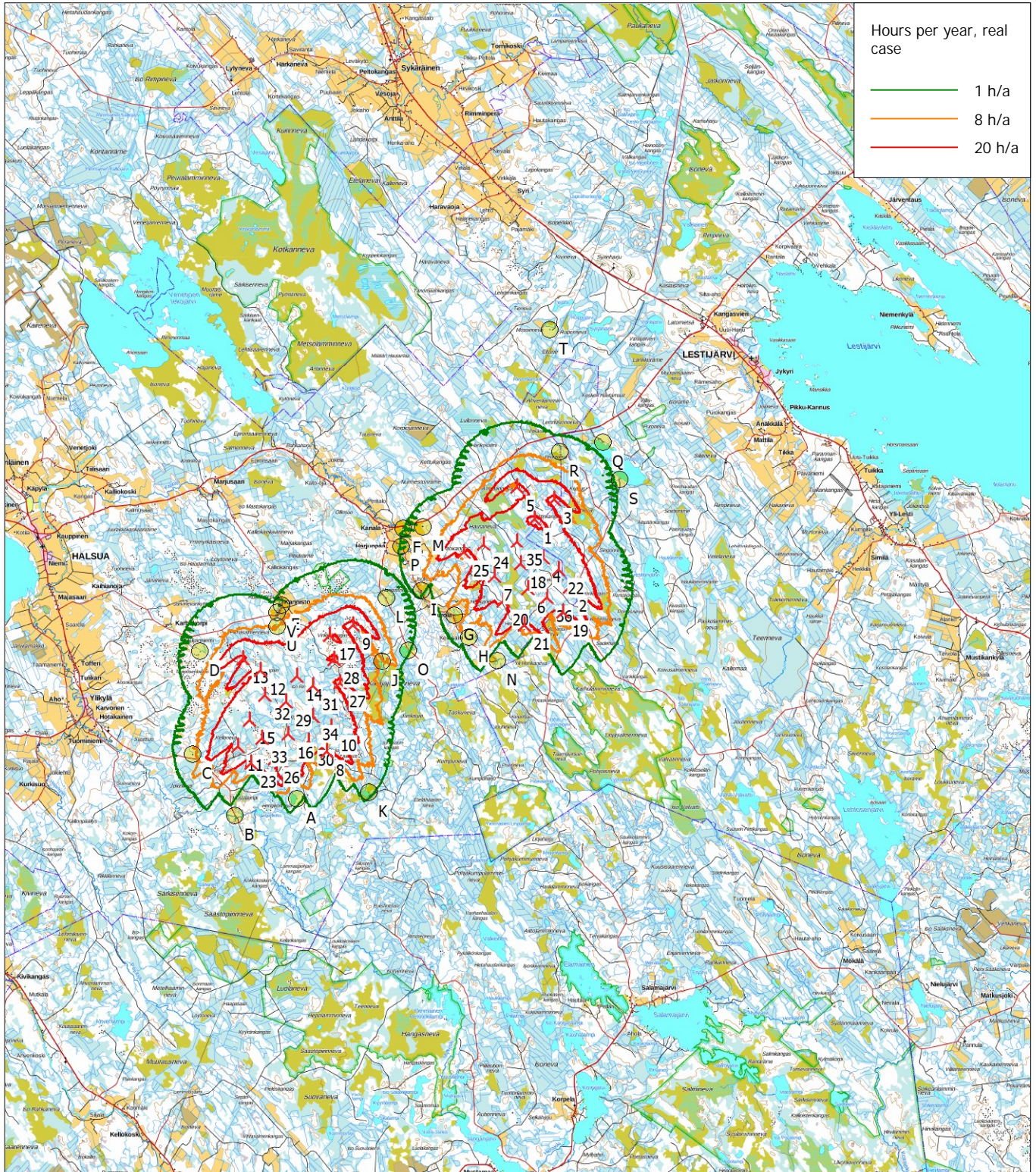
36: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

## SHADOW - Map

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402



Map: aastokarttarasteri 100K , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 375 570 North: 7 038 420

📍 New WTG      🟡 Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)

14.4.2021

---

**Liite 6: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset ”real case, no forest yhteisvaikutushankkeiden kanssa**

## SHADOW - Main Result

Calculation: Halsua\_Generic RD180x36xHH210\_no forest\_20210402 + yhteisvaikutukset

### Assumptions for shadow calculations

Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

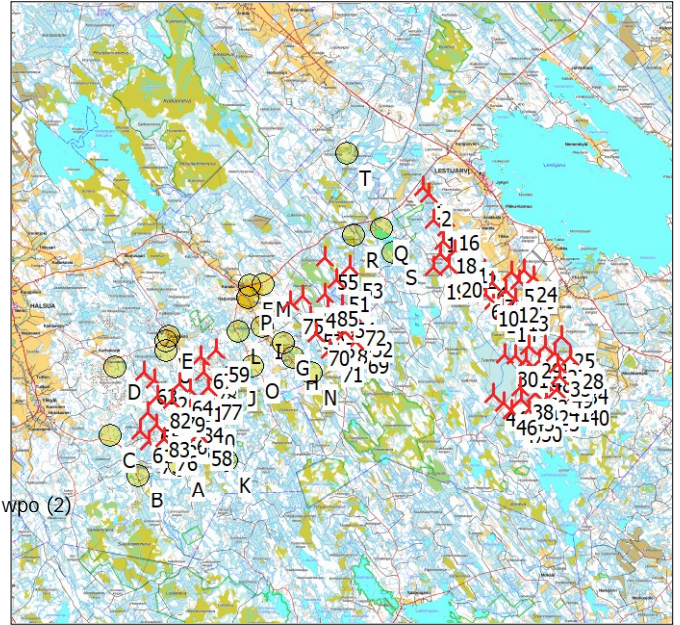
Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)  
 Obstacles used in calculation  
 Eye height for map: 1,5 m  
 Grid resolution: 10,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89



### WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
1	380 684	7 045 698	150,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
2	381 007	7 045 328	151,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
3	383 517	7 041 785	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
4	383 921	7 041 331	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
5	385 377	7 041 252	150,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
6	383 621	7 040 446	163,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
7	384 366	7 040 664	153,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
8	385 748	7 040 770	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
9	386 533	7 040 991	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
10	384 006	7 040 089	165,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
11	384 378	7 039 713	160,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
12	385 046	7 040 278	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
13	385 544	7 039 842	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
14	384 960	7 039 279	160,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
15	381 256	7 043 966	155,6	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
16	381 931	7 044 063	150,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
17	381 895	7 043 549	152,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
18	381 752	7 042 851	156,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
19	381 247	7 041 502	170,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
20	382 062	7 041 595	168,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
21	382 350	7 042 369	157,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
22	382 800	7 042 046	162,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
23	381 625	7 042 211	167,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
24	386 021	7 041 317	150,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
25	388 010	7 037 832	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
26	387 110	7 037 362	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
27	387 614	7 036 963	158,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
28	388 428	7 036 760	158,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
29	386 241	7 037 319	157,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
30	384 992	7 036 878	159,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
31	385 558	7 036 812	158,2	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
32	386 107	7 036 645	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
33	387 785	7 036 395	165,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
34	388 702	7 035 986	165,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
35	386 237	7 035 806	166,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4

To be continued on next page...



## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
36	387 014	7 035 959	168,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
37	388 741	7 035 374	167,8	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
38	385 820	7 035 172	164,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
39	387 147	7 035 440	168,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
40	388 745	7 034 846	166,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
41	387 731	7 035 082	167,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
42	386 636	7 034 860	172,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
43	387 159	7 034 572	171,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
44	384 386	7 034 826	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
45	385 843	7 034 542	172,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
46	384 948	7 034 376	163,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
47	385 365	7 033 972	170,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
48	386 798	7 036 582	164,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
49	387 892	7 035 785	165,2	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
50	386 250	7 033 976	169,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
51	376 145	7 040 853	169,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
52	377 373	7 038 465	172,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
53	376 837	7 041 535	170,2	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
54	376 444	7 039 476	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
55	375 536	7 041 980	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
56	375 916	7 038 416	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
57	374 748	7 038 849	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
58	368 911	7 032 725	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
59	369 826	7 037 147	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
60	369 062	7 033 588	162,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
61	365 799	7 032 897	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
62	366 591	7 035 576	153,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
63	365 986	7 035 968	147,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
64	367 861	7 035 366	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
65	366 214	7 033 846	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
66	367 557	7 033 342	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
67	369 000	7 036 800	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
68	375 673	7 039 283	164,1	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
69	377 129	7 037 609	175,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
70	375 066	7 037 992	164,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
71	375 806	7 037 151	168,9	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
72	376 995	7 039 070	171,8	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
73	366 276	7 032 332	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
74	374 380	7 039 957	161,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
75	373 695	7 039 683	159,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
76	367 076	7 032 483	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
77	369 380	7 035 142	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
78	369 173	7 035 951	160,4	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
79	367 493	7 034 489	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
80	368 275	7 033 089	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
81	368 432	7 035 039	155,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
82	366 741	7 034 702	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
83	366 662	7 033 192	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
84	368 431	7 033 972	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
85	375 546	7 040 069	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
86	376 570	7 038 123	172,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4

## Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Kuuslammentie)	367 873	7 031 085	163,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243	7 032 622	153,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Purola)	364 501	7 036 228	143,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Kannistontie 557)	367 345	7 037 828	140,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Lestijarventie 1468)	371 569	7 040 539	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Hautakoskentie 455)	373 347	7 037 488	155,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
H	Asuinrakennus H (Hautakoskentie 544)	373 867	7 036 728	157,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Hautakoskentie 289)	372 224	7 038 341	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Katajajarventie 49)	370 829	7 035 870	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus K (Silostenlampi)	370 383	7 031 311	170,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Harjunpaantie 215)	370 996	7 038 086	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

## Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Kuuslammentie)	4:29
B	Lomarakennus B (Loukkukoskentie 700)	0:00
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	4:20
D	Lomarakennus D (Purola)	3:45
E	Asuinrakennus E (Kannistontie 557)	1:37
F	Asuinrakennus F (Lestijarventie 1468)	0:00
G	Asuinrakennus G (Hautakoskentie 455)	5:32
H	Asuinrakennus H (Hautakoskentie 544)	2:19
I	Asuinrakennus I (Hautakoskentie 289)	4:00
J	Lomarakennus J (Katajajarventie 49)	7:14
K	Lomarakennus K (Silostenlampi)	5:46
L	Lomarakennus L (Harjunpaantie 215)	2:48
M	Lomarakennus M (Hakala, Iso-Mottonen)	3:15
N	Lomarakennus N (Hautakoski)	0:00
O	Lomarakennus O (Harjunpaantie 398)	1:56
P	Asuinrakennus P (Hautakoskentie 135)	1:14
Q	Lomarakennus Q (Lemmistonrannantie)	0:00
R	Lomarakennus R (Peuraneva,Valvatintie)	4:25
S	Lomarakennus S (Talonpaikantie 141)	0:00
T	Lomarakennus T (Ruipontie)	0:00
U	Lomarakennus U (Kannistontie, Kivioja)	8:36
V	Asuinrakennus V (Kannistontie 586)	4:48

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (579)	0:00	0:00
2	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (580)	0:00	0:00
3	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (581)	0:00	0:00
4	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (582)	0:00	0:00
5	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (583)	0:00	0:00
6	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (584)	0:00	0:00
7	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (585)	0:00	0:00
8	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (586)	0:00	0:00
9	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (587)	0:00	0:00
10	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (588)	0:00	0:00
11	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (589)	0:00	0:00
12	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (590)	0:00	0:00
13	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (591)	0:00	0:00
14	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (592)	0:00	0:00
15	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (593)	0:00	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
16	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (594)	0:00	0:00
17	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (595)	0:00	0:00
18	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (596)	0:00	0:00
19	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (597)	0:00	0:00
20	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (598)	0:00	0:00
21	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (599)	0:00	0:00
22	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (600)	0:00	0:00
23	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (601)	0:00	0:00
24	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (602)	0:00	0:00
25	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (624)	0:00	0:00
26	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (625)	0:00	0:00
27	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (626)	0:00	0:00
28	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (627)	0:00	0:00
29	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (628)	0:00	0:00
30	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (629)	0:00	0:00
31	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (630)	0:00	0:00
32	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (631)	0:00	0:00
33	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (632)	0:00	0:00
34	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (633)	0:00	0:00
35	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (634)	0:00	0:00
36	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (635)	0:00	0:00
37	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (636)	0:00	0:00
38	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (637)	0:00	0:00
39	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (638)	0:00	0:00
40	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (639)	0:00	0:00
41	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (640)	0:00	0:00
42	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (641)	0:00	0:00
43	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (642)	0:00	0:00
44	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (643)	0:00	0:00
45	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (644)	0:00	0:00
46	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (645)	0:00	0:00
47	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (646)	0:00	0:00
48	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (647)	0:00	0:00
49	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (648)	0:00	0:00
50	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (649)	0:00	0:00
51	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1175)	0:00	0:00
52	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1176)	0:00	0:00
53	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1177)	19:43	2:36
54	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1178)	0:00	0:00
55	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1179)	9:04	1:47
56	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1180)	0:00	0:00
57	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1181)	11:15	3:00
58	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1182)	21:42	5:46
59	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)	24:07	5:02
60	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184)	0:00	0:00
61	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)	14:28	2:58
62	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)	35:34	5:06
63	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)	36:09	6:41
64	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)	13:13	1:55
65	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)	0:00	0:00
66	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190)	0:00	0:00
67	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)	34:50	7:07
68	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)	0:00	0:00
69	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)	0:00	0:00
70	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)	14:03	3:04
71	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)	8:58	1:48
72	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1196)	0:00	0:00
73	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)	24:38	5:50
74	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1198)	6:09	1:07
75	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)	32:05	7:22
76	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200)	0:00	0:00
77	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1201)	11:38	2:15
78	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202)	11:28	2:24
79	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203)	0:00	0:00
80	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)	0:00	0:00
81	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)	0:00	0:00

To be continued on next page...

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.04/3.4.388

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
82	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206)	0:00	0:00
83	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207)	0:00	0:00
84	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)	0:00	0:00
85	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)	0:00	0:00
86	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

Project: Halsua 20190717 - Description: Halsuan tuulivoimapaisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukse Shadow receptor: A - Lomarakenus A (Kuuslammentie)  
 Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.04	09.01	07.32	06.46	05.04	03.33	21.11 (73)	03.15	04.34	21.25 (73)	06.05	07.28	07.59	09.29
2	14.49	16.14	17.41	20.10	21.39	23.10	18 21.29 (73)	23.37	22.23	8 21.33 (73)	20.40	18.56	16.13	14.54
3	10.04	08.58	07.29	06.43	05.01	03.31	21.13 (73)	03.17	21.25 (73)	06.08	07.31	08.02	09.32	
4	14.50	16.17	17.44	20.13	21.42	23.13	17 21.30 (73)	23.36	4 21.29 (73)	22.19	20.36	18.53	16.10	14.52
5	10.03	08.55	07.25	06.39	04.57	03.29	21.13 (73)	03.19	21.24 (73)	06.11	07.34	08.05	09.34	
6	14.52	16.20	17.46	20.16	21.45	23.15	16 21.29 (73)	23.34	7 21.31 (73)	22.16	20.33	18.49	16.07	14.50
7	10.02	08.52	07.22	06.36	04.54	03.27	21.14 (73)	03.20	21.23 (73)	06.14	07.37	08.08	09.37	
8	14.54	16.23	17.49	20.19	21.48	23.18	15 21.29 (73)	23.33	8 21.31 (73)	22.13	20.29	18.46	16.04	14.49
9	10.00	08.49	07.19	06.32	04.51	03.25	21.15 (73)	03.22	21.23 (73)	06.16	07.40	08.11	09.39	
10	14.56	16.26	17.52	20.22	21.51	23.20	14 21.29 (73)	23.31	10 21.33 (73)	22.10	20.26	18.42	16.01	14.47
11	09.59	08.46	07.15	06.29	04.48	03.23	21.16 (73)	03.24	21.22 (73)	06.19	07.43	08.14	09.42	
12	14.59	16.29	17.55	20.25	21.54	23.22	12 21.28 (73)	23.30	12 21.34 (73)	22.07	20.22	18.39	15.58	14.46
13	09.58	08.43	07.12	06.25	04.44	03.21	21.16 (73)	03.26	21.22 (73)	06.22	07.45	08.18	09.44	
14	15.01	16.33	17.58	20.28	21.57	23.24	11 21.27 (73)	23.28	13 21.35 (73)	22.04	20.19	18.36	15.55	14.44
15	09.56	08.40	07.09	06.22	04.41	03.19	21.17 (73)	03.28	21.21 (73)	06.25	07.48	08.21	09.46	
16	15.03	16.36	18.01	20.30	22.00	23.26	9 21.26 (73)	23.26	14 21.35 (73)	22.00	20.16	18.32	15.52	14.43
17	09.55	08.37	07.05	06.18	04.38	03.17	21.19 (73)	03.30	21.21 (73)	06.28	07.51	08.24	09.48	
18	15.06	16.39	18.04	20.33	22.03	23.28	8 21.27 (73)	23.24	15 21.36 (73)	21.57	20.12	18.29	15.49	14.42
19	09.53	08.34	07.02	06.15	04.35	03.16	21.20 (73)	03.33	21.20 (73)	06.30	07.54	08.27	09.50	
20	15.08	16.42	18.07	20.36	22.06	23.30	6 21.26 (73)	23.22	17 21.37 (73)	21.54	20.09	18.25	15.46	14.41
21	09.51	08.31	06.58	06.12	04.32	21.19 (73)	03.15	03.35	21.19 (73)	06.33	07.57	08.30	09.52	
22	15.11	16.45	18.10	20.39	22.09	2 21.21 (73)	23.32	23.20	18 21.37 (73)	21.51	20.05	18.22	15.43	14.40
23	09.50	08.27	06.55	06.08	04.29	21.14 (73)	03.13	03.38	21.19 (73)	06.36	08.00	08.33	09.54	
24	15.13	16.48	18.13	20.42	22.13	10 21.24 (73)	23.33	23.18	19 21.38 (73)	21.47	20.02	18.19	15.40	14.39
25	09.48	08.24	06.51	06.05	04.26	21.12 (73)	03.12	03.40	21.19 (73)	06.39	08.02	08.36	09.56	
26	15.16	16.52	18.16	20.45	22.16	13 21.25 (73)	23.35	23.15	19 21.38 (73)	21.44	19.58	18.15	15.38	14.38
27	09.46	08.21	06.48	06.01	04.22	21.12 (73)	03.11	03.43	21.19 (73)	06.41	08.05	08.39	09.57	
28	15.19	16.55	18.19	20.48	22.19	15 21.27 (73)	23.36	23.13	20 21.39 (73)	21.41	19.55	18.12	15.35	14.37
29	09.44	08.18	06.45	05.58	04.19	21.10 (73)	03.10	03.45	21.19 (73)	06.44	08.08	08.42	09.59	
30	15.22	16.58	18.22	20.51	22.22	18 21.28 (73)	23.37	23.11	20 21.39 (73)	21.37	19.51	18.09	15.32	14.37
31	09.42	08.15	06.41	05.54	04.16	21.10 (73)	03.09	03.48	21.19 (73)	06.47	08.11	08.45	10.00	
1	15.24	17.01	18.24	20.54	22.25	19 21.29 (73)	23.39	23.08	21 21.40 (73)	21.34	19.48	18.05	15.29	14.37
2	09.39	08.12	06.38	05.51	04.13	21.10 (73)	03.09	03.51	21.18 (73)	06.50	08.14	08.49	10.01	
3	15.27	17.04	18.27	20.57	22.28	20 21.30 (73)	23.39	23.06	22 21.40 (73)	21.31	19.44	18.02	15.27	14.36
4	09.37	08.08	06.34	05.48	04.10	21.09 (73)	03.08	03.53	21.18 (73)	06.52	08.17	08.52	10.02	
5	15.30	17.07	18.30	21.00	22.31	21 21.30 (73)	23.40	23.03	22 21.40 (73)	21.27	19.41	17.59	15.24	14.36
6	09.35	08.05	06.31	05.44	04.07	21.09 (73)	03.08	03.56	21.19 (73)	06.55	08.20	08.55	10.03	
7	15.33	17.10	18.33	21.03	22.34	21 21.30 (73)	23.41	23.00	22 21.41 (73)	21.24	19.37	17.55	15.21	14.36
8	09.32	08.02	06.27	05.41	04.05	21.09 (73)	03.08	03.59	21.19 (73)	06.58	08.23	08.58	10.04	
9	15.36	17.13	18.36	21.06	22.37	22 21.31 (73)	23.41	22.58	22 21.41 (73)	21.21	19.34	17.52	15.19	14.36
10	09.30	07.59	06.24	05.37	04.02	21.08 (73)	03.08	04.02	21.18 (73)	06.54	08.01	08.26	09.01	10.05
11	15.39	17.16	18.39	21.09	22.40	22 21.30 (73)	23.42	22.55	23 21.41 (73)	21.17	19.31	17.49	15.16	14.37
12	09.28	07.55	06.21	05.34	03.59	21.08 (73)	03.08	04.05	21.18 (73)	06.56	08.04	08.29	09.04	10.06
13	15.42	17.19	18.42	21.12	22.43	23 21.31 (73)	23.42	22.52	23 21.41 (73)	21.14	19.27	17.45	15.14	14.37
14	09.25	07.52	06.17	05.31	03.56	21.09 (73)	03.08	04.07	21.19 (73)	06.59	08.02	08.37	09.07	10.06
15	15.45	17.22	18.44	21.15	22.46	22 21.31 (73)	23.42	22.49	22 21.41 (73)	21.10	19.24	17.42	15.11	14.38
16	09.23	07.49	06.14	05.27	03.53	21.09 (73)	03.08	04.10	21.19 (73)	06.52	08.05	08.39	09.10	10.06
17	15.48	17.25	18.47	21.18	22.49	22 21.31 (73)	23.42	22.47	22 21.41 (73)	21.07	19.20	17.39	15.09	14.38
18	09.20	07.45	06.10	05.24	03.51	21.09 (73)	03.09	04.13	21.19 (73)	06.54	08.01	08.38	09.13	10.07
19	15.51	17.29	18.50	21.21	22.51	22 21.31 (73)	23.42	22.44	21 21.40 (73)	21.04	19.17	17.36	15.07	14.39
20	09.17	07.42	06.07	05.21	03.48	21.09 (73)	03.10	04.16	21.20 (73)	06.54	08.01	08.37	09.15	10.07
21	15.55	17.32	18.53	21.24	22.54	22 21.31 (73)	23.41	22.41	21 21.41 (73)	21.00	19.13	17.32	15.04	14.40
22	09.15	07.39	06.03	05.17	03.45	21.09 (73)	03.11	04.19	21.20 (73)	06.51	08.01	08.38	09.18	10.07
23	15.58	17.35	18.56	21.27	22.57	22 21.31 (73)	23.41	22.38	20 21.40 (73)	20.57	19.10	17.29	15.02	14.41
24	09.12	07.35	06.00	05.14	03.43	21.10 (73)	03.12	04.22	21.21 (73)	06.54	08.01	08.37	09.21	10.06
25	16.01	17.38	18.59	21.30	23.00	20 21.30 (73)	23.40	22.35	19 21.40 (73)	20.53	19.06	17.26	15.00	14.42
26	09.09	07.32	06.00	05.11	03.40	21.10 (73)	03.13	04.25	21.22 (73)	06.57	08.03	08.38	09.24	10.06
27	16.04	17.41	19.02	21.33	23.03	20 21.30 (73)	23.39	22.32	16 21.38 (73)	20.50	19.03	17.23	14.58	14.44
28	09.06	07.30	06.00	05.07	03.38	21.11 (73)	03.14	04.28	21.22 (73)	06.59	08.04	08.39	09.27	10.06
29	16.07	17.44	19.05	21.36	23.05	20 21.31 (73)	23.38	22.29	15 21.37 (73)	20.47	19.00	17.26	14.56	14.45
30	09.03	07.28	06.00	05.05	03.35	21.11 (73)	03.13	04.31	21.24 (73)	06.02	07.26	08.01	08.39	10.05
31	16.10	17.47	19.08	21.37	23.06	19 21.30 (73)	23.39	22.26	12 21.36 (73)	20.43	19.01	17.26	14.56	14.45
Potential sun hours	179	241	363	448	561	609	597	504	392	307	204	148		
Total, worst case					395	126	519	8						
Sun reduction					0.48	0.49	0.39	0.32						
Oper. time red.					0.93	0.93	0.93	0.93						
Wind dir. red.					0.64	0.64	0.64	0.64						
Total reduction					0.28	0.29	0.23	0.19						
Total, real					112									

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: B - Lomarakenus B (Loukkukoskentie 700)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.01	07.32	06.46	05.04	03.33	03.16	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.14	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.51	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.58	03.29	03.19	04.40	06.11	07.34	08.05	09.34
	14.53	16.20	17.47	20.16	21.45	23.15	23.35	22.16	20.33	18.49	16.07	14.51
4	10.02	08.52	07.22	06.36	04.54	03.27	03.21	04.43	06.14	07.37	08.08	09.37
	14.55	16.23	17.50	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.00	08.49	07.19	06.32	04.51	03.25	03.22	04.46	06.17	07.40	08.11	09.39
	14.57	16.27	17.53	20.22	21.51	23.20	23.31	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.56	20.25	21.54	23.22	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.26	04.45	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.24	23.28	22.04	20.19	18.36	15.55	14.44
8	09.56	08.40	07.09	06.22	04.42	03.19	03.29	04.55	06.25	07.48	08.21	09.46
	15.04	16.36	18.01	20.31	22.00	23.26	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.18	03.31	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.03	23.28	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.31	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.26	15.46	14.41
11	09.51	08.31	06.58	06.12	04.32	03.15	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.46	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.14	03.38	05.07	06.36	08.00	08.33	09.54
	15.14	16.49	18.13	20.42	22.13	23.33	23.18	21.47	20.02	18.19	15.41	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.16	15.38	14.38
14	09.46	08.21	06.48	06.02	04.23	03.11	03.43	05.13	06.42	08.06	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.36	23.13	21.41	19.55	18.12	15.35	14.38
15	09.44	08.18	06.45	05.58	04.20	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.22	16.58	18.22	20.51	22.22	23.37	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.17	03.10	03.48	05.19	06.47	08.11	08.46	10.00
	15.25	17.01	18.25	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.37
17	09.39	08.12	06.38	05.51	04.14	03.09	03.51	05.22	06.50	08.14	08.49	10.01
	15.28	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.27	14.37
18	09.37	08.09	06.35	05.48	04.11	03.09	03.54	05.25	06.53	08.17	08.52	10.02
	15.30	17.07	18.30	21.00	22.31	23.40	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.08	03.08	03.56	05.28	06.55	08.20	08.55	10.03
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.56	15.21	14.36
20	09.33	08.02	06.28	05.41	04.05	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.14	18.36	21.06	22.37	23.41	22.58	21.21	19.34	17.52	15.19	14.37
21	09.30	07.59	06.24	05.38	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.17	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.37
22	09.28	07.55	06.21	05.34	03.59	03.08	04.05	05.37	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.08	05.40	07.06	08.32	09.07	10.06
	15.46	17.23	18.45	21.15	22.46	23.42	22.49	21.11	19.24	17.42	15.11	14.38
24	09.23	07.49	06.14	05.28	03.54	03.09	04.11	05.42	07.09	08.35	09.10	10.06
	15.49	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.14	05.45	07.12	07.38	09.13	10.07
	15.52	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.54	23.41	22.41	21.00	19.13	16.33	15.05	14.40
27	09.15	07.39	06.03	05.17	03.46	03.11	04.19	05.51	07.18	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.12	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	16.23	14.58	14.44
30	09.06		06.53	05.08	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.36		04.31	06.03		07.56		10.05
	16.11		20.08		23.08		22.26	20.43		16.17		14.47
Potential sun hours	180	241	363	448	561	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	07.32	06.46	07.50 (73)	05.04
	14.49	16.14	17.41	20.11	15 08.05 (73)	17 06.57 (61)
2	10.04	08.58	07.29	06.43	07.52 (73)	05.01
	14.51	16.17	17.44	20.13	11 08.03 (73)	12 06.54 (61)
3	10.03	08.55	07.26	06.39	07.55 (73)	04.58
	14.52	16.20	17.47	20.16	5 08.00 (73)	5 06.50 (61)
4	10.02	08.52	07.22	06.36		04.54
	14.54	16.23	17.50	20.19		21.48
5	10.01	08.49	07.19	06.33		04.51
	14.57	16.27	17.53	20.22		21.51
6	10.00	08.46	07.16	06.29		04.48
	14.59	16.30	17.56	20.25		21.55
7	09.58	08.43	07.12	06.26		04.45
	15.01	16.33	17.59	20.28		21.58
8	09.57	08.40	07.09	06.22		04.41
	15.03	16.36	18.01	20.31		22.01
9	09.55	08.37	07.05	06.19		04.38
	15.06	16.39	18.04	20.34		22.04
10	09.54	08.34	07.02	06.15		04.35
	15.08	16.42	18.07	20.37		22.07
11	09.52	08.31	06.59	06.12		04.32
	15.11	16.46	18.10	20.39		22.10
12	09.50	08.28	06.55	06.08		04.29
	15.14	16.49	18.13	20.42		22.13
13	09.48	08.25	06.52	06.05		04.26
	15.16	16.52	18.16	20.45		22.16
14	09.46	08.22	06.48	06.02	06.46 (61)	04.23
	15.19	16.55	18.19	20.48	12 06.58 (61)	22.19
15	09.44	08.18	06.45	05.58	06.44 (61)	04.20
	15.22	16.58	18.22	20.51	16 07.00 (61)	22.22
16	09.42	08.15	06.42	05.55	06.41 (61)	04.17
	15.25	17.01	18.25	20.54	20 07.01 (61)	22.25
17	09.40	08.12	06.38	05.51	06.40 (61)	04.14
	15.27	17.04	18.28	20.57	22 07.02 (61)	22.28
18	09.38	08.09	06.35	05.48	06.39 (61)	04.11
	15.30	17.07	18.30	21.00	24 07.03 (61)	22.31
19	09.35	08.05	06.31	05.44	06.38 (61)	04.08
	15.33	17.10	18.33	21.03	26 07.04 (61)	22.34
20	09.33	08.02	06.28	05.41	06.38 (61)	04.05
	15.36	17.14	18.36	21.06	26 07.04 (61)	22.37
21	09.30	07.59	06.24	07.01 (73)	05.38	06.36 (61)
	15.39	17.17	18.39	1 07.02 (73)	21.09	27 07.03 (61)
22	09.28	07.56	06.21	06.56 (73)	05.34	06.36 (61)
	15.42	17.20	18.42	11 07.07 (73)	21.12	27 07.03 (61)
23	09.25	07.52	06.17	06.53 (73)	05.31	06.36 (61)
	15.45	17.23	18.45	15 07.08 (73)	21.15	27 07.03 (61)
24	09.23	07.49	06.14	06.52 (73)	05.28	06.36 (61)
	15.49	17.26	18.48	17 07.09 (73)	21.18	27 07.03 (61)
25	09.20	07.46	06.11	06.50 (73)	05.24	06.36 (61)
	15.52	17.29	18.51	19 07.09 (73)	21.21	27 07.03 (61)
26	09.18	07.42	06.07	06.50 (73)	05.21	06.36 (61)
	15.55	17.32	18.53	20 07.10 (73)	21.24	26 07.02 (61)
27	09.15	07.39	06.04	06.50 (73)	05.18	06.37 (61)
	15.58	17.35	18.56	20 07.10 (73)	21.27	25 07.02 (61)
28	09.12	07.36	06.00	06.49 (73)	05.14	06.37 (61)
	16.01	17.38	18.59	20 07.09 (73)	21.30	24 07.01 (61)
29	09.10		06.57	07.49 (73)	05.11	06.38 (61)
	16.04		20.02	20 08.09 (73)	21.33	22 07.00 (61)
30	09.07		06.53	07.49 (73)	05.08	06.39 (61)
	16.07		20.05	19 08.08 (73)	21.36	19 06.58 (61)
31	09.04		06.50	07.50 (73)		03.36
	16.11		20.08	17 08.07 (73)		23.08
Potential sun hours	179	241	363	448	562	609
Total, worst case			179	428		34
Sun reduction			0,32	0,41		0,48
Oper. time red.			0,93	0,93		0,93
Wind dir. red.			0,61	0,60		0,60
Total reduction			0,18	0,23		0,27
Total, real			33	99		9

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
Shadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
Assumptions for shadow calculations  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.14	09.30 14.54
2	03.17 23.36	04.37 22.20	06.08 20.37	07.32 18.53	08.02 16.11	09.32 14.52
3	03.19 23.35	04.40 22.17	06.11 20.33	07.34 18.50	08.06 16.07	09.35 14.51
4	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	09.37 14.49
5	03.22 23.32	04.46 22.10	06.17 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	03.26 23.28	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.44 14.44
8	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.47 14.43
9	03.31 23.25	04.58 21.57	06.28 20.12	07.49 (73) 07.53 (73)	07.51 18.29	08.24 15.49
10	03.33 23.23	05.01 21.54	06.31 20.09	07.45 (73) 07.56 (73)	07.54 18.26	08.27 15.46
11	03.35 23.20	05.04 21.51	06.33 20.05	07.43 (73) 07.58 (73)	07.57 18.22	08.30 15.43
12	03.38 23.18	05.07 21.48	06.36 20.02	07.41 (73) 07.58 (73)	08.00 18.19	08.33 15.41
13	03.40 23.16	05.10 21.44	06.39 19.59	07.40 (73) 07.59 (73)	08.03 18.16	08.37 15.38
14	03.43 23.14	05.13 21.41	06.42 (61) 19.55	07.40 (73) 08.00 (73)	08.06 18.12	08.40 15.35
15	03.45 23.11	05.16 21.38	06.44 (61) 19.52	07.38 (73) 07.59 (73)	08.09 18.09	08.43 15.32
16	03.48 23.09	05.19 21.34	06.47 (61) 19.48	07.38 (73) 07.59 (73)	08.11 18.06	08.46 15.29
17	03.51 23.06	05.22 21.31	06.43 (61) 19.45	07.38 (73) 07.59 (73)	08.14 18.02	08.49 15.27
18	03.53 23.04	05.25 21.28	06.42 (61) 19.41	07.38 (73) 07.57 (73)	08.17 17.59	08.52 15.24
19	03.56 23.01	05.28 21.24	06.42 (61) 19.38	07.38 (73) 07.56 (73)	08.20 17.56	08.55 15.21
20	03.59 22.58	05.31 21.21	06.41 (61) 19.34	07.39 (73) 07.55 (73)	08.23 17.52	08.58 15.19
21	04.02 22.55	05.34 21.18	06.42 (61) 19.31	07.41 (73) 07.53 (73)	08.26 17.49	09.01 15.16
22	04.05 22.53	05.37 21.14	06.41 (61) 19.27	07.43 (73) 07.49 (73)	08.29 17.46	09.04 15.14
23	04.08 22.50	05.40 21.11	06.41 (61) 19.24	08.32 17.42	09.07 15.11	10.07 14.38
24	04.10 22.47	05.43 21.07	06.42 (61) 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	04.13 22.44	05.45 21.04	06.42 (61) 19.17	07.38 16.36	09.13 15.07	10.07 14.39
26	04.16 22.41	05.48 21.01	06.43 (61) 19.14	07.41 16.33	09.16 15.04	10.07 14.40
27	04.19 22.38	05.51 20.57	06.44 (61) 19.10	07.44 16.29	09.19 15.02	10.07 14.41
28	04.22 22.35	05.54 20.54	06.45 (61) 19.07	07.47 16.26	09.21 15.00	10.07 14.42
29	04.25 22.32	05.57 20.50	06.47 (61) 19.03	07.50 16.23	09.24 14.58	10.07 14.44
30	04.28 22.29	06.00 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.45
31	04.31 22.26	06.03 20.43		07.56 16.17		10.06 14.47
Potential sun hours	597	504	392	307	204	148
Total, worst case		437	220			
Sun reduction		0,32	0,33			
Oper. time red.		0,93	0,93			
Wind dir. red.		0,60	0,61			
Total reduction		0,18	0,19			
Total, real		78	42			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------



Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: D - Lomarakenus D (Purola)  
 Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05 14.48	09.01 16.14	07.33 17.41	06.46 20.11	07.54 (63) 08.21 (63)	05.04 21.39	03.33 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	08.09 (62) 08.23 (62)	08.00 16.13	09.30 14.54
2	10.04 14.50	08.58 16.17	07.29 17.44	06.43 20.13	07.54 (63) 08.21 (63)	05.01 21.42	03.30 23.14	03.16 23.37	04.37 22.20	06.08 20.37	07.32 18.53	08.10 (62) 08.21 (62)	08.03 16.10	09.33 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	07.55 (63) 08.20 (63)	04.57 21.46	03.28 23.16	03.18 23.36	04.40 22.17	06.11 20.33	07.34 18.50	08.14 (62) 08.15 (62)	08.06 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	07.55 (63) 08.18 (63)	04.54 21.49	03.26 23.19	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.01 (63) 08.05 (63)	07.43 18.46	09.38 14.48
5	10.01 14.56	08.49 16.26	07.19 17.53	06.32 20.22	07.56 (63) 08.17 (63)	04.51 21.52	03.24 23.21	03.22 23.33	04.46 22.11	06.17 20.26	07.56 (63) 08.09 (63)	07.40 18.43	08.12 16.01	09.40 14.47
6	10.00 14.58	08.46 16.29	07.16 17.56	06.29 20.25	07.57 (63) 08.15 (63)	04.48 21.55	03.22 23.23	03.24 23.31	04.49 22.07	06.19 20.23	07.53 (63) 08.11 (63)	07.43 18.39	08.15 15.58	09.42 14.45
7	09.59 15.01	08.43 16.33	07.12 17.58	06.26 20.28	07.59 (63) 08.12 (63)	04.44 21.58	03.20 23.25	03.26 23.29	04.52 22.04	06.22 20.19	07.51 (63) 08.12 (63)	07.46 18.36	08.21 15.55	09.45 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	08.03 (63) 08.08 (63)	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.49 (63) 08.12 (63)	07.49 18.32	08.21 15.52	09.47 14.43
9	09.56 15.05	08.37 16.39	07.05 18.04	06.19 20.34		04.38 22.04	03.17 23.29	03.30 23.25	04.58 22.12	06.28 20.12	07.48 (63) 08.13 (63)	07.51 18.29	08.24 15.49	09.49 14.41
10	09.54 15.08	08.34 16.42	07.02 18.07	06.15 20.37		04.35 22.07	03.15 23.31	03.32 23.23	05.01 22.07	06.31 20.09	07.48 (63) 08.14 (63)	07.54 18.26	08.27 15.46	09.51 14.40
11	09.52 15.11	08.31 16.45	06.59 18.10	06.12 20.40	07.32 (62) 07.40 (62)	06.12 22.10	03.14 23.33	03.35 23.21	05.04 21.51	06.33 20.06	07.47 (63) 08.14 (63)	07.57 18.22	08.31 15.43	09.53 14.39
12	09.50 15.13	08.28 16.49	06.55 18.13	06.08 20.42	07.30 (62) 07.43 (62)	06.08 22.09	03.13 23.35	03.37 23.19	05.07 21.48	06.36 20.02	07.46 (63) 08.14 (63)	08.00 18.19	08.34 15.40	09.55 14.38
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	07.28 (62) 07.43 (62)	06.05 22.16	03.12 23.36	03.40 23.16	05.10 21.45	06.39 19.59	07.46 (63) 08.14 (63)	08.03 18.16	08.37 15.37	09.56 14.38
14	09.46 15.19	08.22 16.55	06.48 18.19	06.01 20.48	07.27 (62) 07.45 (62)	06.01 22.08	03.10 23.37	03.42 23.14	05.13 21.41	06.42 19.55	07.46 (63) 08.14 (63)	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	07.26 (62) 07.44 (62)	05.58 22.22	03.09 23.39	03.45 23.12	05.16 21.38	06.44 19.52	07.45 (63) 08.12 (63)	08.09 18.09	08.43 15.32	10.00 14.37
16	09.42 15.24	08.15 17.01	06.42 18.25	05.55 20.54	07.26 (62) 07.45 (62)	05.55 22.26	03.07 23.40	03.47 23.09	05.19 21.35	06.47 19.48	07.45 (63) 08.12 (63)	08.12 18.05	08.46 15.29	10.01 14.36
17	09.40 15.27	08.12 17.04	06.38 18.28	05.51 20.57	07.25 (62) 07.44 (62)	05.51 22.29	03.08 23.41	03.50 23.07	05.22 21.31	06.50 19.45	07.46 (63) 08.11 (63)	08.14 18.02	08.49 15.26	10.02 14.36
18	09.38 15.30	08.09 17.07	06.35 18.30	05.48 21.00	07.25 (62) 07.44 (62)	05.48 22.32	03.08 23.41	03.53 23.04	05.25 21.28	06.53 19.41	07.45 (63) 08.09 (63)	08.17 17.59	08.52 15.24	10.03 14.36
19	09.36 15.33	08.06 17.10	06.31 18.33	05.44 21.03	07.25 (62) 07.43 (62)	05.44 22.35	03.07 23.42	03.56 23.01	05.28 21.24	06.55 19.38	07.47 (63) 08.08 (63)	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	07.26 (62) 07.42 (62)	05.41 22.38	03.07 23.43	03.59 22.59	05.31 21.21	06.58 19.34	07.48 (63) 08.06 (63)	08.23 17.52	08.58 15.19	10.05 14.36
21	09.31 15.39	07.59 17.16	06.24 18.39	05.38 21.09	07.27 (62) 07.40 (62)	05.38 22.41	03.07 23.43	04.01 22.56	05.34 21.18	07.01 19.31	07.50 (63) 08.23 (62)	08.26 17.49	09.01 15.16	10.06 14.36
22	09.28 15.42	07.56 17.20	06.21 18.42	05.34 21.12	07.05 (63) 07.38 (62)	05.34 22.44	03.07 23.43	04.04 22.53	05.37 21.14	07.04 19.27	07.53 (63) 08.24 (62)	08.29 17.46	09.04 15.14	10.07 14.37
23	09.26 15.45	07.52 17.23	06.17 18.45	05.31 21.15	07.02 (63) 07.19 (63)	05.31 22.47	03.07 23.43	04.07 22.50	05.39 21.11	07.07 19.24	08.10 (62) 08.26 (62)	08.32 17.42	09.07 15.11	10.07 14.37
24	09.23 15.48	07.49 17.26	06.14 18.48	05.27 21.18	07.00 (63) 07.21 (63)	05.27 22.49	03.08 23.43	04.10 22.47	05.42 21.08	07.09 19.20	08.09 (62) 08.27 (62)	08.35 17.39	09.10 15.09	10.07 14.38
25	09.21 15.51	07.46 17.29	06.10 18.51	05.24 21.21	06.58 (63) 07.21 (63)	05.24 22.52	03.08 23.43	04.13 22.44	05.45 21.04	07.12 19.17	08.08 (62) 08.27 (62)	07.38 16.36	09.13 15.06	10.08 14.39
26	09.18 15.55	07.43 17.32	06.07 18.53	05.21 21.24	06.57 (63) 07.22 (63)	05.21 22.55	03.09 23.42	04.16 22.41	05.48 21.01	07.15 19.14	08.07 (62) 08.26 (62)	07.41 16.33	09.16 15.04	10.08 14.40
27	09.15 15.58	07.39 17.35	06.04 18.56	05.17 21.27	06.57 (63) 07.23 (63)	05.17 22.58	03.10 23.42	04.19 22.39	05.51 20.57	07.18 19.10	08.07 (62) 08.26 (62)	07.44 16.29	09.19 15.02	10.08 14.41
28	09.13 16.01	07.36 17.38	06.00 18.59	05.14 21.30	06.55 (63) 07.23 (63)	05.14 23.01	03.11 23.41	04.22 22.36	05.54 20.54	07.20 19.07	08.07 (62) 08.26 (62)	07.47 16.26	09.22 15.00	10.07 14.42
29	09.10 16.04		06.57 20.02	05.11 21.33	07.55 (63) 08.23 (63)	05.11 23.04	03.12 23.40	04.25 22.32	05.57 20.50	07.23 19.03	08.07 (62) 08.25 (62)	07.50 16.23	09.25 14.58	10.07 14.43
30	09.07 16.07		06.53 20.05	05.07 21.36	07.54 (63) 08.22 (63)	05.07 23.06	03.13 23.39	04.28 22.29	06.00 20.47	07.26 19.00	08.08 (62) 08.24 (62)	07.53 16.20	09.27 14.56	10.07 14.45
31	09.04 16.10		06.50 20.08	05.04 21.36	07.54 (63) 08.22 (63)	05.04 23.09	03.15 22.26	04.31 20.44	06.02 20.44	07.18 16.17	08.07 (62) 16.17	07.44 14.46	09.19 15.02	10.08 14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147		
Total, worst case			421	159					566	26				
Sun reduction			0.32	0.41					0.33	0.35				
Oper. time red.			0.93	0.93					0.93	0.93				
Wind dir. red.			0.61	0.61					0.61	0.61				
Total reduction			0.18	0.23					0.19	0.20				
Total, real			77	37					106	5				

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

F CG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukse Shadow receptor: E - Asuinrakennus E (Kannistontie 557)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.01	07.32	08.23 (67)	06.46	05.04	03.32	03.14	04.34	06.05	07.29	07.59	09.30	
	14.48	16.13	17.40	20 08.43 (67)	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.53	
2	10.04	08.58	07.29	08.22 (67)	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.33	
	14.50	16.16	17.43	21 08.43 (67)	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.51	
3	10.03	08.55	07.26	08.22 (67)	06.39	04.57	03.28	03.17	04.40	06.11	07.34	09.08 (67)	08.06	09.35
	14.52	16.20	17.46	22 08.44 (67)	20.16	21.45	23.16	23.36	22.17	20.33	18.49	1 09.09 (67)	16.07	14.50
4	10.02	08.52	07.22	08.21 (67)	06.36	04.54	03.26	03.19	04.43	06.13	07.37	09.03 (67)	08.09	09.38
	14.54	16.23	17.49	22 08.43 (67)	20.19	21.48	23.19	23.34	22.14	20.30	18.46	11 09.14 (67)	16.04	14.48
5	10.01	08.49	07.19	08.21 (67)	06.32	04.51	03.24	03.21	04.46	06.16	07.40	09.00 (67)	08.12	09.40
	14.56	16.26	17.52	21 08.42 (67)	20.22	21.52	23.21	23.33	22.11	20.26	18.42	16 09.16 (67)	16.01	14.46
6	10.00	08.46	07.15	08.22 (67)	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.59 (67)	08.15	09.42
	14.58	16.29	17.55	20 08.42 (67)	20.25	21.55	23.23	23.31	22.07	20.23	18.39	18 09.17 (67)	15.58	14.45
7	09.59	08.43	07.12	08.22 (67)	06.25	04.44	03.20	03.25	04.52	06.22	07.46	08.58 (67)	08.18	09.45
	15.00	16.32	17.58	19 08.41 (67)	20.28	21.58	23.25	23.29	22.04	20.19	18.36	20 09.18 (67)	15.55	14.43
8	09.57	08.40	07.09	08.23 (67)	06.22	04.41	03.18	03.27	04.55	06.25	07.48	08.57 (67)	08.21	09.47
	15.03	16.36	18.01	17 08.40 (67)	20.31	22.01	23.28	23.27	22.01	20.16	18.32	21 09.18 (67)	15.52	14.42
9	09.56	08.37	07.05	08.24 (67)	06.18	04.38	03.16	03.30	04.58	06.28	07.51	08.56 (67)	08.24	09.49
	15.05	16.39	18.04	14 08.38 (67)	20.34	22.04	23.29	23.25	21.58	20.12	18.29	22 09.18 (67)	15.49	14.41
10	09.54	08.34	07.02	08.27 (67)	06.15	04.34	03.15	03.32	05.01	06.30	07.54	08.56 (67)	08.27	09.51
	15.08	16.42	18.07	8 08.35 (67)	20.36	22.07	23.31	23.23	21.54	20.09	18.25	22 09.18 (67)	15.46	14.40
11	09.52	08.31	06.58		06.11	04.31	03.13	03.34	05.04	06.33	07.57	08.56 (67)	08.30	09.53
	15.10	16.45	18.10		20.39	22.10	23.33	23.21	21.51	20.05	18.22	21 09.17 (67)	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.12	03.37	05.07	06.36	08.00		08.56 (67)	08.34	09.55
	15.13	16.48	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.19	21 09.17 (67)	15.40	14.38	
13	09.48	08.25	06.52	06.05	04.25	03.11	03.39	05.10	06.39	08.03		08.56 (67)	08.37	09.56
	15.15	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	20 09.16 (67)	15.37	14.37	
14	09.46	08.22	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.06		08.56 (67)	08.40	09.58
	15.18	16.54	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	19 09.15 (67)	15.34	14.37	
15	09.44	08.18	06.45	05.58	04.19	03.09	03.44	05.16	06.44	08.08		08.57 (67)	08.43	10.00
	15.21	16.58	18.22	20.51	22.22	23.39	23.12	21.38	19.51	18.09	16 09.13 (67)	15.32	14.36	
16	09.42	08.15	06.41	05.54	04.16	03.08	03.47	05.19	06.47	08.11		09.00 (67)	08.46	10.01
	15.24	17.01	18.24	20.54	22.25	23.40	23.09	21.34	19.48	18.05	12 09.12 (67)	15.29	14.36	
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14		09.02 (67)	08.49	10.02
	15.27	17.04	18.27	20.57	22.29	23.41	23.07	21.31	19.45	18.02	7 09.09 (67)	15.26	14.35	
18	09.38	08.09	06.34	05.47	04.10	03.07	03.53	05.25	06.52	08.17		08.52	10.03	
	15.30	17.07	18.30	21.00	22.32	23.42	23.04	21.28	19.41	17.58		15.23	14.35	
19	09.36	08.05	06.31	05.44	04.07	03.07	03.55	05.27	06.55	08.20		08.55	10.04	
	15.33	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.38	17.55		15.21	14.35	
20	09.33	08.02	06.28	05.41	04.04	03.07	03.58	05.30	06.58	08.23		08.58	10.05	
	15.36	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.52		15.18	14.35	
21	09.31	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26		09.01	10.06	
	15.39	17.16	18.39	21.09	22.41	23.43	22.56	21.18	19.31	17.49		15.16	14.36	
22	09.28	07.56	06.21	05.34	03.58	03.07	04.04	05.36	07.04	08.29		09.04	10.07	
	15.42	17.19	18.42	21.12	22.44	23.43	22.53	21.14	19.27	17.45		15.13	14.36	
23	09.26	07.52	06.17	05.30	03.55	03.07	04.07	05.39	07.06	08.32		09.07	10.07	
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42		15.11	14.37	
24	09.23	07.49	06.14	05.27	03.53	03.07	04.10	05.42	07.09	08.35		09.10	10.07	
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39		15.08	14.37	
25	09.21	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38		09.13	10.08	
	15.51	17.28	9 08.38 (67)	18.50	21.21	22.52	23.43	22.44	21.04	19.17	16.35	15.06	14.38	
26	09.18	07.42	08.26 (67)	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.08	
	15.54	17.31	14 08.40 (67)	18.53	21.24	22.55	23.42	22.41	21.01	19.13	16.32	15.04	14.39	
27	09.15	07.39	08.25 (67)	06.03	05.17	03.45	03.09	04.19	05.51	07.17	07.44	09.19	10.08	
	15.57	17.34	17 08.42 (67)	18.56	21.27	22.58	23.42	22.38	20.57	19.10	16.29	15.01	14.40	
28	09.12	07.36	08.23 (67)	06.00	05.14	03.42	03.10	04.22	05.54	07.20	07.47	09.22	10.07	
	16.00	17.37	19 08.42 (67)	18.59	21.30	23.01	23.41	22.35	20.54	19.06	16.26	14.59	14.41	
29	09.10		06.56	05.10	03.39	03.12	04.25	05.56	07.23	07.50		09.25	10.07	
	16.04		20.02	21.33	23.04	23.40	22.32	20.50	19.03	16.23		14.57	14.43	
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53		09.27	10.07	
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.19		14.55	14.44	
31	09.04		06.49		03.35		04.31	06.02		07.56			10.06	
	16.10		20.08		23.09		22.26	20.43		16.16			14.46	
Potential sun hours	179	241	363	448	562	610	598	504	392	307		204	147	
Total, worst case		59	184							247				
Sun reduction		0.33	0.32							0.35				
Oper. time red.		0.93	0.93							0.93				
Wind dir. red.		0.64	0.64							0.64				
Total reduction		0.20	0.19							0.21				
Total, real		12	35							51				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: F - Asuinrakennus F (Lestijarventie 1468)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.03	03.32	03.13	04.33	06.05	07.28	07.59	09.30
	14.47	16.13	17.40	20.10	21.39	23.12	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.33
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.10	14.51
3	10.04	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.17	23.36	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.37	08.09	09.38
	14.53	16.22	17.49	20.19	21.48	23.19	23.34	22.14	20.29	18.45	16.03	14.47
5	10.01	08.49	07.19	06.32	04.50	03.23	03.20	04.45	06.16	07.40	08.12	09.40
	14.55	16.25	17.52	20.22	21.51	23.21	23.33	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.19	07.42	08.15	09.42
	14.57	16.29	17.55	20.25	21.55	23.23	23.31	22.07	20.22	18.39	15.57	14.44
7	09.59	08.43	07.12	06.25	04.44	03.19	03.24	04.51	06.22	07.45	08.18	09.45
	15.00	16.32	17.58	20.27	21.58	23.26	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.01	23.28	23.27	22.01	20.15	18.32	15.51	14.41
9	09.56	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.02	06.15	04.34	03.14	03.31	05.00	06.30	07.54	08.27	09.51
	15.07	16.41	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.33	05.03	06.33	07.57	08.30	09.53
	15.09	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.42	14.38
12	09.50	08.28	06.55	06.08	04.28	03.11	03.36	05.06	06.35	08.00	08.33	09.55
	15.12	16.48	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.18	15.39	14.37
13	09.48	08.25	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.37	09.57
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	08.05	08.40	09.58
	15.18	16.54	18.18	20.48	22.19	23.38	23.14	21.41	19.55	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.44	08.08	08.43	10.00
	15.20	16.57	18.21	20.51	22.22	23.39	23.12	21.38	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.47	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.48	18.05	15.28	14.35
17	09.40	08.12	06.38	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.07	21.31	19.44	18.01	15.26	14.35
18	09.38	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.07	18.30	21.00	22.32	23.42	23.04	21.28	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.04
	15.32	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.58	08.23	08.58	10.05
	15.35	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.51	15.18	14.35
21	09.31	07.59	06.24	05.37	04.00	03.06	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.16	18.39	21.09	22.41	23.43	22.56	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	08.29	09.04	10.07
	15.41	17.19	18.41	21.12	22.44	23.43	22.53	21.14	19.27	17.45	15.13	14.35
23	09.26	07.52	06.17	05.30	03.55	03.06	04.06	05.39	07.06	08.32	09.07	10.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.23	17.42	15.10	14.36
24	09.23	07.49	06.13	05.27	03.52	03.06	04.09	05.42	07.09	08.35	09.10	10.07
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.45	07.12	07.38	09.13	10.08
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.04	19.16	16.35	15.05	14.37
26	09.18	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.41	09.16	10.08
	15.54	17.31	18.53	21.24	22.55	23.43	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.39	06.03	05.17	03.44	03.09	04.18	05.50	07.17	07.44	09.19	10.08
	15.57	17.34	18.56	21.27	22.58	23.42	22.38	20.57	19.10	16.29	15.01	14.39
28	09.12	07.35	06.00	05.13	03.41	03.10	04.21	05.53	07.20	07.47	09.22	10.07
	16.00	17.37	18.59	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.10		06.56	05.10	03.39	03.11	04.24	05.56	07.23	07.50	09.25	10.07
	16.03		20.01	21.33	23.04	23.41	22.32	20.50	19.03	16.22	14.57	14.42
30	09.07		06.53	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.07
	16.06		20.04	21.36	23.06	23.40	22.29	20.47	18.59	16.19	14.55	14.43
31	09.04		06.49	05.03	03.34		04.30	06.02		07.56		10.06
	16.09		20.07	23.09			22.26	20.43		16.16		14.45
Potential sun hours	178	241	363	448	562	611	599	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: G - Asuinrakennus G (Hautakoskentie 455)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	07.32	06.46	05.03	06.12 (70) 03.32
	14.47	16.13	17.40	20.10	21.39	24 06.36 (70) 23.11
2	10.04	08.58	07.29	06.42	05.00	06.12 (70) 03.30
	14.49	16.16	17.43	20.13	21.42	23 06.35 (70) 23.13 7 04.39 (57)
3	10.03	08.55	07.25	06.39	04.57	06.12 (70) 03.27 04.30 (57)
	14.51	16.19	17.46	20.16	21.45	22 06.34 (70) 23.16 10 04.40 (57)
4	10.02	08.52	07.22	06.35	04.53	06.13 (70) 03.25 04.30 (57)
	14.53	16.22	17.49	20.19	21.48	20 06.33 (70) 23.18 11 04.41 (57)
5	10.01	08.49	07.18	06.32	04.50	06.13 (70) 03.23 04.29 (57)
	14.55	16.25	17.52	20.21	21.51	19 06.32 (70) 23.21 14 04.43 (57)
6	09.59	08.46	07.15	06.28	04.47	06.15 (70) 03.21 04.29 (57)
	14.57	16.29	17.55	20.24	21.54	17 06.32 (70) 23.23 15 04.44 (57)
7	09.58	08.43	07.12	06.25	04.44	06.16 (70) 03.19 04.28 (57)
	15.00	16.32	17.58	20.27	21.57	14 06.30 (70) 23.25 15 04.43 (57)
8	09.57	08.40	07.08	06.21	04.40	06.18 (70) 03.18 04.28 (57)
	15.02	16.35	18.01	20.30	22.00	10 06.28 (70) 23.27 16 04.44 (57)
9	09.55	08.37	07.05	06.18	04.37	03.16 04.27 (57)
	15.05	16.38	18.04	20.33	22.03	18 04.45 (57)
10	09.53	08.34	07.01	06.14	04.34	03.14 04.28 (57)
	15.07	16.41	18.07	20.36	22.07	18 04.46 (57)
11	09.52	08.31	06.58	06.11	04.31	03.13 04.28 (57)
	15.10	16.45	18.09	20.39	22.10	18 04.46 (57)
12	09.50	08.27	06.55	06.08	04.28	03.12 04.27 (57)
	15.12	16.48	18.12	20.42	22.13	19 04.46 (57)
13	09.48	08.24	06.51	06.04	04.25	03.11 04.28 (57)
	15.15	16.51	18.15	20.45	22.16	19 04.47 (57)
14	09.46	08.21	06.48	06.01	04.21	03.09 04.28 (57)
	15.18	16.54	18.18	20.48	22.19	19 04.47 (57)
15	09.44	08.18	06.44	05.57	04.18	03.09 04.28 (57)
	15.21	16.57	18.21	20.51	22.22	20 04.48 (57)
16	09.42	08.15	06.41	05.54	04.15	03.08 04.27 (57)
	15.23	17.00	18.24	20.54	22.25	21 04.48 (57)
17	09.40	08.11	06.37	05.50	04.12	03.07 04.28 (57)
	15.26	17.03	18.27	20.57	22.28	20 04.48 (57)
18	09.37	08.08	06.34	05.47	04.09	03.07 04.28 (57)
	15.29	17.06	18.30	21.00	22.31	21 04.49 (57)
19	09.35	08.05	06.30	05.44	04.06	03.06 04.28 (57)
	15.32	17.10	18.33	21.03	22.34	21 04.49 (57)
20	09.33	08.02	06.27	05.40	04.03	03.06 04.28 (57)
	15.35	17.13	18.35	21.05	5 06.29 (70) 22.37	21 04.49 (57)
21	09.30	07.58	06.24	05.37	04.01	03.06 04.28 (57)
	15.38	17.16	18.38	21.08	12 06.32 (70) 22.40	21 04.49 (57)
22	09.28	07.55	06.20	05.33	03.58	03.06 04.28 (57)
	15.41	17.19	18.41	21.11	16 06.33 (70) 22.43	21 04.49 (57)
23	09.25	07.52	06.17	05.30	03.55	03.06 04.29 (57)
	15.44	17.22	18.44	21.14	19 06.34 (70) 22.46	21 04.50 (57)
24	09.23	07.49	06.13	05.27	03.52	03.07 04.29 (57)
	15.47	17.25	18.47	21.17	21 06.35 (70) 22.49	21 04.50 (57)
25	09.20	07.45	06.10	05.23	03.49	03.07 04.30 (57)
	15.51	17.28	18.50	21.21	23 06.36 (70) 22.52	20 04.50 (57)
26	09.17	07.42	06.06	05.20	03.47	03.08 04.30 (57)
	15.54	17.31	18.53	21.24	23 06.36 (70) 22.55	20 04.50 (57)
27	09.15	07.39	06.03	05.17	03.44	03.09 04.30 (57)
	15.57	17.34	18.56	21.27	24 06.36 (70) 22.57	20 04.50 (57)
28	09.12	07.35	05.59	05.13	03.42	03.10 04.31 (57)
	16.00	17.37	18.58	21.30	24 06.36 (70) 23.00	20 04.51 (57)
29	09.09		06.56	05.10	03.39	03.11 04.31 (57)
	16.03		20.01	21.33	24 06.36 (70) 23.03	20 04.51 (57)
30	09.06		06.52	05.07	03.37	03.12 04.32 (57)
	16.06		20.04	21.36	24 06.36 (70) 23.06	19 04.51 (57)
31	09.04		06.49		03.34	
	16.10		20.07		23.08	
Potential sun hours	179	241	363	448	562	610
Total, worst case				215	149	526
Sun reduction				0,41	0,48	0,49
Oper. time red.				0,93	0,93	0,93
Wind dir. red.				0,60	0,60	0,62
Total reduction				0,23	0,26	0,28
Total, real				49	39	147

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: G - Asuinrakennus G (Hautakoskentie 455)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December		
1	03.14	04.32 (57)	04.33	06.05	07.28	07.59	09.29	
	23.38	19 04.51 (57)	22.23	20.39	18.56	16.13	14.53	
2	03.15	04.32 (57)	04.36	06.07	07.31	08.02	09.32	
	23.37	18 04.50 (57)	22.20	20.36	18.52	16.10	14.51	
3	03.17	04.33 (57)	04.39	06.10	07.34	08.05	09.35	
	23.35	17 04.50 (57)	22.16	20.33	18.49	16.06	14.49	
4	03.19	04.33 (57)	04.42	06.13	07.37	08.08	09.37	
	23.34	17 04.50 (57)	22.13	5 06.35 (70)	20.29	18.45	16.03	14.48
5	03.21	04.34 (57)	04.45	06.27 (70)	06.16	07.39	08.11	09.40
	23.32	16 04.50 (57)	22.10	12 06.39 (70)	20.26	18.42	16.00	14.46
6	03.23	04.34 (57)	04.48	06.25 (70)	06.19	07.42	08.14	09.42
	23.30	15 04.49 (57)	22.07	15 06.40 (70)	20.22	18.39	15.57	14.44
7	03.25	04.36 (57)	04.51	06.24 (70)	06.21	07.45	08.18	09.44
	23.29	13 04.49 (57)	22.04	17 06.41 (70)	20.19	18.35	15.54	14.43
8	03.27	04.36 (57)	04.54	06.23 (70)	06.24	07.48	08.21	09.46
	23.27	12 04.48 (57)	22.00	20 06.43 (70)	20.15	18.32	15.51	14.42
9	03.29	04.37 (57)	04.57	06.22 (70)	06.27	07.51	08.24	09.49
	23.25	11 04.48 (57)	21.57	21 06.43 (70)	20.12	18.28	15.48	14.40
10	03.31	04.39 (57)	05.00	06.21 (70)	06.30	07.54	08.27	09.51
	23.23	8 04.47 (57)	21.54	23 06.44 (70)	20.08	18.25	15.45	14.39
11	03.34	04.41 (57)	05.03	06.21 (70)	06.33	07.56	08.30	09.52
	23.20	3 04.44 (57)	21.51	23 06.44 (70)	20.05	18.22	15.42	14.38
12	03.36		05.06	06.20 (70)	06.35	07.59	08.33	09.54
	23.18		21.47	24 06.44 (70)	20.01	18.18	15.40	14.38
13	03.39		05.09	06.20 (70)	06.38	08.02	08.36	09.56
	23.16		21.44	24 06.44 (70)	19.58	18.15	15.37	14.37
14	03.41		05.12	06.19 (70)	06.41	08.05	08.39	09.58
	23.14		21.41	25 06.44 (70)	19.54	18.11	15.34	14.36
15	03.44		05.15	06.19 (70)	06.44	08.08	08.42	09.59
	23.11		21.37	25 06.44 (70)	19.51	18.08	15.31	14.36
16	03.47		05.18	06.20 (70)	06.46	08.11	08.46	10.00
	23.09		21.34	24 06.44 (70)	19.48	18.05	15.28	14.35
17	03.49		05.21	06.19 (70)	06.49	08.14	08.49	10.02
	23.06		21.31	23 06.42 (70)	19.44	18.01	15.26	14.35
18	03.52		05.24	06.20 (70)	06.52	08.17	08.52	10.03
	23.03		21.27	22 06.42 (70)	19.41	17.58	15.23	14.35
19	03.55		05.27	06.21 (70)	06.55	08.20	08.55	10.04
	23.01		21.24	20 06.41 (70)	19.37	17.55	15.20	14.35
20	03.58		05.30	06.21 (70)	06.58	08.23	08.58	10.05
	22.58		21.20	18 06.39 (70)	19.34	17.51	15.18	14.35
21	04.01		05.33	06.23 (70)	07.00	08.26	09.01	10.05
	22.55		21.17	15 06.38 (70)	19.30	17.48	15.15	14.35
22	04.03		05.36	06.25 (70)	07.03	08.29	09.04	10.06
	22.53		21.14	11 06.36 (70)	19.27	17.45	15.13	14.36
23	04.06		05.39	06.29 (70)	07.06	08.32	09.07	10.07
	22.50		21.10	2 06.31 (70)	19.23	17.42	15.10	14.36
24	04.09		05.42		07.09	08.35	09.10	10.07
	22.47		21.07		19.20	17.38	15.08	14.37
25	04.12		05.44		07.11	07.38	09.13	10.07
	22.44		21.03		19.16	16.35	15.06	14.38
26	04.15		05.47		07.14	07.41	09.16	10.07
	22.41		21.00		19.13	16.32	15.03	14.39
27	04.18		05.50		07.17	07.44	09.18	10.07
	22.38		20.57		19.09	16.29	15.01	14.40
28	04.21		05.53		07.20	07.47	09.21	10.07
	22.35		20.53		19.06	16.25	14.59	14.41
29	04.24		05.56		07.23	07.50	09.24	10.07
	22.32		20.50		19.03	16.22	14.57	14.42
30	04.27		05.59		07.25	07.53	09.27	10.06
	22.29		20.46		18.59	16.19	14.55	14.44
31	04.30		06.02			07.56		10.06
	22.26		20.43			16.16		14.45
Potential sun hours	598		504		392	307	204	147
Total, worst case	149		369					
Sun reduction	0,38		0,32					
Oper. time red.	0,93		0,93					
Wind dir. red.	0,62		0,60					
Total reduction	0,22		0,17					
Total, real	33		65					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapaisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: H - Asuinrakennus H (Hautakoskentie 544)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December			
1	10.05	09.01	07.32	06.46	05.03	03.32	03.14	04.33	06.05	07.28	07.59	09.29			
	14.47	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.56	16.13	14.53			
2	10.04	08.58	07.28	06.42	05.00	03.30	03.15	04.36	06.07	07.31	08.02	09.32			
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.10	14.51			
3	10.03	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35			
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49			
4	10.02	08.52	07.22	06.35	04.53	03.25	03.19	04.42	06.13	07.36	08.08	09.37			
	14.53	16.22	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.48			
5	10.01	08.49	07.18	06.32	04.50	03.23	03.21	04.45	06.16	07.39	08.11	09.39			
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.26	18.42	16.00	14.46			
6	09.59	08.46	07.15	06.28	04.47	03.21	03.23	04.48	06.19	07.42	08.14	09.42			
	14.57	16.29	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44			
7	09.58	08.43	07.12	06.25	04.44	03.19	03.25	04.51	06.21	07.45	08.17	09.44			
	15.00	16.32	17.58	20.27	21.57	23.25	23.28	22.03	20.19	18.35	15.54	14.43			
8	09.56	08.40	07.08	06.21	04.40	03.18	03.27	04.54	06.24	07.48	08.21	09.46			
	15.02	16.35	18.01	20.30	22.00	23.27	23.27	22.00	20.15	18.32	15.51	14.42			
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.48			
	15.05	16.38	18.04	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.41			
10	09.53	08.34	07.01	06.14	04.34	03.15	03.31	05.00	06.30	07.54	08.27	09.50			
	15.07	16.41	18.07	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39			
11	09.52	08.30	06.58	06.11	04.31	03.13	03.34	05.03	06.33	07.56	08.30	09.52			
	15.10	16.45	18.09	20.39	22.10	23.32	23.20	21.50	20.05	18.21	15.42	14.38			
12	09.50	08.27	06.54	06.08	04.28	03.12	03.36	05.06	06.35	07.59	08.33	09.54			
	15.12	16.48	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.40	14.38			
13	09.48	08.24	06.51	06.04	04.25	03.11	03.39	05.09	06.38	08.02	08.36	09.56			
	15.15	16.51	18.15	20.45	22.16	23.35	23.16	21.44	5 06.48 (71)	19.58	18.15	15.37	14.37		
14	09.46	08.21	06.48	06.01	04.22	03.10	03.41	05.12	06.39 (71)	06.41	08.05	08.39	09.57		
	15.18	16.54	18.18	20.48	22.19	23.37	4 04.27 (70)	23.13	21.41	11 06.50 (71)	19.54	18.11	15.34	14.36	
15	09.44	08.18	06.44	05.57	06.36 (71)	04.18	03.09	04.27 (70)	03.44	05.15	06.38 (71)	06.44	08.08	08.42	09.59
	15.21	16.57	18.21	20.51	10 06.46 (71)	22.22	23.38	5 04.32 (70)	23.11	21.37	14 06.52 (71)	19.51	18.08	15.31	14.36
16	09.42	08.15	06.41	05.54	06.34 (71)	04.15	03.08	04.26 (70)	03.47	05.18	06.37 (71)	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.54	14 06.48 (71)	22.25	23.39	7 04.33 (70)	23.08	21.34	17 06.54 (71)	19.47	18.05	15.28	14.35
17	09.39	08.11	06.37	05.50	06.31 (71)	04.12	03.07	04.26 (70)	03.49	05.21	06.35 (71)	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.56	17 06.48 (71)	22.28	23.40	8 04.34 (70)	23.06	21.30	19 06.54 (71)	19.44	18.01	15.26	14.35
18	09.37	08.08	06.34	05.47	06.30 (71)	04.09	03.07	04.26 (70)	03.52	05.24	06.35 (71)	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	19 06.49 (71)	22.31	23.41	8 04.34 (70)	23.03	21.27	20 06.55 (71)	19.41	17.58	15.23	14.35
19	09.35	08.05	06.30	05.44	06.29 (71)	04.06	03.06	04.26 (70)	03.55	05.27	06.34 (71)	06.55	08.20	08.55	10.04
	15.32	17.10	18.33	21.02	21 06.50 (71)	22.34	23.42	9 04.35 (70)	23.01	21.24	21 06.55 (71)	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	06.29 (71)	04.04	03.06	04.26 (70)	03.58	05.30	06.33 (71)	06.57	08.23	08.58	10.05
	15.35	17.13	18.35	21.05	21 06.50 (71)	22.37	23.42	9 04.35 (70)	22.58	21.20	22 06.55 (71)	19.34	17.51	15.18	14.35
21	09.30	07.58	06.24	05.37	06.29 (71)	04.01	03.06	04.26 (70)	04.01	05.33	06.33 (71)	07.00	08.26	09.01	10.05
	15.38	17.16	18.38	21.08	21 06.50 (71)	22.40	23.42	9 04.35 (70)	22.55	21.17	22 06.55 (71)	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	06.28 (71)	03.58	03.06	04.26 (70)	04.03	05.36	06.33 (71)	07.03	08.29	09.04	10.06
	15.41	17.19	18.41	21.11	21 06.49 (71)	22.43	23.43	9 04.35 (70)	22.52	21.14	22 06.55 (71)	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	06.28 (71)	03.55	03.07	04.27 (70)	04.06	05.39	06.33 (71)	07.06	08.32	09.07	10.06
	15.44	17.22	18.44	21.14	21 06.49 (71)	22.46	23.43	9 04.36 (70)	22.50	21.10	21 06.54 (71)	19.23	17.42	15.10	14.36
24	09.23	07.48	06.13	05.27	06.28 (71)	03.52	03.07	04.27 (70)	04.09	05.42	06.33 (71)	07.09	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	21 06.49 (71)	22.49	23.42	8 04.35 (70)	22.47	21.07	20 06.53 (71)	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	06.28 (71)	03.49	03.07	04.28 (70)	04.12	05.44	06.34 (71)	07.11	07.38	09.13	10.07
	15.51	17.28	18.50	21.20	20 06.48 (71)	22.52	23.42	8 04.36 (70)	22.44	21.03	19 06.53 (71)	19.16	16.35	15.06	14.38
26	09.17	07.42	06.06	05.20	06.29 (71)	03.47	03.08	04.28 (70)	04.15	05.47	06.34 (71)	07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.23	18 06.47 (71)	22.55	23.42	7 04.35 (70)	22.41	21.00	17 06.51 (71)	19.13	16.32	15.03	14.39
27	09.15	07.38	06.03	05.17	06.30 (71)	03.44	03.09	04.29 (70)	04.18	05.50	06.35 (71)	07.17	07.44	09.18	10.07
	15.57	17.34	18.56	21.26	16 06.46 (71)	22.57	23.41	6 04.35 (70)	22.38	20.57	15 06.50 (71)	19.09	16.29	15.01	14.40
28	09.12	07.35	05.59	05.13	06.31 (71)	03.42	03.10	04.30 (70)	04.21	05.53	06.37 (71)	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	14 06.45 (71)	23.00	23.41	4 04.34 (70)	22.35	20.53	10 06.47 (71)	19.06	16.25	14.59	14.41
29	09.09	06.56	05.10	06.33 (71)	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.06			
	16.03	20.01	21.33	9 06.42 (71)	23.03	23.40	22.32	20.50	19.02	16.22	14.57	14.42			
30	09.06	06.52	05.07	03.37	03.37	03.12	04.27	05.59	07.25	07.53	09.27	10.06			
	16.06	20.04	21.36	03.37	23.06	23.39	22.29	20.46	18.59	16.19	14.55	14.44			
31	09.03	06.49	05.04	03.34	03.34	03.12	04.30	06.02	07.26	07.56	09.27	10.05			
	16.10	20.07	21.38	03.38	23.08	23.40	22.26	20.43	18.59	16.16	14.55	14.45			
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147			
Total, worst case				263		110		275							
Sun reduction				0.41		0.49		0.32							
Oper. time red.				0.93		0.93		0.93							
Wind dir. red.				0.60		0.62		0.60							
Total reduction				0.23		0.28		0.18							
Total, real				60		31		48							

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: I - Asuinrakennus I (Hautakoskentie 289)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December			
1	10.05	09.01	07.32	06.46	05.03	03.32	04.35 (75)	03.14	04.38 (75)	04.33	06.05	07.28	07.59	09.30	
	14.47	16.13	17.40	20.10	21.39	23.11	04.49 (75)	23.38	21	04.59 (75)	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	05.00	03.29	04.35 (75)	03.15	04.38 (75)	04.36	06.07	07.31	08.02	09.32	
	14.49	16.16	17.43	20.13	21.42	23.14	04.50 (75)	23.37	21	04.59 (75)	22.20	20.36	18.52	16.10	14.51
3	10.03	08.55	07.25	06.39	04.57	03.27	04.34 (75)	03.17	04.38 (75)	04.39	06.10	07.34	08.05	09.35	
	14.51	16.19	17.46	20.16	21.45	23.16	04.51 (75)	23.35	21	04.59 (75)	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	04.34 (75)	03.19	04.38 (75)	04.42	06.13	07.37	08.08	09.37	
	14.53	16.22	17.49	20.19	21.48	23.19	04.52 (75)	23.34	21	04.59 (75)	22.13	20.29	18.45	16.03	14.48
5	10.01	08.49	07.18	06.32	04.50	03.23	04.34 (75)	03.21	04.39 (75)	04.45	06.16	07.39	08.11	09.40	
	14.55	16.26	17.52	20.22	21.51	23.21	04.52 (75)	23.32	20	04.59 (75)	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	04.34 (75)	03.23	04.39 (75)	04.48	06.19	07.42	08.15	09.42	
	14.57	16.29	17.55	20.24	21.54	23.23	04.53 (75)	23.31	20	04.59 (75)	22.07	20.22	18.39	15.57	14.44
7	09.58	08.43	07.12	06.25	04.44	03.19	04.33 (75)	03.25	04.40 (75)	04.51	06.22	07.45	08.18	09.44	
	15.00	16.32	17.58	20.27	21.57	23.25	04.53 (75)	23.29	19	04.59 (75)	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.18	04.33 (75)	03.27	04.40 (75)	04.54	06.24	07.48	08.21	09.47	
	15.02	16.35	18.01	20.30	22.01	23.27	04.53 (75)	23.27	18	04.58 (75)	22.00	20.15	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37	03.16	04.33 (75)	03.29	04.41 (75)	04.57	06.27	07.51	08.24	09.49	
	15.05	16.38	18.04	20.33	22.04	23.29	04.54 (75)	23.25	18	04.59 (75)	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.15	04.34	03.14	04.34 (75)	03.31	04.42 (75)	05.00	06.30	07.54	08.27	09.51	
	15.07	16.41	18.07	20.36	22.07	23.31	04.55 (75)	23.23	16	04.58 (75)	21.54	20.08	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	04.33 (75)	03.34	04.42 (75)	05.03	06.33	07.57	08.30	09.53	
	15.10	16.45	18.10	20.39	22.10	23.33	04.55 (75)	23.21	15	04.57 (75)	21.51	20.05	18.22	15.42	14.38
12	09.50	08.27	06.55	06.08	04.28	03.12	04.33 (75)	03.36	04.43 (75)	05.06	06.35	07.59	08.33	09.54	
	15.12	16.48	18.12	20.42	22.13	23.34	04.55 (75)	23.18	14	04.57 (75)	21.47	20.01	18.18	15.40	14.38
13	09.48	08.24	06.51	06.04	04.25	03.10	04.34 (75)	03.39	04.44 (75)	05.09	06.38	08.02	08.36	09.56	
	15.15	16.51	18.15	20.45	22.16	23.36	04.56 (75)	23.16	12	04.56 (75)	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.09	04.34 (75)	03.41	04.46 (75)	05.12	06.41	08.05	08.39	09.58	
	15.18	16.54	18.18	20.48	22.19	23.37	04.56 (75)	23.14	9	04.55 (75)	21.41	19.55	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.09	04.34 (75)	03.44	04.48 (75)	05.15	06.44	08.08	08.43	09.59	
	15.21	16.57	18.21	20.51	22.22	23.38	04.56 (75)	23.11	5	04.53 (75)	21.37	19.51	18.08	15.31	14.36
16	09.42	08.15	06.41	05.54	04.15	03.08	04.34 (75)	03.47	05.18	06.47	08.11	08.46	09.10	10.01	
	15.23	17.00	18.24	20.54	22.25	23.40	04.56 (75)	23.09	22	04.56 (75)	21.34	19.48	18.05	15.28	14.35
17	09.40	08.12	06.37	05.50	04.12	03.07	04.34 (75)	03.49	05.21	06.49	08.14	08.49	09.10	10.02	
	15.26	17.03	18.27	20.57	22.28	23.40	04.56 (75)	23.06	22	04.56 (75)	21.31	19.44	18.01	15.26	14.35
18	09.37	08.08	06.34	05.47	04.09	03.07	04.34 (75)	03.52	05.24	06.52	08.17	08.52	10.03	10.03	
	15.29	17.07	18.30	21.00	22.31	23.41	04.57 (75)	23.04	23	04.57 (75)	21.27	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.06	03.06	04.35 (75)	03.55	05.27	06.55	08.20	08.55	10.04	10.04	
	15.32	17.10	18.33	21.03	22.34	23.42	04.57 (75)	23.01	22	04.57 (75)	21.24	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	03.06	04.35 (75)	03.58	05.30	06.58	08.23	08.58	10.05	10.05	
	15.35	17.13	18.36	21.06	22.37	23.42	04.57 (75)	22.58	22	04.57 (75)	21.21	19.34	17.51	15.18	14.35
21	09.30	07.59	06.24	05.37	04.01	03.06	04.35 (75)	04.01	05.33	07.00	08.26	09.01	10.06	10.06	
	15.38	17.16	18.38	21.09	22.40	23.43	04.57 (75)	22.55	21	04.57 (75)	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	03.06	04.35 (75)	04.03	05.36	07.03	08.29	09.04	10.06	10.06	
	15.41	17.19	18.41	21.12	22.43	23.43	04.57 (75)	22.53	22	04.57 (75)	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.55	03.06	04.36 (75)	04.06	05.39	07.06	08.32	09.07	10.07	10.07	
	15.44	17.22	18.44	21.15	22.46	23.43	04.58 (75)	22.50	21	04.57 (75)	21.10	19.23	17.42	15.10	14.36
24	09.23	07.49	06.13	05.27	03.52	03.07	04.35 (75)	04.09	05.42	07.09	08.35	09.10	10.07	10.07	
	15.47	17.25	18.47	21.18	22.49	23.43	04.58 (75)	22.47	23	04.58 (75)	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.36 (75)	04.12	05.45	07.11	08.38	09.13	10.07	10.07	
	15.51	17.28	18.50	21.21	22.52	23.43	04.59 (75)	22.44	23	04.59 (75)	21.04	19.16	16.35	15.06	14.38
26	09.18	07.42	06.06	05.20	03.47	03.08	04.36 (75)	04.15	05.47	07.14	08.41	09.16	10.07	10.07	
	15.54	17.31	18.53	21.24	22.55	23.42	04.58 (75)	22.41	22	04.58 (75)	21.00	19.13	16.32	15.03	14.39
27	09.15	07.39	06.03	05.17	03.44	03.09	04.36 (75)	04.18	05.50	07.17	08.44	09.19	10.07	10.07	
	15.57	17.34	18.56	21.27	22.58	23.42	04.59 (75)	22.38	23	04.59 (75)	20.57	19.10	16.29	15.01	14.40
28	09.12	07.35	05.59	05.13	03.42	03.10	04.37 (75)	04.21	05.53	07.20	08.47	09.21	10.07	10.07	
	16.00	17.37	18.59	21.30	23.00	23.41	04.59 (75)	22.35	22	04.59 (75)	20.53	19.06	16.25	14.59	14.41
29	09.09	06.56	05.10	03.39	03.39	03.11	04.37 (75)	04.24	05.56	07.23	08.50	09.24	10.07	10.07	
	16.03	20.01	21.33	23.03	7	04.45 (75)	23.40	22	04.59 (75)	22.32	20.50	19.03	16.22	14.57	14.42
30	09.07	06.53	05.07	03.37	03.37	03.12	04.37 (75)	04.27	05.59	07.25	08.53	09.27	10.06	10.06	
	16.06	20.04	21.36	23.06	11	04.48 (75)	23.39	21	04.59 (75)	22.29	20.46	18.59	16.19	14.55	14.44
31	09.04	06.49	04.54	03.34	03.34	03.12	04.36 (75)	04.30	06.02	07.28	08.56	09.30	10.06	10.06	
	16.10	20.07	21.39	23.09	13	04.49 (75)	23.26	22	20.43	18.59	16.16	14.55	14.45	14.45	
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147			
Total, worst case					31	626	250								
Sun reduction					0,48	0,49	0,38								
Oper. time red.					0,93	0,93	0,93								
Wind dir. red.					0,62	0,62	0,62								
Total reduction					0,27	0,28	0,22								
Total, real					9	176	55								

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukseShadow receptor: J - Lomarakenus J (Katajajarventie 49)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June								
1	10.05	09.01	07.32	16.26 (77)	06.46	19.06 (78)	05.04	20.28 (67)	03.32					
	14.48	16.13	17.40	23	16.49 (77)	20.10	20	19.26 (78)	21.39	20	20.48 (67)	23.11		
2	10.04	08.58	07.29	16.26 (77)	06.42	19.04 (78)	05.00	20.27 (67)	03.30					
	14.50	16.16	17.43	24	16.50 (77)	20.13	22	19.26 (78)	21.42	21	20.48 (67)	23.13		
3	10.03	08.55	07.25	16.25 (77)	06.39	19.03 (78)	04.57	20.27 (67)	03.28					
	14.52	16.19	17.46	25	16.50 (77)	20.16	24	19.27 (78)	21.45	21	20.48 (67)	23.16		
4	10.02	08.52	07.22	16.25 (77)	06.35	19.02 (78)	04.54	20.28 (67)	03.26					
	14.54	16.23	17.49	26	16.51 (77)	20.19	25	19.27 (78)	21.48	21	20.49 (67)	23.18		
5	10.01	08.49	07.19	16.24 (77)	06.32	19.01 (78)	04.50	20.28 (67)	03.24					
	14.56	16.26	17.52	26	16.50 (77)	20.22	26	19.27 (78)	21.51	21	20.49 (67)	23.21		
6	09.59	08.46	07.15	16.24 (77)	06.28	19.01 (78)	04.47	20.27 (67)	03.22					
	14.58	16.29	17.55	26	16.50 (77)	20.25	26	19.27 (78)	21.54	21	20.48 (67)	23.23		
7	09.58	08.43	07.12	16.24 (77)	06.25	19.01 (78)	04.44	20.28 (67)	03.20					
	15.00	16.32	17.58	26	16.50 (77)	20.27	26	19.27 (78)	21.57	20	20.48 (67)	23.25		
8	09.57	08.40	07.08	16.24 (77)	06.22	19.01 (78)	04.41	20.28 (67)	03.18					
	15.02	16.35	18.01	24	16.48 (77)	20.30	25	19.26 (78)	22.00	19	20.47 (67)	23.27		
9	09.55	08.37	07.05	16.25 (77)	06.18	19.01 (78)	04.38	20.29 (67)	03.16					
	15.05	16.39	18.04	23	16.48 (77)	20.33	24	19.25 (78)	22.04	18	20.47 (67)	23.29		
10	09.53	08.34	07.02	16.25 (77)	06.15	19.02 (78)	04.34	20.30 (67)	03.15					
	15.07	16.42	18.07	21	16.46 (77)	20.36	23	19.25 (78)	22.07	16	20.46 (67)	23.31		
11	09.52	08.31	06.58	16.26 (77)	06.11	19.02 (78)	04.31	20.30 (67)	03.13					
	15.10	16.45	18.10	19	16.45 (77)	20.39	21	19.23 (78)	22.10	14	20.44 (67)	23.32		
12	09.50	08.27	06.55	16.28 (77)	06.08	19.03 (78)	04.28	20.33 (67)	03.12					
	15.13	16.48	18.13	15	16.43 (77)	20.42	19	19.22 (78)	22.13	11	20.44 (67)	23.34		
13	09.48	08.24	06.51	16.31 (77)	06.04	19.05 (78)	04.25	20.35 (67)	03.11					
	15.15	16.51	18.16	10	16.41 (77)	20.45	15	19.20 (78)	22.16	6	20.41 (67)	23.36		
14	09.46	08.21	06.48	16.31 (77)	06.01	19.06 (78)	04.22	20.36 (67)	03.10					
	15.18	16.54	18.18	11	16.42 (77)	20.48	11	19.17 (78)	22.19	11	20.42 (67)	23.37		
15	09.44	08.18	06.44	16.32 (77)	05.58	19.07 (78)	04.19	20.37 (67)	03.09					
	15.21	16.57	18.21	11	16.43 (77)	20.51	11	19.18 (78)	22.22	11	20.43 (67)	23.38		
16	09.42	08.15	06.41	16.33 (77)	05.54	19.08 (78)	04.16	20.38 (67)	03.08					
	15.24	17.01	18.24	12	16.44 (77)	20.54	12	19.19 (78)	22.25	12	20.44 (67)	23.39	2	22.19 (59)
17	09.40	08.12	06.38	16.34 (77)	05.51	19.09 (78)	04.13	20.39 (67)	03.08					
	15.27	17.04	18.27	13	16.45 (77)	20.57	13	19.20 (78)	22.28	13	20.45 (67)	23.40	4	22.19 (59)
18	09.37	08.08	06.34	16.35 (77)	05.47	19.10 (78)	04.10	20.40 (67)	03.07					
	15.30	17.07	18.30	14	16.46 (77)	21.00	14	19.21 (78)	22.31	14	20.46 (67)	23.41	5	22.20 (59)
19	09.35	08.05	06.31	16.36 (77)	05.44	19.11 (78)	04.07	20.41 (67)	03.07					
	15.33	17.10	18.33	15	16.47 (77)	21.03	15	19.22 (78)	22.34	15	20.47 (67)	23.42	6	22.21 (59)
20	09.33	08.02	06.27	16.37 (77)	05.40	19.12 (78)	04.04	20.42 (67)	03.07					
	15.36	17.13	18.36	16	16.48 (77)	21.06	16	19.23 (78)	22.37	16	20.48 (67)	23.42	6	22.21 (59)
21	09.30	07.59	06.24	16.38 (77)	05.37	19.13 (78)	04.01	20.43 (67)	03.07					
	15.39	17.16	18.39	17	16.49 (77)	21.09	17	19.24 (78)	22.40	17	20.49 (67)	23.42	7	22.22 (59)
22	09.28	07.55	06.20	16.39 (77)	05.34	19.14 (78)	03.58	20.44 (67)	03.07					
	15.42	17.19	18.41	18	16.50 (77)	21.12	18	19.25 (78)	22.43	18	20.50 (67)	23.43	7	22.23 (59)
23	09.25	07.52	06.17	16.40 (77)	05.30	19.15 (78)	03.55	20.45 (67)	03.07					
	15.45	17.22	18.44	19	16.51 (77)	21.15	19	19.26 (78)	22.46	19	20.51 (67)	23.43	6	22.22 (59)
24	09.23	07.49	06.13	16.41 (77)	05.27	19.16 (78)	03.53	20.46 (67)	03.07					
	15.48	17.25	18.47	20	16.52 (77)	21.18	20	19.27 (78)	22.49	20	20.52 (67)	23.43	6	22.22 (59)
25	09.20	07.45	16.35 (77)	06.10	05.24	19.17 (78)	03.50	20.47 (67)	03.08					
	15.51	17.28	6	16.41 (77)	18.50	21.21	21	19.28 (78)	22.52	21	20.53 (67)	23.42	5	22.22 (59)
26	09.17	07.42	16.32 (77)	06.07	05.20	19.18 (78)	03.47	20.48 (67)	03.09					
	15.54	17.31	13	16.45 (77)	18.53	21.24	8	20.43 (67)	22.55	8	20.49 (67)	23.42	3	22.22 (59)
27	09.15	07.39	16.29 (77)	06.03	05.17	19.19 (78)	03.44	20.49 (67)	03.09					
	15.57	17.34	18	16.47 (77)	18.56	21.27	13	20.45 (67)	22.57	13	20.50 (67)	23.41		
28	09.12	07.35	16.28 (77)	06.00	05.13	19.20 (78)	03.42	20.50 (67)	03.10					
	16.00	17.37	20	16.48 (77)	18.59	21.30	15	20.46 (67)	23.00	15	20.51 (67)	23.41		
29	09.09	07.32	06.56	16.49 (77)	05.10	19.21 (78)	03.39	20.51 (67)	03.12					
	16.03	17.40	20.01	4	19.18 (78)	21.33	17	20.47 (67)	23.03	17	20.52 (67)	23.40		
30	09.06	07.27	06.53	16.50 (77)	05.07	19.22 (78)	03.37	20.52 (67)	03.13					
	16.07	17.43	20.04	13	19.23 (78)	21.36	19	20.48 (67)	23.06	19	20.53 (67)	23.39		
31	09.04	07.22	06.49	16.51 (77)	05.04	19.23 (78)	03.35	20.53 (67)	03.13					
	16.10	17.46	20.07	17	19.24 (78)	21.39	20	20.49 (67)	23.08	20	20.54 (67)	23.39		
Potential sun hours	179	241	363	448	562	610								
Total, worst case			57	322	379	229								57
Sun reduction			0,33	0,32	0,41	0,48								0,49
Oper. time red.			0,93	0,93	0,93	0,93								0,93
Wind dir. red.			0,62	0,62	0,62	0,63								0,65
Total reduction			0,19	0,19	0,24	0,28								0,30
Total, real			11	60	90	64								17

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukseShadow receptor: J - Lomarakenus J (Katajajarventie 49)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December			
1	03.14	04.33	20.42 (67)	06.05	19.01 (78)	07.28	17.08 (77)	07.59	09.30
	23.38	22.23	12 20.54 (67)	20.40	21 19.22 (78)	18.56	13 17.21 (77)	16.13	14.53
2	03.16	04.36	20.41 (67)	06.08	19.00 (78)	07.31	17.05 (77)	08.02	09.32
	23.36	22.20	15 20.56 (67)	20.36	23 19.23 (78)	18.52	18 17.23 (77)	16.10	14.51
3	03.17	04.39	20.39 (67)	06.10	18.59 (78)	07.34	17.04 (77)	08.05	09.35
	23.35	22.16	17 20.56 (67)	20.33	24 19.23 (78)	18.49	20 17.24 (77)	16.07	14.50
4	03.19	04.43	20.39 (67)	06.13	18.58 (78)	07.37	17.02 (77)	08.08	09.37
	23.34	22.13	18 20.57 (67)	20.29	25 19.23 (78)	18.46	23 17.25 (77)	16.04	14.48
5	03.21	04.46	20.38 (67)	06.16	18.57 (78)	07.40	17.01 (77)	08.11	09.40
	23.32	22.10	19 20.57 (67)	20.26	26 19.23 (78)	18.42	25 17.26 (77)	16.01	14.46
6	03.23	04.49	20.37 (67)	06.19	18.57 (78)	07.42	17.01 (77)	08.15	09.42
	23.30	22.07	21 20.58 (67)	20.22	26 19.23 (78)	18.39	25 17.26 (77)	15.58	14.45
7	03.25	04.52	20.36 (67)	06.22	18.56 (78)	07.45	17.00 (77)	08.18	09.44
	23.29	22.04	22 20.58 (67)	20.19	26 19.22 (78)	18.35	26 17.26 (77)	15.55	14.43
8	03.27	04.55	20.37 (67)	06.24	18.57 (78)	07.48	17.00 (77)	08.21	09.46
	23.27	22.00	21 20.58 (67)	20.15	25 19.22 (78)	18.32	26 17.26 (77)	15.52	14.42
9	03.30	04.58	20.37 (67)	06.27	18.57 (78)	07.51	16.59 (77)	08.24	09.49
	23.25	21.57	21 20.58 (67)	20.12	24 19.21 (78)	18.29	27 17.26 (77)	15.49	14.41
10	03.32	05.01	20.36 (67)	06.30	18.57 (78)	07.54	16.59 (77)	08.27	09.51
	23.23	21.54	22 20.58 (67)	20.08	22 19.19 (78)	18.25	26 17.25 (77)	15.46	14.40
11	03.34	05.04	20.37 (67)	06.33	18.58 (78)	07.57	17.00 (77)	08.30	09.52
	23.20	21.51	21 20.58 (67)	20.05	20 19.18 (78)	18.22	24 17.24 (77)	15.43	14.39
12	03.37	05.07	20.36 (67)	06.36	18.59 (78)	07.59	17.00 (77)	08.33	09.54
	23.18	21.47	20 20.56 (67)	20.02	18 19.17 (78)	18.18	23 17.23 (77)	15.40	14.38
13	03.39	05.10	20.37 (67)	06.38	19.00 (78)	08.02	17.00 (77)	08.36	09.56
	23.16	21.44	19 20.56 (67)	19.58	14 19.14 (78)	18.15	22 17.22 (77)	15.37	14.37
14	03.42	05.13	20.38 (67)	06.41	19.03 (78)	08.05	17.01 (77)	08.39	09.58
	23.14	21.41	17 20.55 (67)	19.55	7 19.10 (78)	18.12	20 17.21 (77)	15.34	14.37
15	03.44	05.15	20.38 (67)	06.44		08.08	17.02 (77)	08.43	09.59
	23.11	21.37	15 20.53 (67)	19.51		18.08	17 17.19 (77)	15.31	14.36
16	03.47	05.18	20.40 (67)	06.47		08.11	17.04 (77)	08.46	10.00
	23.09	21.34	12 20.52 (67)	19.48		18.05	12 17.16 (77)	15.29	14.36
17	03.50	05.21	20.43 (67)	06.49		08.14		08.49	10.02
	23.06	21.31	6 20.49 (67)	19.44		18.02		15.26	14.35
18	03.52	05.24		06.52		08.17		08.52	10.03
	23.03	21.27		19.41		17.58		15.23	14.35
19	03.55	05.27		06.55		08.20		08.55	10.04
	23.01	21.24		19.37		17.55		15.21	14.35
20	03.58	05.30		06.58		08.23		08.58	10.05
	22.58	21.21		19.34		17.52		15.18	14.35
21	04.01	05.33		07.00		08.26		09.01	10.05
	22.55	21.17		19.30		17.48		15.16	14.36
22	04.04	05.36		07.03		08.29		09.04	10.06
	22.53	21.14		19.27		17.45		15.13	14.36
23	04.07	05.39		07.06		08.32		09.07	10.06
	22.50	21.10		19.23		17.42		15.11	14.37
24	04.10	05.42		07.09		08.35		09.10	10.07
	22.47	21.07		19.20		17.39		15.08	14.37
25	04.13	05.45		07.12		07.38		09.13	10.07
	22.44	21.04		19.17		16.35		15.06	14.38
26	04.15	05.48		07.14		07.41		09.16	10.07
	22.41	21.00		19.13		16.32		15.04	14.39
27	04.18	05.51		07.17		07.44		09.19	10.07
	22.38	20.57		19.10		16.29		15.01	14.40
28	04.21	05.53		07.20		07.47		09.21	10.07
	22.35	20.53		19.06		16.26		14.59	14.41
29	04.24	05.56	19.07 (78)	07.23		07.50		09.24	10.07
	22.32	20.50	11 19.18 (78)	19.03		16.22		14.57	14.43
30	04.27	05.59	19.04 (78)	07.25	17.12 (77)	07.53		09.27	10.06
	22.29	20.46	16 19.20 (78)	18.59	6 17.18 (77)	16.19		14.55	14.44
31	04.30	06.02	19.03 (78)			07.56			10.06
	22.26	20.43	19 19.22 (78)			16.16			14.46
Potential sun hours	598	8 20.52 (67)	504	392		307	204	147	
Total, worst case	8		344	307		347			
Sun reduction	0,38		0,32	0,33		0,35			
Oper. time red.	0,93		0,93	0,93		0,93			
Wind dir. red.	0,63		0,63	0,62		0,62			
Total reduction	0,23		0,19	0,19		0,20			
Total, real	2		64	58		69			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapaisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: K - Lomarakenus K (Silostenlampi)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December					
1	10.04	09.00	07.32	06.46	05.04	03.33	21.33 (58)	03.15	21.40 (58)	04.34	06.05	07.28	07.59	09.29			
	14.48	16.13	17.40	20.10	21.39	23.10	22	21.55 (58)	23.37	22	22.02 (58)	22.22	20.39	18.56	16.13	14.54	
2	10.03	08.58	07.29	06.42	05.01	03.31	21.34 (58)	03.17	21.40 (58)	04.37	06.08	07.31	08.02	09.32			
	14.50	16.17	17.43	20.13	21.42	23.13	22	21.56 (58)	23.36	22	22.02 (58)	22.19	20.36	18.52	16.10	14.52	
3	10.02	08.55	07.25	06.39	04.57	03.28	21.33 (58)	03.18	21.40 (58)	04.40	06.11	07.34	08.05	09.34			
	14.52	16.20	17.46	20.16	21.45	23.15	23	21.56 (58)	23.34	22	22.02 (58)	22.16	20.33	18.49	16.07	14.50	
4	10.01	08.52	07.22	06.35	04.54	03.26	21.34 (58)	03.20	21.39 (58)	04.43	06.13	07.37	08.08	09.37			
	14.54	16.23	17.49	20.19	21.48	23.18	22	21.56 (58)	23.33	23	22.02 (58)	22.13	20.29	18.46	16.04	14.48	
5	10.00	08.49	07.18	06.32	04.51	03.24	21.34 (58)	03.22	21.40 (58)	04.46	06.16	07.40	08.11	09.39			
	14.56	16.26	17.52	20.22	21.51	23.20	23	21.57 (58)	23.31	23	22.03 (58)	22.10	20.26	18.42	16.01	14.47	
6	09.59	08.46	07.15	06.29	04.47	03.22	21.33 (58)	03.24	21.40 (58)	04.49	06.19	07.42	08.14	09.41			
	14.58	16.29	17.55	20.24	21.54	23.22	23	21.56 (58)	23.30	22	22.02 (58)	22.07	20.22	18.39	15.58	14.45	
7	09.58	08.43	07.12	06.25	04.44	03.21	21.34 (58)	03.26	21.40 (58)	04.52	06.22	07.45	08.17	09.44			
	15.01	16.32	17.58	20.27	21.57	23.24	22	21.56 (58)	23.28	22	22.02 (58)	22.03	20.19	18.35	15.55	14.44	
8	09.56	08.40	07.08	06.22	04.41	03.19	21.34 (58)	03.28	21.40 (58)	04.55	06.25	07.48	08.20	09.46			
	15.03	16.36	18.01	20.30	22.00	23.26	22	21.56 (58)	23.26	23	22.03 (58)	22.00	20.15	18.32	15.52	14.43	
9	09.55	08.37	07.05	06.18	04.38	03.17	21.34 (58)	03.30	21.41 (58)	04.58	06.27	07.51	08.24	09.48			
	15.05	16.39	18.04	20.33	22.03	23.28	22	21.56 (58)	23.24	22	22.03 (58)	21.57	20.12	18.29	15.49	14.41	
10	09.53	08.34	07.02	06.15	04.35	03.16	21.34 (58)	03.33	21.40 (58)	05.01	06.30	07.54	08.27	09.50			
	15.08	16.42	18.07	20.36	22.06	23.30	22	21.56 (58)	23.22	23	22.03 (58)	21.54	20.08	18.25	15.46	14.40	
11	09.51	08.30	06.58	06.11	04.32	03.14	21.35 (58)	03.35	21.41 (58)	05.04	06.33	07.57	08.30	09.52			
	15.11	16.45	18.10	20.39	22.09	23.32	22	21.57 (58)	23.20	22	22.03 (58)	21.50	20.05	18.22	15.43	14.39	
12	09.49	08.27	06.55	06.08	04.28	03.13	21.35 (58)	03.37	21.41 (58)	05.07	06.36	07.59	08.33	09.54			
	15.13	16.48	18.13	20.42	22.12	23.33	22	21.57 (58)	23.18	22	22.03 (58)	21.47	20.01	18.18	15.40	14.39	
13	09.47	08.24	06.51	06.05	04.25	03.12	21.35 (58)	03.40	21.42 (58)	05.10	06.38	08.02	08.36	09.55			
	15.16	16.51	18.16	20.45	22.15	23.35	22	21.57 (58)	23.15	21	22.03 (58)	21.44	19.58	18.15	15.37	14.38	
14	09.46	08.21	06.48	06.01	04.22	03.11	21.36 (58)	03.42	21.42 (58)	05.13	06.41	08.05	08.39	09.57			
	15.19	16.55	18.18	20.48	22.19	23.36	22	21.58 (58)	23.13	21	22.03 (58)	21.40	19.55	18.12	15.34	14.37	
15	09.43	08.18	06.44	05.58	04.19	03.10	21.36 (58)	03.45	21.42 (58)	05.16	06.44	08.08	08.42	09.58			
	15.21	16.58	18.21	20.51	22.22	23.37	21	21.57 (58)	23.11	21	22.03 (58)	21.37	19.51	18.08	15.32	14.37	
16	09.41	08.15	06.41	05.54	04.16	03.09	21.36 (58)	03.48	21.43 (58)	05.19	06.47	08.11	08.45	10.00			
	15.24	17.01	18.24	20.54	22.25	23.38	22	21.58 (58)	23.08	20	22.03 (58)	21.34	19.48	18.05	15.29	14.36	
17	09.39	08.11	06.38	05.51	04.13	03.08	21.37 (58)	03.50	21.43 (58)	05.22	06.50	08.14	08.48	10.01			
	15.27	17.04	18.27	20.57	22.28	23.39	21	21.58 (58)	23.05	19	22.02 (58)	21.30	19.44	18.02	15.26	14.36	
18	09.37	08.08	06.34	05.47	04.10	03.08	21.37 (58)	03.53	21.44 (58)	05.25	06.52	08.17	08.51	10.02			
	15.30	17.07	18.30	21.00	22.31	23.40	21	21.58 (58)	23.03	18	22.02 (58)	21.27	19.41	17.58	15.24	14.36	
19	09.35	08.05	06.31	05.44	04.07	03.08	21.37 (58)	03.56	21.44 (58)	05.28	06.55	08.20	08.54	10.03			
	15.33	17.10	18.33	21.02	22.34	23.41	22	21.59 (58)	23.00	17	22.01 (58)	21.24	19.37	17.55	15.21	14.36	
20	09.32	08.02	06.27	05.41	04.04	3 21.41 (58)	03.07	21.37 (58)	03.59	21.45 (58)	05.30	06.58	08.23	08.58	10.04		
	15.36	17.13	18.36	21.05	22.37	23.41	22	21.59 (58)	22.58	15	22.00 (58)	21.20	19.34	17.52	15.18	14.36	
21	09.30	07.58	06.24	05.37	04.01	21.38 (58)	03.07	21.38 (58)	04.01	21.47 (58)	05.33	07.01	08.26	09.01	10.05		
	15.39	17.16	18.39	21.08	22.40	9 21.47 (58)	23.42	21	21.59 (58)	22.55	13	22.00 (58)	21.17	19.30	17.49	15.16	14.36
22	09.27	07.55	06.20	05.34	03.59	21.37 (58)	03.08	21.38 (58)	04.04	21.48 (58)	05.36	07.03	08.29	09.04	10.05		
	15.42	17.19	18.41	21.11	22.43	12 21.49 (58)	23.42	21	21.59 (58)	22.52	11	21.59 (58)	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.30	03.56	21.36 (58)	03.08	21.38 (58)	04.07	21.49 (58)	05.39	07.06	08.32	09.06	10.06		
	15.45	17.22	18.44	21.14	22.46	15 21.51 (58)	23.42	22	22.00 (58)	22.49	7	21.56 (58)	21.10	19.23	17.42	15.11	14.37
24	09.22	07.49	06.13	05.27	03.53	21.35 (58)	03.08	21.38 (58)	04.10	21.50 (58)	05.42	07.09	08.35	09.09	10.06		
	15.48	17.25	18.47	21.17	22.48	17 21.52 (58)	23.42	21	21.59 (58)	22.46	21.07	19.20	17.39	15.09	14.38		
25	09.20	07.45	06.10	05.24	03.50	21.35 (58)	03.09	21.38 (58)	04.13	21.51 (58)	05.45	07.12	07.38	09.12	10.06		
	15.51	17.28	18.50	21.20	22.51	18 21.53 (58)	23.41	21	21.59 (58)	22.43	21.03	19.17	16.35	15.06	14.39		
26	09.17	07.42	06.07	05.20	03.48	21.34 (58)	03.09	21.38 (58)	04.16	21.53 (58)	05.48	07.14	07.41	09.15	10.07		
	15.54	17.31	18.53	21.23	22.54	19 21.53 (58)	23.41	22	22.00 (58)	22.41	21.00	19.13	16.32	15.04	14.40		
27	09.14	07.39	06.03	05.17	03.45	21.34 (58)	03.10	21.39 (58)	04.19	21.57 (58)	05.51	07.17	07.44	09.18	10.06		
	15.58	17.34	18.56	21.26	22.57	20 21.54 (58)	23.40	21	22.00 (58)	22.38	20.57	19.10	16.29	15.02	14.41		
28	09.12	07.35	06.00	05.14	03.43	21.34 (58)	03.11	21.39 (58)	04.22	21.59 (58)	05.54	07.20	07.47	09.21	10.06		
	16.01	17.37	18.59	21.29	23.00	20 21.54 (58)	23.40	22	22.01 (58)	22.35	20.53	19.06	16.26	15.00	14.42		
29	09.09	06.56	05.10	03.40	21.33 (58)	03.12	21.38 (58)	04.25	21.50 (58)	05.56	07.23	07.50	09.24	10.06			
	16.04	20.01	21.33	23.02	21 21.54 (58)	23.39	22	22.00 (58)	22.32	20.50	19.03	16.23	14.58	14.43			
30	09.06	06.53	05.07	03.38	21.33 (58)	03.14	21.39 (58)	04.28	21.51 (58)	05.59	07.25	07.53	09.26	10.06			
	16.07	20.04	21.36	23.05	21 21.54 (58)	23.38	21	22.00 (58)	22.29	20.46	18.59	16.19	14.56	14.45			
31	09.03	06.49	05.03	03.35	21.33 (58)	03.14	21.39 (58)	04.28	21.51 (58)	05.59	07.25	07.53	09.26	10.06			
	16.10	20.07	23.08	22 21.55 (58)	23.38	21	22.00 (58)	22.29	20.46	18.59	16.19	14.56	14.45				
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148					
Total, worst case					197	654	451										
Sun reduction					0,48	0,49	0,39										
Oper. time red.					0,93	0,93	0,93										
Wind dir. red.					0,63	0,63	0,63										
Total reduction					0,28	0,29	0,23										
Total, real					55	189	102										

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: L - Lomarakenus L (Harjunpaantie 215)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.01	07.32	15.40 (59)	06.46	05.03	03.32	03.14	04.33	06.05	07.28	07.59	09.30	
	14.48	16.13	17.40	23 16.03 (59)	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.53	
2	10.04	08.58	07.29	15.41 (59)	06.42	05.00	03.30	03.15	04.36	06.08	07.31	08.02	09.32	
	14.49	16.16	17.43	21 16.02 (59)	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.10	14.51	
3	10.03	08.55	07.25	15.42 (59)	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35	
	14.51	16.19	17.46	18 16.00 (59)	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.49	
4	10.02	08.52	07.22	15.45 (59)	06.35	04.53	03.25	03.19	04.42	06.13	07.37	08.08	09.37	
	14.53	16.22	17.49	13 15.58 (59)	20.19	21.48	23.19	23.34	22.13	20.29	18.46	16.03	14.48	
5	10.01	08.49	07.19		06.32	04.50	03.23	03.21	04.45	06.16	07.40	08.12	09.40	
	14.55	16.26	17.52		20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.00	14.46	
6	10.00	08.46	07.15		06.28	04.47	03.21	03.23	04.48	06.19	07.42	08.15	09.42	
	14.58	16.29	17.55		20.25	21.54	23.23	23.31	22.07	20.22	18.39	15.57	14.45	
7	09.58	08.43	07.12		06.25	04.44	03.19	03.25	04.51	06.22	07.45	08.18	09.44	
	15.00	16.32	17.58		20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43	
8	09.57	08.40	07.08		06.22	04.41	03.18	03.27	04.54	06.24	07.48	08.21	09.47	
	15.02	16.35	18.01		20.30	22.01	23.27	23.27	22.01	20.15	18.32	15.51	14.42	
9	09.55	08.37	07.05		06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.49	
	15.05	16.38	18.04		20.33	22.04	23.29	23.25	21.57	20.12	18.28	9 16.22 (59)	15.48	14.41
10	09.54	08.34	07.02		06.15	04.34	03.15	03.31	05.00	06.30	07.54	16 16.18 (59)	08.27	09.51
	15.07	16.42	18.07		20.36	22.07	23.31	23.23	21.54	20.09	18.25	16 16.34 (59)	15.45	14.40
11	09.52	08.31	06.58		06.11	04.31	03.13	03.34	05.03	06.33	07.57	16 16.16 (59)	08.30	09.53
	15.10	16.45	18.10		20.39	22.10	23.33	23.21	21.51	20.05	18.22	19 16.35 (59)	15.43	14.39
12	09.50	08.28	06.55		06.08	04.28	03.12	03.36	05.06	06.36	08.00	22 16.14 (59)	08.33	09.55
	15.12	16.48	18.13		20.42	22.13	23.34	23.18	21.47	20.02	18.18	22 16.36 (59)	15.40	14.38
13	09.48	08.24	06.51		06.04	04.25	03.11	03.39	05.09	06.38	08.02	24 16.13 (59)	08.36	09.56
	15.15	16.51	18.15		20.45	22.16	23.36	23.16	21.44	19.58	18.15	24 16.37 (59)	15.37	14.37
14	09.46	08.21	15.51 (59)	06.48	06.01	04.22	03.10	03.41	05.12	06.41	08.05	25 16.12 (59)	08.40	09.58
	15.18	16.54	4 15.55 (59)	18.18	20.48	22.19	23.37	23.14	21.41	19.55	18.12	25 16.37 (59)	15.34	14.36
15	09.44	08.18	15.46 (59)	06.44	05.57	04.19	03.09	03.44	05.15	06.44	08.08	27 16.11 (59)	08.43	09.59
	15.21	16.57	13 15.59 (59)	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	27 16.38 (59)	15.31	14.36
16	09.42	08.15	15.44 (59)	06.41	05.54	04.16	03.08	03.47	05.18	06.47	08.11	28 16.10 (59)	08.46	10.01
	15.24	17.00	18 16.02 (59)	18.24	20.54	22.25	23.40	23.09	21.34	19.48	18.05	28 16.38 (59)	15.28	14.35
17	09.40	08.12	15.42 (59)	06.38	05.51	04.12	03.07	03.49	05.21	06.49	08.14	29 16.10 (59)	08.49	10.02
	15.26	17.04	21 16.03 (59)	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.02	29 16.39 (59)	15.26	14.35
18	09.38	08.08	15.42 (59)	06.34	05.47	04.10	03.07	03.52	05.24	06.52	08.17	30 16.10 (59)	08.52	10.03
	15.29	17.07	23 16.05 (59)	18.30	21.00	22.31	23.41	23.04	21.27	19.41	17.58	28 16.38 (59)	15.23	14.35
19	09.35	08.05	15.40 (59)	06.31	05.44	04.07	03.06	03.55	05.27	06.55	08.20	30 16.09 (59)	08.55	10.04
	15.32	17.10	25 16.05 (59)	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	29 16.38 (59)	15.20	14.35
20	09.33	08.02	15.39 (59)	06.27	05.40	04.04	03.06	03.58	05.30	06.58	08.23	31 16.09 (59)	08.58	10.05
	15.35	17.13	27 16.06 (59)	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	28 16.37 (59)	15.18	14.35
21	09.30	07.59	15.39 (59)	06.24	05.37	04.01	03.06	04.01	05.33	07.00	08.26	30 16.09 (59)	09.01	10.06
	15.38	17.16	28 16.07 (59)	18.39	21.09	22.40	23.43	22.56	21.17	19.30	17.48	27 16.36 (59)	15.15	14.35
22	09.28	07.55	15.38 (59)	06.20	05.34	03.58	03.06	04.04	05.36	07.03	08.29	31 16.10 (59)	09.04	10.06
	15.41	17.19	28 16.06 (59)	18.41	21.12	22.43	23.43	22.53	21.14	19.27	17.45	26 16.36 (59)	15.13	14.36
23	09.25	07.52	15.39 (59)	06.17	05.30	03.55	03.07	04.06	05.39	07.06	08.32	30 16.11 (59)	09.07	10.07
	15.44	17.22	28 16.07 (59)	18.44	21.15	22.46	23.43	22.50	21.10	19.23	17.42	24 16.35 (59)	15.10	14.36
24	09.23	07.49	15.38 (59)	06.13	05.27	03.52	03.07	04.09	05.42	07.09	08.35	31 16.11 (59)	09.10	10.07
	15.48	17.25	29 16.07 (59)	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	23 16.34 (59)	15.08	14.37
25	09.20	07.45	15.38 (59)	06.10	05.23	03.50	03.08	04.12	05.45	07.12	07.38	30 15.13 (59)	09.13	10.07
	15.51	17.28	29 16.07 (59)	18.50	21.21	22.52	23.43	22.44	21.04	19.17	16.35	20 15.33 (59)	15.06	14.38
26	09.18	07.42	15.38 (59)	06.06	05.20	03.47	03.08	04.15	05.48	07.14	07.41	31 15.14 (59)	09.16	10.07
	15.54	17.31	28 16.06 (59)	18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32	17 15.31 (59)	15.03	14.39
27	09.15	07.39	15.38 (59)	06.03	05.17	03.44	03.09	04.18	05.50	07.17	07.44	30 15.17 (59)	09.19	10.07
	15.57	17.34	27 16.05 (59)	18.56	21.27	22.58	23.42	22.38	20.57	19.10	16.29	11 15.28 (59)	15.01	14.40
28	09.12	07.35	15.39 (59)	06.00	05.13	03.42	03.10	04.21	05.53	07.20	07.47	31 09.22	10.07	10.07
	16.00	17.37	26 16.05 (59)	18.59	21.30	23.01	23.41	22.35	20.53	19.06	16.26	14.59	14.41	14.41
29	09.09		06.56		05.10	03.39	03.11	04.24	05.56	07.23	07.50	30 09.24	10.07	10.07
	16.03		20.01		21.33	23.03	23.40	22.32	20.50	19.03	16.22	14.57	14.42	14.42
30	09.07		06.53		05.07	03.37	03.13	04.27	05.59	07.26	07.53	29 09.27	10.06	10.06
	16.07		20.04		21.36	23.06	23.39	22.29	20.47	18.59	16.19	14.55	14.44	14.44
31	09.04		06.49			03.34		04.30	06.02		07.56	30 09.27	10.06	10.06
	16.10		20.07			23.09		22.26	20.43		16.16	14.57	14.45	14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	432	204	147	
Total, worst case		354	75								432			
Sun reduction		0.33	0.32								0.35			
Oper. time red.		0.93	0.93								0.93			
Wind dir. red.		0.62	0.62								0.62			
Total reduction		0.19	0.19								0.20			
Total, real		68	14								87			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: M - Lomarakennus M (Hakala, Iso-Mottonen)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December				
1	10.05	09.01	07.32	08.23 (75)	06.46	05.03	03.31	03.13	04.33	06.05	07.28	08.07 (74)	07.59	09.30		
	14.47	16.13	17.40	22	08.45 (75)	20.10	21.39	23.11	23.38	22.23	20.40	18.56	20	09.16 (75)	16.13	14.53
2	10.04	08.58	07.29	08.23 (75)	06.42	05.00	03.29	03.15	04.36	06.07	07.31	09.03 (75)	08.02	09.33		
	14.49	16.16	17.43	23	08.46 (75)	20.13	21.42	23.14	23.37	22.20	20.36	18.52	15	09.18 (75)	16.09	14.51
3	10.03	08.55	07.25	08.22 (75)	06.39	04.57	03.27	03.17	04.39	06.10	07.34	09.01 (75)	08.05	09.35		
	14.51	16.19	17.46	24	08.46 (75)	20.16	21.45	23.16	23.36	22.17	20.33	18.49	19	09.20 (75)	16.06	14.49
4	10.02	08.52	07.22	08.22 (75)	06.35	04.53	03.25	03.18	04.42	06.13	07.37	08.59 (75)	08.08	09.38		
	14.53	16.22	17.49	25	08.47 (75)	20.19	21.48	23.19	23.34	22.14	20.29	18.45	22	09.21 (75)	16.03	14.47
5	10.01	08.49	07.19	08.21 (75)	06.32	04.50	03.23	03.20	04.45	06.16	07.39	08.58 (75)	08.12	09.40		
	14.55	16.25	17.52	25	08.46 (75)	20.22	21.51	23.21	23.33	22.10	20.26	18.42	23	09.21 (75)	16.00	14.46
6	10.00	08.46	07.15	08.21 (75)	06.28	04.47	03.21	03.22	04.48	06.19	07.42	08.58 (75)	08.15	09.42		
	14.57	16.29	17.55	25	08.46 (75)	20.25	21.54	23.23	23.31	22.07	20.22	18.39	24	09.22 (75)	15.57	14.44
7	09.59	08.43	07.12	08.21 (75)	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.57 (75)	08.18	09.45		
	14.59	16.32	17.58	24	08.45 (75)	20.27	21.58	23.26	23.29	22.04	20.19	18.35	25	09.22 (75)	15.54	14.43
8	09.57	08.40	07.08	08.21 (75)	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.56 (75)	08.21	09.47		
	15.02	16.35	18.01	23	08.44 (75)	20.30	22.01	23.28	23.27	22.01	20.15	18.32	26	09.22 (75)	15.51	14.41
9	09.56	08.37	07.05	08.22 (75)	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.56 (75)	08.24	09.49		
	15.04	16.38	18.04	22	08.44 (75)	20.33	22.04	23.30	23.25	21.57	20.12	18.28	25	09.21 (75)	15.48	14.40
10	09.54	08.34	07.02	08.22 (75)	06.14	04.34	03.14	03.31	05.00	06.30	07.54	08.56 (75)	08.27	09.51		
	15.07	16.41	18.07	20	08.42 (75)	20.36	22.07	23.31	23.23	21.54	20.08	18.25	25	09.21 (75)	15.45	14.39
11	09.52	08.31	06.58	08.23 (75)	06.11	04.31	03.13	03.33	05.03	06.33	07.57	08.56 (75)	08.30	09.53		
	15.09	16.45	18.10	18	08.41 (75)	20.39	22.10	23.33	23.21	21.51	20.05	18.22	24	09.20 (75)	15.42	14.38
12	09.50	08.28	06.55	07.29 (74)	06.08	04.28	03.11	03.36	05.06	06.35	07.59	08.57 (75)	08.33	09.55		
	15.12	16.48	18.12	19	08.38 (75)	20.42	22.13	23.35	23.19	21.48	20.02	18.18	22	09.19 (75)	15.39	14.37
13	09.48	08.24	06.51	07.26 (74)	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.57 (75)	08.37	09.56		
	15.15	16.51	18.15	17	08.34 (75)	20.45	22.16	23.36	23.16	21.44	19.58	18.15	21	09.18 (75)	15.37	14.36
14	09.46	08.21	06.48	07.24 (74)	06.01	04.21	03.09	03.41	05.12	06.41	08.05	08.58 (75)	08.40	09.58		
	15.18	16.54	18.18	15	07.39 (74)	20.48	22.19	23.38	23.14	21.41	19.55	18.11	18	09.16 (75)	15.34	14.36
15	09.44	08.18	06.44	07.23 (74)	05.57	04.18	03.08	03.44	05.15	06.44	08.08	08.59 (75)	08.43	10.00		
	15.20	16.57	18.21	17	07.40 (74)	20.51	22.22	23.39	23.12	21.38	19.51	18.08	15	09.14 (75)	15.31	14.35
16	09.42	08.15	06.41	07.22 (74)	05.54	04.15	03.07	03.46	05.18	06.47	08.11	09.02 (75)	08.46	10.01		
	15.23	17.00	18.24	18	07.40 (74)	20.54	22.25	23.40	23.09	21.34	19.48	18.05	9	09.11 (75)	15.28	14.35
17	09.40	08.12	06.37	07.22 (74)	05.50	04.12	03.07	03.49	05.21	06.49	08.14	09.01	08.49	10.02		
	15.26	17.03	18.27	19	07.41 (74)	20.57	22.28	23.41	23.07	21.31	19.44	18.04	15.25	14.35		
18	09.38	08.08	06.34	07.21 (74)	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03			
	15.29	17.06	18.30	19	07.40 (74)	21.00	22.31	23.42	23.04	21.27	19.41	17.58	15.23	14.35		
19	09.35	08.05	06.31	07.21 (74)	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.04			
	15.32	17.10	18.33	19	07.40 (74)	21.03	22.35	23.42	23.01	21.24	19.37	17.55	15.20	14.35		
20	09.33	08.02	06.27	07.21 (74)	05.40	04.03	03.06	03.57	05.30	06.58	08.23	08.58	10.05			
	15.35	17.13	18.36	18	07.39 (74)	21.06	22.38	23.43	22.59	21.21	19.34	8	08.19 (74)	17.51	15.18	14.35
21	09.31	07.59	06.24	07.22 (74)	05.37	04.00	03.06	04.00	05.33	07.00	08.26	08.08 (74)	08.26	09.01	10.06	
	15.38	17.16	18.38	16	07.38 (74)	21.09	22.41	23.43	22.56	21.17	19.30	13	08.21 (74)	17.48	15.15	14.35
22	09.28	07.55	06.20	07.22 (74)	05.33	03.58	03.06	04.03	05.36	07.03	08.29	08.07 (74)	08.29	09.04	10.07	
	15.41	17.19	18.41	14	07.36 (74)	21.12	22.43	23.43	22.53	21.14	19.27	16	08.23 (74)	17.45	15.12	14.35
23	09.26	07.52	06.17	07.24 (74)	05.30	03.55	03.06	04.06	05.39	07.06	08.32	08.06 (74)	08.32	09.07	10.07	
	15.44	17.22	18.44	10	07.34 (74)	21.15	22.46	23.43	22.50	21.11	19.23	18	08.24 (74)	17.42	15.10	14.36
24	09.23	07.49	06.13		05.27	03.52	03.06	04.09	05.42	07.09	08.35	08.04 (74)	08.35	09.10	10.07	
	15.47	17.25	18.47		21.18	22.49	23.43	22.47	21.07	19.20	19	08.23 (74)	17.38	15.08	14.37	
25	09.20	07.45	06.10	08.35 (75)	06.10	05.23	03.49	04.12	05.44	07.11	08.35	08.04 (74)	07.38	09.13	10.08	
	15.50	17.28	1	08.36 (75)	18.50	21.21	22.52	23.43	22.44	21.04	19.16	19	08.23 (74)	16.35	15.05	14.37
26	09.18	07.42	06.06	08.29 (75)	06.06	05.20	03.46	03.08	04.15	05.47	07.14	08.04 (74)	07.41	09.16	10.08	
	15.54	17.31	12	08.41 (75)	18.53	21.24	22.55	23.43	22.41	21.00	19.13	19	08.23 (74)	16.32	15.03	14.38
27	09.15	07.39	06.03	08.26 (75)	06.03	05.16	03.44	03.09	04.18	05.50	07.17	08.04 (74)	07.44	09.19	10.08	
	15.57	17.34	16	08.42 (75)	18.56	21.27	22.58	23.42	22.38	20.57	19.10	18	08.22 (74)	16.29	15.01	14.39
28	09.12	07.35	06.05	08.25 (75)	05.59	05.13	03.41	03.10	04.21	05.53	07.20	08.04 (74)	07.47	09.22	10.07	
	16.00	17.37	19	08.44 (75)	18.59	21.30	23.01	23.41	22.35	20.53	19.06	18	08.22 (74)	16.25	14.59	14.41
29	09.09		06.56		05.10	03.39	03.11	04.24	05.56	07.23	08.04 (74)	07.50	09.24	10.07		
	16.03		20.01		21.33	23.04	23.40	22.32	20.50	19.03	16	08.20 (74)	16.22	14.57	14.42	
30	09.07		06.53		05.06	03.36	03.12	04.27	05.59	07.25	08.05 (74)	07.53	09.27	10.07		
	16.06		20.04		21.36	23.06	23.39	22.29	20.47	18.59	13	08.18 (74)	16.19	14.55	14.43	
31	09.04		06.49		03.34	03.34	04.30	06.02	07.30	08.02	07.56		10.06			
	16.09		20.07		23.09	23.09	22.26	20.43			16.16		14.45			
Potential sun hours	178	241	363		448	562	611	599	504	392		307		204	147	
Total, worst case																
Sun reduction		48		452						177		333				
Oper. time red.		0,33		0,32						0,33		0,35				
Wind dir. red.		0,93		0,93						0,93		0,93				
Total reduction		0,64		0,62						0,60		0,64				
Total, real		0,20		0,19						0,19		0,21				
		9		85						33		69				

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: N - Lomarakennus N (Hautakoski)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.32	06.45	05.03	03.32	03.14	04.33	06.04	07.28	07.59	09.29
	14.47	16.13	17.40	20.10	21.39	23.11	23.37	22.22	20.39	18.56	16.13	14.53
2	10.04	08.58	07.28	06.42	05.00	03.30	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.34
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.19	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.48
5	10.00	08.49	07.18	06.32	04.50	03.23	03.21	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.23	04.48	06.19	07.42	08.14	09.42
	14.57	16.29	17.55	20.24	21.54	23.22	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.44	03.19	03.25	04.51	06.21	07.45	08.17	09.44
	15.00	16.32	17.58	20.27	21.57	23.25	23.28	22.03	20.19	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.18	03.27	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.48
	15.05	16.38	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.28	15.48	14.41
10	09.53	08.33	07.01	06.14	04.34	03.15	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.30	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.34	05.03	06.32	07.56	08.30	09.52
	15.10	16.45	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.28	03.12	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.48	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.38
13	09.48	08.24	06.51	06.04	04.25	03.11	03.39	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.10	03.41	05.12	06.41	08.05	08.39	09.57
	15.18	16.54	18.18	20.48	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.09	03.44	05.15	06.44	08.08	08.42	09.59
	15.21	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.36
16	09.41	08.14	06.41	05.54	04.15	03.08	03.47	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.05	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.26	14.35
18	09.37	08.08	06.34	05.47	04.09	03.07	03.52	05.24	06.52	08.17	08.51	10.02
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.03
	15.32	17.10	18.32	21.02	22.34	23.41	23.00	21.24	19.37	17.55	15.20	14.35
20	09.32	08.02	06.27	05.40	04.04	03.06	03.58	05.30	06.57	08.22	08.58	10.04
	15.35	17.13	18.35	21.05	22.37	23.42	22.58	21.20	19.34	17.51	15.18	14.35
21	09.30	07.58	06.23	05.37	04.01	03.06	04.01	05.33	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.27	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.42	22.52	21.13	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.55	03.07	04.06	05.39	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.42	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.27	03.52	03.07	04.09	05.42	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.08	04.12	05.44	07.11	07.37	09.12	10.07
	15.51	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.06	14.38
26	09.17	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.54	17.31	18.53	21.23	22.54	23.42	22.41	21.00	19.13	16.32	15.03	14.39
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.40
28	09.12	07.35	05.59	05.13	03.42	03.10	04.21	05.53	07.20	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.06
	16.03		20.01	21.32	23.03	23.39	22.32	20.50	19.02	16.22	14.57	14.42
30	09.06		06.52	05.06	03.37	03.13	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.35	23.05	23.38	22.29	20.46	18.59	16.19	14.55	14.44
31	09.03		06.49		03.34		04.30	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapaisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: O - Lomarakenus O (Harijnpaantie 398  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.01	07.32	06.46	05.03	20.19 (59)	03.32	03.14	04.33	06.05	07.28	07.59	09.29	
	14.48	16.13	17.40	20.10	21.39	20.40 (59)	23.11	23.38	22.23	20.40	18.56	16.13	14.53	
2	10.04	08.58	07.29	06.42	05.00	20.20 (59)	03.30	03.16	04.36	06.08	07.31	08.02	09.32	
	14.49	16.16	17.43	20.13	21.42	19 20.39 (59)	23.13	23.36	22.20	20.36	18.52	16.10	14.51	
3	10.03	08.55	07.25	06.39	04.57	20.20 (59)	03.28	03.17	04.39	06.10	07.34	08.05	09.35	
	14.51	16.19	17.46	20.16	21.45	19 20.39 (59)	23.16	23.35	22.16	20.33	18.49	16.07	14.49	
4	10.02	08.52	07.22	06.35	04.54	20.20 (59)	03.26	03.19	04.42	06.13	07.37	08.08	09.37	
	14.53	16.23	17.49	20.19	21.48	18 20.38 (59)	23.18	23.34	22.13	20.29	18.45	16.04	14.48	
5	10.01	08.49	07.18	06.32	04.50	20.22 (59)	03.23	03.21	04.45	20.36 (59)	06.16	07.39	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	16 20.38 (59)	23.21	23.32	22.10	6 20.42 (59)	20.26	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	20.23 (59)	03.22	03.23	04.48	20.34 (59)	06.19	07.42	08.14	09.42
	14.58	16.29	17.55	20.24	21.54	13 20.36 (59)	23.23	23.30	22.07	11 20.45 (59)	20.22	18.39	15.57	14.45
7	09.58	08.43	07.12	06.25	04.44	20.25 (59)	03.20	03.25	04.51	20.32 (59)	06.22	07.45	08.18	09.44
	15.00	16.32	17.58	20.27	21.57	9 20.34 (59)	23.25	23.28	22.04	14 20.46 (59)	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.41	20.28 (59)	03.18	03.27	04.54	20.31 (59)	06.24	07.48	08.21	09.46
	15.02	16.35	18.01	20.30	22.00	2 20.30 (59)	23.27	23.27	22.00	16 20.47 (59)	20.15	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37		03.16	03.29	04.57	20.29 (59)	06.27	07.51	08.24	09.48
	15.05	16.38	18.04	20.33	22.03		23.29	23.25	21.57	18 20.47 (59)	20.12	18.28	15.48	14.41
10	09.53	08.34	07.01	06.15	04.34		03.15	03.32	05.00	20.29 (59)	06.30	07.54	08.27	09.51
	15.07	16.42	18.07	20.36	22.07		23.31	23.23	21.54	19 20.48 (59)	20.08	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31		03.13	03.34	05.03	20.29 (59)	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10		23.32	23.20	21.51	20 20.49 (59)	20.05	18.22	15.43	14.39
12	09.50	08.27	06.55	06.08	04.28		03.12	03.37	05.06	20.28 (59)	06.36	07.59	08.33	09.54
	15.13	16.48	18.13	20.42	22.13		23.34	23.18	21.47	20 20.48 (59)	20.01	18.18	15.40	14.38
13	09.48	08.24	06.51	06.04	04.25		03.11	03.39	05.09	20.28 (59)	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16		23.36	23.16	21.44	21 20.49 (59)	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22		03.10	03.42	05.12	20.28 (59)	06.41	08.05	08.39	09.58
	15.18	16.54	18.18	20.48	22.19		23.37	23.13	21.41	21 20.49 (59)	19.55	18.12	15.34	14.36
15	09.44	08.18	06.44	05.57	04.19		03.09	03.44	05.15	20.27 (59)	06.44	08.08	08.42	09.59
	15.21	16.57	18.21	20.51	22.22		23.38	23.11	21.37	21 20.48 (59)	19.51	18.08	15.31	14.36
16	09.42	08.15	06.41	05.54	04.16		03.08	03.47	05.18	20.28 (59)	06.47	08.11	08.46	10.00
	15.24	17.00	18.24	20.54	22.25		23.39	23.09	21.34	19 20.47 (59)	19.48	18.05	15.29	14.36
17	09.40	08.12	06.37	05.51	04.13		03.07	03.50	05.21	20.29 (59)	06.49	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28		23.40	23.06	21.31	18 20.47 (59)	19.44	18.02	15.26	14.35
18	09.37	08.08	06.34	05.47	04.10		03.07	03.52	05.24	20.29 (59)	06.52	08.17	08.52	10.03
	15.29	17.07	18.30	21.00	22.31		23.41	23.03	21.27	16 20.45 (59)	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.07		03.07	03.55	05.27	20.30 (59)	06.55	08.20	08.55	10.04
	15.32	17.10	18.33	21.03	22.34		23.42	23.01	21.24	14 20.44 (59)	19.37	17.55	15.21	14.35
20	09.33	08.02	06.27	05.40	04.04		03.06	03.58	05.30	20.31 (59)	06.58	08.23	08.58	10.05
	15.35	17.13	18.36	21.06	22.37		23.42	22.58	21.21	9 20.40 (59)	19.34	17.52	15.18	14.35
21	09.30	07.59	06.24	05.37	04.01		03.06	04.01	05.33	20.34 (59)	07.00	08.26	09.01	10.05
	15.38	17.16	18.38	21.09	22.40		23.42	22.55	21.17	3 20.37 (59)	19.30	17.48	15.15	14.36
22	09.28	07.55	06.20	05.34	20.29 (59)	03.58	03.07	04.04	05.36		07.03	08.29	09.04	10.06
	15.41	17.19	18.41	21.12	4 20.33 (59)	22.43	23.43	22.52	21.14		19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	20.25 (59)	03.55	03.07	04.07	05.39		07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	10 20.35 (59)	22.46	23.43	22.50	21.10		19.23	17.42	15.10	14.37
24	09.23	07.49	06.13	05.27	20.23 (59)	03.52	03.07	04.09	05.42		07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	15 20.38 (59)	22.49	23.43	22.47	21.07		19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	20.22 (59)	03.50	03.08	04.12	05.45		07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	17 20.39 (59)	22.52	23.42	22.44	21.04		19.16	16.35	15.06	14.38
26	09.17	07.42	06.06	05.20	20.21 (59)	03.47	03.08	04.15	05.48		07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	19 20.40 (59)	22.55	23.42	22.41	21.00		19.13	16.32	15.03	14.39
27	09.15	07.39	06.03	05.17	20.20 (59)	03.44	03.09	04.18	05.50		07.17	07.44	09.18	10.07
	15.57	17.34	18.56	21.27	20 20.40 (59)	22.57	23.41	22.38	20.57		19.10	16.29	15.01	14.40
28	09.12	07.35	06.00	05.13	20.20 (59)	03.42	03.10	04.21	05.53		07.20	07.47	09.21	10.07
	16.00	17.37	18.59	21.30	20 20.40 (59)	23.00	23.41	22.35	20.53		19.06	16.26	14.59	14.41
29	09.09		06.56	05.10	20.20 (59)	03.39	03.11	04.24	05.56		07.23	07.50	09.24	10.07
	16.03		20.01	21.33	20 20.40 (59)	23.03	23.40	22.32	20.50		19.03	16.22	14.57	14.43
30	09.06		06.53	05.07	20.19 (59)	03.37	03.13	04.27	05.59		07.25	07.53	09.27	10.06
	16.07		20.04	21.36	21 20.40 (59)	23.06	23.39	22.29	20.46		18.59	16.19	14.55	14.44
31	09.04		06.49		03.34		04.30	06.02			07.56		10.06	
	16.10		20.07		23.08		22.26	20.43			16.16		14.46	
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147		
Total, worst case				146	117		266							
Sun reduction				0.41	0.48		0.32							
Oper. time red.				0.93	0.93		0.93							
Wind dir. red.				0.63	0.63		0.63							
Total reduction				0.24	0.28		0.18							
Total, real				35	33		49							

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: P - Asuinrakennus P (Hautakoskentie 135)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05	09.01	07.32	06.46	07.38 (75)	05.03	03.32	03.14	04.33	06.05	07.28	07.59	09.30
	14.47	16.13	17.40	20.10	19 07.57 (75)	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	07.38 (75)	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.33
	14.49	16.16	17.43	20.13	17 07.55 (75)	21.42	23.14	23.37	22.20	20.36	18.52	16.10	14.51
3	10.03	08.55	07.25	06.39	07.39 (75)	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	15 07.54 (75)	21.45	23.16	23.36	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	07.41 (75)	04.53	03.25	03.19	04.42	06.13	07.37	08.08	09.38
	14.53	16.22	17.49	20.19	12 07.53 (75)	21.48	23.19	23.34	22.14	20.29	18.45	16.03	14.47
5	10.01	08.49	07.19	06.32	07.43 (75)	04.50	03.23	03.20	04.45	06.16	07.40	08.12	09.40
	14.55	16.26	17.52	20.22	6 07.49 (75)	21.51	23.21	23.33	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.19	07.42	08.15	09.42	11.10
	14.57	16.29	17.55	20.25	21.54	23.23	23.31	22.07	20.22	18.39	15.57	14.44	13.32
7	09.59	08.43	07.12	06.25	04.44	03.19	03.24	04.51	06.22	07.38 (75)	07.45	08.18	09.45
	15.00	16.32	17.58	20.27	21.58	23.26	23.29	22.04	20.19	6 07.44 (75)	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.27	04.54	06.24	07.35 (75)	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.01	23.28	23.27	22.01	20.15	12 07.47 (75)	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.34 (75)	07.51	08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.30	23.25	21.57	20.12	15 07.49 (75)	18.28	15.48	14.40
10	09.54	08.34	07.02	06.15	04.34	03.14	03.31	05.00	06.30	07.32 (75)	07.54	08.27	09.51
	15.07	16.41	18.07	20.36	22.07	23.31	23.23	21.54	20.09	17 07.49 (75)	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.34	05.03	06.33	07.31 (75)	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18 07.49 (75)	18.22	15.42	14.38
12	09.50	08.28	06.55	06.08	04.28	03.11	03.36	05.06	06.35	07.30 (75)	08.00	08.33	09.55
	15.12	16.48	18.13	20.42	22.13	23.35	23.19	21.48	20.02	19 07.49 (75)	18.18	15.40	14.37
13	09.48	08.24	06.51	06.04	04.25	03.10	03.39	05.09	06.38	07.29 (75)	08.02	08.37	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	20 07.49 (75)	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	07.29 (75)	08.05	08.40	09.58
	15.18	16.54	18.18	20.48	22.19	23.38	23.14	21.41	19.55	19 07.48 (75)	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.44	07.30 (75)	08.08	08.43	10.00
	15.20	16.57	18.21	20.51	22.22	23.39	23.12	21.38	19.51	18 07.48 (75)	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.08	03.46	05.18	06.47	07.29 (75)	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.48	17 07.46 (75)	18.05	15.28	14.35
17	09.40	08.12	06.38	05.50	04.12	03.07	03.49	05.21	06.49	07.30 (75)	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	15 07.45 (75)	18.01	15.26	14.35
18	09.38	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	07.32 (75)	08.17	08.52	10.03
	15.29	17.07	18.30	21.00	22.31	23.42	23.04	21.27	19.41	11 07.43 (75)	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.06	03.06	03.55	05.27	06.55	07.35 (75)	08.20	08.55	10.04
	15.32	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	5 07.40 (75)	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	03.06	03.58	05.30	06.58	07.30 (75)	08.23	08.58	10.05
	15.35	17.13	18.36	21.06	22.38	23.43	22.58	21.21	19.34	07.30 (75)	17.51	15.18	14.35
21	09.31	07.59	06.24	05.37	04.00	03.06	04.00	05.33	07.00	07.29 (75)	08.26	09.01	10.06
	15.38	17.16	18.39	21.09	22.40	23.43	22.56	21.17	19.30	07.29 (75)	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	07.28 (75)	08.29	09.04	10.07
	15.41	17.19	18.41	21.12	22.43	23.43	22.53	21.14	19.27	07.27 (75)	17.45	15.13	14.36
23	09.26	07.52	06.17	05.30	03.55	03.06	04.06	05.39	07.06	07.26 (75)	08.32	09.07	10.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.23	07.25 (75)	17.42	15.10	14.36
24	09.23	07.49	06.13	05.27	03.52	03.07	04.09	05.42	07.09	07.24 (75)	08.35	09.10	10.07
	15.47	17.25	18.47	1 06.49 (75)	22.49	23.43	22.47	21.07	19.20	07.23 (75)	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.45	07.12	07.22 (75)	08.38	09.13	10.08
	15.51	17.28	18.50	10 06.45 (75)	22.52	23.43	22.44	21.04	19.16	07.21 (75)	17.35	15.05	14.38
26	09.18	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.20 (75)	08.41	09.16	10.08
	15.54	17.31	18.53	14 06.42 (75)	22.55	23.43	22.41	21.00	19.13	07.19 (75)	17.32	15.03	14.38
27	09.15	07.39	06.03	05.17	03.44	03.09	04.18	05.50	07.17	07.18 (75)	08.44	09.19	10.08
	15.57	17.34	18.56	16 06.41 (75)	22.58	23.42	22.38	20.57	19.10	07.17 (75)	17.29	15.01	14.40
28	09.12	07.35	06.00	05.13	03.41	03.10	04.21	05.53	07.20	07.16 (75)	08.47	09.22	10.07
	16.00	17.37	18.59	18 06.40 (75)	23.01	23.41	22.35	20.53	19.06	07.15 (75)	17.25	14.59	14.41
29	09.09	07.32	05.57	05.10	03.39	03.11	04.24	05.56	07.23	07.14 (75)	08.50	09.24	10.07
	16.03	17.40	19.01	19 06.38 (75)	23.03	23.40	22.32	20.50	19.03	07.13 (75)	17.22	14.57	14.42
30	09.07	07.28	05.53	05.07	03.36	03.12	04.27	05.59	07.25	07.12 (75)	08.53	09.27	10.07
	16.06	17.43	19.04	19 06.36 (75)	23.06	23.39	22.29	20.47	18.59	07.11 (75)	17.19	14.55	14.44
31	09.04	07.24	05.49	05.04	03.34	03.09	04.30	06.02	07.28	07.10 (75)	08.56	09.30	10.06
	16.10	17.49	19.10	19 06.34 (75)	23.09	23.39	22.26	20.43	18.59	07.09 (75)	17.16	14.53	14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147	100
Total, worst case			116	69					192				
Sun reduction			0.32	0.41					0.33				
Oper. time red.			0.93	0.93					0.93				
Wind dir. red.			0.61	0.61					0.61				
Total reduction			0.18	0.24					0.19				
Total, real			21	16					36				

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: Q - Lomarakenus Q (Lemmistonrannantie)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.02	03.31	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.28	03.14	04.35	06.07	07.31	08.02	09.32
	14.48	16.15	17.42	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.16	04.38	06.10	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.35	04.53	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.22	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.17	09.45
	14.59	16.31	17.57	20.27	21.57	23.26	23.29	22.04	20.18	18.35	15.53	14.42
8	09.57	08.40	07.08	06.21	04.40	03.16	03.25	04.53	06.24	07.48	08.21	09.47
	15.01	16.34	18.00	20.30	22.00	23.28	23.27	22.00	20.15	18.31	15.50	14.41
9	09.55	08.37	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.24	09.49
	15.03	16.38	18.03	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.47	14.39
10	09.54	08.34	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.24	15.45	14.38
11	09.52	08.30	06.58	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.55
	15.11	16.47	18.12	20.42	22.13	23.35	23.19	21.47	20.01	18.18	15.39	14.36
13	09.48	08.24	06.51	06.04	04.24	03.09	03.37	05.08	06.38	08.02	08.36	09.56
	15.14	16.50	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.48	22.19	23.38	23.14	21.41	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.57	04.17	03.07	03.43	05.14	06.43	08.08	08.42	09.59
	15.20	16.56	18.21	20.50	22.22	23.39	23.12	21.37	19.51	18.07	15.30	14.34
16	09.42	08.15	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.01
	15.22	17.00	18.24	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.14	08.49	10.02
	15.25	17.03	18.26	20.56	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.38	08.08	06.34	05.46	04.08	03.05	03.51	05.23	06.52	08.17	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.34
19	09.35	08.05	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.02	06.27	05.40	04.02	03.05	03.57	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.56	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.33	03.57	03.05	04.02	05.35	07.03	08.28	09.04	10.07
	15.40	17.18	18.41	21.11	22.43	23.44	22.53	21.14	19.26	17.44	15.12	14.34
23	09.25	07.52	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.44	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.47	17.24	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.08
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.05	14.36
26	09.17	07.42	06.06	05.19	03.46	03.07	04.14	05.47	07.14	07.40	09.16	10.08
	15.53	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.16	03.43	03.07	04.17	05.50	07.17	07.43	09.19	10.08
	15.56	17.33	18.55	21.27	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.47	09.22	10.07
	15.59	17.36	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.50	09.24	10.07
	16.02		20.01	21.33	23.03	23.41	22.32	20.50	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.53	09.27	10.07
	16.06		20.04	21.36	23.06	23.40	22.29	20.46	18.59	16.18	14.54	14.42
31	09.04		06.49		03.33		04.29	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: R - Lomarakennus R (Peuraneva,Valvatintie)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	12.43 (53)	07.32	06.45	05.03
	14.46	16.12	21 13.04 (53)	17.40	20.10	21.39
2	10.04	08.58	12.45 (53)	07.28	06.42	04.59
	14.48	16.15	18 13.03 (53)	17.43	20.13	21.42
3	10.03	08.55	12.46 (53)	07.25	06.38	04.56
	14.50	16.18	16 13.02 (53)	17.46	20.16	21.45
4	10.02	08.52	12.50 (53)	07.22	06.35	04.53
	14.52	16.22	10 13.00 (53)	17.49	20.18	21.48
5	10.01	08.49		07.18	06.31	04.49
	14.54	16.25		17.51	20.21	21.51
6	10.00	08.46		07.15	06.28	04.46
	14.56	16.28		17.54	20.24	21.54
7	09.59	08.43		07.11	06.24	04.43
	14.59	16.31		17.57	20.27	21.57
8	09.57	12.43 (53)	08.40	07.08	06.21	04.40
	15.01	6 12.49 (53)	16.34	18.00	20.30	22.01
9	09.55	12.42 (53)	08.37	07.05	06.17	04.36
	15.04	10 12.52 (53)	16.38	18.03	20.33	22.04
10	09.54	12.41 (53)	08.34	07.01	06.14	04.33
	15.06	13 12.54 (53)	16.41	18.06	20.36	22.07
11	09.52	12.40 (53)	08.31	06.58	06.11	04.30
	15.09	15 12.55 (53)	16.44	18.09	20.39	22.10
12	09.50	12.40 (53)	08.27	15.50 (55)	06.54	06.07
	15.11	17 12.57 (53)	16.47	11 16.01 (55)	18.12	20.42
13	09.48	12.39 (53)	08.24	15.48 (55)	06.51	06.04
	15.14	19 12.58 (53)	16.50	15 16.03 (55)	18.15	20.45
14	09.46	12.39 (53)	08.21	15.47 (55)	06.47	06.00
	15.17	20 12.59 (53)	16.53	18 16.05 (55)	18.18	20.48
15	09.44	12.39 (53)	08.18	15.46 (55)	06.44	05.57
	15.20	21 13.00 (53)	16.57	19 16.05 (55)	18.21	20.51
16	09.42	12.38 (53)	08.15	15.46 (55)	06.41	05.53
	15.23	23 13.01 (53)	17.00	20 16.06 (55)	18.24	20.54
17	09.40	12.39 (53)	08.11	15.45 (55)	06.37	05.50
	15.25	23 13.02 (53)	17.03	21 16.06 (55)	18.27	20.57
18	09.38	12.38 (53)	08.08	15.44 (55)	06.34	05.46
	15.28	25 13.03 (53)	17.06	22 16.06 (55)	18.29	20.59
19	09.35	12.38 (53)	08.05	15.44 (55)	06.30	05.43
	15.31	25 13.03 (53)	17.09	23 16.07 (55)	18.32	21.02
20	09.33	12.38 (53)	08.02	15.44 (55)	06.27	05.40
	15.34	26 13.04 (53)	17.12	22 16.06 (55)	18.35	21.05
21	09.30	12.38 (53)	07.58	15.45 (55)	06.23	05.36
	15.37	26 13.04 (53)	17.15	21 16.06 (55)	18.38	21.08
22	09.28	12.39 (53)	07.55	15.45 (55)	06.20	05.33
	15.40	26 13.05 (53)	17.18	20 16.05 (55)	18.41	21.11
23	09.25	12.39 (53)	07.52	15.45 (55)	06.16	05.29
	15.44	26 13.05 (53)	17.21	19 16.04 (55)	18.44	21.14
24	09.23	12.38 (53)	07.48	15.46 (55)	06.13	05.26
	15.47	27 13.05 (53)	17.24	18 16.04 (55)	18.47	21.17
25	09.20	12.39 (53)	07.45	15.48 (55)	06.09	05.23
	15.50	27 13.06 (53)	17.27	14 16.02 (55)	18.50	21.21
26	09.18	12.39 (53)	07.42	15.51 (55)	06.06	05.19
	15.53	27 13.06 (53)	17.31	8 15.59 (55)	18.52	21.24
27	09.15	12.40 (53)	07.38		06.03	05.16
	15.56	27 13.07 (53)	17.34		18.55	21.27
28	09.12	12.40 (53)	07.35		05.59	05.13
	15.59	26 13.06 (53)	17.37		18.58	21.30
29	09.09	12.41 (53)			06.56	05.09
	16.02	25 13.06 (53)			20.01	21.33
30	09.07	12.42 (53)			06.52	05.06
	16.06	24 13.06 (53)			20.04	21.36
31	09.04	12.42 (53)			06.49	05.03
	16.09	23 13.05 (53)			20.07	23.09
Potential sun hours	178	241	363	449	563	611
Total, worst case	527		336			
Sun reduction	0,18		0,33			
Oper. time red.	0,93		0,93			
Wind dir. red.	0,67		0,63			
Total reduction	0,11		0,20			
Total, real	59		66			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: R - Lomarakenus R (Peuraneva,Valvatintie)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.13	04.32	06.04	07.28	07.59	09.30
	23.38	22.23	20.39	18.55	16.12	14.52
2	03.14	04.35	06.07	07.31	08.02	09.32
	23.37	22.20	20.36	18.52	16.09	14.50
3	03.16	04.38	06.10	07.33	08.05	09.35
	23.36	22.17	20.32	18.48	16.06	14.48
4	03.17	04.41	06.13	07.36	08.08	09.38
	23.34	22.13	20.29	18.45	16.03	14.47
5	03.19	04.44	06.15	07.39	08.11	09.40
	23.33	22.10	20.26	18.42	16.00	14.45
6	03.21	04.48	06.18	07.42	08.14	09.42
	23.31	22.07	20.22	18.38	15.57	14.43
7	03.23	04.51	06.21	07.45	08.18	12.19 (53)
	23.29	22.04	20.19	18.35	15.54	11 12.30 (53)
8	03.26	04.54	06.24	07.48	08.21	12.17 (53)
	23.27	22.00	20.15	18.31	15.51	15 12.32 (53)
9	03.28	04.57	06.27	07.51	08.24	12.16 (53)
	23.25	21.57	20.12	18.28	15.48	18 12.34 (53)
10	03.30	05.00	06.29	07.53	08.27	12.15 (53)
	23.23	21.54	20.08	18.25	15.45	21 12.36 (53)
11	03.33	05.03	06.32	07.56	08.30	12.14 (53)
	23.21	21.51	20.05	18.21	15.42	23 12.37 (53)
12	03.35	05.06	06.35	07.59	08.33	12.13 (53)
	23.19	21.47	20.01	18.18	15.39	24 12.37 (53)
13	03.38	05.09	06.38	08.02	08.36	12.12 (53)
	23.16	21.44	19.58	18.14	15.36	25 12.37 (53)
14	03.40	05.12	06.41	08.05	08.39	12.12 (53)
	23.14	21.41	19.54	18.11	15.33	26 12.38 (53)
15	03.43	05.15	06.43	08.08	08.43	12.12 (53)
	23.12	21.37	19.51	18.08	15.30	26 12.38 (53)
16	03.46	05.18	06.46	08.11	16.21 (55)	08.46
	23.09	21.34	19.47	18.04	11 16.32 (55)	15.28
17	03.48	05.21	06.49	08.14	16.19 (55)	08.49
	23.06	21.31	19.44	18.01	15 16.34 (55)	15.25
18	03.51	05.23	06.52	08.17	16.17 (55)	08.52
	23.04	21.27	19.40	17.58	18 16.35 (55)	15.22
19	03.54	05.26	06.54	08.20	16.16 (55)	08.55
	23.01	21.24	19.37	17.54	20 16.36 (55)	15.20
20	03.57	05.29	06.57	08.23	16.15 (55)	08.58
	22.58	21.20	19.33	17.51	21 16.36 (55)	15.17
21	04.00	05.32	07.00	08.26	16.14 (55)	09.01
	22.56	21.17	19.30	17.48	22 16.36 (55)	15.14
22	04.02	05.35	07.03	08.29	16.15 (55)	09.04
	22.53	21.14	19.26	17.44	22 16.37 (55)	15.12
23	04.05	05.38	07.06	08.31	16.14 (55)	09.07
	22.50	21.10	19.23	17.41	23 16.37 (55)	15.09
24	04.08	05.41	07.08	08.35	16.14 (55)	09.10
	22.47	21.07	19.20	17.38	22 16.36 (55)	15.07
25	04.11	05.44	07.11	07.38	15.15 (55)	09.13
	22.44	21.03	19.16	16.35	21 15.36 (55)	15.05
26	04.14	05.47	07.14	07.41	15.15 (55)	09.16
	22.41	21.00	19.13	16.31	20 15.35 (55)	15.02
27	04.17	05.50	07.17	07.44	15.16 (55)	09.19
	22.38	20.57	19.09	16.28	19 15.35 (55)	15.00
28	04.20	05.53	07.19	07.47	15.17 (55)	09.22
	22.35	20.53	19.06	16.25	16 15.33 (55)	14.58
29	04.23	05.55	07.22	07.50	15.17 (55)	09.24
	22.32	20.50	19.02	16.22	14 15.31 (55)	14.56
30	04.26	05.58	07.25	07.53	15.20 (55)	09.27
	22.29	20.46	18.59	16.18	9 15.29 (55)	14.54
31	04.29	06.01		07.56		
	22.26	20.43		16.15		
Potential sun hours	599	504	392	307	203	146
Total, worst case				273	547	44
Sun reduction				0,35	0,23	0,20
Oper. time red.				0,93	0,93	0,93
Wind dir. red.				0,62	0,67	0,67
Total reduction				0,20	0,15	0,13
Total, real				55	80	6

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset Shadow receptor: S - Lomarakennus S (Talonpaikantie 141)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.02	03.31	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.28	03.14	04.35	06.07	07.31	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.16	04.38	06.10	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.35	04.53	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.22	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.35	15.53	14.42
8	09.57	08.40	07.08	06.21	04.40	03.16	03.26	04.53	06.24	07.47	08.20	09.47
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.41
9	09.55	08.37	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.24	15.45	14.38
11	09.52	08.30	06.58	06.10	04.30	03.12	03.33	05.02	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.04	18.21	15.42	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.42	22.13	23.35	23.18	21.47	20.01	18.18	15.39	14.36
13	09.48	08.24	06.51	06.04	04.24	03.09	03.38	05.08	06.38	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.57	04.18	03.07	03.43	05.14	06.43	08.08	08.42	09.59
	15.20	16.56	18.21	20.50	22.22	23.39	23.11	21.37	19.51	18.07	15.30	14.35
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.45	10.01
	15.22	17.00	18.24	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.14	08.49	10.02
	15.25	17.03	18.26	20.56	22.28	23.41	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.34
19	09.35	08.05	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.01	06.27	05.40	04.03	03.05	03.57	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.33	03.57	03.05	04.02	05.35	07.03	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.53	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.47	17.24	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.07	04.14	05.47	07.14	07.40	09.16	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.38
27	09.15	07.38	06.02	05.16	03.43	03.08	04.17	05.50	07.16	07.43	09.19	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.39
28	09.12	07.35	05.59	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.18	14.54	14.43
31	09.03		06.48		03.33		04.29	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: T - Lomarakenus T (Ruipontie)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.06	09.01	07.32	06.45	05.02	03.30	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.12	23.39	22.23	20.40	18.55	16.12	14.52
2	10.05	08.58	07.28	06.42	04.59	03.28	03.13	04.35	06.07	07.31	08.02	09.33
	14.48	16.15	17.42	20.13	21.42	23.15	23.38	22.20	20.36	18.52	16.09	14.50
3	10.04	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.10	07.34	08.05	09.36
	14.50	16.18	17.45	20.16	21.45	23.17	23.37	22.17	20.33	18.48	16.06	14.48
4	10.03	08.52	07.22	06.35	04.52	03.23	03.17	04.41	06.12	07.36	08.09	09.38
	14.52	16.21	17.48	20.19	21.48	23.20	23.35	22.14	20.29	18.45	16.03	14.46
5	10.02	08.49	07.18	06.31	04.49	03.21	03.19	04.44	06.15	07.39	08.12	09.41
	14.54	16.25	17.51	20.21	21.52	23.22	23.33	22.11	20.26	18.42	15.59	14.45
6	10.00	08.46	07.15	06.28	04.46	03.19	03.21	04.47	06.18	07.42	08.15	09.43
	14.56	16.28	17.54	20.24	21.55	23.24	23.32	22.07	20.22	18.38	15.56	14.43
7	09.59	08.43	07.12	06.24	04.43	03.18	03.23	04.50	06.21	07.45	08.18	09.45
	14.58	16.31	17.57	20.27	21.58	23.26	23.30	22.04	20.19	18.35	15.53	14.42
8	09.58	08.40	07.08	06.21	04.39	03.16	03.25	04.53	06.24	07.48	08.21	09.47
	15.01	16.34	18.00	20.30	22.01	23.28	23.28	22.01	20.15	18.31	15.50	14.40
9	09.56	08.37	07.05	06.17	04.36	03.14	03.27	04.56	06.27	07.51	08.24	09.50
	15.03	16.37	18.03	20.33	22.04	23.30	23.26	21.58	20.12	18.28	15.47	14.39
10	09.54	08.34	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.54	08.27	09.52
	15.06	16.41	18.06	20.36	22.07	23.32	23.24	21.54	20.08	18.24	15.44	14.38
11	09.53	08.31	06.58	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.54
	15.08	16.44	18.09	20.39	22.10	23.34	23.22	21.51	20.05	18.21	15.41	14.37
12	09.51	08.28	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.34	09.55
	15.11	16.47	18.12	20.42	22.13	23.36	23.19	21.48	20.01	18.18	15.39	14.36
13	09.49	08.24	06.51	06.04	04.23	03.09	03.37	05.08	06.38	08.02	08.37	09.57
	15.14	16.50	18.15	20.45	22.16	23.37	23.17	21.44	19.58	18.14	15.36	14.35
14	09.47	08.21	06.48	06.00	04.20	03.07	03.40	05.11	06.41	08.05	08.40	09.59
	15.16	16.53	18.18	20.48	22.20	23.39	23.15	21.41	19.54	18.11	15.33	14.35
15	09.45	08.18	06.44	05.57	04.17	03.06	03.42	05.14	06.43	08.08	08.43	10.00
	15.19	16.56	18.21	20.51	22.23	23.40	23.12	21.38	19.51	18.08	15.30	14.34
16	09.43	08.15	06.41	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.02
	15.22	17.00	18.24	20.54	22.26	23.41	23.10	21.34	19.47	18.04	15.27	14.34
17	09.40	08.12	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.14	08.49	10.03
	15.25	17.03	18.27	20.57	22.29	23.42	23.07	21.31	19.44	18.01	15.25	14.33
18	09.38	08.08	06.34	05.46	04.08	03.05	03.51	05.23	06.52	08.17	08.52	10.04
	15.28	17.06	18.29	21.00	22.32	23.43	23.04	21.27	19.40	17.57	15.22	14.33
19	09.36	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.20	08.55	10.05
	15.31	17.09	18.32	21.03	22.35	23.43	23.02	21.24	19.37	17.54	15.19	14.33
20	09.33	08.02	06.27	05.39	04.02	03.04	03.56	05.29	06.57	08.23	08.58	10.06
	15.34	17.12	18.35	21.06	22.38	23.44	22.59	21.21	19.33	17.51	15.17	14.33
21	09.31	07.59	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.26	09.01	10.07
	15.37	17.15	18.38	21.09	22.41	23.44	22.56	21.17	19.30	17.48	15.14	14.34
22	09.28	07.55	06.20	05.33	03.56	03.04	04.02	05.35	07.03	08.29	09.04	10.07
	15.40	17.18	18.41	21.12	22.44	23.44	22.53	21.14	19.27	17.44	15.12	14.34
23	09.26	07.52	06.16	05.29	03.54	03.04	04.05	05.38	07.06	08.32	09.08	10.08
	15.43	17.21	18.44	21.15	22.47	23.44	22.51	21.10	19.23	17.41	15.09	14.35
24	09.23	07.49	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.35	09.10	10.08
	15.46	17.24	18.47	21.18	22.50	23.44	22.48	21.07	19.20	17.38	15.07	14.35
25	09.21	07.45	06.09	05.22	03.48	03.05	04.11	05.44	07.11	07.38	09.13	10.08
	15.50	17.27	18.50	21.21	22.53	23.44	22.45	21.04	19.16	16.34	15.04	14.36
26	09.18	07.42	06.06	05.19	03.45	03.06	04.14	05.47	07.14	07.41	09.16	10.08
	15.53	17.30	18.53	21.24	22.56	23.44	22.42	21.00	19.13	16.31	15.02	14.37
27	09.15	07.39	06.03	05.16	03.43	03.07	04.17	05.50	07.17	07.44	09.19	10.08
	15.56	17.33	18.55	21.27	22.59	23.43	22.39	20.57	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.53	07.20	07.47	09.22	10.08
	15.59	17.36	18.58	21.30	23.01	23.42	22.36	20.53	19.06	16.25	14.58	14.39
29	09.10		06.56	05.09	03.37	03.09	04.23	05.55	07.22	07.50	09.25	10.08
	16.02		20.01	21.33	23.04	23.41	22.33	20.50	19.02	16.21	14.56	14.41
30	09.07		06.52	05.06	03.35	03.10	04.26	05.58	07.25	07.53	09.28	10.07
	16.05		20.04	21.36	23.07	23.40	22.30	20.46	18.59	16.18	14.53	14.42
31	09.04		06.49		03.33		04.29	06.01		07.56		10.07
	16.09		20.07		23.10		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	612	600	505	392	307	203	146
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: U - Lomarakenus U (Kannistontie, Kivioja)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	10.43 (64)	07.32	06.46	07.52 (67)
	14.48	16.13	51 14.07 (62)	17.40	20 08.12 (67)	21.39
2	10.04	08.58	10.43 (64)	07.29	06.43	07.53 (67)
	14.50	16.16	50 14.07 (62)	17.43	20.13	18 08.11 (67)
3	10.03	08.55	10.43 (64)	07.26	06.39	07.54 (67)
	14.52	16.20	49 14.06 (62)	17.46	20.16	15 08.09 (67)
4	10.02	08.52	10.44 (64)	07.22	06.36	07.56 (67)
	14.54	16.23	47 14.06 (62)	17.49	20.19	11 08.07 (67)
5	10.01	08.49	10.45 (64)	07.19	06.32	07.57 (67)
	14.56	16.26	43 14.05 (62)	17.52	20.22	21.52
6	10.00	08.46	10.47 (64)	07.15	06.29	07.58 (67)
	14.58	16.29	39 14.05 (62)	17.55	20.25	21.55
7	09.59	08.43	10.48 (64)	07.12	06.25	07.59 (67)
	15.00	16.32	35 14.04 (62)	17.58	20.28	21.58
8	09.57	08.40	10.50 (64)	07.09	06.22	07.60 (67)
	15.03	16.36	28 14.03 (62)	18.01	20.31	22.01
9	09.55	08.37	13.48 (62)	07.05	06.18	07.61 (67)
	15.05	16.39	23 15.42 (63)	18.04	20.34	22.04
10	09.54	08.34	15.28 (63)	07.02	06.15	07.62 (67)
	15.08	16.42	16 15.44 (63)	18.07	20.36	22.07
11	09.52	08.31	15.27 (63)	06.58	06.12	07.63 (67)
	15.10	16.45	19 15.46 (63)	18.10	20.39	22.10
12	09.50	08.28	15.26 (63)	06.55	06.08	07.64 (67)
	15.13	16.48	21 15.47 (63)	18.13	20.42	22.13
13	09.48	08.25	15.25 (63)	06.52	06.05	07.65 (67)
	15.16	16.51	23 15.48 (63)	18.16	20.45	22.16
14	09.46	08.22	15.24 (63)	06.48	06.01	07.66 (67)
	15.18	16.55	25 15.49 (63)	18.19	20.48	22.19
15	09.44	08.18	15.23 (63)	06.45	05.58	07.67 (67)
	15.21	16.58	26 15.49 (63)	18.22	20.51	22.22
16	09.42	08.15	15.24 (63)	06.41	05.54	07.68 (67)
	15.24	17.01	26 15.50 (63)	18.24	20.54	22.25
17	09.40	13.46 (62)	08.12	06.38	05.51	07.69 (67)
	15.27	5 13.51 (62)	17.04	18.27	20.57	22.28
18	09.38	13.44 (62)	08.09	06.34	05.47	07.70 (67)
	15.30	11 13.55 (62)	17.07	18.30	21.00	22.32
19	09.35	10.50 (64)	08.05	06.31	05.44	07.71 (67)
	15.33	18 13.57 (62)	17.10	18.33	21.03	22.35
20	09.33	10.47 (64)	08.02	06.28	05.41	07.72 (67)
	15.36	27 13.59 (62)	17.13	18.36	21.06	22.38
21	09.31	10.45 (64)	07.59	06.24	05.37	07.73 (67)
	15.39	33 14.00 (62)	17.16	18.39	21.09	22.41
22	09.28	10.45 (64)	07.56	06.21	05.34	07.74 (67)
	15.42	37 14.02 (62)	17.19	18.42	21.12	22.44
23	09.26	10.44 (64)	07.52	06.17	05.31	07.75 (67)
	15.45	41 14.03 (62)	17.22	18.45	21.15	22.46
24	09.23	10.43 (64)	07.49	06.14	05.27	07.76 (67)
	15.48	43 14.03 (62)	17.25	18.47	21.18	22.49
25	09.20	10.43 (64)	07.46	06.10	05.24	07.77 (67)
	15.51	45 14.04 (62)	17.28	18.50	21.21	22.52
26	09.18	10.42 (64)	07.42	06.07	05.20	07.78 (67)
	15.54	48 14.05 (62)	17.31	18.53	21.24	22.55
27	09.15	10.43 (64)	07.39	06.03	05.17	07.79 (67)
	15.57	48 14.06 (62)	17.34	18.56	21.27	22.58
28	09.12	10.42 (64)	07.36	06.00	05.14	07.80 (67)
	16.01	50 14.06 (62)	17.37	18.59	21.30	22.61
29	09.10	10.42 (64)	07.33	05.56	05.10	07.81 (67)
	16.04	50 14.06 (62)	07.30	18.62	21.33	22.64
30	09.07	10.42 (64)	07.30	05.53	05.07	07.82 (67)
	16.07	52 14.07 (62)	07.27	18.65	21.36	22.67
31	09.04	10.42 (64)	07.27	05.49	05.03	07.83 (67)
	16.10	51 14.06 (62)	07.24	18.68	21.39	22.70
Potential sun hours	179	241	363	448	562	610
Total, worst case	559	737	196	64		
Sun reduction	0,18	0,33	0,32	0,41		
Oper. time red.	0,93	0,93	0,93	0,93		
Wind dir. red.	0,66	0,64	0,61	0,61		
Total reduction	0,11	0,20	0,18	0,24		
Total, real	61	145	36	15		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetShadow receptor: U - Lomarakennus U (Kannistontie, Kivioja)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14	04.34	06.05	07.29	07.59	13.21 (62) 09.30
	23.38	22.23	20.40	18.56	16.13	20 15.13 (63) 14.53
2	03.16	04.37	06.08	07.31	08.02	10.23 (64) 09.33
	23.37	22.20	20.36	18.53	16.10	26 15.11 (63) 14.52
3	03.18	04.40	06.11	07.34	08.06	10.19 (64) 09.35
	23.36	22.17	20.33	18.49	16.07	29 13.33 (62) 14.50
4	03.19	04.43	06.14	07.37	08.09	10.17 (64) 09.38
	23.34	22.14	20.30	18.46	16.04	35 13.33 (62) 14.48
5	03.21	04.46	06.16	07.40	08.12	10.16 (64) 09.40
	23.32	22.10	20.26	18.42	16.01	40 13.35 (62) 14.47
6	03.23	04.49	06.19	07.43	08.15	10.15 (64) 09.42
	23.31	22.07	20.23	18.39	15.58	44 13.36 (62) 14.45
7	03.25	04.52	06.22	07.46	08.18	10.14 (64) 09.45
	23.29	22.04	20.19	18.36	15.55	46 13.36 (62) 14.44
8	03.27	04.55	06.25	07.50 (67) 07.48	08.21	10.14 (64) 09.47
	23.27	22.01	20.16	18.32	15.52	48 13.37 (62) 14.42
9	03.30	04.58	06.28	07.51	08.24	10.14 (64) 09.49
	23.25	21.58	20.12	18.29	15.49	49 13.37 (62) 14.41
10	03.32	05.01	06.30	07.54	08.27	10.14 (64) 09.51
	23.23	21.54	20.09	18.25	15.46	50 13.38 (62) 14.40
11	03.34	05.04	06.33	07.57	08.30	10.14 (64) 09.53
	23.21	21.51	20.05	18.22	15.43	51 13.38 (62) 14.39
12	03.37	05.07	06.36	08.00	08.34	10.14 (64) 09.55
	23.19	21.48	20.02	18.19	15.40	52 13.39 (62) 14.38
13	03.39	05.10	06.39	08.03	08.37	10.13 (64) 09.56
	23.16	21.44	19.58	18.15	15.37	51 13.38 (62) 14.37
14	03.42	05.13	06.41	08.06	08.40	10.14 (64) 09.58
	23.14	21.41	19.55	18.12	15.34	50 13.38 (62) 14.37
15	03.44	05.16	06.44	08.08	08.43	10.14 (64) 09.59
	23.12	21.38	19.51	18.09	15.32	50 13.38 (62) 14.36
16	03.47	05.19	06.47	08.11	16.03 (63) 08.46	10.15 (64) 10.01
	23.09	21.34	19.48	18.05	11 16.14 (63) 15.29	48 13.38 (62) 14.36
17	03.50	05.22	06.50	08.14	16.00 (63) 08.49	10.16 (64) 10.02
	23.06	21.31	19.45	18.02	16 16.16 (63) 15.26	45 13.37 (62) 14.36
18	03.53	05.25	06.52	08.17	15.58 (63) 08.52	10.17 (64) 10.03
	23.04	21.28	19.41	17.59	19 16.17 (63) 15.23	43 13.37 (62) 14.35
19	03.55	05.28	06.55	08.20	15.56 (63) 08.55	10.18 (64) 10.04
	23.01	21.24	19.38	17.55	22 16.18 (63) 15.21	41 13.37 (62) 14.35
20	03.58	05.30	06.58	08.23	15.55 (63) 08.58	10.19 (64) 10.05
	22.58	21.21	19.34	17.52	23 16.18 (63) 15.18	37 13.36 (62) 14.36
21	04.01	05.33	07.01	08.26	15.55 (63) 09.01	10.21 (64) 10.06
	22.56	21.18	19.31	17.49	25 16.20 (63) 15.16	33 13.36 (62) 14.36
22	04.04	05.36	07.04	08.29	15.54 (63) 09.04	10.23 (64) 10.06
	22.53	21.14	19.27	17.45	26 16.20 (63) 15.13	27 13.35 (62) 14.36
23	04.07	05.39	07.06	08.32	15.53 (63) 09.07	10.26 (64) 10.07
	22.50	21.11	19.24	17.42	26 16.19 (63) 15.11	19 13.34 (62) 14.37
24	04.10	05.42	07.09	08.35	15.53 (63) 09.10	13.21 (62) 10.07
	22.47	21.07	19.20	17.39	27 16.20 (63) 15.08	12 13.33 (62) 14.37
25	04.13	05.45	07.12	07.38	14.53 (63) 09.13	13.24 (62) 10.07
	22.44	21.04	19.17	16.36	26 15.19 (63) 15.06	6 13.30 (62) 14.38
26	04.16	05.48	07.15	07.41	14.53 (63) 09.16	10.08
	22.41	21.01	19.13	16.32	26 15.19 (63) 15.04	14.39
27	04.19	05.51	07.17	07.44	14.54 (63) 09.19	10.08
	22.38	20.57	19.10	16.29	25 15.19 (63) 15.02	14.40
28	04.22	05.54	07.20	07.47	14.54 (63) 09.22	10.07
	22.35	20.54	19.06	16.26	24 15.18 (63) 14.59	14.41
29	04.25	05.56	07.23	07.50	14.55 (63) 09.25	10.07
	22.32	20.50	19.03	16.23	23 15.18 (63) 14.57	14.43
30	04.28	05.59	07.26	07.53	14.55 (63) 09.27	10.07
	22.29	20.47	19.00	16.19	21 15.16 (63) 14.55	14.44
31	04.31	06.02		07.56	14.57 (63)	10.06
	22.26	20.43		16.16	18 15.15 (63)	14.46
Potential sun hours	598	504	392	307	204	147
Total, worst case			263		358	952
Sun reduction			0,33		0,35	0,23
Oper. time red.			0,93		0,93	0,93
Wind dir. red.			0,61		0,62	0,66
Total reduction			0,19		0,20	0,14
Total, real			50		72	137

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukseShadow receptor: V - Asuinrakennus V (Kannistontie 586)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05	09.01	14.49 (63)	07.32	06.46	05.04
	14.48	16.13	19 15.08 (63)	17.40	20.10	21.39
2	10.04	08.58	14.48 (63)	07.29	06.43	05.00
	14.50	16.16	21 15.09 (63)	17.43	20.13	21.42
3	10.03	08.55	14.47 (63)	07.26	06.39	04.57
	14.52	16.20	22 15.09 (63)	17.46	20.16	21.45
4	10.02	08.52	14.48 (63)	07.22	06.36	04.54
	14.54	16.23	22 15.10 (63)	17.49	20.19	21.48
5	10.01	08.49	14.48 (63)	07.19	08.00 (67)	06.32
	14.56	16.26	21 15.09 (63)	17.52	2 08.02 (67)	20.22
6	10.00	08.46	14.48 (63)	07.15	07.56 (67)	06.29
	14.58	16.29	22 15.10 (63)	17.55	11 08.07 (67)	20.25
7	09.59	08.43	14.48 (63)	07.12	07.53 (67)	06.25
	15.00	16.32	21 15.09 (63)	17.58	15 08.08 (67)	20.28
8	09.57	13.26 (62)	08.40	14.49 (63)	07.09	07.52 (67)
	15.03	6 13.32 (62)	16.36	21 15.10 (63)	18.01	18 08.10 (67)
9	09.56	13.25 (62)	08.37	14.49 (63)	07.05	07.50 (67)
	15.05	8 13.33 (62)	16.39	20 15.09 (63)	18.04	20 08.10 (67)
10	09.54	13.23 (62)	08.34	14.50 (63)	07.02	07.50 (67)
	15.08	12 13.35 (62)	16.42	18 15.08 (63)	18.07	21 08.11 (67)
11	09.52	13.23 (62)	08.31	14.52 (63)	06.58	07.49 (67)
	15.10	14 13.37 (62)	16.45	15 15.07 (63)	18.10	22 08.11 (67)
12	09.50	13.22 (62)	08.28	14.53 (63)	06.55	07.49 (67)
	15.13	15 13.37 (62)	16.48	12 15.05 (63)	18.13	22 08.11 (67)
13	09.48	13.23 (62)	08.25	14.57 (63)	06.52	07.49 (67)
	15.15	16 13.39 (62)	16.51	5 15.02 (63)	18.16	21 08.10 (67)
14	09.46	13.22 (62)	08.22	06.48	07.49 (67)	06.01
	15.18	17 13.39 (62)	16.55	18.19	21 08.10 (67)	20.48
15	09.44	13.22 (62)	08.18	06.45	07.49 (67)	05.58
	15.21	19 13.41 (62)	16.58	18.22	19 08.08 (67)	20.51
16	09.42	13.22 (62)	08.15	06.41	07.51 (67)	05.54
	15.24	19 13.41 (62)	17.01	18.24	17 08.08 (67)	20.54
17	09.40	13.23 (62)	08.12	06.38	07.51 (67)	05.51
	15.27	20 13.43 (62)	17.04	18.27	14 08.05 (67)	20.57
18	09.38	13.22 (62)	08.09	06.34	07.54 (67)	05.47
	15.30	21 13.43 (62)	17.07	18.30	9 08.03 (67)	21.00
19	09.35	13.22 (62)	08.05	06.31	05.44	04.07
	15.33	21 13.43 (62)	17.10	18.33	21.03	22.35
20	09.33	13.23 (62)	08.02	06.28	05.41	04.04
	15.36	21 13.44 (62)	17.13	18.36	21.06	22.38
21	09.31	13.22 (62)	07.59	06.24	05.37	04.01
	15.39	22 13.44 (62)	17.16	18.39	21.09	22.41
22	09.28	13.23 (62)	07.56	06.21	05.34	03.58
	15.42	22 13.45 (62)	17.19	18.42	21.12	22.44
23	09.26	13.23 (62)	07.52	06.17	05.30	03.55
	15.45	22 13.45 (62)	17.22	18.45	21.15	22.46
24	09.23	13.23 (62)	07.49	06.14	05.27	03.53
	15.48	21 13.44 (62)	17.25	18.47	21.18	22.49
25	09.21	13.25 (62)	07.46	06.10	05.24	03.50
	15.51	20 13.45 (62)	17.28	18.50	21.21	22.52
26	09.18	13.25 (62)	07.42	06.07	05.20	03.47
	15.54	19 13.44 (62)	17.31	18.53	21.24	22.55
27	09.15	13.26 (62)	07.39	06.03	05.17	03.45
	15.57	23 15.00 (63)	17.34	18.56	21.27	22.58
28	09.12	13.27 (62)	07.36	06.00	05.14	03.42
	16.01	27 15.03 (63)	17.37	18.59	21.30	23.01
29	09.10	13.28 (62)	07.33	05.56	05.10	03.39
	16.04	28 15.04 (63)	17.34	18.56	21.33	23.03
30	09.07	13.30 (62)	07.30	05.53	05.07	03.37
	16.07	27 15.06 (63)	17.31	18.53	21.36	23.06
31	09.04	13.33 (62)	07.27	05.50	05.04	03.35
	16.10	24 15.07 (63)	17.28	18.50	21.39	23.09
Potential sun hours	179	241	363	448	562	610
Total, worst case	464	239	232	232		
Sun reduction	0,18	0,33	0,32	0,32		
Oper. time red.	0,93	0,93	0,93	0,93		
Wind dir. red.	0,65	0,64	0,62	0,62		
Total reduction	0,11	0,20	0,19	0,19		
Total, real	50	47	44	44		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapaisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukseShadow receptor: V - Asuinrakennus V (Kannistontie 586)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December	
1	03.14	04.34	06.05	07.29	08.28 (67)	09.30	
	23.38	22.23	20.40	18.56	21 08.49 (67)	16.13 18 14.37 (63)	
2	03.16	04.37	06.08	07.31	08.27 (67)	08.02	
	23.37	22.20	20.36	18.53	22 08.49 (67)	16.10 19 14.38 (63)	
3	03.18	04.40	06.11	07.34	08.27 (67)	08.06	
	23.36	22.17	20.33	18.49	22 08.49 (67)	16.07 20 14.39 (63)	
4	03.19	04.43	06.14	07.37	08.28 (67)	08.09	
	23.34	22.14	20.30	18.46	20 08.48 (67)	16.04 21 14.39 (63)	
5	03.21	04.46	06.16	07.40	08.28 (67)	08.12	
	23.33	22.11	20.26	18.42	19 08.47 (67)	16.01 22 14.40 (63)	
6	03.23	04.49	06.19	07.43	08.29 (67)	08.15	
	23.31	22.07	20.23	18.39	17 08.46 (67)	15.58 22 14.40 (63)	
7	03.25	04.52	06.22	07.46	08.30 (67)	08.18	
	23.29	22.04	20.19	18.36	14 08.44 (67)	15.55 21 14.39 (63)	
8	03.27	04.55	06.25	07.48	08.33 (67)	08.21	
	23.27	22.01	20.16	18.32	8 08.41 (67)	15.52 21 14.39 (63)	
9	03.30	04.58	06.28	07.51	08.24	14.19 (63) 09.49	
	23.25	21.58	20.12	18.29	15.49	20 14.39 (63)	
10	03.32	05.01	06.30	07.54	08.27	14.20 (63) 09.51	
	23.23	21.54	20.09	18.25	15.46	19 14.39 (63)	
11	03.34	05.04	06.33	07.57	08.30	13.04 (62) 09.53	
	23.21	21.51	20.05	18.22	15.43	25 14.39 (63)	
12	03.37	05.07	06.36	08.00	08.34	13.02 (62) 09.55	
	23.19	21.48	20.02	18.19	15.40	27 14.38 (63)	
13	03.39	05.10	06.39	08.03	08.37	12.59 (62) 09.56	
	23.16	21.44	19.58	18.15	15.37	29 14.36 (63)	
14	03.42	05.13	06.41	08.06	08.40	12.59 (62) 09.58	
	23.14	21.41	19.55	18.12	15.34	26 14.34 (63)	
15	03.44	05.16	06.44	08.08	08.43	12.58 (62) 10.00	
	23.12	21.38	19.51	18.09	15.32	22 14.31 (63)	
16	03.47	05.19	06.47	08.11	08.46	12.58 (62) 10.01	
	23.09	21.34	19.48	18.05	15.29	19 13.17 (62)	
17	03.50	05.22	06.50	08.14	08.49	12.57 (62) 10.02	
	23.07	21.31	19.45	18.02	15.26	21 13.18 (62)	
18	03.53	05.25	06.52	08.17	08.52	12.57 (62) 10.03	
	23.04	21.28	19.41	17.59	15.23	21 13.18 (62)	
19	03.55	05.28	06.55	08.20	08.55	12.57 (62) 10.04	
	23.01	21.24	19.38	17.55	15.21	22 13.19 (62)	
20	03.58	05.30	06.58	08.23	08.58	12.58 (62) 10.05	
	22.59	21.21	19.34	17.52	15.18	22 13.20 (62)	
21	04.01	05.33	07.01	08.26	09.01	12.59 (62) 10.06	
	22.56	21.18	19.31	17.49	15.16	21 13.20 (62)	
22	04.04	05.36	07.04	08.29	09.04	12.59 (62) 10.07	
	22.53	21.14	19.27	17.45	15.13	21 13.20 (62)	
23	04.07	05.39	07.06	08.32	09.07	12.59 (62) 10.07	
	22.50	21.11	19.24	17.42	15.11	21 13.20 (62)	
24	04.10	05.42	07.09	08.35	09.10	12.59 (62) 10.07	
	22.47	21.07	19.20	17.39	15.08	21 13.20 (62)	
25	04.13	05.45	07.12	08.37 (67)	09.13	13.00 (62) 10.08	
	22.44	21.04	19.17	7 08.44 (67)	16.36	15.06 20 13.20 (62)	
26	04.16	05.48	07.15	08.34 (67)	07.41	09.16	13.00 (62) 10.08
	22.41	21.01	19.13	13 08.47 (67)	16.32	15.04 20 13.20 (62)	
27	04.19	05.51	07.17	08.32 (67)	07.44	09.19	13.02 (62) 10.08
	22.38	20.57	19.10	16 08.48 (67)	16.29	15.02 18 13.20 (62)	
28	04.22	05.54	07.20	08.31 (67)	07.47	09.22	13.02 (62) 10.07
	22.35	20.54	19.06	18 08.49 (67)	16.26	14.59 18 13.20 (62)	
29	04.25	05.56	07.23	08.30 (67)	07.50	14.25 (63) 09.25	13.03 (62) 10.07
	22.32	20.50	19.03	20 08.50 (67)	16.23	8 14.33 (63) 14.57	16 13.19 (62) 14.43
30	04.28	05.59	07.26	08.29 (67)	07.53	14.22 (63) 09.27	13.04 (62) 10.07
	22.29	20.47	19.00	21 08.50 (67)	16.19	13 14.35 (63) 14.55	15 13.19 (62) 14.44
31	04.31	06.02		07.56	14.21 (63)		10.06
	22.26	20.43		16.16	16 14.37 (63)		14.46
Potential sun hours	598	504	392	307	204	147	
Total, worst case			95	180	628	38	
Sun reduction			0,33	0,35	0,23	0,20	
Oper. time red.			0,93	0,93	0,93	0,93	
Wind dir. red.			0,62	0,63	0,65	0,65	
Total reduction			0,19	0,20	0,14	0,12	
Total, real			18	37	88	5	

Table layout: For each day in each month the following matrix apply

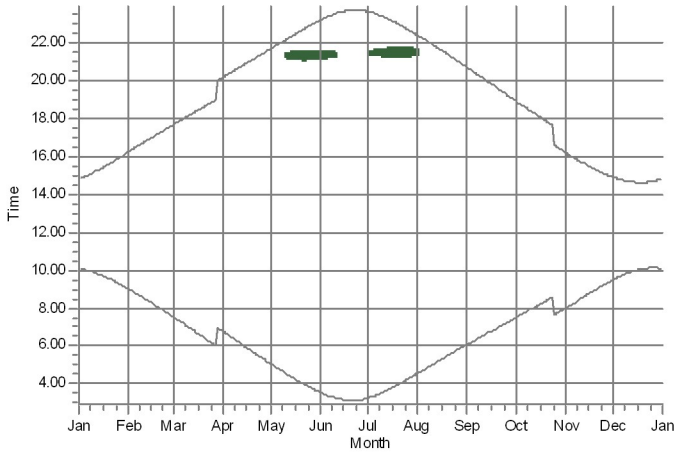
Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------



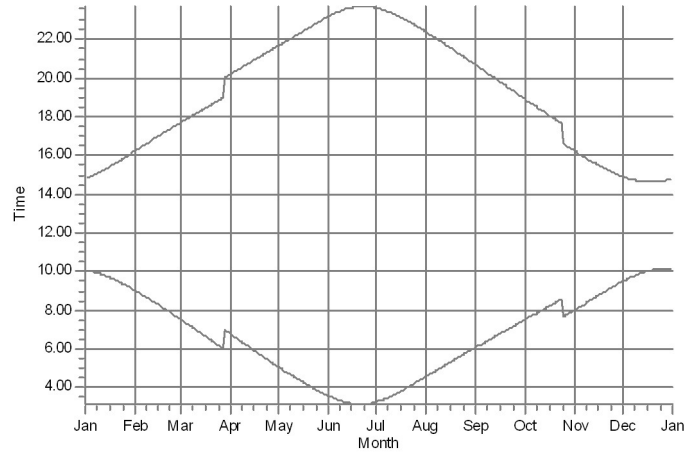
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

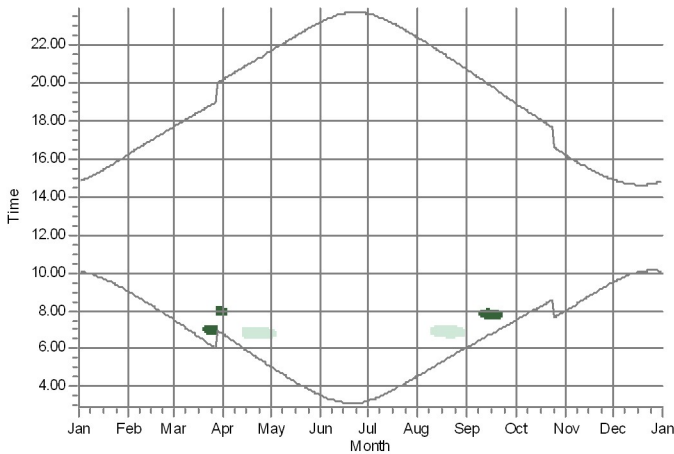
A: Lomarakenus A (Kuuslammentie)



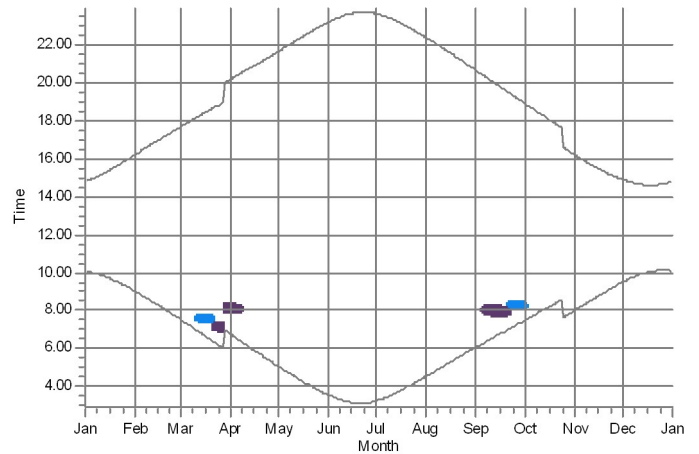
B: Lomarakenus B (Loukkukoskentie 700)



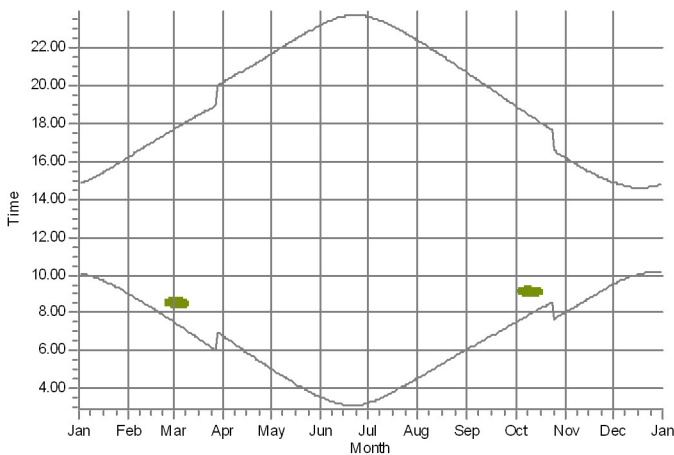
C: Asuinrakennus C (Loukkukoskentie, Mantyla)



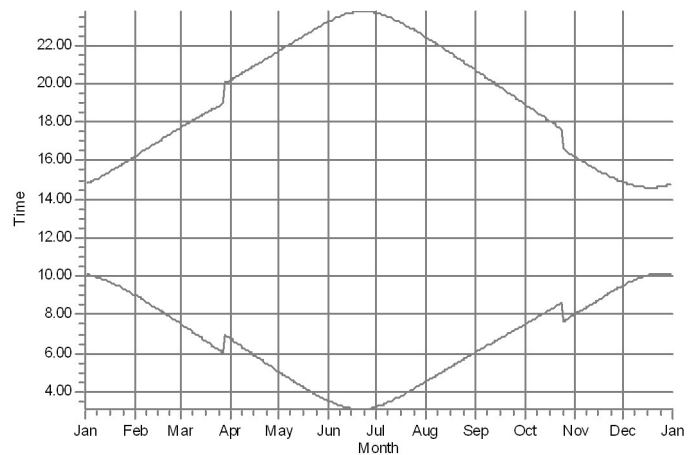
D: Lomarakenus D (Purola)



E: Asuinrakennus E (Kannistontie 557)



F: Asuinrakennus F (Lestjarventie 1468)



WTG:

61. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1185)  
 62. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1188)

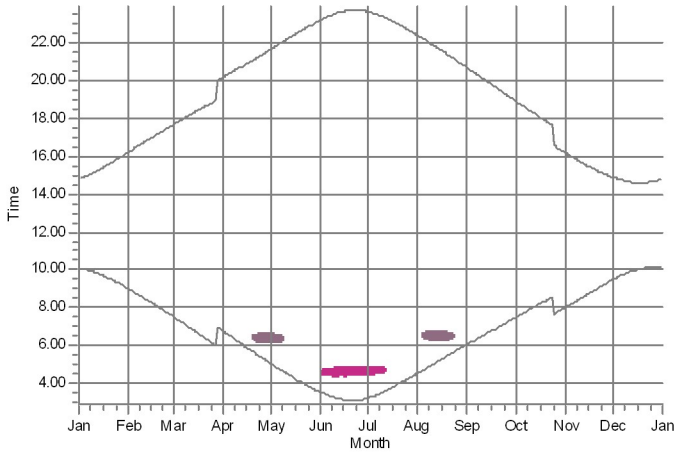
63. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1187)  
 67. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)

73. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1197)

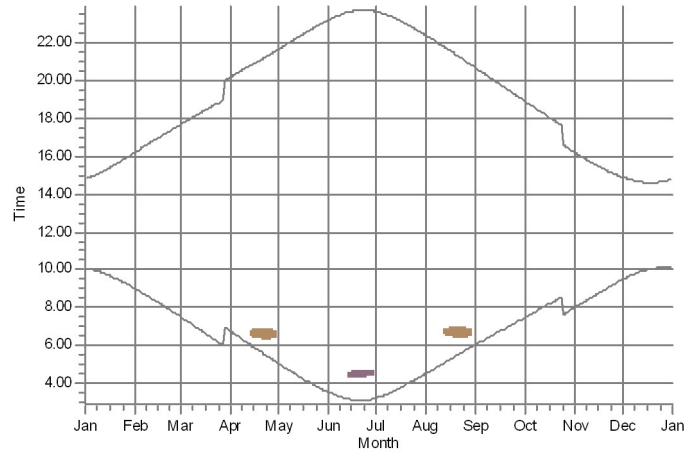
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

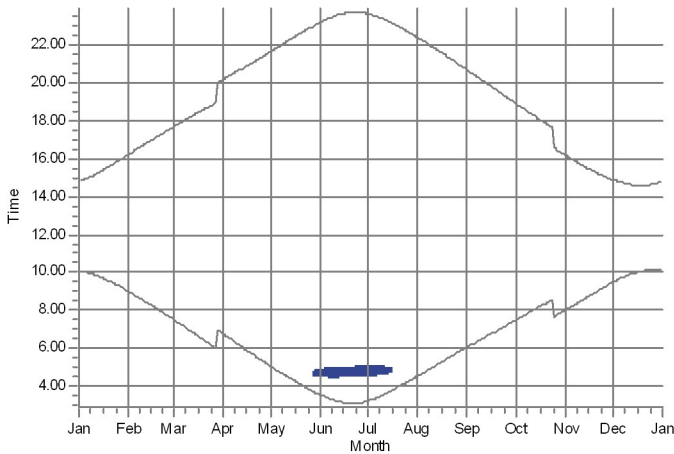
G: Asuinrakennus G (Hautakoskentie 455)



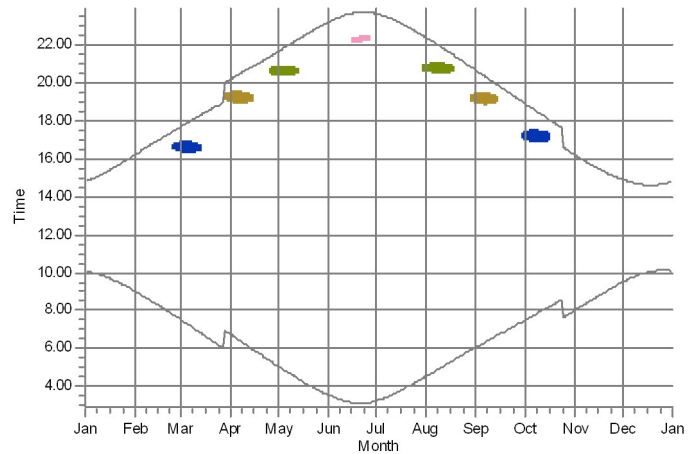
H: Asuinrakennus H (Hautakoskentie 544)



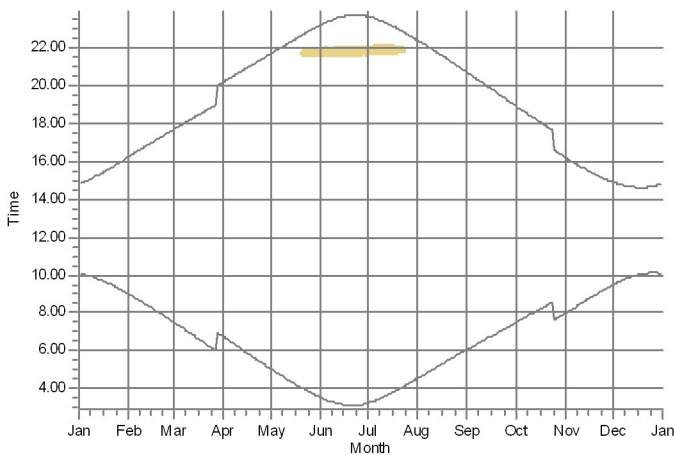
I: Asuinrakennus I (Hautakoskentie 289)



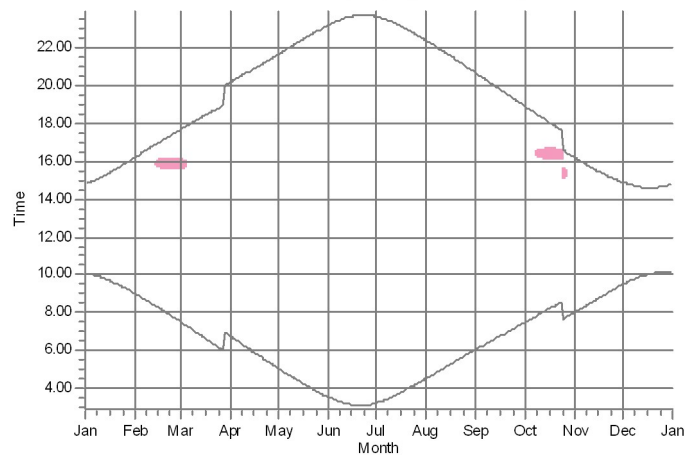
J: Lomarakennus J (Katajarventie 49)



K: Lomarakennus K (Silostenlampi)



L: Lomarakennus L (Harjunpaantie 215)



WTG:

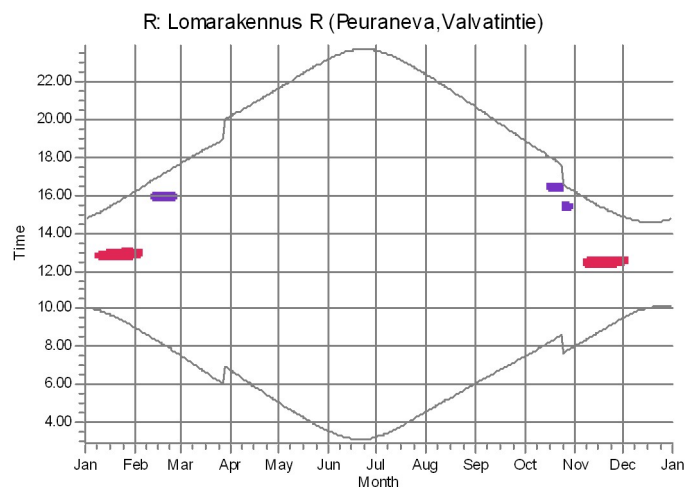
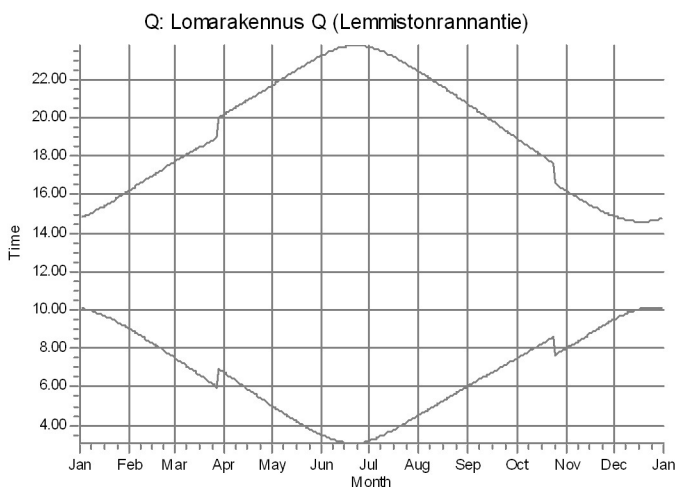
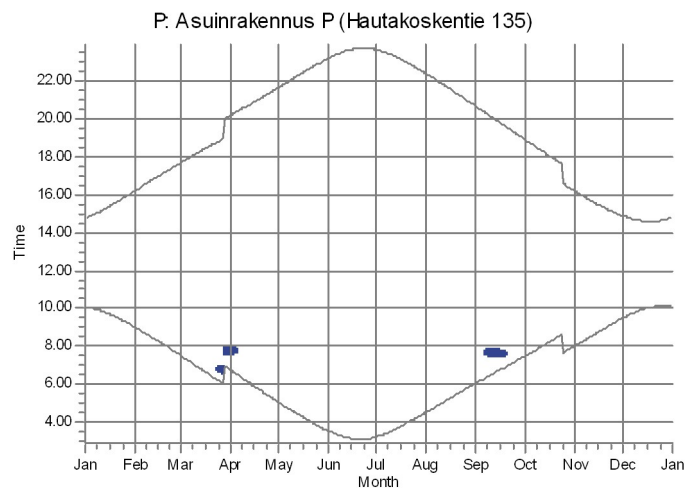
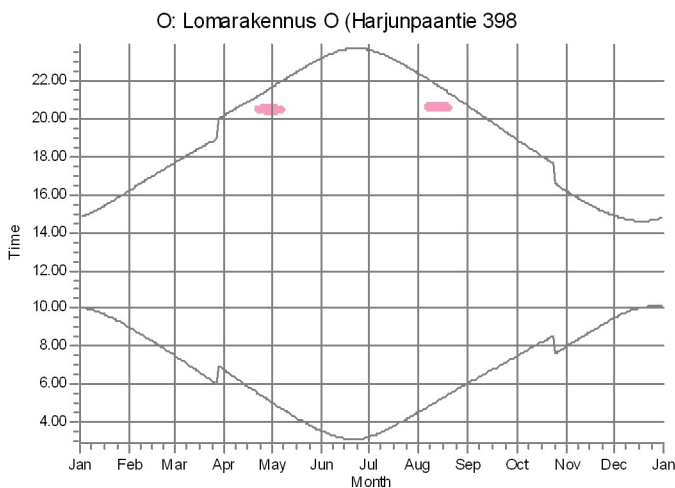
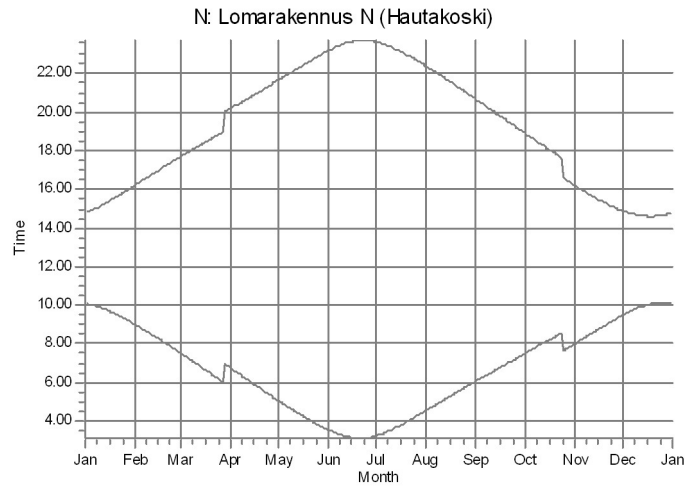
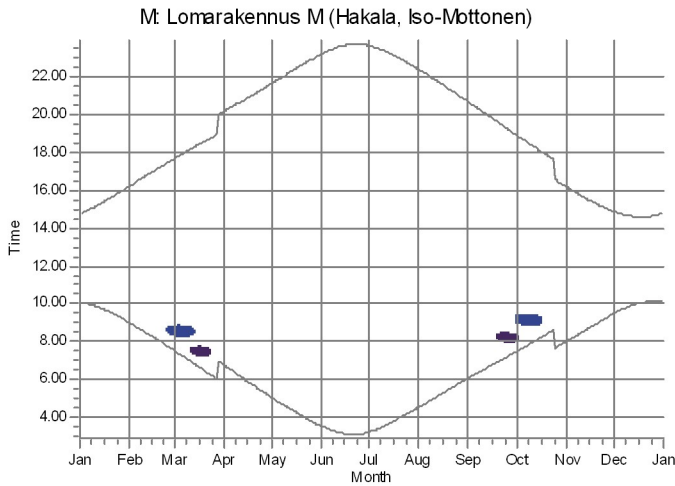
57. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1181)  
 58. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1182)  
 59. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)

67. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)  
 70. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1194)  
 71. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1195)

75. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)  
 77. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1201)  
 78. VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1202)

## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

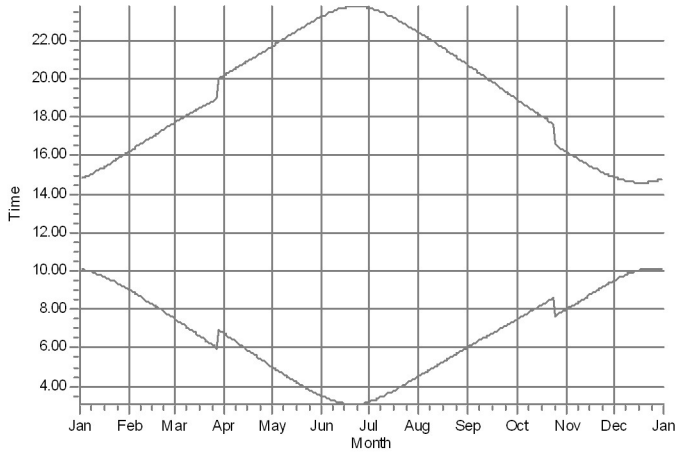


WTG:  
 53: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1177)  
 54: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1179)  
 55: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1177)  
 59: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)  
 74: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1198)  
 75: VESTAS V162-S-6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)

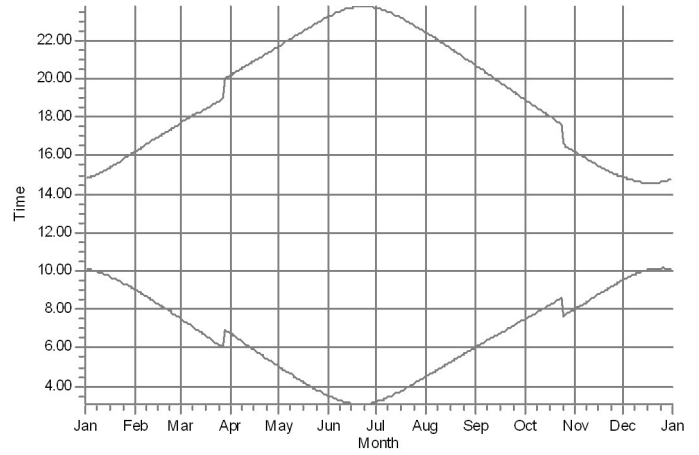
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

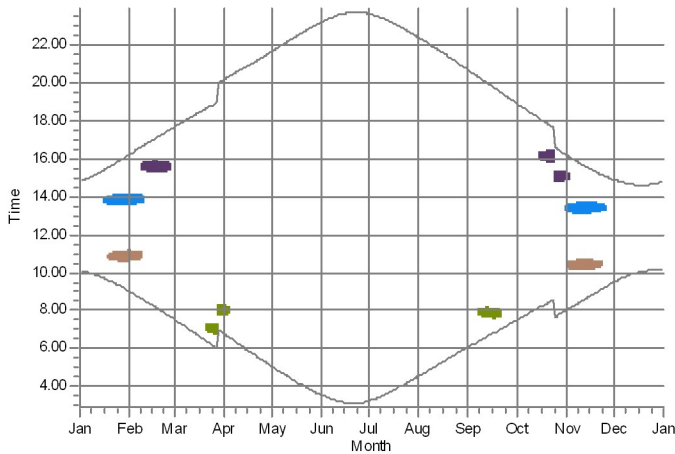
S: Lomarakennus S (Talonpaikantie 141)



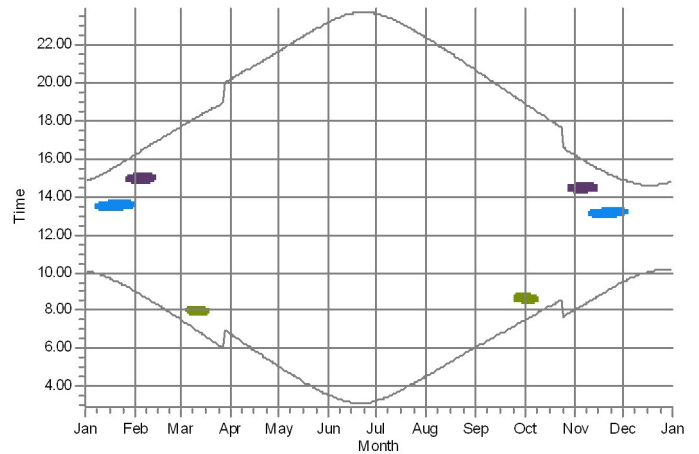
T: Lomarakennus T (Ruipontie)



U: Lomarakennus U (Kannistontie, Kivioja)



V: Asuinrakennus V (Kannistontie 586)



WTG:

62: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1184)

63: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1187)

64: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1188)

67: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 1 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (579)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.02	03.30	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.10	21.39	23.12	23.39	22.23	20.39	18.55	16.12	14.51
2	10.04	08.58	07.28	06.41	04.59	03.28	03.13	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.49	16.18	17.45	20.15	21.45	23.17	23.36	22.17	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.23	03.17	04.41	06.12	07.36	08.08	09.38
	14.52	16.21	17.48	20.18	21.48	23.19	23.35	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.21	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.24	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	15.59	14.44
6	10.00	08.46	07.15	06.27	04.46	03.19	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.24	23.31	22.07	20.22	18.38	15.56	14.43
7	09.59	08.43	07.11	06.24	04.42	03.17	03.23	04.50	06.21	07.45	08.17	09.45
	14.58	16.31	17.57	20.27	21.57	23.26	23.29	22.04	20.18	18.34	15.53	14.41
8	09.57	08.40	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.21	09.47
	15.01	16.34	18.00	20.30	22.00	23.28	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.37	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.24	09.49
	15.03	16.37	18.03	20.33	22.04	23.30	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.12	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.36	22.07	23.32	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.26	03.10	03.34	05.05	06.35	07.59	08.33	09.55
	15.11	16.47	18.12	20.42	22.13	23.35	23.19	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.08	03.37	05.08	06.37	08.02	08.36	09.57
	15.14	16.50	18.15	20.44	22.16	23.37	23.17	21.44	19.57	18.14	15.35	14.35
14	09.46	08.21	06.47	06.00	04.20	03.07	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.18	20.47	22.19	23.38	23.14	21.41	19.54	18.11	15.33	14.34
15	09.44	08.18	06.44	05.56	04.17	03.06	03.42	05.14	06.43	08.08	08.42	10.00
	15.19	16.56	18.20	20.50	22.22	23.39	23.12	21.37	19.51	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.13	08.49	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.07	21.30	19.44	18.01	15.24	14.33
18	09.38	08.08	06.33	05.46	04.08	03.04	03.50	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.43	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.44	22.56	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.07
	15.40	17.18	18.41	21.11	22.43	23.44	22.53	21.14	19.26	17.44	15.11	14.34
23	09.25	07.52	06.16	05.29	03.53	03.04	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.44	22.50	21.10	19.23	17.41	15.09	14.34
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.44	22.47	21.07	19.19	17.37	15.06	14.35
25	09.20	07.45	06.09	05.22	03.48	03.05	04.11	05.44	07.11	07.37	09.13	10.08
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.42	06.06	05.19	03.45	03.06	04.14	05.46	07.14	07.40	09.16	10.08
	15.52	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.16	03.42	03.07	04.17	05.49	07.16	07.43	09.19	10.08
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.22	10.08
	15.59	17.36	18.58	21.30	23.01	23.42	22.35	20.53	19.05	16.24	14.57	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.50	09.24	10.07
	16.02		20.01	21.33	23.04	23.41	22.32	20.49	19.02	16.21	14.55	14.41
30	09.06		06.52	05.05	03.35	03.10	04.26	05.58	07.25	07.53	09.27	10.07
	16.05		20.04	21.36	23.06	23.40	22.29	20.46	18.58	16.18	14.53	14.42
31	09.04		06.48		03.32		04.29	06.01		07.56		10.06
	16.08		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	612	599	505	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 2 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (580) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.09	21.39	23.11	23.39	22.23	20.39	18.55	16.12	14.51
2	10.04	08.58	07.28	06.41	04.59	03.28	03.13	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.17	23.36	22.16	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.23	03.17	04.41	06.12	07.36	08.08	09.38
	14.52	16.21	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.21	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.24	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	15.59	14.44
6	10.00	08.46	07.15	06.27	04.46	03.19	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.24	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.42	03.17	03.23	04.50	06.21	07.45	08.17	09.45
	14.58	16.31	17.57	20.27	21.57	23.26	23.29	22.04	20.18	18.34	15.53	14.41
8	09.57	08.40	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.21	09.47
	15.01	16.34	18.00	20.30	22.00	23.28	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.37	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.24	09.49
	15.03	16.37	18.03	20.33	22.03	23.30	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.12	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.36	22.07	23.32	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.26	03.10	03.34	05.05	06.35	07.59	08.33	09.55
	15.11	16.47	18.12	20.42	22.13	23.35	23.19	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.35	14.35
14	09.46	08.21	06.47	06.00	04.20	03.07	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.18	20.47	22.19	23.38	23.14	21.40	19.54	18.11	15.33	14.34
15	09.44	08.18	06.44	05.56	04.17	03.06	03.42	05.14	06.43	08.08	08.42	10.00
	15.19	16.56	18.20	20.50	22.22	23.39	23.12	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.11	08.46	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.13	08.49	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.44	18.01	15.24	14.33
18	09.38	08.08	06.33	05.46	04.08	03.05	03.50	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.43	23.01	21.24	19.37	17.54	15.19	14.34
20	09.33	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.56	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.20	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.07
	15.40	17.18	18.41	21.11	22.43	23.44	22.53	21.13	19.26	17.44	15.11	14.34
23	09.25	07.52	06.16	05.29	03.53	03.04	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.44	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.44	22.47	21.07	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.05	04.11	05.44	07.11	07.37	09.13	10.08
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.42	06.06	05.19	03.45	03.06	04.14	05.46	07.14	07.40	09.16	10.08
	15.52	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.19	10.08
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.22	10.07
	15.59	17.36	18.58	21.29	23.01	23.42	22.35	20.53	19.05	16.24	14.57	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.33	23.03	23.41	22.32	20.49	19.02	16.21	14.55	14.41
30	09.06		06.52	05.05	03.35	03.10	04.26	05.58	07.25	07.53	09.27	10.07
	16.05		20.04	21.36	23.06	23.40	22.29	20.46	18.58	16.18	14.53	14.42
31	09.03		06.48		03.32		04.29	06.01		07.56		10.06
	16.08		20.07		23.09		22.26	20.43		16.15		14.44
Potential sun hours	178	241	363	449	563	612	599	505	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 3 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (581) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.37	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.28	18.45	16.02	14.46
5	10.01	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.25	21.57	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.33	23.20	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.36	23.16	21.43	19.57	18.14	15.36	14.35
14	09.46	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.44	08.17	06.43	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.05	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.35	08.04	06.30	05.43	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.57	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.46	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.43	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.52	23.42	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.41	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.00	14.38
28	09.11	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.38	03.09	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.25	07.52	09.26	10.06
	16.05		20.03	21.35	23.06	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 4 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (582)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.34	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.51	23.20	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.57	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.36	23.16	21.43	19.57	18.14	15.36	14.35
14	09.46	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.05	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.35	08.04	06.30	05.43	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.38	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.46	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.43	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.41	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.01	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 5 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (583)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.11	07.31 17.39	06.45 20.09	05.02 21.38	03.30 23.11	03.12 23.38	04.32 22.22	06.03 20.39	07.27 18.55	07.58 16.11	09.29 14.51
2	10.04 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.03 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.55 21.44	03.26 23.16	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.13	06.12 20.28	07.36 18.44	08.07 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.18 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.38 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.27	07.14 17.54	06.27 20.24	04.46 21.54	03.20 23.23	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.38	08.14 15.56	09.41 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.26	04.42 21.57	03.18 23.25	03.23 23.28	04.50 22.03	06.20 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.14	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.27 23.24	04.56 21.56	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.00 18.06	06.13 20.35	04.33 22.06	03.13 23.31	03.30 23.22	04.59 21.53	06.29 20.07	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.43	06.57 18.08	06.10 20.38	04.30 22.09	03.11 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.20	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.11	06.06 20.41	04.26 22.12	03.10 23.34	03.35 23.18	05.05 21.47	06.34 20.00	07.58 18.17	08.32 15.38	09.54 14.36
13	09.47 15.14	08.23 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.16	05.08 21.43	06.37 19.57	08.01 18.14	08.36 15.35	09.56 14.35
14	09.45 15.16	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.42 23.11	05.14 21.37	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.45 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.36 18.26	05.49 20.56	04.11 22.27	03.05 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.01 14.33
18	09.37 15.28	08.07 17.05	06.33 18.29	05.46 20.59	04.08 22.31	03.05 23.41	03.51 23.03	05.23 21.26	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.33
19	09.34 15.31	08.04 17.08	06.30 18.32	05.42 21.02	04.05 22.34	03.05 23.42	03.53 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.33
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.04 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.16	10.04 14.33
21	09.30 15.37	07.58 17.15	06.23 18.37	05.36 21.08	03.59 22.40	03.04 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.43	03.04 23.43	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.53 22.46	03.05 23.43	04.05 22.49	05.38 21.10	07.05 19.22	08.31 17.40	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.25 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.40 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.07 14.35
25	09.19 15.49	07.44 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.43 21.03	07.10 19.15	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.52	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.37	05.49 20.56	07.16 19.08	07.43 16.27	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.58 18.58	05.12 21.29	03.40 23.00	03.08 23.41	04.20 22.34	05.52 20.52	07.19 19.05	07.46 16.24	09.21 14.58	10.07 14.39
29	09.09 16.02		06.55 20.00	05.09 21.32	03.37 23.03	03.09 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.24 14.55	10.06 14.41
30	09.06 16.05		06.51 20.03	05.05 21.35	03.35 23.05	03.11 23.39	04.26 22.28	05.58 20.46	07.24 18.58	07.52 16.18	09.26 14.53	10.06 14.42
31	09.03 16.08		06.48 20.06		03.33 23.08		04.29 22.25	06.01 20.42		07.55 16.15		10.05 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 6 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (584)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.09	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.45	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.57	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.16	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.17	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.11	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.34
19	09.35	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.34	23.42	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.38	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.07
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.59	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.01	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 7 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (585)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.16	21.43	19.57	18.14	15.36	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.34	23.41	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.00	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 8 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (586)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.11	07.31 17.39	06.44 20.09	05.02 21.38	03.30 23.10	03.12 23.37	04.32 22.22	06.03 20.39	07.27 18.55	07.58 16.11	09.29 14.51
2	10.03 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.02 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.55 21.44	03.26 23.15	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.13	06.12 20.28	07.36 18.44	08.07 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.17 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.38 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.27	07.14 17.54	06.27 20.23	04.46 21.53	03.20 23.22	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.37	08.14 15.56	09.41 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.26	04.42 21.57	03.18 23.25	03.23 23.28	04.50 22.03	06.20 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.14	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.27 23.24	04.56 21.56	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.00 18.06	06.13 20.35	04.33 22.06	03.13 23.30	03.30 23.22	04.59 21.53	06.29 20.07	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.43	06.57 18.08	06.10 20.38	04.30 22.09	03.11 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.20	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.11	06.06 20.41	04.26 22.12	03.10 23.34	03.35 23.18	05.05 21.46	06.34 20.00	07.58 18.17	08.32 15.38	09.54 14.36
13	09.47 15.14	08.23 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.15	05.08 21.43	06.37 19.57	08.01 18.14	08.35 15.35	09.55 14.35
14	09.45 15.16	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.42 23.11	05.14 21.36	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.45 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.36 18.26	05.49 20.56	04.11 22.27	03.05 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.01 14.33
18	09.37 15.28	08.07 17.05	06.33 18.29	05.46 20.59	04.08 22.30	03.05 23.41	03.51 23.03	05.23 21.26	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.33
19	09.34 15.31	08.04 17.08	06.30 18.32	05.42 21.02	04.05 22.33	03.05 23.41	03.53 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.33
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.04 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.16	10.04 14.33
21	09.30 15.37	07.58 17.15	06.23 18.37	05.36 21.08	03.59 22.40	03.04 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.42	03.04 23.42	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.45	03.05 23.42	04.05 22.49	05.38 21.09	07.05 19.22	08.31 17.40	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.25 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.40 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.06 14.35
25	09.19 15.49	07.44 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.43 21.03	07.10 19.15	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.52	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.37	05.49 20.56	07.16 19.08	07.43 16.27	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.58 18.57	05.12 21.29	03.40 23.00	03.08 23.40	04.20 22.34	05.52 20.52	07.19 19.05	07.46 16.24	09.21 14.58	10.06 14.39
29	09.08 16.02	07.31 17.33	05.55 19.00	05.09 21.32	03.38 23.03	03.09 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.23 14.55	10.06 14.41
30	09.06 16.05	07.29 17.31	05.53 19.02	05.07 21.30	03.36 23.01	03.07 23.39	04.21 22.28	05.53 20.45	07.24 18.58	07.52 16.18	09.26 14.53	10.06 14.42
31	09.03 16.08	07.26 17.28	05.50 19.06	05.04 21.28	03.34 23.08	03.05 23.40	04.19 22.25	05.51 20.42	07.21 16.15	07.49 15.00	09.24 14.50	10.05 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 9 - VESTAS V150-4.2 4200 150.0 IOI hub: 165,0 m (TOT: 240,0 m) (587)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.29
	14.46	16.11	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.11	14.51
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.15	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.44
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.17	07.41	08.14	09.41
	14.56	16.27	17.54	20.23	21.53	23.22	23.30	22.06	20.21	18.37	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.41
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.54	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.05	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.29	03.11	03.32	05.02	06.31	07.55	08.29	09.52
	15.08	16.43	18.08	20.38	22.09	23.32	23.20	21.50	20.04	18.20	15.41	14.37
12	09.49	08.27	06.54	06.06	04.26	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.46	18.11	20.41	22.12	23.34	23.18	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.35	09.55
	15.13	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	05.59	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.05	21.30	19.43	18.00	15.24	14.33
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.33
19	09.34	08.04	06.29	05.42	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.56	08.22	08.57	10.04
	15.34	17.11	18.34	21.05	22.36	23.42	22.57	21.20	19.33	17.50	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.39	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.53	03.05	04.05	05.37	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.25	03.51	03.05	04.08	05.40	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.06	14.35
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.52	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.55	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.57	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.57	14.39
29	09.08		06.55	05.09	03.37	03.09	04.23	05.55	07.21	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.40	22.31	20.49	19.01	16.21	14.55	14.41
30	09.06		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.45	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 10 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (588)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.09	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.28	17.54	20.24	21.54	23.22	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.59	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.32	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.17	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.06	21.30	19.43	18.00	15.25	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.34	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.38	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.42	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.59	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.00	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 11 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (589)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.28	17.54	20.24	21.53	23.22	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.59	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.26	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.17	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.05	21.30	19.43	18.00	15.25	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.57	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.39	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.38	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 12 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (590) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.28	17.54	20.24	21.53	23.22	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.43	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.33
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.03	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 13 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (591)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.30	22.06	20.21	18.38	15.56	14.43
7	09.57	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.43	18.08	20.38	22.09	23.32	23.20	21.50	20.04	18.20	15.41	14.37
12	09.49	08.27	06.54	06.06	04.27	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.58
	15.19	16.56	18.20	20.50	22.21	23.38	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.05	21.30	19.43	18.00	15.24	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.33
19	09.34	08.04	06.30	05.42	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.36	23.42	22.57	21.20	19.33	17.50	15.16	14.34
21	09.29	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.39	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.11	14.34
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.25	03.51	03.05	04.08	05.40	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.57	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 14 - VESTAS V150-4.2 4200 150.0 IOI hub: 165.0 m (TOT: 240.0 m) (592)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.30	22.06	20.21	18.38	15.56	14.43
7	09.57	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.59	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.26	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.26	23.26	22.00	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.58
	15.19	16.56	18.20	20.50	22.21	23.38	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.05	21.30	19.43	18.00	15.24	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.36	23.42	22.57	21.20	19.33	17.50	15.17	14.34
21	09.29	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.39	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.12	14.34
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.09	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.06
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.06
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.28	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.06
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 15 - VESTAS V150-4.2 4200 150.0 IOI hub: 165.0 m (TOT: 240.0 m) (593)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.28	07.59	09.30
	14.46	16.12	17.39	20.09	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.41	04.59	03.28	03.14	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.19	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.24	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	15.59	14.45
6	10.00	08.46	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.42	03.18	03.23	04.50	06.21	07.45	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.40	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.47
	15.01	16.34	18.00	20.30	22.00	23.28	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.24	09.49
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.55
	15.11	16.47	18.12	20.41	22.13	23.35	23.19	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.18	20.47	22.19	23.38	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.18	06.44	05.56	04.17	03.07	03.42	05.14	06.43	08.08	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.39	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.13	08.49	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.01	15.24	14.33
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.19	14.33
20	09.33	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.53	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.07	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.14	07.40	09.16	10.07
	15.53	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.19	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.01	23.41	22.35	20.53	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.55	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.36	23.06	23.39	22.29	20.46	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.56		10.06
	16.08		20.07		23.09		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 16 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (594)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.59	09.30
	14.46	16.12	17.39	20.09	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.51
2	10.04	08.58	07.28	06.41	04.59	03.28	03.13	04.35	06.06	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.19	20.36	18.51	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.21	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.24	17.51	20.21	21.51	23.21	23.33	22.10	20.25	18.41	15.59	14.44
6	10.00	08.46	07.14	06.27	04.46	03.19	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.42	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.47
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.24	09.49
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.54	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.38	22.10	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.26	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.13	23.35	23.19	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.17	20.47	22.19	23.38	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.39	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.00	15.24	14.33
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.36	17.54	15.19	14.33
20	09.33	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.53	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.53	03.04	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.05	04.11	05.44	07.11	07.37	09.13	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.16	10.07
	15.52	17.30	18.52	21.23	22.55	23.43	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.55	14.41
30	09.06		06.52	05.05	03.35	03.10	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.56		10.06
	16.08		20.06		23.09		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 17 - VESTAS V150-4.2 4200 150.0 IOI hub: 165.0 m (TOT: 240.0 m) (595)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.59	09.30
	14.46	16.12	17.39	20.09	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.19	20.36	18.51	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.36	22.16	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.24	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	10.00	08.46	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.42	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.47
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.23	09.49
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.38	22.09	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.13	23.35	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.17	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.39	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.40	08.11	06.37	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.01	15.24	14.33
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.52	10.03
	15.28	17.06	18.29	20.59	22.31	23.42	23.04	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.04	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.33
20	09.33	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.53	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.23	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.16	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.15	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.55	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.08		20.06		23.09		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 18 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (596) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.59	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.19	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	10.00	08.46	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.43	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.28	04.56	06.26	07.50	08.23	09.49
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.40	18.06	20.35	22.06	23.31	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.53
	15.08	16.44	18.09	20.38	22.09	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.13	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.51	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.16	16.53	18.18	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.39	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.01
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.50	04.11	03.05	03.48	05.20	06.49	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.01	15.24	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.35	08.05	06.30	05.43	04.05	03.05	03.53	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.06
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.14	07.40	09.16	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.58	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.38	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.08		20.06		23.08		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 19 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (597)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.31	03.12	04.32	06.04	07.28	07.59	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.37	22.19	20.35	18.52	16.09	14.50
3	10.03	08.54	07.25	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.46	07.14	06.28	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.21	04.39	03.16	03.26	04.53	06.24	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.41
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.50
	15.06	16.41	18.06	20.35	22.06	23.31	23.23	21.53	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.38	22.09	23.33	23.20	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.39	14.36
13	09.48	08.24	06.51	06.03	04.24	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.13	08.48	10.02
	15.25	17.03	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.01	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.34
19	09.35	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.37	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	03.59	05.32	07.00	08.25	09.01	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.27	07.55	06.19	05.33	03.57	03.05	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.36
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.46	03.07	04.14	05.47	07.14	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.42	22.38	20.56	19.09	16.28	15.00	14.39
28	09.12	07.35	05.59	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.25	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.09		20.06		23.08		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 20 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (598)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.37	22.19	20.35	18.51	16.09	14.50
3	10.03	08.54	07.25	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.05	09.34
	14.50	16.18	17.45	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.22	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.23	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.30	09.52
	15.08	16.44	18.09	20.38	22.09	23.33	23.20	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.39	14.36
13	09.48	08.24	06.50	06.03	04.24	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.15	23.36	23.16	21.44	19.57	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.17	16.53	18.17	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.03	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.01	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.34
19	09.35	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	07.00	08.25	09.01	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.27	07.55	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.36
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.12	10.07
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.46	03.07	04.14	05.47	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.09		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 21 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (599)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.41	23.14	23.37	22.19	20.35	18.51	16.09	14.50
3	10.03	08.54	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.22	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.23	21.53	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.52
	15.08	16.44	18.09	20.38	22.09	23.33	23.20	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.58
	15.16	16.53	18.17	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.01	15.24	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.35	08.04	06.30	05.43	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.29	17.47	15.14	14.34
22	09.27	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.08		20.06		23.08		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 22 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (600  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.37	22.19	20.35	18.51	16.09	14.50
3	10.03	08.54	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.02	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.28	18.45	16.02	14.46
5	10.01	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.22	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.08	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.25	21.57	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.23	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.30	09.52
	15.08	16.44	18.09	20.38	22.09	23.33	23.20	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.48	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.15	23.36	23.16	21.43	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.02
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.35	08.04	06.30	05.43	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.57	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.29	17.47	15.14	14.34
22	09.27	07.55	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.35
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.09	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.03	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 23 - VESTAS V150-4.2 4200 150.0 IOI hub: 165.0 m (TOT: 240.0 m) (601)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.59	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.07	07.30	08.02	09.32
	14.48	16.15	17.42	20.12	21.42	23.14	23.37	22.19	20.35	18.52	16.09	14.50
3	10.03	08.54	07.25	06.38	04.56	03.26	03.15	04.38	06.09	07.33	08.05	09.35
	14.50	16.18	17.45	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.48
4	10.02	08.52	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.02	14.46
5	10.01	08.49	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.40
	14.54	16.25	17.51	20.21	21.51	23.21	23.32	22.10	20.25	18.41	15.59	14.45
6	09.59	08.46	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.42	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.43	03.18	03.23	04.50	06.21	07.44	08.17	09.44
	14.58	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.34	15.53	14.42
8	09.57	08.39	07.08	06.21	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.47	14.39
10	09.53	08.33	07.01	06.14	04.33	03.13	03.30	04.59	06.29	07.53	08.27	09.51
	15.06	16.41	18.06	20.35	22.06	23.31	23.23	21.54	20.08	18.24	15.44	14.38
11	09.52	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.30	09.52
	15.08	16.44	18.09	20.38	22.09	23.33	23.21	21.50	20.04	18.21	15.41	14.37
12	09.50	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.35	07.59	08.33	09.54
	15.11	16.47	18.12	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.39	14.36
13	09.48	08.24	06.51	06.03	04.24	03.09	03.37	05.08	06.37	08.02	08.36	09.56
	15.14	16.50	18.15	20.44	22.16	23.36	23.16	21.44	19.57	18.14	15.36	14.35
14	09.46	08.21	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.05	08.39	09.58
	15.17	16.53	18.18	20.47	22.19	23.37	23.14	21.40	19.54	18.11	15.33	14.35
15	09.44	08.17	06.44	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.22	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.42	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.25	23.40	23.09	21.34	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.50	04.11	03.06	03.48	05.20	06.49	08.13	08.48	10.02
	15.25	17.03	18.26	20.56	22.28	23.41	23.06	21.30	19.43	18.01	15.25	14.34
18	09.37	08.08	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.03
	15.28	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.34
19	09.35	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.55	10.04
	15.31	17.09	18.32	21.02	22.34	23.42	23.01	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.58	10.05
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	07.00	08.25	09.01	10.05
	15.37	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.47	15.14	14.34
22	09.28	07.55	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.04	10.06
	15.40	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.07	10.07
	15.43	17.21	18.43	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.09	14.35
24	09.22	07.48	06.13	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.10	10.07
	15.46	17.24	18.46	21.17	22.49	23.43	22.47	21.06	19.19	17.37	15.07	14.36
25	09.20	07.45	06.09	05.22	03.48	03.06	04.11	05.44	07.11	07.37	09.13	10.07
	15.50	17.27	18.49	21.20	22.52	23.43	22.44	21.03	19.16	16.34	15.04	14.36
26	09.17	07.41	06.06	05.19	03.45	03.07	04.14	05.47	07.14	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.55	23.42	22.41	21.00	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.16	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.42	22.38	20.56	19.09	16.28	15.00	14.38
28	09.12	07.35	05.59	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.35	20.53	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.07
	16.02		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.06	03.35	03.11	04.26	05.58	07.25	07.52	09.27	10.06
	16.05		20.04	21.35	23.06	23.39	22.29	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.06
	16.09		20.06		23.08		22.26	20.42		16.15		14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 24 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (602)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.29
	14.46	16.11	17.39	20.09	21.38	23.11	23.37	22.22	20.39	18.55	16.11	14.51
2	10.03	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.55	03.26	03.15	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.44
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.27	17.54	20.23	21.53	23.23	23.30	22.06	20.21	18.37	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.29	03.11	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.43	18.08	20.38	22.09	23.32	23.20	21.50	20.04	18.20	15.41	14.37
12	09.49	08.27	06.54	06.06	04.26	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.16	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.06	21.30	19.43	18.00	15.24	14.33
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.41	23.03	21.26	19.40	17.57	15.22	14.33
19	09.34	08.04	06.29	05.42	04.05	03.04	03.53	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.32	21.02	22.34	23.41	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.56	08.22	08.57	10.04
	15.34	17.11	18.34	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.53	03.05	04.05	05.37	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.43	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.25	03.51	03.05	04.08	05.40	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.06	14.35
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.52	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.57	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.57	14.39
29	09.08		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.00	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.55	14.41
30	09.06		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.45	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 25 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (624)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.28
	14.46	16.11	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.54	16.11	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.20	21.50	23.20	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.17	07.41	08.13	09.41
	14.56	16.27	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.16	09.43
	14.58	16.31	17.57	20.26	21.56	23.18	23.28	22.02	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.40
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.32	05.02	06.31	07.55	08.29	09.51
	15.08	16.43	18.08	20.38	22.09	23.32	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.26	03.10	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	05.59	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.57
	15.16	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.08	21.33	19.46	18.03	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.31	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.56	08.21	08.57	10.04
	15.34	17.11	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.16	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.42	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.51	21.13	19.26	17.44	15.11	14.34
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.37	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.47	06.12	05.25	03.51	03.05	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.36
26	09.16	07.41	06.05	05.19	03.45	03.07	04.14	05.46	07.13	07.39	09.15	10.06
	15.52	17.30	18.52	21.22	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.42
31	09.02		06.48		03.33		04.29	06.00		07.55		10.05
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 26 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (625) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.20	21.50	23.20	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.52	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.08	16.43	18.08	20.38	22.09	23.32	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.07	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.08	21.33	19.46	18.04	15.27	14.34
17	09.39	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.32	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.22	08.57	10.04
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.42	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.22	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.56	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 27 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (626) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.17	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.16	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.08	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.07	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.01
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.31	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.57	10.04
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 28 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (627)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.21	20.38	18.54	16.11	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.30	04.49	03.22	03.19	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.17	07.41	08.13	09.41
	14.56	16.27	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.17	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.16	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	17.59	20.29	21.59	23.26	23.25	21.59	20.14	18.30	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.49	08.23	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.08	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.35	14.36
14	09.45	08.20	06.46	05.59	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.46	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.42	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.34
16	09.41	08.13	06.40	05.53	04.14	03.07	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.03	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.50	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.54	10.03
	15.31	17.08	18.31	21.01	22.33	23.40	23.00	21.23	19.36	17.53	15.19	14.34
20	09.31	08.00	06.26	05.39	04.02	03.05	03.56	05.29	06.56	08.21	08.57	10.03
	15.34	17.11	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.26	17.44	15.11	14.34
23	09.24	07.51	06.15	05.29	03.54	03.05	04.05	05.37	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.11	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.52	17.30	18.51	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.37
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.34	23.04	23.38	22.28	20.45	18.58	16.18	14.54	14.42
31	09.02		06.48		03.33		04.29	06.00		07.55		10.04
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 29 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (628)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.36	22.19	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.20	21.50	23.20	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.11	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.17	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.52	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.09	23.32	23.19	21.50	20.04	18.20	15.41	14.37
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.24	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.13	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.45	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.08	21.33	19.46	18.04	15.27	14.34
17	09.39	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.39	23.05	21.30	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.22	08.57	10.04
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	03.59	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.42	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.23	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.38	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.26	22.56	23.40	22.37	20.56	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 30 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (629)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.39	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.36	22.19	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.39
	14.54	16.25	17.51	20.21	21.50	23.20	23.31	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.18	03.24	04.50	06.21	07.44	08.17	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.04	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.14	04.33	03.14	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.52
	15.09	16.44	18.09	20.38	22.09	23.32	23.19	21.50	20.04	18.21	15.41	14.37
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.40	05.11	06.40	08.04	08.38	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.46	08.10	08.45	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.39	23.05	21.30	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.59	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.36	23.41	22.57	21.20	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.08	22.39	23.42	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.11	22.42	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.45	23.42	22.49	21.09	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.34	09.09	10.06
	15.47	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.44	07.10	07.37	09.12	10.06
	15.50	17.27	18.49	21.20	22.51	23.41	22.43	21.03	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.23	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.18	10.06
	15.56	17.33	18.55	21.26	22.57	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.52	05.06	03.36	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 31 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (630) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.19	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.39
	14.54	16.25	17.51	20.20	21.50	23.20	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.43
7	09.57	08.42	07.11	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.17	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.04	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.09	20.38	22.09	23.32	23.19	21.50	20.04	18.21	15.41	14.37
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.40	05.11	06.40	08.04	08.38	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.13	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.45	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.39	23.05	21.30	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.59	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.42	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.44	07.10	07.37	09.12	10.06
	15.50	17.27	18.49	21.20	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.23	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.26	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.51	05.06	03.36	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 32 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (631)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.39
	14.54	16.24	17.51	20.20	21.50	23.20	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.43
7	09.57	08.42	07.11	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.49
	15.06	16.40	18.06	20.35	22.05	23.30	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.09	23.31	23.19	21.49	20.04	18.21	15.41	14.37
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.35	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.57
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.08	21.33	19.46	18.04	15.27	14.34
17	09.39	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.39	23.05	21.30	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.22	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.26	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.06
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.51	05.06	03.36	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.05
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 33 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (632)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.54	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.46
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.17	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.18	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.09	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.13	06.40	05.53	04.14	03.07	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.50	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.31	21.01	22.33	23.40	23.00	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.04	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 34 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (633)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.37	23.10	23.36	22.21	20.38	18.54	16.11	14.52
2	10.03	08.56	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.32	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.46
5	09.59	08.48	07.17	06.30	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.17	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.18	23.27	22.02	20.17	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	17.59	20.29	21.59	23.26	23.25	21.59	20.14	18.30	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.49	08.22	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.08	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.48	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.14	23.34	23.15	21.43	19.57	18.14	15.35	14.36
14	09.45	08.20	06.46	05.59	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.46	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.42	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.45	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.03	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.15	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.53	10.02
	15.31	17.08	18.31	21.01	22.33	23.40	22.59	21.23	19.36	17.53	15.19	14.34
20	09.31	08.00	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.56	10.03
	15.34	17.11	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	03.59	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.25	17.44	15.12	14.35
23	09.24	07.51	06.15	05.29	03.54	03.05	04.05	05.37	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.08	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.45	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.11	10.06
	15.49	17.27	18.49	21.19	22.50	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.51	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.18	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.48	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.48	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.25	10.05
	16.05		20.03	21.34	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.00		07.55		10.04
	16.08		20.06		23.07		22.24	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 35 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (634)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.13	04.33	03.14	03.30	04.59	06.29	07.53	08.26	09.49
	15.06	16.40	18.06	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.39
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.41	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.40	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.56	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.41	15.09	14.35
24	09.22	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.11	05.43	07.10	07.36	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.37	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.25	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.51	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 36 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (635) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.40	23.00	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	04.00	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.36	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.04	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 37 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (636) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.37	23.09	23.36	22.21	20.38	18.54	16.11	14.52
2	10.03	08.56	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.53	07.24	06.37	04.55	03.26	03.16	04.38	06.09	07.32	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.14	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.46
5	09.59	08.48	07.17	06.30	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.17	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.21	23.29	22.05	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.42	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.23	23.27	22.02	20.17	18.34	15.53	14.42
8	09.55	08.38	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	17.59	20.29	21.59	23.26	23.25	21.59	20.14	18.30	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.49	08.22	09.47
	15.03	16.37	18.02	20.32	22.02	23.27	23.23	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.52	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.09	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.48	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.43	22.14	23.34	23.14	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.46	05.59	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.46	22.17	23.35	23.12	21.39	19.53	18.10	15.33	14.35
15	09.42	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.42	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.03	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.24	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.15	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.53	10.02
	15.31	17.08	18.31	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.00	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.56	10.03
	15.34	17.11	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	03.59	05.32	06.59	08.24	08.59	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.02	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.25	17.44	15.12	14.35
23	09.24	07.51	06.15	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.05	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.08	10.05
	15.46	17.24	18.46	21.16	22.48	23.41	22.45	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.11	10.06
	15.49	17.27	18.49	21.19	22.50	23.41	22.42	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.51	21.22	22.53	23.40	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.18	07.45	09.20	10.05
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.48	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.48	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.51	09.25	10.05
	16.05		20.03	21.34	23.04	23.37	22.27	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.00		07.55		10.04
	16.08		20.06		23.07		22.24	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 38 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (637)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.06	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.40	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.13	04.33	03.14	03.31	04.59	06.29	07.53	08.26	09.49
	15.06	16.40	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.39
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.42	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.15	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.23	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.12	03.06	03.49	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.06	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.40	23.00	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.57	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.27	07.54	06.19	05.32	03.57	03.05	04.03	05.35	07.02	08.28	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.09	14.35
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.11	05.44	07.10	07.36	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.40	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.25	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.41
30	09.05		06.51	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.04	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 39 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (638)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.50	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.56	08.21	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	04.00	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.07	04.11	05.43	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 40 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (639)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.37	23.09	23.36	22.21	20.38	18.54	16.12	14.52
2	10.02	08.56	07.27	06.41	04.59	03.29	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.40	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.01	08.53	07.24	06.37	04.56	03.26	03.16	04.38	06.09	07.32	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.14	23.34	22.15	20.31	18.48	16.05	14.48
4	10.00	08.51	07.20	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.30	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.17	07.41	08.13	09.40
	14.56	16.28	17.54	20.23	21.53	23.21	23.29	22.05	20.21	18.37	15.56	14.43
7	09.57	08.41	07.10	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.23	23.27	22.02	20.17	18.34	15.53	14.42
8	09.55	08.38	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	17.59	20.29	21.59	23.25	23.25	21.59	20.14	18.30	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.49	08.22	09.47
	15.04	16.37	18.02	20.32	22.02	23.27	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.52	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.09	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.48	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.37
13	09.46	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.54
	15.14	16.50	18.14	20.43	22.14	23.34	23.14	21.43	19.57	18.14	15.36	14.36
14	09.44	08.20	06.46	06.00	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.46	22.17	23.35	23.12	21.39	19.53	18.10	15.33	14.35
15	09.42	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.42	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.20	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.15	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.39	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.53	10.02
	15.31	17.08	18.31	21.01	22.33	23.40	22.59	21.22	19.36	17.54	15.19	14.34
20	09.31	08.00	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.56	10.03
	15.34	17.11	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	04.00	05.32	06.59	08.24	08.59	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.02	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.25	17.44	15.12	14.35
23	09.24	07.51	06.15	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.05	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.08	10.05
	15.46	17.24	18.46	21.16	22.47	23.41	22.45	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.07	04.11	05.43	07.10	07.36	09.11	10.06
	15.49	17.27	18.49	21.19	22.50	23.41	22.42	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.51	21.22	22.53	23.40	22.39	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.18	07.45	09.20	10.05
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.48	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.30	20.48	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.36	03.12	04.26	05.58	07.24	07.51	09.25	10.05
	16.05		20.03	21.34	23.04	23.37	22.27	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.24	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 41 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (640) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.37	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.56	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.14	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.22	09.47
	15.04	16.37	18.02	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.48	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.14	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.46	22.18	23.35	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.53	10.02
	15.31	17.08	18.31	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.00	06.26	05.39	04.03	03.05	03.57	05.29	06.56	08.21	08.56	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	04.00	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.07	08.33	09.08	10.05
	15.46	17.24	18.46	21.16	22.48	23.41	22.45	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.07	04.11	05.43	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.50	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.40	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.48	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.36	03.12	04.26	05.58	07.24	07.52	09.25	10.05
	16.05		20.03	21.34	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.24	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 42 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (641)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.37	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.31	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.39
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.38
12	09.49	08.26	06.53	06.07	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.23	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.02
	15.31	17.09	18.32	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.03	03.05	03.57	05.29	06.56	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	04.00	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.03	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.09	14.35
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.11	05.43	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.50	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 43 - VESTAS V150-4.2 4200 150.0 IOI hub: 165.0 m (TOT: 240.0 m) (642)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03 14.47	08.59 16.12	07.31 17.39	06.44 20.09	05.02 21.38	03.31 23.09	03.13 23.36	04.32 22.21	06.03 20.38	07.27 18.55	07.58 16.12	09.28 14.52
2	10.03 14.48	08.56 16.15	07.27 17.42	06.41 20.12	04.59 21.41	03.29 23.12	03.15 23.35	04.35 22.18	06.06 20.35	07.30 18.51	08.01 16.09	09.31 14.50
3	10.02 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.56 21.44	03.27 23.14	03.16 23.34	04.38 22.15	06.09 20.31	07.33 18.48	08.04 16.05	09.33 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.17	04.52 21.47	03.24 23.17	03.18 23.32	04.41 22.12	06.12 20.28	07.35 18.44	08.07 16.02	09.36 14.47
5	09.59 14.54	08.48 16.25	07.17 17.51	06.31 20.20	04.49 21.50	03.22 23.19	03.20 23.31	04.44 22.09	06.15 20.24	07.38 18.41	08.10 15.59	09.38 14.45
6	09.58 14.57	08.45 16.28	07.14 17.54	06.27 20.23	04.46 21.53	03.20 23.21	03.22 23.29	04.47 22.06	06.18 20.21	07.41 18.37	08.13 15.56	09.41 14.44
7	09.57 14.59	08.42 16.31	07.10 17.57	06.24 20.26	04.43 21.56	03.19 23.23	03.24 23.27	04.50 22.02	06.20 20.18	07.44 18.34	08.16 15.53	09.43 14.42
8	09.55 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 21.59	03.17 23.26	03.26 23.25	04.53 21.59	06.23 20.14	07.47 18.31	08.19 15.50	09.45 14.41
9	09.54 15.04	08.35 16.37	07.04 18.03	06.17 20.32	04.36 22.02	03.15 23.27	03.28 23.23	04.56 21.56	06.26 20.11	07.50 18.27	08.22 15.47	09.47 14.40
10	09.52 15.06	08.32 16.40	07.00 18.05	06.13 20.35	04.33 22.05	03.14 23.29	03.31 23.21	04.59 21.53	06.29 20.07	07.52 18.24	08.26 15.44	09.49 14.39
11	09.50 15.09	08.29 16.44	06.57 18.08	06.10 20.38	04.30 22.08	03.12 23.31	03.33 23.19	05.02 21.49	06.32 20.04	07.55 18.20	08.29 15.41	09.51 14.38
12	09.48 15.11	08.26 16.47	06.53 18.11	06.07 20.41	04.27 22.11	03.11 23.33	03.35 23.17	05.05 21.46	06.34 20.00	07.58 18.17	08.32 15.39	09.53 14.37
13	09.47 15.14	08.23 16.50	06.50 18.14	06.03 20.44	04.24 22.14	03.10 23.34	03.38 23.14	05.08 21.43	06.37 19.57	08.01 18.14	08.35 15.36	09.55 14.36
14	09.45 15.17	08.20 16.53	06.47 18.17	06.00 20.47	04.21 22.18	03.09 23.35	03.40 23.12	05.11 21.39	06.40 19.53	08.04 18.10	08.38 15.33	09.56 14.35
15	09.43 15.20	08.17 16.56	06.43 18.20	05.56 20.49	04.18 22.21	03.08 23.37	03.43 23.10	05.14 21.36	06.43 19.50	08.07 18.07	08.41 15.30	09.58 14.35
16	09.40 15.22	08.13 16.59	06.40 18.23	05.53 20.52	04.14 22.24	03.07 23.38	03.46 23.07	05.17 21.33	06.45 19.46	08.10 18.04	08.44 15.27	09.59 14.34
17	09.38 15.25	08.10 17.02	06.36 18.26	05.49 20.55	04.11 22.27	03.06 23.39	03.48 23.05	05.20 21.29	06.48 19.43	08.13 18.00	08.47 15.25	10.00 14.34
18	09.36 15.28	08.07 17.05	06.33 18.29	05.46 20.58	04.08 22.30	03.06 23.39	03.51 23.02	05.23 21.26	06.51 19.39	08.16 17.57	08.50 15.22	10.01 14.34
19	09.34 15.31	08.04 17.09	06.29 18.32	05.43 21.01	04.06 22.33	03.06 23.40	03.54 22.59	05.26 21.23	06.54 19.36	08.19 17.54	08.53 15.19	10.02 14.34
20	09.31 15.34	08.00 17.12	06.26 18.34	05.39 21.04	04.03 22.36	03.05 23.41	03.57 22.57	05.29 21.19	06.56 19.33	08.21 17.50	08.56 15.17	10.03 14.34
21	09.29 15.37	07.57 17.15	06.22 18.37	05.36 21.07	04.00 22.39	03.05 23.41	04.00 22.54	05.32 21.16	06.59 19.29	08.24 17.47	09.00 15.14	10.04 14.34
22	09.26 15.40	07.54 17.18	06.19 18.40	05.32 21.10	03.57 22.42	03.05 23.41	04.03 22.51	05.35 21.12	07.02 19.26	08.27 17.44	09.03 15.12	10.05 14.35
23	09.24 15.43	07.51 17.21	06.16 18.43	05.29 21.13	03.54 22.45	03.06 23.41	04.05 22.48	05.38 21.09	07.05 19.22	08.30 17.40	09.06 15.09	10.05 14.35
24	09.21 15.47	07.47 17.24	06.12 18.46	05.26 21.16	03.51 22.48	03.06 23.41	04.08 22.45	05.41 21.06	07.07 19.19	08.33 17.37	09.08 15.07	10.05 14.36
25	09.19 15.50	07.44 17.27	06.09 18.49	05.22 21.19	03.49 22.50	03.07 23.41	04.11 22.43	05.43 21.02	07.10 19.15	07.36 16.34	09.11 15.05	10.06 14.37
26	09.16 15.53	07.41 17.30	06.05 18.52	05.19 21.22	03.46 22.53	03.07 23.40	04.14 22.40	05.46 20.59	07.13 19.12	07.39 16.31	09.14 15.02	10.06 14.38
27	09.13 15.56	07.37 17.33	06.02 18.54	05.16 21.25	03.43 22.56	03.08 23.40	04.17 22.37	05.49 20.55	07.16 19.08	07.42 16.28	09.17 15.00	10.06 14.39
28	09.11 15.59	07.34 17.36	05.58 18.57	05.12 21.28	03.41 22.59	03.09 23.39	04.20 22.34	05.52 20.52	07.19 19.05	07.45 16.24	09.20 14.58	10.06 14.40
29	09.08 16.02	07.31 17.39	05.55 19.00	05.09 21.31	03.38 23.02	03.10 23.38	04.23 22.31	05.55 20.49	07.21 19.01	07.48 16.21	09.23 14.56	10.05 14.41
30	09.05 16.05	07.28 17.46	05.52 19.07	05.06 21.34	03.36 23.04	03.12 23.37	04.26 22.28	05.58 20.45	07.24 18.58	07.52 16.18	09.25 14.54	10.05 14.43
31	09.02 16.09	07.25 17.53	05.49 19.14	05.03 21.37	03.33 23.07	03.11 23.40	04.29 22.24	06.01 20.42	07.55 16.15	07.55 15.00	09.25 14.44	10.04 14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 44 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (643)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.29	03.15	04.35	06.07	07.30	08.01	09.31
	14.49	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.16	04.38	06.09	07.33	08.04	09.34
	14.51	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.06	14.49
4	10.01	08.51	07.21	06.34	04.53	03.25	03.18	04.41	06.12	07.36	08.07	09.36
	14.53	16.22	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.03	14.47
5	10.00	08.48	07.17	06.31	04.49	03.23	03.20	04.44	06.15	07.38	08.10	09.38
	14.55	16.25	17.51	20.21	21.50	23.19	23.31	22.09	20.25	18.41	16.00	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.44	08.17	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.03	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.21	04.40	03.17	03.26	04.54	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.57	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.14	04.33	03.14	03.31	05.00	06.29	07.53	08.26	09.49
	15.06	16.41	18.06	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.45	14.39
11	09.51	08.30	06.57	06.10	04.30	03.12	03.33	05.03	06.32	07.55	08.29	09.51
	15.09	16.44	18.09	20.38	22.09	23.31	23.19	21.50	20.04	18.21	15.42	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.58	08.32	09.53
	15.12	16.47	18.12	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.40	19.54	18.11	15.33	14.36
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.15	03.07	03.46	05.17	06.46	08.10	08.44	09.59
	15.23	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.47	18.04	15.28	14.35
17	09.38	08.10	06.36	05.50	04.12	03.07	03.49	05.20	06.48	08.13	08.48	10.01
	15.26	17.03	18.26	20.56	22.27	23.39	23.05	21.30	19.43	18.01	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.29	17.06	18.29	20.59	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.33	23.40	23.00	21.23	19.36	17.54	15.20	14.34
20	09.32	08.01	06.26	05.39	04.03	03.06	03.57	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.04	22.36	23.41	22.57	21.19	19.33	17.51	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.06	04.00	05.32	06.59	08.25	09.00	10.04
	15.38	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.27	07.54	06.19	05.33	03.57	03.06	04.03	05.35	07.02	08.28	09.03	10.05
	15.41	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.06	05.38	07.05	08.31	09.06	10.05
	15.44	17.21	18.43	21.13	22.45	23.41	22.49	21.09	19.22	17.41	15.10	14.36
24	09.22	07.48	06.12	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.09	10.06
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.12	05.44	07.10	07.37	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.08	04.14	05.47	07.13	07.40	09.15	10.06
	15.53	17.30	18.52	21.23	22.54	23.41	22.40	20.59	19.12	16.31	15.03	14.38
27	09.14	07.38	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.26	22.56	23.40	22.37	20.56	19.09	16.28	15.00	14.39
28	09.11	07.34	05.59	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.58	21.29	22.59	23.39	22.34	20.52	19.05	16.25	14.58	14.40
29	09.08		06.55	05.09	03.38	03.11	04.23	05.55	07.22	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.02	16.21	14.56	14.42
30	09.05		06.52	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.06		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.34		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 45 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (644)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.49	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.06	14.48
4	10.01	08.51	07.21	06.34	04.52	03.25	03.18	04.41	06.12	07.36	08.07	09.36
	14.52	16.21	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.23	03.20	04.44	06.15	07.38	08.10	09.38
	14.55	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.40	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.31	04.59	06.29	07.53	08.26	09.49
	15.06	16.41	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.39
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.42	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.36	05.05	06.34	07.58	08.32	09.53
	15.12	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.15	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.23	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.35
17	09.38	08.10	06.36	05.49	04.12	03.07	03.49	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.28	17.06	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.02
	15.31	17.09	18.32	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.03	03.06	03.57	05.29	06.57	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.06	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.27	07.54	06.19	05.32	03.57	03.06	04.03	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.06	05.38	07.05	08.30	09.06	10.05
	15.44	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.09	14.36
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.11	05.44	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.08	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.25	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.11	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.38	22.31	20.49	19.02	16.21	14.56	14.42
30	09.05		06.51	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.06		20.03	21.35	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 46 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (645)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.28	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.49	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.17	04.38	06.09	07.33	08.04	09.33
	14.51	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.32	18.48	16.06	14.49
4	10.01	08.51	07.21	06.34	04.53	03.25	03.18	04.41	06.12	07.36	08.07	09.36
	14.53	16.22	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.03	14.47
5	09.59	08.48	07.17	06.31	04.49	03.23	03.20	04.44	06.15	07.38	08.10	09.38
	14.55	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.21	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.40	03.17	03.26	04.54	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.29	04.57	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.33	07.00	06.14	04.33	03.14	03.31	05.00	06.29	07.53	08.26	09.49
	15.06	16.41	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.45	14.39
11	09.50	08.29	06.57	06.10	04.30	03.13	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.09	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.42	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.36	05.05	06.34	07.58	08.32	09.53
	15.12	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.40	19.53	18.11	15.33	14.36
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.15	03.07	03.46	05.17	06.46	08.10	08.44	09.59
	15.23	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.47	18.04	15.28	14.35
17	09.38	08.10	06.36	05.50	04.12	03.07	03.49	05.20	06.48	08.13	08.47	10.00
	15.26	17.03	18.26	20.56	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.29	17.06	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.40	23.00	21.23	19.36	17.54	15.20	14.34
20	09.31	08.01	06.26	05.39	04.03	03.06	03.57	05.29	06.57	08.22	08.57	10.03
	15.34	17.12	18.35	21.04	22.36	23.41	22.57	21.19	19.33	17.51	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.06	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.27	07.54	06.19	05.33	03.57	03.06	04.03	05.35	07.02	08.28	09.03	10.05
	15.41	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.06	05.38	07.05	08.31	09.06	10.05
	15.44	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.10	14.36
24	09.21	07.48	06.12	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.09	10.06
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.12	05.44	07.10	07.37	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.08	04.14	05.47	07.13	07.40	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.03	14.38
27	09.14	07.38	06.02	05.16	03.43	03.09	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.25	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.10	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.39	22.34	20.52	19.05	16.25	14.58	14.40
29	09.08		06.55	05.09	03.38	03.11	04.23	05.55	07.22	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.38	22.31	20.49	19.02	16.21	14.56	14.42
30	09.05		06.52	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.06		20.03	21.35	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.34		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 47 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (646)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.49	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.17	04.38	06.09	07.33	08.04	09.33
	14.51	16.18	17.45	20.15	21.44	23.14	23.34	22.15	20.31	18.48	16.06	14.49
4	10.01	08.51	07.21	06.34	04.53	03.25	03.18	04.41	06.12	07.36	08.07	09.36
	14.53	16.22	17.48	20.18	21.47	23.17	23.32	22.12	20.28	18.44	16.03	14.47
5	09.59	08.48	07.17	06.31	04.49	03.23	03.20	04.44	06.15	07.38	08.10	09.38
	14.55	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.21	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.40	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.16	03.29	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.27	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.14	04.33	03.14	03.31	04.59	06.29	07.53	08.26	09.49
	15.06	16.41	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.45	14.39
11	09.50	08.29	06.57	06.10	04.30	03.13	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.09	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.42	14.38
12	09.49	08.26	06.54	06.07	04.27	03.11	03.36	05.05	06.34	07.58	08.32	09.53
	15.12	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.35	23.12	21.39	19.53	18.10	15.33	14.36
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.14	06.40	05.53	04.15	03.07	03.46	05.17	06.46	08.10	08.44	09.59
	15.23	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.47	18.04	15.28	14.35
17	09.38	08.10	06.36	05.50	04.12	03.07	03.49	05.20	06.48	08.13	08.47	10.00
	15.26	17.03	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.29	17.06	18.29	20.58	22.30	23.40	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.30	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.54	10.02
	15.31	17.09	18.32	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.20	14.34
20	09.31	08.01	06.26	05.39	04.03	03.06	03.57	05.29	06.57	08.22	08.57	10.03
	15.34	17.12	18.35	21.04	22.36	23.41	22.57	21.19	19.33	17.51	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.06	04.00	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.27	07.54	06.19	05.33	03.57	03.06	04.03	05.35	07.02	08.28	09.03	10.05
	15.41	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.06	05.38	07.05	08.30	09.06	10.05
	15.44	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.10	14.36
24	09.21	07.47	06.12	05.26	03.52	03.06	04.09	05.41	07.08	08.33	09.09	10.05
	15.47	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.12	05.44	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.50	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.08	04.14	05.47	07.13	07.40	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.40	22.40	20.59	19.12	16.31	15.03	14.38
27	09.13	07.38	06.02	05.16	03.43	03.09	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.55	21.25	22.56	23.40	22.37	20.56	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.10	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.11	04.23	05.55	07.22	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.38	22.31	20.49	19.02	16.21	14.56	14.42
30	09.05		06.52	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.26	10.05
	16.06		20.03	21.35	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.34		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.25	20.42		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 48 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (647)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.37	22.22	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.33	22.12	20.28	18.44	16.02	14.47
5	10.00	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.18	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.22	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.11	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.20	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.26	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.03	20.32	22.02	23.28	23.24	21.56	20.11	18.27	15.47	14.39
10	09.52	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.30	23.21	21.53	20.07	18.24	15.44	14.38
11	09.51	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.09	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.12	23.33	23.17	21.46	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.40	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.41	08.14	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.53	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.01	22.33	23.41	23.00	21.23	19.36	17.54	15.19	14.34
20	09.32	08.01	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.22	08.57	10.04
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.05	03.59	05.32	06.59	08.25	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.42	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.42	22.49	21.09	19.22	17.40	15.09	14.35
24	09.22	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.12	10.06
	15.50	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.15	10.06
	15.53	17.30	18.52	21.22	22.54	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.14	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.43	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.56	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.46	09.20	10.06
	15.59	17.36	18.57	21.29	22.59	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.32	23.02	23.39	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.35	23.05	23.38	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 49 - VESTAS V150-4.2 4200 150.0 !OI hub: 165.0 m (TOT: 240.0 m) (648)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.44	05.02	03.31	03.13	04.32	06.03	07.27	07.58	09.28
	14.46	16.12	17.39	20.09	21.38	23.10	23.36	22.21	20.38	18.54	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.31
	14.48	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.08	14.50
3	10.02	08.54	07.24	06.37	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.14	21.44	23.15	23.34	22.15	20.31	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.22	03.20	04.44	06.15	07.38	08.10	09.38
	14.54	16.24	17.51	20.20	21.50	23.19	23.31	22.09	20.24	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.20	03.22	04.47	06.17	07.41	08.13	09.41
	14.56	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.37	15.56	14.43
7	09.57	08.42	07.10	06.24	04.43	03.18	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.24	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.39	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.26	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.35	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.03	16.37	18.02	20.32	22.02	23.28	23.23	21.56	20.11	18.27	15.47	14.39
10	09.52	08.32	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.52	08.26	09.49
	15.06	16.40	18.05	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.38
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.31	07.55	08.29	09.51
	15.09	16.43	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.20	15.41	14.37
12	09.49	08.26	06.53	06.06	04.27	03.11	03.35	05.05	06.34	07.58	08.32	09.53
	15.11	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.38	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.15	23.34	23.15	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.20	03.09	03.40	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.36	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.19	16.56	18.20	20.49	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.14	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.22	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.34
17	09.38	08.10	06.36	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.47	10.00
	15.25	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.08	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.28	17.05	18.29	20.58	22.30	23.40	23.02	21.26	19.39	17.57	15.22	14.34
19	09.34	08.04	06.29	05.42	04.05	03.05	03.54	05.26	06.54	08.18	08.53	10.02
	15.31	17.08	18.31	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.00	06.26	05.39	04.02	03.05	03.57	05.29	06.56	08.21	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.32	17.50	15.17	14.34
21	09.29	07.57	06.22	05.36	04.00	03.05	03.59	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.34
22	09.26	07.54	06.19	05.32	03.57	03.05	04.02	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.12	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.30	09.06	10.05
	15.43	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.40	15.09	14.35
24	09.21	07.47	06.12	05.25	03.51	03.06	04.08	05.40	07.07	08.33	09.09	10.06
	15.46	17.24	18.46	21.16	22.48	23.41	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.36	09.11	10.06
	15.49	17.27	18.49	21.19	22.51	23.41	22.43	21.02	19.15	16.34	15.04	14.37
26	09.16	07.41	06.05	05.19	03.46	03.07	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.41	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.15	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.27	15.00	14.39
28	09.11	07.34	05.58	05.12	03.40	03.09	04.20	05.52	07.19	07.45	09.20	10.06
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.10	04.23	05.55	07.21	07.48	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.49	19.01	16.21	14.56	14.41
30	09.05		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.05
	16.05		20.03	21.34	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.08		20.06		23.07		22.25	20.42		16.15		14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuksetWTG: 50 - VESTAS V150-4.2 4200 150.0 !OI! hub: 165.0 m (TOT: 240.0 m) (649)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03	08.59	07.31	06.45	05.02	03.31	03.13	04.32	06.04	07.27	07.58	09.28
	14.47	16.12	17.39	20.09	21.38	23.09	23.36	22.21	20.38	18.55	16.12	14.52
2	10.03	08.57	07.27	06.41	04.59	03.29	03.15	04.35	06.06	07.30	08.01	09.31
	14.49	16.15	17.42	20.12	21.41	23.12	23.35	22.18	20.35	18.51	16.09	14.50
3	10.02	08.54	07.24	06.38	04.56	03.27	03.16	04.38	06.09	07.33	08.04	09.33
	14.50	16.18	17.45	20.15	21.44	23.14	23.34	22.15	20.31	18.48	16.06	14.49
4	10.01	08.51	07.21	06.34	04.52	03.25	03.18	04.41	06.12	07.35	08.07	09.36
	14.52	16.21	17.48	20.17	21.47	23.17	23.32	22.12	20.28	18.44	16.02	14.47
5	09.59	08.48	07.17	06.31	04.49	03.23	03.20	04.44	06.15	07.38	08.10	09.38
	14.55	16.25	17.51	20.20	21.50	23.19	23.31	22.09	20.25	18.41	15.59	14.45
6	09.58	08.45	07.14	06.27	04.46	03.21	03.22	04.47	06.18	07.41	08.13	09.41
	14.57	16.28	17.54	20.23	21.53	23.21	23.29	22.06	20.21	18.38	15.56	14.44
7	09.57	08.42	07.11	06.24	04.43	03.19	03.24	04.50	06.20	07.44	08.16	09.43
	14.59	16.31	17.57	20.26	21.56	23.23	23.27	22.02	20.18	18.34	15.53	14.42
8	09.55	08.39	07.07	06.20	04.40	03.17	03.26	04.53	06.23	07.47	08.19	09.45
	15.01	16.34	18.00	20.29	21.59	23.25	23.25	21.59	20.14	18.31	15.50	14.41
9	09.54	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.47
	15.04	16.37	18.03	20.32	22.02	23.27	23.23	21.56	20.11	18.27	15.47	14.40
10	09.52	08.32	07.00	06.13	04.33	03.14	03.31	04.59	06.29	07.52	08.26	09.49
	15.06	16.41	18.06	20.35	22.05	23.29	23.21	21.53	20.07	18.24	15.44	14.39
11	09.50	08.29	06.57	06.10	04.30	03.12	03.33	05.02	06.32	07.55	08.29	09.51
	15.09	16.44	18.08	20.38	22.08	23.31	23.19	21.49	20.04	18.21	15.42	14.38
12	09.48	08.26	06.53	06.07	04.27	03.11	03.36	05.05	06.34	07.58	08.32	09.53
	15.12	16.47	18.11	20.41	22.11	23.33	23.17	21.46	20.00	18.17	15.39	14.37
13	09.47	08.23	06.50	06.03	04.24	03.10	03.38	05.08	06.37	08.01	08.35	09.55
	15.14	16.50	18.14	20.44	22.14	23.34	23.14	21.43	19.57	18.14	15.36	14.36
14	09.45	08.20	06.47	06.00	04.21	03.09	03.41	05.11	06.40	08.04	08.38	09.56
	15.17	16.53	18.17	20.47	22.18	23.35	23.12	21.39	19.53	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.18	03.08	03.43	05.14	06.43	08.07	08.41	09.58
	15.20	16.56	18.20	20.50	22.21	23.37	23.10	21.36	19.50	18.07	15.30	14.35
16	09.40	08.13	06.40	05.53	04.15	03.07	03.46	05.17	06.45	08.10	08.44	09.59
	15.23	16.59	18.23	20.52	22.24	23.38	23.07	21.33	19.46	18.04	15.27	14.35
17	09.38	08.10	06.36	05.49	04.12	03.07	03.49	05.20	06.48	08.13	08.47	10.00
	15.26	17.02	18.26	20.55	22.27	23.39	23.05	21.29	19.43	18.00	15.25	14.34
18	09.36	08.07	06.33	05.46	04.09	03.06	03.51	05.23	06.51	08.16	08.50	10.01
	15.28	17.06	18.29	20.58	22.30	23.39	23.02	21.26	19.40	17.57	15.22	14.34
19	09.34	08.04	06.29	05.43	04.06	03.06	03.54	05.26	06.54	08.19	08.53	10.02
	15.31	17.09	18.32	21.01	22.33	23.40	22.59	21.23	19.36	17.54	15.19	14.34
20	09.31	08.01	06.26	05.39	04.03	03.06	03.57	05.29	06.56	08.22	08.57	10.03
	15.34	17.12	18.34	21.04	22.36	23.41	22.57	21.19	19.33	17.50	15.17	14.34
21	09.29	07.57	06.23	05.36	04.00	03.06	04.00	05.32	06.59	08.24	09.00	10.04
	15.37	17.15	18.37	21.07	22.39	23.41	22.54	21.16	19.29	17.47	15.14	14.35
22	09.26	07.54	06.19	05.32	03.57	03.06	04.03	05.35	07.02	08.27	09.03	10.05
	15.40	17.18	18.40	21.10	22.42	23.41	22.51	21.13	19.26	17.44	15.12	14.35
23	09.24	07.51	06.16	05.29	03.54	03.06	04.06	05.38	07.05	08.30	09.06	10.05
	15.44	17.21	18.43	21.13	22.45	23.41	22.48	21.09	19.22	17.41	15.09	14.36
24	09.21	07.47	06.12	05.26	03.51	03.06	04.08	05.41	07.08	08.33	09.08	10.05
	15.47	17.24	18.46	21.16	22.48	23.41	22.45	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.49	03.07	04.11	05.44	07.10	07.36	09.11	10.06
	15.50	17.27	18.49	21.19	22.50	23.41	22.43	21.02	19.15	16.34	15.05	14.37
26	09.16	07.41	06.05	05.19	03.46	03.08	04.14	05.46	07.13	07.39	09.14	10.06
	15.53	17.30	18.52	21.22	22.53	23.40	22.40	20.59	19.12	16.31	15.02	14.38
27	09.13	07.37	06.02	05.16	03.43	03.08	04.17	05.49	07.16	07.42	09.17	10.06
	15.56	17.33	18.54	21.25	22.56	23.40	22.37	20.55	19.08	16.28	15.00	14.39
28	09.11	07.34	05.58	05.12	03.41	03.09	04.20	05.52	07.19	07.45	09.20	10.05
	15.59	17.36	18.57	21.28	22.59	23.39	22.34	20.52	19.05	16.24	14.58	14.40
29	09.08		06.55	05.09	03.38	03.11	04.23	05.55	07.21	07.49	09.23	10.05
	16.02		20.00	21.31	23.02	23.38	22.31	20.49	19.02	16.21	14.56	14.42
30	09.05		06.51	05.06	03.36	03.12	04.26	05.58	07.24	07.52	09.25	10.05
	16.06		20.03	21.34	23.04	23.37	22.28	20.45	18.58	16.18	14.54	14.43
31	09.02		06.48		03.33		04.29	06.01		07.55		10.04
	16.09		20.06		23.07		22.24	20.42		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 51 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1175)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.30 14.52
2	10.04 14.49	08.58 16.15	07.28 17.43	06.42 20.13	04.59 21.42	03.29 23.14	03.15 23.37	04.36 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.50
3	10.03 14.50	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.16 23.36	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.52	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.24 23.19	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.22 23.21	03.20 23.32	04.45 22.10	06.16 20.26	07.39 18.42	08.11 16.00	09.40 14.45
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.46 21.54	03.20 23.23	03.22 23.31	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.31	07.11 17.57	06.24 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35	08.18 15.54	09.44 14.42
8	09.57 15.01	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.21 15.51	09.47 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.15 23.29	03.28 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40
10	09.54 15.06	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.07	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.30 22.10	03.12 23.33	03.33 23.21	05.03 21.51	06.32 20.05	07.56 18.21	08.30 15.42	09.53 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.35	03.35 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.55 14.37
13	09.48 15.14	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.14	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 15.33	09.58 14.35
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.39	03.43 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.53 20.54	04.15 22.25	03.07 23.40	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.46 15.28	10.01 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.06 23.41	03.49 23.06	05.21 21.31	06.49 19.44	08.14 18.01	08.49 15.25	10.02 14.34
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	03.51 23.04	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.22	10.03 14.34
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.05 23.42	03.54 23.01	05.27 21.24	06.55 19.37	08.20 17.54	08.55 15.20	10.04 14.34
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.05 23.43	03.57 22.58	05.30 21.20	06.57 19.33	08.23 17.51	08.58 15.17	10.05 14.34
21	09.30 15.38	07.58 17.15	06.23 18.38	05.36 21.08	04.00 22.40	03.05 23.43	03.50 22.55	05.32 21.17	07.00 19.30	08.26 17.48	09.01 15.15	10.06 14.35
22	09.28 15.41	07.55 17.18	06.20 18.41	05.33 21.11	03.57 22.43	03.05 23.43	04.03 22.53	05.35 21.14	07.03 19.27	08.28 17.44	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.54 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.07	10.07 14.36
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	04.12 22.44	05.44 21.03	07.11 19.16	07.37 18.35	09.13 15.05	10.07 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.19 21.24	03.46 22.55	03.07 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.41 18.31	09.16 15.03	10.07 14.38
27	09.15 15.56	07.38 17.34	06.03 18.55	05.16 21.27	03.43 22.58	03.08 23.42	04.18 22.38	05.50 20.57	07.17 19.09	07.44 18.28	09.19 15.00	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.01	03.09 23.41	04.21 22.35	05.53 20.53	07.20 19.06	07.47 18.25	09.21 14.58	10.07 14.40
29	09.09 16.03		06.56 20.01	05.09 21.33	03.38 23.03	03.10 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 18.22	09.24 14.56	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 18.19	09.27 14.54	10.06 14.43
31	09.04 16.09		06.49 20.07		03.33 23.09		04.30 22.26	06.01 20.43		07.56 18.15		10.06 14.45
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 52 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1176)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.33	08.05	09.34
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.21	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.15	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.54	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.36	07.04	06.18	04.37	03.15	03.29	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.11	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.29	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.30	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.44	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.16	08.51	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.32	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.21	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.19	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.35	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 53 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1177)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47 10.04 14.48	09.01 12.43-13.04/21 16.12 08.58 12.45-13.03/18 16.15	07.32 17.40 07.28 17.43	06.45 20.10 06.42 20.13	05.03 21.39 04.59 21.42	03.31 23.11 03.29 23.14	03.13 23.38 03.14 23.37	04.32 22.23 04.36 22.20	06.04 20.39 06.07 20.36	07.28 18.55 07.31 18.52	07.59 16.12 08.02 16.09	09.30 12.22-12.37/15 14.52 09.32 12.24-12.37/13 14.50
2	10.03 14.50 10.02 14.52	08.55 12.46-13.02/16 16.19 08.52 12.50-13.00/10 16.22	07.25 17.46 07.22 17.49	06.38 20.16 06.35 20.18	04.56 21.45 04.53 21.48	03.26 23.16 03.24 23.19	03.16 23.36 03.18 23.34	04.39 22.16 04.42 22.13	06.10 20.32 06.13 20.29	07.33 18.48 07.36 18.45	08.05 16.06 08.08 16.03	09.35 12.26-12.36/10 14.48 09.37 12.28-12.34/6 14.47
3	10.01 14.54 10.00 14.57	08.49 16.25 08.46 16.28	07.18 17.52 07.15 17.54	06.31 20.21 06.28 20.24	04.50 21.51 04.46 21.54	03.22 23.21 03.20 23.23	03.20 23.32 03.22 23.31	04.45 22.10 04.48 22.07	06.15 20.25 06.18 20.22	07.39 18.45 07.42 18.38	08.11 16.00 08.14 15.57	09.40 14.45 09.42 14.44
4	09.57 12.43-12.49/6 14.59 15.01	08.40 16.35 08.37 16.38	07.08 18.00 07.05 18.03	06.21 20.30 06.18 20.33	04.40 22.00 04.37 22.03	03.17 23.27 03.15 23.29	03.26 23.27 03.28 23.25	04.54 22.00 04.57 21.57	06.24 20.19 06.27 20.12	07.48 18.35 07.51 18.28	08.24 12.17-12.32/15 15.54 08.24 12.16-12.34/18 15.48	09.47 14.42 09.49 14.41
5	09.55 12.42-12.52/10 15.04	08.34 16.38 08.34 16.41	07.01 18.06 06.58 18.09	06.14 20.36 06.11 20.39	04.33 22.07 04.30 22.10	03.13 23.31 03.12 23.33	03.30 23.23 03.33 23.25	05.00 21.54 05.03 21.54	06.29 20.08 06.32 20.05	07.53 18.25 07.56 18.21	08.27 12.15-12.36/21 15.45 08.24 12.14-12.37/23 15.42	09.51 14.39 09.53 14.38
6	09.54 12.41-12.54/13 15.06	08.30 16.44 08.30 16.44	06.58 18.09 06.58 18.09	06.11 20.36 06.11 20.36	04.30 22.07 04.30 22.07	03.12 23.33 03.12 23.33	03.33 23.23 03.33 23.23	05.03 21.54 05.03 21.54	06.32 20.08 06.32 20.08	07.56 18.25 07.56 18.25	08.30 12.14-12.37/23 15.45 08.30 12.14-12.37/23 15.45	09.53 14.39 09.53 14.39
7	09.52 12.40-12.55/15 15.09	08.30 16.44 08.30 16.44	06.58 18.09 06.58 18.09	06.11 20.36 06.11 20.36	04.30 22.07 04.30 22.07	03.12 23.33 03.12 23.33	03.33 23.23 03.33 23.23	05.03 21.54 05.03 21.54	06.32 20.08 06.32 20.08	07.56 18.25 07.56 18.25	08.30 12.14-12.37/23 15.45 08.30 12.14-12.37/23 15.45	09.53 14.39 09.53 14.39
8	09.50 12.39-12.54/19 15.14	08.24 16.50 08.24 16.50	06.51 18.15 06.51 18.15	06.04 20.45 06.04 20.45	04.24 22.16 04.24 22.16	03.10 23.36 03.10 23.36	03.38 23.16 03.40 23.14	05.09 21.44 05.12 21.41	06.38 20.02 06.41 20.05	08.02 18.14 08.05 18.11	08.36 12.12-12.37/25 15.36 08.39 12.12-12.38/26 15.33	09.56 14.36 09.58 14.35
9	09.46 12.39-12.59/20 15.17	08.21 16.54 08.21 16.54	06.47 18.18 06.47 18.18	06.00 20.48 06.00 20.48	04.21 22.19 04.21 22.19	03.08 23.37 03.10 23.35	03.40 23.14 03.42 23.11	05.12 21.41 05.15 21.37	06.41 20.05 06.44 20.02	08.05 18.11 08.08 18.08	08.39 12.12-12.38/26 15.33 08.42 12.12-12.38/26 15.30	09.59 14.35 09.59 14.35
10	09.44 12.39-13.00/21 15.20	08.18 16.57 08.18 16.57	06.44 18.21 06.44 18.21	05.57 20.51 05.57 20.51	04.18 22.22 04.18 22.22	03.08 23.39 03.10 23.37	03.43 23.11 03.45 23.09	05.15 21.37 05.18 21.34	06.43 20.01 06.46 20.04	08.08 18.08 08.11 18.04	08.42 12.12-12.38/26 15.30 08.46 12.12-12.39/27 15.28	09.59 14.35 09.59 14.35
11	09.42 12.38-13.01/23 15.23	08.15 17.00 08.15 17.00	06.41 18.24 06.41 18.24	05.53 20.53 05.53 20.53	04.15 22.25 04.15 22.25	03.07 23.40 03.09 23.38	03.46 23.09 03.48 23.06	05.18 21.34 05.21 21.31	06.46 20.04 06.49 20.01	08.11 18.04 08.14 18.01	08.46 12.12-12.39/27 15.28 08.49 12.12-12.39/27 15.25	10.01 14.34 10.02 14.34
12	09.40 12.39-13.02/23 15.26	08.11 17.03 08.11 17.03	06.37 18.27 06.37 18.27	05.50 20.56 05.50 20.56	04.12 22.28 04.12 22.28	03.06 23.41 03.08 23.39	03.48 23.06 03.51 23.03	05.21 21.31 05.24 21.27	06.49 20.01 06.52 20.04	08.14 18.01 08.17 17.58	08.49 12.12-12.39/27 15.25 08.52 12.12-12.39/27 15.22	10.02 14.34 10.03 14.34
13	09.37 12.38-13.03/25 15.29	08.08 17.06 08.08 17.06	06.34 18.29 06.34 18.29	05.47 20.59 05.47 20.59	04.09 22.31 04.09 22.31	03.06 23.42 03.08 23.40	03.51 23.04 03.54 23.01	05.24 21.27 05.27 21.24	06.54 20.02 06.57 20.05	08.17 17.58 08.20 17.54	08.52 12.12-12.39/27 15.22 08.55 12.13-12.39/26 15.20	10.03 14.34 10.04 14.34
14	09.35 12.38-13.03/25 15.32	08.05 17.09 08.05 17.09	06.30 18.32 06.30 18.32	05.43 21.02 05.43 21.02	04.06 22.34 04.06 22.34	03.05 23.42 03.07 23.40	03.54 23.01 03.57 23.05	05.27 21.24 05.30 21.20	06.54 20.02 06.57 20.05	08.20 17.54 08.23 17.51	08.55 12.13-12.39/26 15.20 08.58 12.14-12.40/26 15.17	10.04 14.34 10.05 14.34
15	09.33 12.38-13.04/26 15.35	08.02 17.12 08.02 17.12	06.27 18.35 06.27 18.35	05.40 21.05 05.40 21.05	04.03 22.37 04.03 22.37	03.05 23.43 03.07 23.41	03.57 23.05 03.60 23.02	05.29 21.20 05.32 21.16	06.57 20.04 06.60 20.01	08.23 17.51 08.26 17.48	08.58 12.14-12.40/26 15.17 09.01 12.14-12.40/26 15.15	10.05 14.34 10.06 14.34
16	09.30 12.38-13.04/26 15.38	07.58 17.15 07.58 17.15	06.23 18.38 06.23 18.38	05.36 21.08 05.36 21.08	04.00 22.40 04.00 22.40	03.05 23.43 03.07 23.41	04.00 22.56 04.03 22.53	05.32 21.17 05.35 21.13	07.00 20.01 07.03 20.04	08.25 17.48 08.28 17.44	09.01 12.14-12.40/26 15.15 09.04 12.14-12.40/26 15.12	10.06 14.34 10.06 14.35
17	09.28 12.39-13.05/26 15.41	07.55 17.18 07.55 17.18	06.20 18.41 06.20 18.41	05.33 21.11 05.33 21.11	03.57 22.43 03.57 22.43	03.05 23.43 03.07 23.41	04.03 22.53 04.06 22.50	05.35 21.14 05.38 21.10	07.03 20.04 07.06 20.01	08.28 17.44 08.31 17.41	09.04 12.14-12.40/26 15.12 09.07 12.15-12.40/25 15.10	10.06 14.35 10.07 14.35
18	09.25 12.39-13.05/26 15.44	07.52 17.21 07.52 17.21	06.16 18.44 06.16 18.44	05.30 21.14 05.30 21.14	03.54 22.46 03.54 22.46	03.05 23.43 03.07 23.41	04.06 22.50 04.09 22.47	05.38 21.10 05.41 21.07	07.06 20.04 07.09 20.01	08.31 17.41 08.34 17.38	09.07 12.15-12.40/25 15.10 09.10 12.15-12.40/25 15.07	10.07 14.35 10.07 14.36
19	09.23 12.38-13.05/27 15.47	07.48 17.24 07.48 17.24	06.13 18.47 06.13 18.47	05.26 21.17 05.26 21.17	03.51 22.49 03.51 22.49	03.06 23.43 03.08 23.41	04.09 22.47 04.11 22.44	05.41 21.07 05.44 21.03	07.08 20.03 07.11 20.00	08.34 17.38 08.37 17.35	09.10 12.15-12.40/25 15.07 09.13 12.16-12.39/23 15.05	10.07 14.37 10.07 14.37
20	09.20 12.39-13.06/27 15.50	07.45 17.28 07.45 17.28	06.09 18.50 06.09 18.50	05.23 21.20 05.23 21.20	03.49 22.52 03.49 22.52	03.06 23.43 03.08 23.41	04.11 22.44 04.14 22.41	05.44 21.03 05.47 21.00	07.11 20.04 07.14 20.01	07.37 17.35 07.40 17.30	09.13 12.16-12.39/23 15.05 09.16 12.17-12.40/23 15.03	10.07 14.37 10.07 14.38
21	09.17 12.39-13.06/27 15.53	07.42 17.31 07.42 17.31	06.06 18.52 06.06 18.52	05.19 21.23 05.19 21.23	03.46 22.55 03.46 22.55	03.07 23.42 03.09 23.40	04.14 22.41 04.17 22.38	05.47 21.00 05.50 20.57	07.14 20.05 07.17 20.02	07.40 17.30 07.43 17.28	09.16 12.17-12.40/23 15.03 09.19 12.18-12.39/21 15.00	10.07 14.38 10.07 14.39
22	09.15 12.40-13.07/27 15.56	07.38 17.34 07.38 17.34	06.03 18.55 06.03 18.55	05.16 21.27 05.16 21.27	03.43 22.58 03.43 22.58	03.08 23.42 03.10 23.40	04.17 22.38 04.20 22.35	05.50 20.57 05.53 20.54	07.17 20.06 07.20 20.03	07.44 17.28 07.47 17.25	09.19 12.18-12.39/21 15.00 09.22 12.19-12.39/20 14.58	10.07 14.39 10.07 14.40
23	09.12 12.40-13.06/26 15.59	07.35 17.37 07.35 17.37	05.59 18.58 05.59 18.58	05.13 21.30 05.13 21.30	03.41 23.01 03.41 23.01	03.09 23.41 03.11 23.39	04.20 22.35 04.23 22.32	05.53 20.53 05.56 20.50	07.19 20.06 07.22 20.03	07.47 17.25 07.50 17.22	09.21 12.19-12.39/20 14.58 09.24 12.20-12.39/19 14.56	10.07 14.40 10.07 14.41
24	09.09 12.41-13.06/25 16.03	07.32 17.39 07.32 17.39	05.56 18.59 05.56 18.59	05.09 21.33 05.09 21.33	03.38 23.03 03.38 23.03	03.10 23.40 03.12 23.38	04.23 22.32 04.26 22.29	05.56 20.50 05.59 20.47	07.22 20.05 07.25 20.02	07.50 17.22 07.53 17.19	09.24 12.20-12.39/19 14.56 09.27 12.21-12.38/17 14.54	10.07 14.41 10.06 14.43
25	09.06 12.42-13.06/24 16.06	07.29 17.40 07.29 17.40	05.52 19.00 05.52 19.00	05.06 21.36 05.06 21.36	03.36 23.06 03.36 23.06	03.11 23.39 03.13 23.37	04.26 22.29 04.29 22.26	05.58 20.46 05.61 20.43	07.25 20.04 07.28 20.01	07.53 17.19 07.56 17.16	09.27 12.21-12.38/17 14.54 09.30 12.22-12.38/16 14.52	10.06 14.43 10.06 14.44
26	09.04 12.42-13.05/23 16.09	07.26 17.43 07.26 17.43	05.49 19.07 05.49 19.07	05.03 21.39 05.03 21.39	03.33 23.09 03.33 23.09	03.13 23.40 03.15 23.38	04.29 22.26 04.32 22.23	06.01 20.43 06.04 20.40	07.56 17.15 07.59 17.12	14.44 14.41 14.44 14.41		
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	527	65	0	0	0	0	0	0	0	0	547	44

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes
--------------	------------------	---------------------------------	--------------------------------	---------

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 54 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1178)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.29 14.52
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	03.15 23.37	04.36 22.19	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.15	04.56 21.45	03.27 23.16	03.16 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.25	07.39 18.42	08.11 16.00	09.40 14.45
6	09.59 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.46 21.54	03.21 23.23	03.22 23.30	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.11 17.57	06.24 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35	08.17 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.21 15.51	09.46 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.15 23.29	03.28 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40
10	09.53 15.07	08.33 16.41	07.01 18.06	06.14 20.36	04.34 22.06	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.30 22.10	03.12 23.33	03.33 23.21	05.03 21.50	06.32 20.05	07.56 18.21	08.30 15.42	09.52 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.14	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.47 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.14	05.12 21.40	06.41 19.54	08.05 18.11	08.39 15.33	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.50	04.18 22.22	03.08 23.38	03.43 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.14 17.00	06.41 18.24	05.54 20.53	04.15 22.25	03.07 23.39	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.45 15.28	10.00 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.07 23.40	03.49 23.06	05.21 21.30	06.49 19.44	08.14 18.01	08.49 15.25	10.02 14.34
18	09.37 15.29	08.08 17.06	06.34 18.29	05.47 20.59	04.09 22.31	03.06 23.41	03.52 23.03	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.34
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.06 23.42	03.54 23.01	05.27 21.24	06.54 19.37	08.20 17.54	08.55 15.20	10.04 14.34
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.05 23.42	03.57 22.58	05.30 21.20	06.57 19.33	08.22 17.51	08.58 15.17	10.05 14.34
21	09.30 15.38	07.58 17.15	06.23 18.38	05.36 21.08	04.00 22.40	03.05 23.43	05.00 22.55	05.33 21.17	07.00 19.30	08.25 17.48	09.01 15.15	10.05 14.35
22	09.28 15.41	07.55 17.18	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.03 22.52	05.35 21.14	07.03 19.26	08.28 17.44	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.54 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.07	10.07 14.36
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	04.12 22.44	05.44 21.03	07.11 19.16	07.37 18.35	09.13 15.05	10.07 14.37
26	09.17 15.53	07.42 17.31	06.06 18.52	05.20 21.23	03.46 22.55	03.07 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.40 18.31	09.16 15.03	10.07 14.38
27	09.15 15.56	07.38 17.34	06.03 18.55	05.16 21.26	03.44 22.58	03.08 23.42	04.18 22.38	05.50 20.56	07.17 19.09	07.43 18.28	09.18 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.29	03.41 23.00	03.09 23.41	04.21 22.35	05.53 20.53	07.19 19.06	07.47 18.25	09.21 14.58	10.07 14.40
29	09.09 16.03		06.56 20.01	05.09 21.33	03.38 23.03	03.11 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 18.22	09.24 14.56	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 18.19	09.27 14.54	10.06 14.43
31	09.03 16.09		06.49 20.07		03.34 23.08		04.30 22.26	06.01 20.43		07.56 18.15		10.06 14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 55 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1179)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	04.59	03.29	03.14	04.36	06.07	07.31	08.02	09.32
	14.48	16.15	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.50
3	10.03	08.55	07.25	06.38	04.56	03.26	03.16	04.39	06.10	07.34	08.05	09.35
	14.50	16.19	17.46	20.16	21.45	23.16	23.36	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.24	03.18	04.42	06.13	07.36	08.08	09.38
	14.52	16.22	17.49	20.19	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.22	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.33	22.10	20.26	18.42	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.20	03.22	04.48	06.18	07.42	08.15	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.12	06.25	04.43	03.18	03.24	04.51	06.21	07.45	08.18	09.45
	14.59	16.31	17.58	20.27	21.57	23.26	23.29	22.04	20.19	18.35	15.54	14.42
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.01	16.35	18.00	20.30	22.01	23.28	23.27	22.01	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.14	04.33	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.06	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.38
12	09.50	08.27	15.50-16.01/11	06.54	06.07	04.27	03.11	03.35	05.06	06.35	07.59	09.55
	15.12	16.47	18.12	20.42	22.13	23.35	23.19	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	15.48-16.03/15	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	09.56
	15.14	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	15.47-16.05/18	06.48	06.00	04.21	03.08	03.40	05.12	06.41	08.05	09.58
	15.17	16.54	18.18	20.48	22.19	23.38	23.14	21.41	19.54	18.11	15.33	14.35
15	09.44	08.18	15.46-16.05/19	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	09.54
	15.20	16.57	18.21	20.51	22.22	23.39	23.12	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	15.46-16.06/20	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	16.21-16.32/11
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.04	15.28	14.34
17	09.40	08.11	15.45-16.06/21	06.37	05.50	04.12	03.06	03.49	05.21	06.49	08.14	16.19-16.34/15
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.38	08.08	15.44-16.06/22	06.34	05.47	04.09	03.06	03.51	05.24	06.52	08.17	16.17-16.35/18
	15.29	17.06	18.30	21.00	22.31	23.42	23.04	21.27	19.40	17.58	15.22	14.34
19	09.35	08.05	15.44-16.07/23	06.30	05.43	04.06	03.05	03.54	05.27	06.55	08.20	16.16-16.36/20
	15.32	17.09	18.32	21.03	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	15.44-16.06/22	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.23	16.15-16.36/21
	15.35	17.12	18.35	21.06	22.37	23.43	22.58	21.21	19.34	17.51	15.17	14.34
21	09.30	07.58	15.45-16.06/21	06.23	05.36	04.00	03.05	04.00	05.32	07.00	08.26	16.14-16.36/22
	15.38	17.15	18.38	21.09	22.40	23.43	22.56	21.17	19.30	17.48	15.15	14.34
22	09.28	07.55	15.45-16.05/20	06.20	05.33	03.57	03.05	04.03	05.35	07.03	08.29	16.15-16.37/22
	15.41	17.18	18.41	21.12	22.43	23.43	22.53	21.14	19.27	17.44	15.12	14.35
23	09.25	07.52	15.45-16.04/19	06.16	05.30	03.54	03.05	04.06	05.38	07.06	08.32	16.14-16.37/23
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.35
24	09.23	07.49	15.46-16.04/18	06.13	05.26	03.51	03.06	04.09	05.41	07.08	08.35	16.14-16.36/22
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	15.48-16.02/14	06.10	05.23	03.49	03.06	04.12	05.44	07.11	07.38	15.15-15.36/21
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.03	19.16	16.35	15.05	14.37
26	09.18	07.42	15.51-15.59/8	06.06	05.19	03.46	03.07	04.15	05.47	07.14	07.41	15.15-15.35/20
	15.53	17.31	18.53	21.24	22.55	23.43	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.39	06.03	05.16	03.43	03.08	04.17	05.50	07.17	07.44	15.16-15.35/19	
	15.56	17.34	18.55	21.27	22.58	23.42	22.38	20.57	19.09	16.28	15.00	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.20	05.53	07.20	07.47	15.17-15.33/16	
	16.00	17.37	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09	07.32	06.56	05.09	03.38	03.10	04.23	05.56	07.22	07.50	15.17-15.31/14	
	16.03	17.32	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.58	14.40
30	09.07	07.29	06.52	05.06	03.36	03.11	04.27	05.59	07.25	07.53	15.20-15.29/9	
	16.06	17.31	18.57	21.29	23.00	23.40	22.29	20.46	18.59	16.19	14.54	14.43
31	09.04	07.26	06.49	05.01	03.33	03.08	04.30	06.01	07.30	07.56	15.17	14.44
	16.09	17.28	18.54	21.26	23.09	23.39	22.26	20.43	18.56	16.15	14.44	14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	271	0	0	0	0	0	0	0	273	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 56 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1180)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.29 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.13	03.15 23.36	04.36 22.19	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.17 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.25	07.39 18.42	08.11 16.00	09.40 14.46
6	09.59 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	03.22 23.30	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.11 17.58	06.25 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.03	06.21 20.19	07.45 18.35	08.17 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.20 15.51	09.46 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.16 23.29	03.29 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.48 14.40
10	09.53 15.07	08.33 16.41	07.01 18.06	06.14 20.36	04.34 22.06	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.50 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.09	03.13 23.33	03.33 23.20	05.03 21.50	06.32 20.05	07.56 18.21	08.30 15.42	09.52 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.47 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.13	05.12 21.40	06.41 19.54	08.05 18.11	08.39 15.34	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.50	04.18 22.22	03.08 23.38	03.44 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.14 17.00	06.41 18.24	05.54 20.53	04.15 22.25	03.07 23.39	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.45 15.28	10.00 14.35
17	09.39 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.07 23.40	03.49 23.06	05.21 21.30	06.49 19.44	08.14 18.01	08.48 15.25	10.02 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	03.52 23.03	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.35
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.06 23.42	03.55 23.01	05.27 21.24	06.55 19.37	08.20 17.54	08.55 15.20	10.04 14.35
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.06 23.42	03.57 22.58	05.30 21.20	06.57 19.33	08.22 17.51	08.58 15.17	10.05 14.35
21	09.30 15.38	07.58 17.15	06.23 18.38	05.37 21.08	04.00 22.40	03.06 23.43	03.06 22.55	05.33 21.17	07.00 19.30	08.25 17.48	09.01 15.15	10.05 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.03 22.52	05.36 21.14	07.03 19.27	08.28 17.45	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.55 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.06 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.08	10.07 14.37
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.42	03.55 22.44	05.27 21.03	06.55 19.16	08.20 17.35	08.55 15.05	10.04 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.23	03.46 22.55	03.08 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.40 16.32	09.16 15.03	10.07 14.38
27	09.15 15.57	07.38 17.34	06.03 18.55	05.16 21.26	03.44 22.57	03.09 23.41	04.18 22.38	05.50 20.56	07.17 19.09	07.43 16.28	09.18 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.29	03.41 23.00	03.10 23.41	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.25	09.21 14.59	10.07 14.41
29	09.09 16.03		06.56 20.01	05.10 21.33	03.39 23.03	03.11 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 16.22	09.24 14.56	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.54	10.06 14.43
31	09.03 16.09		06.49 20.07		03.34 23.08		04.30 22.26	06.01 20.43		07.56 16.16		10.06 14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 57 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1181)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.13	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.32-04.51/19 22.23	04.33 20.39	06.04 18.56	07.28 16.12	07.59 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	04.32-04.39/7 23.37	03.15 22.20	04.32-04.50/18 20.36	04.36 18.52	06.07 16.09	07.31 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	04.30-04.40/10 23.35	03.17 22.16	04.33-04.50/17 20.32	04.39 18.49	06.10 16.06	07.34 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	04.30-04.41/11 23.34	03.18 22.13	04.33-04.50/17 20.29	04.42 18.45	06.13 16.03	07.36 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.32 20.21	04.50 21.51	03.23 23.21	04.29-04.43/14 23.32	03.20 22.10	04.34-04.50/16 20.26	04.45 18.42	06.16 16.00	07.39 14.46
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	04.29-04.44/15 23.30	03.22 22.07	04.34-04.49/15 20.22	04.48 18.38	06.18 15.57	07.42 14.44
7	09.58 14.59	08.43 16.32	07.12 17.58	06.25 20.27	04.43 21.57	03.19 23.25	04.28-04.43/15 23.29	03.24 22.04	04.36-04.49/13 20.19	04.51 18.35	06.21 15.54	07.45 14.43
8	09.57 15.02	08.40 16.35	07.08 18.01	06.21 20.30	04.40 22.00	03.17 23.27	04.28-04.44/16 23.27	03.26 22.00	04.36-04.48/12 20.15	04.54 18.32	06.24 15.51	07.48 14.41
9	09.55 15.04	08.37 16.38	07.05 18.04	06.18 20.33	04.37 22.03	03.16 23.29	04.27-04.45/18 23.25	03.29 21.57	04.37-04.48/11 20.12	04.57 18.28	06.27 15.48	07.51 14.40
10	09.53 15.07	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.07	03.14 23.31	04.28-04.46/18 23.23	03.31 22.00	04.39-04.47/8 20.08	05.00 18.25	06.30 15.45	07.53 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.10	03.13 23.33	04.28-04.46/18 23.21	03.33 21.51	04.41-04.44/3 20.05	05.03 18.21	06.32 15.42	07.56 14.38
12	09.50 15.12	08.27 16.48	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	04.27-04.46/19 23.18	03.36 21.47	05.06 20.01	06.35 18.18	07.59 15.39	08.33 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	04.28-04.47/19 23.16	03.38 21.44	05.09 19.58	06.38 18.15	08.02 15.36	08.36 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	04.21 22.19	03.09 23.37	04.28-04.47/19 23.14	03.41 21.41	05.12 19.54	06.41 18.11	08.05 15.34	08.39 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.38	04.28-04.48/20 23.11	03.44 21.37	05.15 19.51	06.44 18.08	08.08 15.31	08.42 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.54	04.15 22.25	03.07 23.39	04.27-04.48/21 23.09	03.46 21.34	05.18 19.47	06.46 18.05	08.11 15.28	08.46 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.57	04.12 22.28	03.07 23.40	04.28-04.48/20 23.06	03.49 21.31	05.21 19.44	06.49 18.01	08.14 15.25	08.49 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	04.28-04.49/21 23.03	03.52 21.27	05.24 19.40	06.52 17.58	08.17 15.23	08.52 14.35
19	09.35 15.32	08.05 17.09	06.30 18.33	05.43 21.02	04.06 22.34	03.06 23.42	04.28-04.49/21 23.01	03.55 21.24	05.27 19.37	06.55 17.55	08.20 15.20	08.55 14.35
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.06 23.42	04.28-04.49/21 22.58	03.57 21.20	05.30 19.34	06.57 17.51	08.23 15.17	08.58 14.35
21	09.30 15.38	07.58 17.16	06.23 18.38	05.37 21.08	04.00 22.40	03.06 23.43	04.28-04.49/21 22.55	04.00 21.17	05.33 19.30	07.00 17.48	08.26 15.15	09.01 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.28-04.49/21 22.53	04.03 21.14	05.36 19.27	07.03 17.45	08.29 15.12	09.04 14.35
23	09.25 15.44	07.52 17.22	06.17 18.44	05.30 21.14	03.55 22.46	03.06 23.43	04.29-04.50/21 22.50	04.06 21.10	05.39 19.23	07.06 17.41	08.32 15.10	09.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.29-04.50/21 22.47	04.09 21.07	05.41 19.20	07.08 17.38	08.35 15.08	09.10 14.37
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	04.30-04.50/20 22.44	04.12 21.03	05.44 19.16	07.11 17.35	07.38 15.05	09.13 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.23	03.46 22.55	03.08 23.42	04.30-04.50/20 22.41	04.15 21.00	05.47 19.13	07.14 17.32	07.41 15.03	09.16 14.38
27	09.15 15.57	07.38 17.34	06.03 18.55	05.16 21.27	03.44 22.58	03.09 23.42	04.30-04.50/20 22.38	04.18 20.57	05.50 19.09	07.17 17.28	07.44 15.01	09.19 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.00	03.10 23.41	04.31-04.51/20 22.35	04.21 20.53	05.53 19.06	07.20 17.25	07.47 15.01	09.21 14.41
29	09.09 16.03		06.56 20.01	05.10 21.33	03.39 23.03	03.11 23.40	04.31-04.51/20 22.32	04.24 20.50	05.56 19.02	07.22 17.22	07.50 16.22	09.24 14.57
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.32-04.51/19 22.29	04.27 20.46	05.59 18.59	07.25 17.19	07.53 16.19	09.27 14.55
31	09.04 16.09		06.49 20.07		03.34 23.08			04.30 22.26	06.02 20.43		07.56 16.16	
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	526	149	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 58 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1182)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.04 14.48	09.01 16.13	07.32 17.40	06.46 20.10	05.04 21.39	03.33 23.11	21.33-21.55/22 23.37	03.15 21.40-22.02/22 22.23	04.34 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.29 14.54
2	10.04 14.50	08.58 16.17	07.29 17.43	06.42 20.13	05.01 21.42	03.31 23.13	21.34-21.56/22 23.36	03.17 21.40-22.02/22 22.19	04.37 20.36	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.25 17.46	06.39 20.16	04.57 21.45	03.28 23.16	21.33-21.56/23 23.35	03.18 21.40-22.02/22 22.16	04.40 20.33	06.11 20.33	07.34 18.49	08.05 16.07	09.34 14.50
4	10.02 14.54	08.52 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.18	21.34-21.56/22 23.33	03.20 21.39-22.02/23 22.13	04.43 20.29	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.20	21.34-21.57/23 23.32	03.22 21.40-22.03/23 22.10	04.46 20.26	06.16 20.26	07.40 18.42	08.11 16.01	09.39 14.47
6	09.59 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.48 21.54	03.22 23.22	21.33-21.56/23 23.30	03.24 21.40-22.02/22 22.07	04.49 20.22	06.19 20.22	07.42 18.39	08.14 15.58	09.42 14.45
7	09.58 15.01	08.43 16.32	07.12 17.58	06.25 20.27	04.44 21.57	03.20 23.25	21.34-21.56/22 23.28	03.26 21.40-22.02/22 22.04	04.52 20.19	06.22 20.19	07.45 18.36	08.18 15.55	09.44 14.44
8	09.56 15.03	08.40 16.36	07.08 18.01	06.22 20.30	04.41 22.00	03.19 23.27	21.34-21.56/22 23.26	03.28 21.40-22.03/23 22.00	04.55 20.15	06.25 20.15	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.18 20.33	04.38 22.03	03.17 23.28	21.34-21.56/22 23.24	03.30 21.41-22.03/22 21.57	04.58 20.12	06.27 20.12	07.51 18.29	08.24 15.49	09.48 14.41
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.06	03.16 23.30	21.34-21.56/22 23.22	03.32 21.40-22.03/23 21.54	05.01 20.09	06.30 20.09	07.54 18.25	08.27 15.46	09.50 14.40
11	09.51 15.10	08.31 16.45	06.58 18.10	06.11 20.39	04.32 22.10	03.14 23.32	21.35-21.57/22 23.20	03.35 21.41-22.03/22 21.51	05.04 20.05	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.39
12	09.50 15.13	08.27 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	21.35-21.57/22 23.18	03.37 21.41-22.03/22 21.47	05.07 20.02	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.38
13	09.48 15.16	08.24 16.51	06.51 18.16	06.05 20.45	04.25 22.16	03.12 23.35	21.35-21.57/22 23.16	03.40 21.42-22.03/21 21.44	05.10 20.02	06.39 20.02	08.02 18.15	08.36 15.37	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.36	21.36-21.58/22 23.13	03.42 21.42-22.03/21 21.41	05.13 20.02	06.41 20.02	08.05 18.12	08.39 15.35	09.57 14.37
15	09.44 15.21	08.18 16.58	06.45 18.21	05.58 20.51	04.19 22.22	03.10 23.38	21.36-21.57/21 23.11	03.45 21.42-22.03/21 21.37	05.16 20.02	06.44 20.02	08.08 18.09	08.42 15.32	09.59 14.37
16	09.42 15.24	08.15 17.01	06.41 18.24	05.54 20.54	04.16 22.25	03.09 23.39	21.36-21.58/22 23.08	03.48 21.43-22.03/20 21.34	05.19 20.02	06.47 20.02	08.11 18.05	08.46 15.29	10.00 14.36
17	09.39 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	21.37-21.58/21 23.06	03.50 21.43-22.02/19 21.31	05.22 20.02	06.50 20.02	08.14 18.02	08.49 15.26	10.01 14.36
18	09.37 15.30	08.08 17.07	06.34 18.30	05.48 21.00	04.10 22.31	03.08 23.40	21.37-21.58/21 23.03	03.53 21.44-22.02/18 21.27	05.25 20.02	06.52 20.02	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.08 23.41	21.37-21.59/22 23.01	03.56 21.44-22.01/17 21.24	05.28 20.02	06.55 20.02	08.20 17.55	08.55 15.21	10.03 14.36
20	09.33 15.36	08.02 17.13	06.27 18.36	05.41 21.06	04.04 22.37	03.07 23.42	21.37-21.59/22 22.58	03.59 21.45-22.00/15 21.21	05.31 20.02	06.58 20.02	08.23 17.52	08.58 15.18	10.04 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.42	21.38-21.59/21 22.55	04.01 21.47-22.00/13 21.17	05.33 20.02	07.01 20.02	08.26 17.49	09.01 15.16	10.05 14.36
22	09.28 15.42	07.55 17.19	06.20 18.42	05.34 21.12	03.59 22.43	03.07 23.42	21.38-21.59/21 22.52	04.04 21.48-21.59/11 21.14	05.36 20.02	07.03 20.02	08.29 17.45	09.04 15.13	10.06 14.37
23	09.25 15.45	07.52 17.22	06.17 18.44	05.31 21.15	03.56 22.46	03.08 23.42	21.38-22.00/22 22.49	04.07 21.49-21.56/7 21.10	05.39 20.02	07.06 20.02	08.32 17.42	09.07 15.11	10.06 14.37
24	09.23 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.42	21.38-21.59/21 22.47	04.10 21.07 21.07	05.42 20.02	07.09 20.02	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.45 17.28	06.10 18.50	05.24 21.21	03.50 22.52	03.09 23.42	21.38-21.59/21 22.44	04.13 21.04 21.04	05.45 20.02	07.12 20.02	07.38 16.36	09.13 15.06	10.07 14.39
26	09.17 15.54	07.42 17.31	06.07 18.53	05.20 21.24	03.48 22.54	03.09 23.41	21.38-22.00/22 22.41	04.16 21.04 21.04	05.48 20.02	07.14 20.02	07.41 16.32	09.15 15.04	10.07 14.40
27	09.15 15.58	07.39 17.34	06.03 18.56	05.17 21.27	03.45 22.57	03.10 23.41	21.39-22.00/21 22.38	04.19 20.57 20.57	05.51 20.02	07.17 20.02	07.44 16.29	09.18 15.02	10.07 14.41
28	09.12 16.01	07.35 17.37	06.00 18.59	05.14 21.30	03.42 23.00	03.11 23.40	21.39-22.01/22 22.35	04.22 20.53 20.53	05.54 20.02	07.20 20.02	07.47 16.26	09.21 15.00	10.07 14.42
29	09.09 16.04	07.32 18.59	06.56 21.30	05.10 21.33	03.40 23.03	03.12 23.39	21.38-22.00/22 22.32	04.25 20.56 20.56	05.56 20.02	07.23 20.02	07.50 16.23	09.24 14.58	10.06 14.43
30	09.06 16.07	07.29 19.04	06.53 21.33	05.07 21.36	03.37 23.05	03.14 23.38	21.39-22.00/21 22.29	04.28 20.59 20.59	05.59 20.02	07.26 20.02	07.53 16.20	09.27 14.56	10.06 14.45
31	09.04 16.10	07.27 19.07	06.49 21.30	05.07 21.36	03.35 23.08	03.13 23.38	21.33-21.55/22 22.26	04.31 20.43 20.43	06.02 20.02	07.56 16.16 16.16	09.25 14.46 14.46	10.05 14.46 14.46	
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148	0
Sum of minutes with flicker	0	0	0	0	197	654	451	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 59 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	15.40-16.03/23 20.10	06.46 20.10	05.04 21.39	20.19-20.40/21 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	15.41-16.02/21 20.13	06.42 20.13	05.00 21.42	20.20-20.39/19 23.14
3	10.03 14.51	08.55 16.19	07.25 17.46	15.42-16.00/18 20.16	06.39 20.16	04.57 21.45	20.20-20.39/19 23.16
4	10.02 14.53	08.52 16.23	07.22 17.49	15.45-15.58/13 20.19	06.35 20.19	04.54 21.48	20.20-20.38/18 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52	20.22	06.32 20.22	04.50 21.51	20.22-20.38/16 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55	20.25	06.29 20.25	04.47 21.54	20.23-20.36/13 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58	20.28	06.25 20.28	04.44 21.58	20.25-20.34/9 23.25
8	09.57 15.02	08.40 16.35	07.08 18.01	20.30	06.22 20.30	04.41 22.01	20.28-20.30/2 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04	20.33	06.18 20.33	04.37 22.04	23.29
10	09.54 15.07	08.34 16.42	07.02 18.07	20.36	06.15 20.36	04.34 22.07	23.31
11	09.52 15.10	08.31 16.45	06.58 18.10	20.39	06.11 20.39	04.31 22.10	23.33
12	09.50 15.13	08.28 16.48	06.55 18.13	20.42	06.08 20.42	04.28 22.13	23.34
13	09.48 15.15	08.24 16.51	06.51 18.16	20.45	06.04 20.45	04.25 22.16	23.36
14	09.46 15.18	08.21 16.54	15.51-15.55/4 18.18	20.48	06.01 20.48	04.22 22.19	23.37
15	09.44 15.21	08.18 16.57	15.46-15.59/13 18.21	20.51	06.45 20.51	05.58 22.22	23.38
16	09.42 15.24	08.15 17.01	15.44-16.02/18 18.24	20.54	06.41 20.54	04.16 22.25	23.39
17	09.40 15.27	08.12 17.04	15.42-16.03/21 18.27	20.57	06.38 20.57	04.13 22.28	23.40
18	09.38 15.30	08.08 17.07	15.42-16.05/23 18.30	21.00	06.34 21.00	04.10 22.31	23.41
19	09.35 15.32	08.05 17.10	15.40-16.05/25 18.33	21.03	06.31 21.03	04.07 22.34	23.42
20	09.33 15.35	08.02 17.13	15.39-16.06/27 18.36	21.06	06.27 21.06	04.04 22.37	23.42
21	09.30 15.39	07.59 17.16	15.39-16.07/28 18.39	21.09	06.24 21.09	04.01 22.40	23.43
22	09.28 15.42	07.55 17.19	15.38-16.06/28 18.42	21.12	06.20 21.12	03.58 22.43	23.43
23	09.25 15.45	07.52 17.22	15.39-16.07/28 18.44	21.15	06.17 21.15	03.55 22.46	23.43
24	09.23 15.48	07.49 17.25	15.38-16.07/29 18.47	21.18	06.14 21.18	03.52 22.49	23.43
25	09.20 15.51	07.45 17.28	15.38-16.07/29 18.50	21.21	06.10 21.21	03.50 22.52	23.43
26	09.18 15.54	07.42 17.31	15.38-16.06/28 18.53	21.24	06.07 21.24	03.47 22.55	23.42
27	09.15 15.57	07.39 17.34	15.38-16.05/27 18.56	21.27	06.03 21.27	03.44 22.58	23.42
28	09.12 16.00	07.35 17.37	15.39-16.05/26 18.59	21.30	06.00 21.30	03.42 23.00	23.41
29	09.09 16.03		06.56 20.02	21.33	05.10 21.33	03.39 23.03	23.40
30	09.07 16.07		06.53 20.04	21.36	05.07 21.36	03.37 23.06	23.39
31	09.04 16.10		06.49 20.07		03.34 23.09		
Potential sun hours	179	241	363	448	562	610	57
Sum of minutes with flicker	0	354	75	146	117		57

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 59 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.33 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.36 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.39 22.17	06.10 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 22.13	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	03.21 23.32	04.46 22.10	20.36-20.42/6 20.26	06.16 18.42	07.40 16.01	08.12 14.46
6	03.23 23.31	04.49 22.07	20.34-20.45/11 20.22	06.19 18.39	07.42 15.58	08.15 14.45
7	03.25 23.29	04.52 22.04	20.32-20.46/14 20.19	06.22 18.35	07.45 15.55	08.18 14.43
8	03.27 23.27	04.55 22.01	20.31-20.47/16 20.16	06.25 18.32	07.48 15.52	08.21 14.42
9	03.29 23.25	04.58 21.57	20.29-20.47/18 20.12	06.27 18.29	07.51 15.49	16.22-16.31/9 14.41
10	03.32 23.23	05.01 21.54	20.29-20.48/19 20.09	06.30 18.25	07.54 15.46	16.18-16.34/16 14.40
11	03.34 23.21	05.04 21.51	20.29-20.49/20 20.05	06.33 18.22	07.57 15.43	16.16-16.35/19 14.39
12	03.37 23.18	05.07 21.47	20.28-20.48/20 20.02	06.36 18.18	08.00 15.40	16.14-16.36/22 14.38
13	03.39 23.16	05.10 21.44	20.28-20.49/21 19.58	06.38 18.15	08.02 15.37	16.13-16.37/24 14.37
14	03.42 23.14	05.13 21.41	20.28-20.49/21 19.55	06.41 18.12	08.05 15.34	16.12-16.37/25 14.36
15	03.44 23.11	05.16 21.38	20.27-20.48/21 19.51	06.44 18.08	08.08 15.31	16.11-16.38/27 14.36
16	03.47 23.09	05.18 21.34	20.28-20.47/19 19.48	06.47 18.05	08.11 15.29	16.10-16.38/28 14.36
17	03.50 23.06	05.21 21.31	20.29-20.47/18 19.44	06.50 18.02	08.14 15.26	16.10-16.39/29 14.35
18	03.52 23.04	05.24 21.27	20.29-20.45/16 19.41	06.52 17.58	08.17 15.23	16.10-16.38/28 14.35
19	03.55 23.01	05.27 21.24	20.30-20.44/14 19.37	06.55 17.55	08.20 15.21	16.09-16.38/29 14.35
20	03.58 22.58	05.30 21.21	20.31-20.40/9 19.34	06.58 17.52	08.23 15.18	16.09-16.37/28 14.35
21	04.01 22.56	05.33 21.17	20.34-20.37/3 19.30	07.01 17.48	08.26 15.15	16.09-16.36/27 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	16.10-16.36/26 15.13	09.04 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	16.11-16.35/24 15.11	09.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	16.11-16.34/23 15.08	09.10 14.37
25	04.12 22.44	05.45 21.04	07.12 19.17	07.38 16.35	15.13-15.33/20 15.06	09.13 14.38
26	04.15 22.41	05.48 21.00	07.14 19.13	07.41 16.32	15.14-15.31/17 15.04	09.16 14.39
27	04.18 22.38	05.51 20.57	07.17 19.10	07.44 16.29	15.17-15.28/11 15.01	09.19 14.40
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.43
30	04.27 22.29	05.59 20.47	07.26 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	266	0	432	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 60 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1184)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.42	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.47	03.22	03.24	04.49	06.19	07.42	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.32	17.58	20.27	21.57	23.25	23.28	22.04	20.19	18.35	15.55	14.44
8	09.56	08.40	07.08	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.18	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.30	17.49	15.16	14.36
22	09.28	07.55	06.20	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.35	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.57	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.35	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.04	21.36	23.05	23.38	22.29	20.47	18.59	17.19	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.04/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 61 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1185)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05	09.01	07.32	06.46	05.04	06.40-06.57/17	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.49	16.14	17.41	20.10	21.39		23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	06.42-06.54/12	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42		23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.58	06.45-06.50/5	03.29	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45		23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54		03.27	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48		23.18	23.33	22.13	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51		03.24	03.22	04.46	06.17	07.40	08.12	09.40
	14.56	16.26	17.53	20.22	21.51		23.20	23.32	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.16	06.29	04.48		03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.55	20.25	21.54		23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.25	04.45		03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.57		23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41		03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01		23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38		03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04		23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35		03.16	03.33	05.01	06.53-07.01/8	06.30	07.54	08.27
	15.08	16.42	18.07	20.36	22.07		23.31	23.22	21.54	20.09	18.26	15.46	14.41
11	09.52	08.31	06.59	06.12	04.32		03.14	03.35	05.04	06.49-07.03/14	06.33	07.57	08.30
	15.11	16.45	18.10	20.39	22.10		23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29		03.13	03.37	05.07	06.48-07.05/17	06.36	08.00	08.33
	15.13	16.49	18.13	20.42	22.13		23.34	23.18	21.48	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.26		03.12	03.40	05.10	06.47-07.07/20	06.39	08.03	08.36
	15.16	16.52	18.16	20.45	22.16		23.35	23.16	21.44	19.58	18.15	15.38	14.38
14	09.46	08.21	06.48	06.01	06.46-06.58/12		03.11	03.43	05.13	06.45-07.07/22	06.42	08.06	08.40
	15.19	16.55	18.19	20.48	22.19		23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	06.44-07.00/16		03.10	03.45	05.16	06.45-07.08/23	06.44	08.08	08.43
	15.22	16.58	18.22	20.51	22.22		23.38	23.11	21.38	19.52	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	06.41-07.01/20		03.09	03.48	05.19	06.44-07.09/25	06.47	08.11	08.46
	15.24	17.01	18.25	20.54	22.25		23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	06.40-07.02/22		03.09	03.51	05.22	06.43-07.09/26	06.50	08.14	08.49
	15.27	17.04	18.27	20.57	22.28		23.40	23.06	21.31	19.45	18.02	15.27	14.36
18	09.37	08.09	06.35	05.48	06.39-07.03/24		03.08	03.53	05.25	06.42-07.09/27	06.53	08.17	08.52
	15.30	17.07	18.30	21.00	22.31		23.41	23.03	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	06.38-07.04/26		03.08	03.56	05.28	06.42-07.10/28	06.55	08.20	08.55
	15.33	17.10	18.33	21.03	22.34		23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	06.38-07.04/26		03.08	03.59	05.31	06.41-07.09/28	06.58	08.23	08.58
	15.36	17.13	18.36	21.06	22.37		23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.38	06.36-07.03/27		03.08	04.02	05.34	06.42-07.09/27	07.01	08.26	09.01
	15.39	17.16	18.39	21.09	22.40		23.42	22.55	21.17	19.31	17.49	15.16	14.37
22	09.28	07.56	06.21	05.34	06.36-07.03/27		03.08	04.05	05.37	06.41-07.08/27	07.04	08.29	09.04
	15.42	17.20	18.42	21.12	22.43		23.42	22.53	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	06.36-07.03/27		03.08	04.07	05.39	06.41-07.08/27	07.06	08.32	09.07
	15.45	17.23	18.45	21.15	22.46		23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	06.36-07.03/27		03.08	04.10	05.42	06.42-07.07/25	07.09	08.35	09.10
	15.48	17.26	18.48	21.18	22.49		23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	06.36-07.03/27		03.09	04.13	05.45	06.42-07.05/23	07.12	07.38	09.13
	15.52	17.29	18.50	21.21	22.52		23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.18	07.42	06.07	05.21	06.36-07.02/26		03.10	04.16	05.48	06.43-07.05/22	07.15	07.41	09.16
	15.55	17.32	18.53	21.24	22.55		23.42	22.41	21.00	19.13	16.33	15.04	14.40
27	09.15	07.39	06.03	05.17	06.37-07.02/25		03.10	04.19	05.51	06.44-07.04/20	07.18	07.44	09.19
	15.58	17.35	18.56	21.27	22.57		23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	06.37-07.01/24		03.11	04.22	05.54	06.45-07.01/16	07.20	07.47	09.21
	16.01	17.38	18.59	21.30	23.00		23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.09	06.57	05.11	06.38-07.00/22		03.40	03.13	04.25	05.57	06.47-06.59/12	07.23	07.50	09.24
	16.04	20.02	21.33	23.03	23.03		23.40	22.32	20.50	19.03	16.23	14.58	14.43
30	09.07	06.53	05.07	06.39-06.58/19		03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07	20.05	21.36	23.06	23.06		23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04	06.50	21.36	23.05	23.05		23.39	22.29	20.47	19.00	16.20	14.56	14.45
	16.10	20.08	21.36	23.08	23.08		23.39	22.26	20.43	19.00	16.17	14.56	14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148	0
Sum of minutes with flicker	0	0	0	397	34	0	0	437	392	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 62 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1186)  
 Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.48	09.01 13.40-14.07/27 16.13	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11
2	10.04 14.50	08.58 13.40-14.07/27 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.30 23.14
3	10.03 14.52	08.55 13.40-14.06/26 16.23	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16
4	10.02 14.54	08.52 13.41-14.06/25 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.19
5	10.01 14.56	08.49 13.42-14.05/23 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.21
6	10.00 14.58	08.46 13.43-14.05/22 16.29	07.15 17.55	06.29 20.25	04.48 21.55	03.22 23.23
7	09.58 15.01	08.43 13.44-14.04/20 16.33	07.12 17.58	06.25 20.28	04.44 21.58	03.20 23.25
8	09.57 13.26-13.32/6 15.03	08.40 13.46-14.03/17 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27
9	09.55 13.25-13.33/8 15.05	08.37 13.48-14.00/12 16.39	07.05 18.04	06.18 20.34	04.38 22.04	03.17 23.29
10	09.54 13.23-13.35/12 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.15 23.31
11	09.52 13.23-13.37/14 15.10	08.31 16.45	06.58 07.32-07.40/8 18.10	06.12 20.39	04.32 22.10	03.14 23.33
12	09.50 13.22-13.37/15 15.13	08.28 16.48	06.55 07.30-07.43/13 18.13	06.08 20.42	04.28 22.13	03.13 23.34
13	09.48 13.23-13.39/16 15.16	08.25 16.52	06.52 07.28-07.43/15 18.16	06.05 20.45	04.25 22.16	03.11 23.36
14	09.46 13.22-13.39/17 15.18	08.21 16.55	06.48 07.27-07.45/18 18.19	06.01 20.48	04.22 22.19	03.10 23.37
15	09.44 13.22-13.41/19 15.21	08.18 16.58	06.45 07.26-07.44/18 18.22	05.58 20.51	04.19 22.22	03.09 23.38
16	09.42 13.22-13.41/19 15.24	08.15 17.01	06.41 07.26-07.45/19 18.25	05.54 20.54	04.16 22.25	03.09 23.39
17	09.40 13.23-13.43/20 15.27	08.12 17.04	06.38 07.25-07.44/19 18.27	05.51 20.57	04.13 22.28	03.08 23.40
18	09.38 13.22-13.43/21 15.30	08.09 17.07	06.34 07.25-07.44/19 18.30	05.48 21.00	04.10 22.31	03.08 23.41
19	09.35 13.22-13.57/35 15.33	08.05 17.10	06.31 07.25-07.43/18 18.33	05.44 21.03	04.07 22.34	03.07 23.42
20	09.33 13.23-13.59/36 15.36	08.02 17.13	06.28 07.26-07.42/16 18.36	05.41 21.06	04.04 22.37	03.07 23.42
21	09.31 13.22-14.00/38 15.39	07.59 17.16	06.24 07.27-07.40/13 18.39	05.37 21.09	04.01 22.40	03.07 23.43
22	09.28 13.23-14.02/39 15.42	07.56 17.19	06.21 07.29-07.38/9 18.42	05.34 21.12	03.58 22.43	03.07 23.43
23	09.26 13.23-14.03/40 15.45	07.52 17.22	06.17 18.45	05.31 21.15	03.56 22.46	03.07 23.43
24	09.23 13.23-14.03/40 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.43
25	09.20 13.25-14.04/39 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.43
26	09.18 13.25-14.05/40 15.54	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42
27	09.15 13.26-14.06/40 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.58	03.10 23.42
28	09.12 13.27-14.06/39 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.42 23.01	03.11 23.41
29	09.10 13.28-14.06/38 16.04		06.56 20.02	05.10 21.33	03.40 23.03	03.12 23.40
30	09.07 13.30-14.07/37 16.07		06.53 20.05	05.07 21.36	03.37 23.06	03.13 23.39
31	09.04 13.33-14.06/33 16.10		06.50 20.08		03.35 23.09	
Potential sun hours	179	241	363	448	562	610
Sum of minutes with flicker	677	199	185	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 62 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1186)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	08.09-08.23/14 16.13	07.59 13.21-13.26/5 09.30 13.06-13.19/13 14.54
2	03.16 23.37	04.37 22.20	06.08 20.36	07.31 18.53	08.10-08.21/11 16.10	08.02 13.17-13.30/13 09.32 13.07-13.18/11 14.52
3	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.14-08.15/1 16.07	08.06 13.16-13.33/17 09.35 13.08-13.17/9 14.50
4	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	13.13-13.33/20 09.37 13.11-13.16/5 14.48
5	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.12 16.01	13.13-13.35/22 09.40 14.47
6	03.23 23.31	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	13.12-13.36/24 09.42 14.45
7	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	13.11-13.36/25 09.45 14.44
8	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	13.11-13.37/26 09.47 14.43
9	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	13.11-13.37/26 09.49 14.41
10	03.32 23.23	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	13.11-13.38/27 09.51 14.40
11	03.35 23.21	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	13.04-13.38/34 09.53 14.39
12	03.37 23.18	05.07 21.48	06.36 20.02	08.00 18.19	08.34 15.40	13.02-13.39/37 09.55 14.38
13	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.37 15.37	12.59-13.38/39 09.56 14.38
14	03.42 23.14	05.13 21.41	06.41 19.55	08.06 18.12	08.40 15.35	12.59-13.38/39 09.58 14.37
15	03.45 23.11	05.16 21.38	06.44 19.51	08.08 18.09	08.43 15.32	12.58-13.38/40 09.59 14.36
16	03.47 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	12.58-13.38/40 10.01 14.36
17	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	12.57-13.37/40 10.02 14.36
18	03.53 23.04	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	12.57-13.37/40 10.03 14.36
19	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	12.57-13.37/40 10.04 14.36
20	03.58 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	12.58-13.36/38 10.05 14.36
21	04.01 22.56	05.33 21.18	07.01 19.31	08.26 17.49	09.01 15.16	12.59-13.36/37 10.06 14.36
22	04.04 22.53	05.36 21.14	07.04 19.27	08.29 17.45	09.04 15.13	12.59-13.35/36 10.06 14.37
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	12.59-13.34/35 10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	12.59-13.20/21 10.07 13.21-13.33/12 14.38
25	04.13 22.44	05.45 21.04	07.12 19.17	08.38 17.36	09.13 15.06	13.00-13.20/20 10.07 13.24-13.30/6 14.39
26	04.16 22.41	05.48 21.00	07.15 19.13	08.41 17.32	09.16 15.04	13.00-13.20/20 10.07 14.39
27	04.19 22.38	05.51 20.57	07.17 19.10	08.44 17.29	09.19 15.02	13.02-13.20/18 10.07 14.41
28	04.22 22.35	05.54 20.54	07.20 19.07	08.47 17.26	09.22 15.00	13.02-13.20/18 10.07 14.42
29	04.25 22.32	05.57 20.50	07.23 19.03	08.50 17.23	09.24 14.58	13.03-13.19/16 10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 19.00	08.53 17.20	09.27 14.56	13.04-13.19/15 10.06 14.44
31	04.31 22.26	06.02 20.43		07.56 17.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	0	163	26	846	38

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.04/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
WTG: 63 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210,0 m (TOT: 300,0 m) (1187)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.48	09.01 14.49-15.08/19 16.13	07.32 17.41	06.46 07.54-08.21/27 20.10	05.04 21.39	03.33 23.11
2	10.04 14.50	08.58 14.48-15.09/21 16.17	07.29 17.44	06.43 07.54-08.21/27 20.13	05.01 21.42	03.30 23.14
3	10.03 14.52	08.55 14.47-15.09/22 16.20	07.26 17.47	06.39 07.55-08.20/25 20.16	04.57 21.45	03.28 23.16
4	10.02 14.54	08.52 14.48-15.10/22 16.23	07.22 17.50	06.36 07.55-08.18/23 20.19	04.54 21.48	03.26 23.19
5	10.01 14.56	08.49 14.48-15.09/21 16.26	07.19 17.52	06.32 07.56-08.17/21 20.22	04.51 21.52	03.24 23.21
6	10.00 14.58	08.46 14.48-15.10/22 16.29	07.16 17.55	06.29 07.57-08.15/18 20.25	04.48 21.55	03.22 23.23
7	09.58 15.01	08.43 14.48-15.09/21 16.33	07.12 17.58	06.25 07.59-08.12/13 20.28	04.44 21.58	03.20 23.25
8	09.57 15.03	08.40 14.49-15.10/21 16.36	07.09 18.01	06.22 08.03-08.08/5 20.31	04.41 22.01	03.18 23.27
9	09.55 15.05	08.37 14.49-15.09/20 16.39 15.31-15.42/11	07.05 18.04	06.19 20.34	04.38 22.04	03.17 23.29
10	09.54 15.08	08.34 14.50-15.08/18 16.42 15.28-15.44/16	07.02 18.07	06.15 20.37	04.35 22.07	03.15 23.31
11	09.52 15.10	08.31 14.52-15.07/15 16.45 15.27-15.46/19	06.59 18.10	06.12 20.39	04.32 22.10	03.14 23.33
12	09.50 15.13	08.28 14.53-15.05/12 16.48 15.26-15.47/21	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34
13	09.48 15.16	08.25 14.57-15.02/5 16.52 15.25-15.48/23	06.52 18.16	06.05 20.45	04.25 22.16	03.11 23.36
14	09.46 15.18	08.22 15.24-15.49/25 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.10 23.37
15	09.44 15.21	08.18 15.23-15.49/26 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.09 23.38
16	09.42 15.24	08.15 15.24-15.50/26 17.01	06.41 18.25	05.54 20.54	04.16 22.25	03.09 23.40
17	09.40 15.27	08.12 15.23-15.49/26 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40
18	09.38 15.30	08.09 15.23-15.50/27 17.07	06.35 18.30	05.48 21.00	04.10 22.31	03.08 23.41
19	09.35 15.33	08.05 15.23-15.49/26 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.42
20	09.33 15.36	08.02 15.24-15.49/25 17.13	06.28 18.36	05.41 21.06	04.04 22.38	03.07 23.42
21	09.31 15.39	07.59 15.24-15.48/24 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.43
22	09.28 15.42	07.56 15.25-15.48/23 17.19	06.21 07.05-07.17/12 18.42	05.34 21.12	03.59 22.43	03.07 23.43
23	09.26 15.45	07.52 15.25-15.47/22 17.22	06.17 07.02-07.19/17 18.45	05.31 21.15	03.56 22.46	03.07 23.43
24	09.23 15.48	07.49 15.26-15.45/19 17.26	06.14 07.00-07.21/21 18.48	05.27 21.18	03.53 22.49	03.08 23.43
25	09.20 15.51	07.46 15.29-15.44/15 17.29	06.10 06.58-07.21/23 18.50	05.24 21.21	03.50 22.52	03.08 23.43
26	09.18 15.54	07.42 15.31-15.40/9 17.32	06.07 06.57-07.22/25 18.53	05.21 21.24	03.48 22.55	03.09 23.42
27	09.15 15.58	14.55-15.00/5 17.35	06.03 06.57-07.23/26 18.56	05.17 21.27	03.45 22.58	03.10 23.42
28	09.12 16.01	14.52-15.03/11 17.38	06.00 06.55-07.23/28 18.59	05.14 21.30	03.42 23.01	03.11 23.41
29	09.10 16.04	14.50-15.04/14 17.41	06.57 07.55-08.23/28 20.02	05.11 21.33	03.40 23.03	03.12 23.40
30	09.07 16.07	14.50-15.06/16 17.44	06.53 07.54-08.22/28 20.05	05.07 21.36	03.37 23.06	03.13 23.39
31	09.04 16.10	14.49-15.07/18 17.47	06.50 07.54-08.22/28 20.08	05.04 21.39	03.35 23.09	03.13 23.39
Potential sun hours	179	241	363	448	562	610
Sum of minutes with flicker	64	622	236	159	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 63 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1187)  
 Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 14.19-14.37/18 16.13 14.58-15.13/15	09.30 14.54
2	03.16 23.37	04.37 22.20	06.08 20.37	07.31 18.53	08.03 14.19-14.38/19 16.10 15.01-15.11/10	09.33 14.52
3	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.06 14.19-14.39/20 16.07	09.35 14.50
4	03.20 23.34	04.43 22.14	06.14 08.01-08.05/4 20.30	07.37 18.46	08.09 14.18-14.39/21 16.04	09.38 14.48
5	03.22 23.32	04.46 22.10	06.16 07.56-08.09/13 20.26	07.40 18.43	08.12 14.18-14.40/22 16.01	09.40 14.47
6	03.23 23.31	04.49 22.07	06.19 07.53-08.11/18 20.23	07.43 18.39	08.15 14.18-14.40/22 15.58	09.42 14.45
7	03.26 23.29	04.52 22.04	06.22 07.51-08.12/21 20.19	07.46 18.36	08.18 14.18-14.39/21 15.55	09.45 14.44
8	03.28 23.27	04.55 22.01	06.25 07.49-08.12/23 20.16	07.48 18.32	08.21 14.18-14.39/21 15.52	09.47 14.43
9	03.30 23.25	04.58 21.58	06.28 07.48-08.13/25 20.12	07.51 18.29	08.24 14.19-14.39/20 15.49	09.49 14.41
10	03.32 23.23	05.01 21.54	06.30 07.48-08.14/26 20.09	07.54 18.26	08.27 14.20-14.39/19 15.46	09.51 14.40
11	03.35 23.21	05.04 21.51	06.33 07.47-08.14/27 20.05	07.57 18.22	08.30 14.21-14.39/18 15.43	09.53 14.39
12	03.37 23.19	05.07 21.48	06.36 07.46-08.14/28 20.02	08.00 18.19	08.34 14.22-14.38/16 15.40	09.55 14.38
13	03.40 23.16	05.10 21.44	06.39 07.46-08.14/28 19.58	08.03 18.15	08.37 14.22-14.36/14 15.37	09.56 14.38
14	03.42 23.14	05.13 21.41	06.42 07.46-08.14/28 19.55	08.06 18.12	08.40 14.24-14.34/10 15.35	09.58 14.37
15	03.45 23.11	05.16 21.38	06.44 07.45-08.12/27 19.52	08.09 18.09	08.43 14.27-14.31/4 15.32	09.59 14.36
16	03.47 23.09	05.19 21.34	06.47 07.45-08.12/27 19.48	08.11 16.03-16.14/11 18.05	08.46 15.29	10.01 14.36
17	03.50 23.06	05.22 21.31	06.50 07.46-08.11/25 19.45	08.14 16.00-16.16/16 18.02	08.49 15.26	10.02 14.36
18	03.53 23.04	05.25 21.28	06.53 07.45-08.09/24 19.41	08.17 15.58-16.17/19 17.59	08.52 15.24	10.03 14.36
19	03.56 23.01	05.28 21.24	06.55 07.47-08.08/21 19.38	08.20 15.56-16.18/22 17.55	08.55 15.21	10.04 14.36
20	03.58 22.58	05.31 21.21	06.58 07.48-08.06/18 19.34	08.23 15.55-16.18/23 17.52	08.58 15.18	10.05 14.36
21	04.01 22.56	05.34 21.18	07.01 07.50-08.04/14 19.31	08.26 15.55-16.20/25 17.49	09.01 15.16	10.06 14.36
22	04.04 22.53	05.36 21.14	07.04 07.53-07.59/6 19.27	08.29 15.54-16.20/26 17.45	09.04 15.13	10.06 14.37
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 15.53-16.19/26 17.42	09.07 15.11	10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 15.53-16.20/27 17.39	09.10 15.09	10.07 14.38
25	04.13 22.44	05.45 21.04	07.12 19.17	07.38 14.53-15.19/26 16.36	09.13 15.06	10.07 14.39
26	04.16 22.41	05.48 21.01	07.15 19.13	07.41 14.53-15.19/26 16.32	09.16 15.04	10.08 14.39
27	04.19 22.38	05.51 20.57	07.18 19.10	07.44 14.54-15.19/25 16.29	09.19 15.02	10.07 14.41
28	04.22 22.35	05.54 20.54	07.20 19.07	07.47 14.54-15.18/24 16.26	09.22 15.00	10.07 14.42
29	04.25 22.32	05.57 20.50	07.23 19.03	07.50 14.25-14.33/8 16.23	09.24 14.58	10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 19.00	07.53 14.22-14.35/13 16.20	09.27 14.56	10.07 14.44
31	04.31 22.26	06.02 20.43		07.56 14.21-14.37/16 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	0	403	395	290	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 64 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1188)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December					
1	10.05	09.01	10.43-11.07/24	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30				
	14.48	16.13		17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54				
2	10.04	08.58	10.43-11.06/23	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	10.23-10.26/3	09.32			
	14.50	16.16		17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.52				
3	10.03	08.55	10.43-11.06/23	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	10.19-10.31/12	09.35			
	14.52	16.20		17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50				
4	10.02	08.52	10.44-11.06/22	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	10.17-10.32/15	09.37			
	14.54	16.23		17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48				
5	10.01	08.49	10.45-11.05/20	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	10.16-10.34/18	09.40			
	14.56	16.26		17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47				
6	10.00	08.46	10.47-11.04/17	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	10.15-10.35/20	09.42			
	14.58	16.29		17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45				
7	09.58	08.43	10.48-11.03/15	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	10.14-10.35/21	09.44			
	15.00	16.32		17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44				
8	09.57	08.40	10.50-11.01/11	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	10.14-10.36/22	09.47			
	15.03	16.36		18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42				
9	09.55	08.37		07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	10.14-10.37/23	09.49			
	15.05	16.39		18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41				
10	09.54	08.34		07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	10.14-10.37/23	09.51			
	15.08	16.42		18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40				
11	09.52	08.31		06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	10.14-10.38/24	09.53			
	15.10	16.45		18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.43	14.39				
12	09.50	08.28		06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	10.14-10.38/24	09.54			
	15.13	16.48		18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.38				
13	09.48	08.25		06.52	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	10.13-10.37/24	09.56			
	15.16	16.51		18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38				
14	09.46	08.21		06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	10.14-10.37/23	09.58			
	15.18	16.55		18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37				
15	09.44	08.18		06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	10.14-10.37/23	09.59			
	15.21	16.58		18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.36				
16	09.42	08.15		06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.15-10.37/22	10.01			
	15.24	17.01		18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36				
17	09.40	08.12		06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.16-10.37/21	10.02			
	15.27	17.04		18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36				
18	09.38	08.09		06.34	05.48	04.10	03.07	03.53	05.25	06.52	08.17	08.52	10.17-10.36/19	10.03			
	15.30	17.07		18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36				
19	09.35	10.50-10.53/3	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.18-10.36/18	10.04			
	15.33	17.10		18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36				
20	09.33	10.47-10.57/10	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.19-10.35/16	10.05			
	15.36	17.13		18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36				
21	09.30	10.45-10.59/14	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.21-10.35/14	10.06			
	15.39	17.16		18.39	21.09	22.40	23.43	22.55	21.17	19.31	17.49	15.16	14.36				
22	09.28	10.45-11.01/16	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.04	08.29	09.04	10.23-10.33/10	10.06			
	15.42	17.19		18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36				
23	09.25	10.44-11.02/18	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.26-10.30/4	10.07			
	15.45	17.22		18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37				
24	09.23	10.43-11.02/19	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07	10.07			
	15.48	17.25		18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38				
25	09.20	10.43-11.04/21	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07	10.07			
	15.51	17.28		18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.06	14.38				
26	09.18	10.42-11.04/22	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07	10.07			
	15.54	17.31		18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32	15.04	14.39				
27	09.15	10.43-11.05/22	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07	10.07			
	15.57	17.34		18.56	21.27	22.58	23.41	22.38	20.57	19.10	16.29	15.02	14.40				
28	09.12	10.42-11.05/23	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07	10.07			
	16.01	17.37		18.59	21.30	23.00	23.41	22.35	20.54	19.06	16.26	15.00	14.42				
29	09.09	10.42-11.05/23		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07	10.07			
	16.04			20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.57	14.43				
30	09.07	10.42-11.06/24		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06	10.06			
	16.07			20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.19	14.55	14.44				
31	09.04	10.42-11.06/24		06.49		03.35		04.31	06.02		07.56		10.06	10.06			
	16.10			20.07		23.08		22.26	20.43		16.16		14.46	14.46			
Potential sun hours	179																
Sum of minutes with flicker	239	241	155	0	0	0	610	0	598	0	392	0	307	0	204	399	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 65 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1189)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.14	17.41	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.34	22.13	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.43	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.54	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.26	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.07	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 66 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1190)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.48	16.13	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.16	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	16.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 67 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05 14.48	09.01 16.13	07.32 17.40	08.23-08.43/20 20.10	06.46 20.10	07.52-08.12/20 21.39	05.04 20.28-20.48/20	03.32 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	08.22-08.43/21 20.13	06.42 20.13	07.53-08.11/18 21.42	05.00 20.27-20.48/21	03.30 23.14
3	10.03 14.52	08.55 16.20	07.25 17.46	08.22-08.44/22 20.16	06.39 20.16	07.54-08.09/15 21.45	04.57 20.27-20.48/21	03.28 23.16
4	10.02 14.54	08.52 16.23	07.22 17.49	08.21-08.43/22 20.19	06.36 20.19	07.56-08.07/11 21.48	04.54 20.28-20.49/21	03.26 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52	08.00-08.02/2 20.22	06.32 20.22	07.56-08.07/11 21.51	04.50 20.28-20.49/21	03.24 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55	07.56-08.07/11 20.25	06.29 20.25	07.56-08.07/11 21.54	04.47 20.27-20.48/21	03.22 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58	07.53-08.08/15 20.28	06.25 20.28	07.53-08.08/15 21.58	04.44 20.28-20.48/20	03.20 23.25
8	09.57 15.03	08.40 16.35	07.09 18.01	07.52-08.10/18 20.30	06.22 20.30	07.52-08.10/18 22.01	04.41 20.28-20.47/19	03.18 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04	07.50-08.10/20 20.33	06.18 20.33	07.50-08.10/20 22.04	04.38 20.29-20.47/18	03.16 23.29
10	09.54 15.07	08.34 16.42	07.02 18.07	07.50-08.11/21 20.36	06.15 20.36	07.50-08.11/21 22.07	04.34 20.30-20.46/16	03.15 23.31
11	09.52 15.10	08.31 16.45	06.58 18.10	07.49-08.11/22 20.39	06.11 20.39	07.49-08.11/22 22.10	04.31 20.30-20.44/14	03.14 23.33
12	09.50 15.13	08.28 16.48	06.55 18.13	07.49-08.11/22 20.42	06.08 20.42	07.49-08.11/22 22.13	04.28 20.33-20.44/11	03.12 23.34
13	09.48 15.15	08.25 16.51	06.51 18.16	07.49-08.10/21 20.45	06.04 20.45	07.49-08.10/21 22.16	04.25 20.35-20.41/6	03.11 23.36
14	09.46 15.18	08.21 16.54	06.48 18.19	07.49-08.10/21 20.48	06.01 20.48	07.49-08.10/21 22.19	04.22 20.35-20.41/6	03.10 23.37
15	09.44 15.21	08.18 16.58	06.45 18.21	07.49-08.08/19 20.51	05.58 20.51	07.49-08.08/19 22.22	04.19 20.35-20.41/6	03.09 23.38
16	09.42 15.24	08.15 17.01	06.41 18.24	07.51-08.08/17 20.54	05.54 20.54	07.51-08.08/17 22.25	04.16 20.35-20.41/6	03.08 23.39
17	09.40 15.27	08.12 17.04	06.38 18.27	07.51-08.05/14 20.57	05.51 20.57	07.51-08.05/14 22.28	04.13 20.35-20.41/6	03.08 23.40
18	09.38 15.30	08.09 17.07	06.34 18.30	07.54-08.03/9 21.00	05.47 21.00	07.54-08.03/9 22.31	04.10 20.35-20.41/6	03.07 23.41
19	09.35 15.33	08.05 17.10	06.31 18.33	07.54-08.03/9 21.03	05.44 21.03	07.54-08.03/9 22.34	04.07 20.35-20.41/6	03.07 23.42
20	09.33 15.36	08.02 17.13	06.27 18.36	07.54-08.03/9 21.06	05.41 21.06	07.54-08.03/9 22.37	04.04 20.35-20.41/6	03.07 23.42
21	09.30 15.39	07.59 17.16	06.24 18.39	07.54-08.03/9 21.09	05.37 21.09	07.54-08.03/9 22.40	04.01 20.35-20.41/6	03.07 23.43
22	09.28 15.42	07.55 17.19	06.20 18.42	07.01-07.11/10 21.12	05.34 21.12	07.01-07.11/10 22.43	03.58 20.35-20.41/6	03.07 23.43
23	09.25 15.45	07.52 17.22	06.17 18.44	06.58-07.12/14 21.15	05.30 21.15	06.58-07.12/14 22.46	03.55 20.35-20.41/6	03.07 23.43
24	09.23 15.48	07.49 17.25	06.14 18.47	06.56-07.14/18 21.18	05.27 21.18	06.56-07.14/18 22.49	03.53 20.35-20.41/6	03.07 23.43
25	09.20 15.51	07.46 17.28	06.10 18.50	06.54-07.14/20 21.21	05.24 21.21	06.54-07.14/20 22.52	03.50 20.35-20.41/6	03.08 23.43
26	09.18 15.54	07.42 17.31	06.07 18.53	06.54-07.15/21 21.24	05.20 21.24	06.54-07.15/21 22.55	03.47 20.35-20.41/6	03.09 23.42
27	09.15 15.57	07.39 17.34	06.03 18.56	06.52-07.15/23 21.27	05.17 21.27	06.52-07.15/23 22.58	03.45 20.35-20.41/6	03.09 23.42
28	09.12 16.00	07.36 17.37	06.00 18.59	06.52-07.15/23 21.30	05.14 21.30	06.52-07.15/23 23.01	03.42 20.35-20.41/6	03.10 23.41
29	09.09 16.04	07.33 17.34	05.56 20.02	07.51-08.14/23 21.33	05.10 21.33	07.51-08.14/23 23.03	03.39 20.35-20.41/6	03.12 23.40
30	09.07 16.07	07.31 17.32	05.53 20.05	07.52-08.14/22 21.36	05.07 21.36	07.52-08.14/22 23.06	03.37 20.35-20.41/6	03.13 23.39
31	09.04 16.10	07.28 17.29	05.49 20.07	07.52-08.14/22 21.39	05.04 21.39	07.52-08.14/22 23.09	03.35 20.35-20.41/6	03.13 23.39
Potential sun hours	179	241	363	448	562	610	0	
Sum of minutes with flicker	0	59	612	136	229	0	0	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 67 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14	04.34 20.42-20.54/12	06.05	07.28 08.28-08.49/21	07.59	09.30
	23.38	22.23	20.40	18.56	16.13	14.53
2	03.16	04.37 20.41-20.56/15	06.08	07.31 08.27-08.49/22	08.02	09.32
	23.37	22.20	20.36	18.53	16.10	14.51
3	03.17	04.40 20.39-20.56/17	06.11	07.34 08.27-08.49/22	08.05	09.35
	23.35	22.17	20.33	18.49 09.08-09.09/1	16.07	14.50
4	03.19	04.43 20.39-20.57/18	06.13	07.37 08.28-08.48/20	08.09	09.37
	23.34	22.13	20.29	18.46 09.03-09.14/11	16.04	14.48
5	03.21	04.46 20.38-20.57/19	06.16	07.40 08.28-08.47/19	08.12	09.40
	23.32	22.10	20.26	18.42 09.00-09.16/16	16.01	14.46
6	03.23	04.49 20.37-20.58/21	06.19	07.43 08.29-08.46/17	08.15	09.42
	23.31	22.07	20.22	18.39 08.59-09.17/18	15.58	14.45
7	03.25	04.52 20.36-20.58/22	06.22	07.45 08.30-08.44/14	08.18	09.44
	23.29	22.04	20.19	18.35 08.58-09.18/20	15.55	14.43
8	03.27	04.55 20.37-20.58/21	06.25 07.50-08.01/11	07.48 08.33-08.41/8	08.21	09.47
	23.27	22.01	20.16	18.32 08.57-09.18/21	15.52	14.42
9	03.30	04.58 20.37-20.58/21	06.27 07.48-08.03/15	07.51 08.56-09.18/22	08.24	09.49
	23.25	21.57	20.12	18.29	15.49	14.41
10	03.32	05.01 20.36-20.58/22	06.30 07.47-08.05/18	07.54 08.56-09.18/22	08.27	09.51
	23.23	21.54	20.09	18.25	15.46	14.40
11	03.34	05.04 20.37-20.58/21	06.33 07.45-08.05/20	07.57 08.56-09.17/21	08.30	09.53
	23.21	21.51	20.05	18.22	15.43	14.39
12	03.37	05.07 20.36-20.56/20	06.36 07.44-08.05/21	08.00 08.56-09.17/21	08.33	09.55
	23.18	21.48	20.02	18.19	15.40	14.38
13	03.39	05.10 20.37-20.56/19	06.39 07.43-08.06/23	08.03 08.56-09.16/20	08.37	09.56
	23.16	21.44	19.58	18.15	15.37	14.37
14	03.42	05.13 20.38-20.55/17	06.41 07.42-08.05/23	08.05 08.56-09.15/19	08.40	09.58
	23.14	21.41	19.55	18.12	15.34	14.37
15	03.44	05.16 20.38-20.53/15	06.44 07.42-08.05/23	08.08 08.57-09.13/16	08.43	09.59
	23.11	21.38	19.51	18.08	15.31	14.36
16	03.47	05.19 20.40-20.52/12	06.47 07.42-08.04/22	08.11 09.00-09.12/12	08.46	10.01
	23.09	21.34	19.48	18.05	15.29	14.36
17	03.50	05.22 20.43-20.49/6	06.50 07.41-08.03/22	08.14 09.02-09.09/7	08.49	10.02
	23.06	21.31	19.44	18.02	15.26	14.35
18	03.53	05.24	06.52 07.42-08.02/20	08.17	08.52	10.03
	23.04	21.28	19.41	17.58	15.23	14.35
19	03.55	05.27	06.55 07.43-08.01/18	08.20	08.55	10.04
	23.01	21.24	19.37	17.55	15.21	14.35
20	03.58	05.30	06.58 07.44-08.00/16	08.23	08.58	10.05
	22.58	21.21	19.34	17.52	15.18	14.35
21	04.01	05.33	07.01 07.45-07.56/11	08.26	09.01	10.06
	22.56	21.17	19.31	17.48	15.16	14.36
22	04.04	05.36	07.03	08.29	09.04	10.06
	22.53	21.14	19.27	17.45	15.13	14.36
23	04.07	05.39	07.06	08.32	09.07	10.07
	22.50	21.11	19.24	17.42	15.11	14.37
24	04.10	05.42	07.09	08.35	09.10	10.07
	22.47	21.07	19.20	17.39	15.08	14.37
25	04.13	05.45	07.12 08.37-08.44/7	07.38	09.13	10.07
	22.44	21.04	19.17	16.35	15.06	14.38
26	04.16	05.48	07.15 08.34-08.47/13	07.41	09.16	10.07
	22.41	21.00	19.13	16.32	15.04	14.39
27	04.19	05.51	07.17 08.32-08.48/16	07.44	09.19	10.07
	22.38	20.57	19.10	16.29	15.01	14.40
28	04.22	05.53	07.20 08.31-08.49/18	07.47	09.22	10.07
	22.35	20.54	19.06	16.26	14.59	14.41
29	04.25	05.56	07.23 08.30-08.50/20	07.50	09.24	10.07
	22.32	20.50	19.03	16.23	14.57	14.43
30	04.28	05.59	07.26 08.29-08.50/21	07.53	09.27	10.06
	22.29	20.47	18.59	16.19	14.55	14.44
31	04.31 20.44-20.52/8	06.02		07.56		10.06
	22.26	20.43		16.16		14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	8	298	358	390	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 68 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1192)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.30 14.52
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	03.15 23.37	04.36 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.16 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.25	07.39 18.42	08.11 16.00	09.40 14.46
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	03.22 23.30	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 15.02	08.43 16.35	07.11 18.00	06.25 20.30	04.43 22.00	03.19 23.27	03.24 23.27	04.51 22.00	06.21 20.15	07.45 18.31	08.17 15.51	09.44 14.41
8	09.57 15.02	08.40 16.35	07.08 18.00	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.21 15.51	09.46 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.15 23.29	03.29 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40
10	09.53 15.07	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.06	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.10	03.13 23.33	03.33 23.21	05.03 21.50	06.32 20.05	07.56 18.21	08.30 15.42	09.53 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 15.34	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.38	03.43 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.53	04.15 22.25	03.07 23.39	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.45 15.28	10.01 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.56	04.12 22.28	03.07 23.40	03.49 23.06	05.21 21.30	06.49 19.44	08.14 18.01	08.49 15.25	10.02 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	03.52 23.03	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.34
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.06 23.42	03.54 23.01	05.27 21.24	06.55 19.37	08.20 17.54	08.55 15.20	10.04 14.34
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.06 23.42	03.57 22.58	05.30 21.20	06.57 19.33	08.23 17.51	08.58 15.17	10.05 14.35
21	09.30 15.38	07.58 17.15	06.23 18.38	05.36 21.08	04.00 22.40	03.06 23.43	04.00 22.55	05.33 21.17	07.00 19.30	08.25 17.48	09.01 15.15	10.06 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.06 23.43	04.03 22.53	05.36 21.14	07.03 19.27	08.28 17.45	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.55 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.07	10.07 14.36
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	03.54 22.44	05.27 21.03	06.55 19.16	08.20 17.35	08.55 15.05	10.04 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.23	03.46 22.55	03.08 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.40 16.32	09.16 15.03	10.07 14.38
27	09.15 15.57	07.38 17.34	06.03 18.55	05.16 21.26	03.44 22.58	03.08 23.42	04.18 22.38	05.50 20.57	07.17 19.09	07.44 16.28	09.18 15.01	10.08 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.00	03.09 23.41	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.25	09.21 14.59	10.07 14.40
29	09.09 16.03	07.32 17.34	05.56 19.01	05.10 21.33	03.39 23.03	03.11 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 16.22	09.24 14.56	10.07 14.42
30	09.06 16.06	07.29 17.31	05.53 19.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.54	10.06 14.43
31	09.03 16.09	07.26 17.28	05.50 19.07	05.03 21.39	03.33 23.09	03.13 23.40	04.27 22.26	05.59 20.43	07.25 16.16	07.53 15.11	09.27 14.51	10.06 14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 69 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1193)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.38	23.11	23.37	22.22	20.39	18.55	16.12	14.53
2	10.04	08.57	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.34
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.21	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.47
5	10.00	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.26	22.00	20.15	18.31	15.51	14.41
9	09.55	08.36	07.04	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.23	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.24	21.57	20.11	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.44	22.16	23.35	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.41	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.16	08.51	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.43	04.06	03.06	03.55	05.27	06.54	08.19	08.54	10.04
	15.32	17.09	18.32	21.02	22.34	23.41	23.00	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.04
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.27	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.19	17.38	15.08	14.37
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.12	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		05.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.22	14.56	14.42
30	09.06		05.52	05.06	03.36	03.12	04.27	05.59	07.25	07.52	09.27	10.06
	16.06		20.04	21.35	23.05	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		05.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 70 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1194)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05	09.01	07.32	06.45	05.03	06.12-06.36/24	03.32	03.14	04.33	06.04	07.28	07.59	09.29
	14.47	16.13	17.40	20.10	21.39		23.11	23.38	22.23	20.39	18.56	16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	06.12-06.35/23	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42		23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	06.12-06.34/22	03.27	03.17	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45		23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	06.13-06.33/20	03.25	03.19	04.42	06.30-06.35/5	06.13	07.36	08.08
	14.53	16.22	17.49	20.18	21.48		23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.32	04.50	06.13-06.32/19	03.23	03.20	04.45	06.27-06.39/12	06.16	07.39	08.11
	14.55	16.25	17.52	20.21	21.51		23.21	23.32	22.10	20.26	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	06.15-06.32/17	03.21	03.22	04.48	06.25-06.40/15	06.18	07.42	08.14
	14.57	16.29	17.55	20.24	21.54		23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	06.16-06.30/14	03.19	03.24	04.51	06.24-06.41/17	06.21	07.45	08.17
	15.00	16.32	17.58	20.27	21.57		23.25	23.29	22.03	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	06.18-06.28/10	03.17	03.27	04.54	06.23-06.43/20	06.24	07.48	08.21
	15.02	16.35	18.01	20.30	22.00		23.27	23.27	22.00	20.15	18.32	15.51	14.42
9	09.55	08.37	07.05	06.18	04.37		03.16	03.29	04.57	06.22-06.43/21	06.27	07.51	08.24
	15.04	16.38	18.03	20.33	22.03		23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.34	07.01	06.14	04.34		03.14	03.31	05.00	06.21-06.44/23	06.30	07.53	08.27
	15.07	16.41	18.06	20.36	22.06		23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.31		03.13	03.34	05.03	06.21-06.44/23	06.32	07.56	08.30
	15.09	16.44	18.09	20.39	22.10		23.33	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.28		03.11	03.36	05.06	06.20-06.44/24	06.35	07.59	08.33
	15.12	16.48	18.12	20.42	22.13		23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24		03.10	03.38	05.09	06.20-06.44/24	06.38	08.02	08.36
	15.15	16.51	18.15	20.45	22.16		23.36	23.16	21.44	19.58	18.15	15.36	14.37
14	09.46	08.21	06.48	06.01	04.21	04.27-04.31/4	03.41	03.41	05.12	06.19-06.44/25	06.41	08.05	08.39
	15.18	16.54	18.18	20.48	22.19		23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	04.27-04.32/5	03.44	03.44	05.15	06.19-06.44/25	06.44	08.08	08.42
	15.20	16.57	18.21	20.51	22.22		23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	04.26-04.33/7	03.46	03.46	05.18	06.20-06.44/24	06.46	08.11	08.45
	15.23	17.00	18.24	20.53	22.25		23.39	23.09	21.34	19.47	18.05	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	04.26-04.34/8	03.49	03.49	05.21	06.19-06.42/23	06.49	08.14	08.49
	15.26	17.03	18.27	20.56	22.28		23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	04.26-04.34/8	03.52	03.52	05.24	06.20-06.42/22	06.52	08.17	08.52
	15.29	17.06	18.30	20.59	22.31		23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.43	04.06	04.26-04.35/9	03.55	03.55	05.27	06.21-06.41/20	06.55	08.20	08.55
	15.32	17.09	18.32	21.02	22.34		23.42	23.01	21.24	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	06.24-06.29/5	04.03	04.03	05.30	06.21-06.39/18	06.57	08.23	08.58
	15.35	17.12	18.35	21.05	22.37		23.42	22.58	21.20	19.34	17.51	15.18	14.35
21	09.30	07.58	06.23	05.37	04.00	06.20-06.32/12	04.00	04.00	05.33	06.23-06.38/15	07.00	08.25	09.01
	15.38	17.16	18.38	21.08	22.40		23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	06.17-06.33/16	04.03	04.03	05.36	06.25-06.36/11	07.03	08.28	09.04
	15.41	17.19	18.41	21.11	22.43		23.43	22.52	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.17	05.30	03.55	06.15-06.34/19	04.06	04.06	05.39	06.29-06.31/2	07.06	08.31	09.07
	15.44	17.22	18.44	21.14	22.46		23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	06.14-06.35/21	04.09	04.09	05.41		07.08	08.34	09.10
	15.47	17.25	18.47	21.17	22.49		23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	06.13-06.36/23	04.09	04.12	05.44		07.11	07.37	09.13
	15.50	17.28	18.50	21.20	22.52		23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.47	06.13-06.36/23	04.15	04.15	05.47		07.14	07.40	09.16
	15.54	17.31	18.53	21.23	22.55		23.42	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	06.12-06.36/24	04.18	04.18	05.50		07.17	07.44	09.18
	15.57	17.34	18.55	21.26	22.57		23.41	22.38	20.57	19.09	16.28	15.01	14.40
28	09.12	07.35	05.59	05.13	03.41	06.12-06.36/24	04.21	04.21	05.53		07.20	07.47	09.21
	16.00	17.37	18.58	21.30	23.00		23.41	22.35	20.53	19.02	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	06.12-06.36/24	04.24	04.24	05.56		07.22	07.50	09.24
	16.03		20.01	21.33	23.03		23.40	22.32	20.50	19.02	16.22	14.57	14.42
30	09.06		06.52	05.06	03.36	06.12-06.36/24	04.27	04.27	05.59		07.25	07.53	09.27
	16.06		20.04	21.36	23.06		23.39	22.29	20.46	18.59	16.19	14.55	14.43
31	09.03		06.49	05.04	03.34			04.30	06.02		07.56		10.06
	16.09		20.07	21.38	23.08			22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147	
Sum of minutes with flicker	0	0	0	215	149	110	0	369	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 71 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1195)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.05	09.00	07.32	06.45	05.03	03.32	03.14	04.33	06.04	07.28	07.59	09.29		
	14.47	16.13	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.53		
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32		
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51		
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.34	08.05	09.34		
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49		
4	10.02	08.52	07.22	06.35	04.53	03.25	03.19	04.42	06.13	07.36	08.08	09.37		
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.47		
5	10.01	08.49	07.18	06.32	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39		
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46		
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42		
	14.57	16.29	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44		
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44		
	15.00	16.32	17.58	20.27	21.57	23.25	23.28	22.03	20.19	18.35	15.54	14.43		
8	09.56	08.40	07.08	06.21	04.40	03.17	03.27	04.54	06.24	07.48	08.20	09.46		
	15.02	16.35	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.51	14.42		
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.48		
	15.04	16.38	18.03	20.33	22.03	23.29	23.24	21.57	20.12	18.28	15.48	14.40		
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50		
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39		
11	09.51	08.30	06.58	06.11	04.31	03.13	03.34	05.03	06.32	07.56	08.30	09.52		
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38		
12	09.50	08.27	06.54	06.07	04.28	03.12	03.36	05.06	06.35	07.59	08.33	09.54		
	15.12	16.48	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37		
13	09.48	08.24	06.51	06.04	04.24	03.10	03.39	05.09	06.43-06.48/5	06.38	08.02	08.36	09.56	
	15.15	16.51	18.15	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.36	14.37		
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.39-06.50/11	06.41	08.05	08.39	09.57	
	15.18	16.54	18.18	20.48	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36		
15	09.44	08.18	06.44	05.57	06.36-06.46/10	04.18	03.08	03.44	05.15	06.38-06.52/14	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35		
16	09.42	08.14	06.41	05.54	06.34-06.48/14	04.15	03.08	03.46	05.18	06.37-06.54/17	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.05	15.28	14.35		
17	09.39	08.11	06.37	05.50	06.31-06.48/17	04.12	03.07	03.49	05.21	06.35-06.54/19	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35		
18	09.37	08.08	06.34	05.47	06.30-06.49/19	04.09	03.06	03.52	05.24	06.35-06.55/20	06.52	08.17	08.51	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35		
19	09.35	08.05	06.30	05.43	06.29-06.50/21	04.06	03.06	03.55	05.27	06.34-06.55/21	06.55	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.41	23.01	21.24	19.37	17.55	15.20	14.35		
20	09.32	08.01	06.27	05.40	06.29-06.50/21	04.03	03.06	03.57	05.30	06.33-06.55/22	06.57	08.22	08.58	10.04
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.18	14.35		
21	09.30	07.58	06.23	05.37	06.29-06.50/21	04.00	03.06	04.00	05.33	06.33-06.55/22	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35		
22	09.28	07.55	06.20	05.33	06.28-06.49/21	03.58	03.06	04.03	05.36	06.33-06.55/22	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.42	22.52	21.13	19.27	17.45	15.12	14.36		
23	09.25	07.52	06.16	05.30	06.28-06.49/21	03.55	03.06	04.06	05.38	06.33-06.54/21	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36		
24	09.22	07.48	06.13	05.26	06.28-06.49/21	03.52	03.07	04.09	05.41	06.33-06.53/20	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.20	17.38	15.08	14.37		
25	09.20	07.45	06.10	05.23	06.28-06.48/20	03.49	03.07	04.12	05.44	06.34-06.53/19	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.38		
26	09.17	07.42	06.06	05.20	06.29-06.47/18	03.47	03.08	04.15	05.47	06.34-06.51/17	07.14	07.40	09.15	10.07
	15.54	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.32	15.03	14.38		
27	09.14	07.38	06.03	05.16	06.30-06.46/16	03.44	03.09	04.18	05.50	06.35-06.50/15	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.40		
28	09.12	07.35	05.59	05.13	06.31-06.45/14	03.41	03.10	04.21	05.53	06.37-06.47/10	07.20	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41		
29	09.09		06.56	05.10	06.33-06.42/9	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.06	
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.57	14.42		
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06		
	16.06		20.04	21.36	23.05	23.39	22.29	20.46	18.59	16.19	14.55	14.44		
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05		
	16.09		20.07		23.08		22.26	20.43		16.16		14.45		
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147		
Sum of minutes with flicker	0	0	0	263	0	0	0	275	0	0	0	0		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 72 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1196)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.37	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.15	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.29	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.33	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.14	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.22	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.01	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.32	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.08	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		06.56	05.09	03.38	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuseWTG: 73 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1197)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June
1	10.05 14.49	09.01 16.14	07.32 17.41	06.46 20.10	07.50-08.05/15 20.10	05.04 21.39
2	10.04 14.50	08.58 16.17	07.29 17.44	06.43 20.13	07.52-08.03/11 20.13	05.01 21.42
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	07.55-08.00/5 20.16	04.58 21.45
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	06.39 20.19	04.54 21.48
5	10.01 14.56	08.49 16.26	07.19 17.53	06.32 20.22	06.32 20.22	04.51 21.51
6	09.59 14.59	08.46 16.30	07.15 17.55	06.29 20.25	06.29 20.25	04.48 21.54
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	06.25 20.28	04.45 21.57
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	06.22 20.31	04.41 22.00
9	09.55 15.06	08.37 16.39	07.05 18.04	06.19 20.33	06.19 20.33	04.38 22.04
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	06.15 20.36	04.35 22.07
11	09.52 15.11	08.31 16.45	06.58 18.10	06.12 20.39	06.12 20.39	21.19-21.21/2 22.10
12	09.50 15.13	08.28 16.49	06.55 18.13	06.08 20.42	06.08 20.42	21.14-21.24/10 22.13
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	06.05 20.45	21.12-21.25/13 22.16
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	06.01 20.48	21.12-21.27/15 22.19
15	09.44 15.22	08.18 16.58	06.45 18.22	05.58 20.51	05.58 20.51	21.10-21.28/18 22.22
16	09.42 15.24	08.15 17.01	06.41 18.25	05.55 20.54	05.55 20.54	21.10-21.29/19 22.25
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	05.51 20.57	21.10-21.30/20 22.28
18	09.37 15.30	08.09 17.07	06.34 18.30	05.48 21.00	05.48 21.00	21.09-21.30/21 22.31
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	05.44 21.03	21.09-21.30/21 22.34
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	05.41 21.06	21.09-21.31/22 22.37
21	09.30 15.39	07.59 17.16	06.24 18.39	05.38 21.09	05.38 21.09	21.08-21.30/22 22.40
22	09.28 15.42	07.56 17.20	06.21 18.42	05.34 21.12	05.34 21.12	21.08-21.31/23 22.43
23	09.25 15.45	07.52 17.23	06.17 18.45	05.31 21.15	05.31 21.15	21.09-21.31/22 22.46
24	09.23 15.48	07.49 17.26	06.14 18.47	05.27 21.18	05.27 21.18	21.09-21.31/22 22.49
25	09.20 15.52	07.46 17.29	06.10 18.50	05.24 21.21	05.24 21.21	21.09-21.31/22 22.52
26	09.18 15.55	07.42 17.32	06.07 18.53	05.21 21.24	05.21 21.24	21.09-21.31/22 22.55
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	05.17 21.27	21.09-21.31/22 22.57
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	05.14 21.30	21.10-21.30/20 23.00
29	09.09 16.04		06.57 20.02	05.11 21.33	05.11 21.33	21.10-21.30/20 23.03
30	09.07 16.07		06.53 20.05	05.07 21.36	05.07 21.36	21.11-21.31/20 23.06
31	09.04 16.10		06.50 20.08	07.50-08.07/17 21.36	07.50-08.07/17 21.36	21.11-21.30/19 23.08
Potential sun hours	179	241	363	448	562	609
Sum of minutes with flicker	0	0	179	31	395	126

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 73 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1197)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.15 23.37	04.34 21.25-21.33/8 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.29 14.54
2	03.17 21.25-21.29/4 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	03.18 21.24-21.31/7 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.20 21.23-21.31/8 23.33	04.43 22.13	06.14 20.29	07.37 18.46	08.08 16.04	09.37 14.49
5	03.22 21.23-21.33/10 23.32	04.46 22.10	06.17 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	03.24 21.22-21.34/12 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	03.26 21.22-21.35/13 23.28	04.52 22.04	06.22 20.19	07.45 18.36	08.18 15.55	09.44 14.44
8	03.28 21.21-21.35/14 23.26	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	03.30 21.21-21.36/15 23.24	04.58 21.57	06.28 07.49-07.53/4 20.12	07.51 18.29	08.24 15.49	09.48 14.42
10	03.33 21.20-21.37/17 23.22	05.01 21.54	06.30 07.45-07.56/11 20.09	07.54 18.26	08.27 15.46	09.50 14.41
11	03.35 21.19-21.37/18 23.20	05.04 21.51	06.33 07.43-07.58/15 20.05	07.57 18.22	08.30 15.43	09.52 14.40
12	03.38 21.19-21.38/19 23.18	05.07 21.47	06.36 07.41-07.58/17 20.02	08.00 18.19	08.33 15.40	09.54 14.39
13	03.40 21.19-21.38/19 23.16	05.10 21.44	06.39 07.40-07.59/19 19.58	08.03 18.15	08.36 15.38	09.56 14.38
14	03.43 21.19-21.39/20 23.13	05.13 21.41	06.42 07.40-08.00/20 19.55	08.06 18.12	08.39 15.35	09.57 14.37
15	03.45 21.19-21.39/20 23.11	05.16 21.38	06.44 07.38-07.59/21 19.51	08.08 18.09	08.43 15.32	09.59 14.37
16	03.48 21.19-21.40/21 23.08	05.19 21.34	06.47 07.38-07.59/21 19.48	08.11 18.05	08.46 15.29	10.00 14.36
17	03.51 21.18-21.40/22 23.06	05.22 21.31	06.50 07.38-07.59/21 19.45	08.14 18.02	08.49 15.27	10.02 14.36
18	03.53 21.18-21.40/22 23.03	05.25 21.27	06.53 07.38-07.57/19 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	03.56 21.19-21.41/22 23.01	05.28 21.24	06.55 07.38-07.56/18 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	03.59 21.19-21.41/22 22.58	05.31 21.21	06.58 07.39-07.55/16 19.34	08.23 17.52	08.58 15.19	10.05 14.36
21	04.02 21.18-21.41/23 22.55	05.34 21.17	07.01 07.41-07.53/12 19.31	08.26 17.49	09.01 15.16	10.05 14.37
22	04.05 21.18-21.41/23 22.52	05.37 21.14	07.04 07.43-07.49/6 19.27	08.29 17.46	09.04 15.14	10.06 14.37
23	04.07 21.19-21.41/22 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.38
24	04.10 21.19-21.41/22 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	04.13 21.19-21.40/21 22.44	05.45 21.04	07.12 19.17	08.38 17.36	09.13 15.07	10.07 14.39
26	04.16 21.20-21.41/21 22.41	05.48 21.00	07.15 19.13	08.41 17.33	09.16 15.04	10.07 14.40
27	04.19 21.20-21.40/20 22.38	05.51 20.57	07.17 19.10	08.44 17.29	09.19 15.02	10.07 14.41
28	04.22 21.21-21.40/19 22.35	05.54 20.54	07.20 19.07	08.47 17.26	09.21 15.00	10.07 14.42
29	04.25 21.22-21.38/16 22.32	05.57 20.50	07.23 19.03	08.50 17.23	09.24 14.58	10.06 14.43
30	04.28 21.22-21.37/15 22.29	06.00 20.47	07.26 19.00	08.53 17.20	09.27 14.56	10.06 14.45
31	04.31 21.24-21.36/12 22.26	06.02 20.43		08.56 17.17		10.05 14.46
Potential sun hours	597	504	392	307	204	148
Sum of minutes with flicker	519	8	220	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutuseWTG: 74 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1198)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December	
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.56	08.07-08.16/9	07.59 16.12	09.30 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	03.15 23.37	04.36 22.20	06.07 20.36	07.31 18.52		08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.16 23.35	04.39 22.17	06.10 20.33	07.34 18.49		08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.19	04.53 21.48	03.25 23.19	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45		08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.32 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.26	07.39 18.42		08.11 16.00	09.40 14.46
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	03.22 23.31	04.48 22.07	06.18 20.22	07.42 18.38		08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.12 17.58	06.25 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35		08.18 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.01	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.32		08.21 15.51	09.47 14.41
9	09.55 15.04	08.37 16.38	07.05 18.04	06.18 20.33	04.37 22.04	03.15 23.29	03.29 23.25	04.57 21.57	06.27 20.12	07.51 18.28		08.24 15.48	09.49 14.40
10	09.54 15.07	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.07	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.54 18.25		08.27 15.45	09.51 14.39
11	09.52 15.09	08.31 16.44	06.58 18.09	06.11 20.39	04.31 22.10	03.13 23.33	03.33 23.21	05.03 21.51	06.32 20.05	07.56 18.21		08.30 15.42	09.53 14.38
12	09.50 15.12	08.27 16.48	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.35	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18		08.33 15.39	09.55 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.15		08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	04.21 22.19	03.09 23.37	03.41 23.14	05.12 21.41	06.41 19.54	08.05 18.11		08.39 15.34	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.39	03.43 23.11	05.15 21.37	06.44 19.51	08.08 18.08		08.43 15.31	09.59 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.54	04.15 22.25	03.07 23.40	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.05		08.46 15.28	10.01 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.57	04.12 22.28	03.07 23.41	03.49 23.06	05.21 21.31	06.49 19.44	08.14 18.01		08.49 15.25	10.02 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 21.00	04.09 22.31	03.06 23.41	03.52 23.04	05.24 21.27	06.52 19.41	08.17 17.58		08.52 15.23	10.03 14.34
19	09.35 15.32	08.05 17.09	06.30 18.33	05.43 21.03	04.06 22.34	03.06 23.42	03.54 23.01	05.27 21.24	06.55 19.37	08.20 17.55		08.55 15.20	10.04 14.34
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.06	04.03 22.37	03.06 23.43	03.57 22.58	05.30 21.21	08.11-08.19/8	08.23 17.51		08.58 15.17	10.05 14.35
21	09.30 15.38	07.58 17.16	06.24 18.38	05.37 21.09	04.00 22.40	03.06 23.43	04.00 22.56	05.33 21.17	08.08-08.21/13	08.26 17.48		09.01 15.15	10.06 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.12	03.57 22.43	03.06 23.43	04.03 22.53	05.36 21.14	08.07-08.23/16	08.29 17.45		09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.17 18.44	05.30 21.15	03.55 22.46	03.06 23.43	04.06 22.50	05.38 21.10	08.06-08.24/18	08.32 17.41		09.07 15.10	10.07 14.36
24	09.23 15.47	07.49 17.25	06.13 18.47	05.26 21.18	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	08.04-08.23/19	08.35 17.38		09.10 15.08	10.07 14.36
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.21	03.49 22.52	03.07 23.43	04.12 22.44	05.44 21.03	08.04-08.23/19	07.38 16.35		09.13 15.05	10.07 14.37
26	09.18 15.53	07.42 17.31	06.06 18.53	05.20 21.24	03.46 22.55	03.08 23.42	04.15 22.41	05.47 21.00	08.04-08.23/19	07.41 16.32		09.16 15.03	10.07 14.38
27	09.15 15.57	07.39 17.34	06.03 18.56	05.16 21.27	03.44 22.58	03.08 23.42	04.18 22.38	05.50 20.57	08.04-08.22/18	07.44 16.28		09.19 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.01	03.09 23.41	04.21 22.35	05.53 20.53	08.04-08.22/18	07.47 16.25		09.21 14.59	10.07 14.41
29	09.09 16.03		06.56 20.01	05.10 21.33	03.39 23.03	03.11 23.40	04.24 22.32	05.56 20.50	08.04-08.20/16	07.50 16.22		09.24 14.56	10.07 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	08.05-08.18/13	07.53 16.19		09.27 14.54	10.06 14.43
31	09.04 16.09		06.49 20.07		03.34 23.09		04.30 22.26	06.02 20.43		07.56 16.16			10.06 14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147	0
Sum of minutes with flicker	0	0	183	0	0	0	0	0	177	9	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 75 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05 14.47	09.01 16.13	07.32 17.40	08.23-08.45/22 20.10	06.45 07.38-07.57/19	05.03 21.39	03.31 23.11	04.35-04.49/14
2	10.04 14.49	08.58 16.16	07.29 17.43	08.23-08.46/23 20.13	06.42 07.38-07.55/17	05.00 21.42	03.29 23.14	04.35-04.50/15
3	10.03 14.51	08.55 16.19	07.25 17.46	08.22-08.46/24 20.16	06.39 07.39-07.54/15	04.56 21.45	03.27 23.16	04.34-04.51/17
4	10.02 14.53	08.52 16.22	07.22 17.49	08.22-08.47/25 20.19	06.35 07.41-07.53/12	04.53 21.48	03.25 23.19	04.34-04.52/18
5	10.01 14.55	08.49 16.25	07.18 17.52	08.21-08.46/25 20.21	06.32 07.43-07.49/6	04.50 21.51	03.23 23.21	04.34-04.52/18
6	10.00 14.57	08.46 16.29	07.15 17.55	08.21-08.46/25 20.24	06.28 20.24	04.47 21.54	03.21 23.23	04.34-04.53/19
7	09.58 14.59	08.43 16.32	07.12 17.58	08.21-08.45/24 20.27	06.25 20.27	04.43 21.57	03.19 23.25	04.33-04.53/20
8	09.57 15.02	08.40 16.35	07.08 18.01	08.21-08.44/23 20.30	06.21 20.30	04.40 22.00	03.17 23.27	04.33-04.53/20
9	09.55 15.04	08.37 16.38	07.05 18.04	08.22-08.44/22 20.33	06.18 20.33	04.37 22.04	03.16 23.29	04.33-04.54/21
10	09.54 15.07	08.34 16.41	07.01 18.07	08.22-08.42/20 20.36	06.14 20.36	04.34 22.07	03.14 23.31	04.34-04.55/21
11	09.52 15.09	08.31 16.44	06.58 18.09	08.23-08.41/18 20.39	06.11 20.39	04.31 22.10	03.13 23.33	04.33-04.55/22
12	09.50 15.12	08.27 16.48	06.55 18.12	08.25-08.38/13 20.42	06.07 20.42	04.27 22.13	03.11 23.35	04.33-04.55/22
13	09.48 15.15	08.24 16.51	06.51 18.15	08.29-08.34/5 20.45	06.04 20.45	04.24 22.16	03.10 23.36	04.34-04.56/22
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	06.01 20.48	04.21 22.19	03.09 23.37	04.34-04.56/22
15	09.44 15.20	08.18 16.57	06.44 18.21	06.44 20.51	05.57 20.51	04.18 22.22	03.08 23.39	04.34-04.56/22
16	09.42 15.23	08.15 17.00	06.41 18.24	06.41 20.54	05.54 20.54	04.15 22.25	03.07 23.40	04.34-04.56/22
17	09.40 15.26	08.11 17.03	06.37 18.27	06.37 20.57	05.50 20.57	04.12 22.28	03.07 23.41	04.34-04.56/22
18	09.38 15.29	08.08 17.06	06.34 18.30	06.34 21.00	05.47 21.00	04.09 22.31	03.06 23.41	04.34-04.57/23
19	09.35 15.32	08.05 17.09	06.30 18.33	06.30 21.03	05.43 21.03	04.06 22.34	03.06 23.42	04.35-04.57/22
20	09.33 15.35	08.02 17.13	06.27 18.35	06.27 21.06	05.40 21.06	04.03 22.37	03.06 23.43	04.35-04.57/22
21	09.30 15.38	07.58 17.16	06.24 18.38	06.24 21.09	05.37 21.09	04.00 22.40	03.06 23.43	04.35-04.57/22
22	09.28 15.41	07.55 17.19	06.20 18.41	06.20 21.12	05.33 21.12	03.57 22.43	03.06 23.43	04.35-04.57/22
23	09.25 15.44	07.52 17.22	06.17 18.44	06.17 21.15	05.30 21.15	03.55 22.46	03.06 23.43	04.36-04.58/22
24	09.23 15.47	07.49 17.25	06.13 18.47	06.49-06.50/1 21.18	05.26 21.18	03.52 22.49	03.06 23.43	04.35-04.58/23
25	09.20 15.50	07.45 17.28	06.10 18.50	06.45-06.55/10 21.21	05.23 21.21	03.49 22.52	03.07 23.43	04.36-04.59/23
26	09.18 15.54	07.42 17.31	06.06 18.53	06.42-06.56/14 21.24	05.20 21.24	03.46 22.55	03.08 23.42	04.36-04.58/22
27	09.15 15.57	07.39 17.34	06.03 18.56	06.41-06.57/16 21.27	05.16 21.27	03.44 22.58	03.09 23.42	04.36-04.59/23
28	09.12 16.00	07.35 17.37	05.59 18.58	06.40-06.58/18 21.30	05.13 21.30	03.41 23.01	03.10 23.41	04.37-04.59/22
29	09.09 16.03		06.56 20.01	07.39-07.58/19 21.33	05.10 21.33	03.39 23.03	03.11 23.40	04.37-04.59/22
30	09.07 16.06		06.52 20.04	07.39-07.58/19 21.36	05.06 21.36	03.36 23.06	03.12 23.39	04.38-04.59/21
31	09.04 16.09		06.49 20.07	07.38-07.57/19		03.34 23.09		04.36-04.49/13
Potential sun hours	179	241	363	448	562	611	626	
Sum of minutes with flicker	0	48	385	69	31			

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 75 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.13 04.38-04.59/21 23.38	04.33 22.23 20.39	06.04 20.39	07.28 09.05-09.16/11 18.56	07.59 16.13 14.53	09.30 14.53
2	03.15 04.38-04.59/21 23.37	04.36 22.20 20.36	06.07 20.36	07.31 09.03-09.18/15 18.52	08.02 16.09 14.51	09.32 14.51
3	03.17 04.38-04.59/21 23.35	04.39 22.17 20.33	06.10 20.33	07.34 09.01-09.20/19 18.49	08.05 16.06 14.49	09.35 14.49
4	03.18 04.38-04.59/21 23.34	04.42 22.13 20.29	06.13 20.29	07.37 08.59-09.21/22 18.45	08.08 16.03 14.47	09.37 14.47
5	03.20 04.39-04.59/20 23.32	04.45 22.10 20.26	06.16 20.26	07.39 08.58-09.21/23 18.42	08.11 16.00 14.46	09.40 14.46
6	03.22 04.39-04.59/20 23.31	04.48 22.07 20.22	06.19 20.22	07.42 08.58-09.22/24 18.38	08.15 15.57 14.44	09.42 14.44
7	03.24 04.40-04.59/19 23.29	04.51 22.04 20.19	06.21 07.38-07.44/6 20.19	07.45 08.57-09.22/25 18.35	08.18 15.54 14.43	09.44 14.43
8	03.26 04.40-04.58/18 23.27	04.54 22.00 20.15	06.24 07.35-07.47/12 20.15	07.48 08.56-09.22/26 18.32	08.21 15.51 14.41	09.47 14.41
9	03.29 04.41-04.59/18 23.25	04.57 21.57 20.12	06.27 07.34-07.49/15 20.12	07.51 08.56-09.21/25 18.28	08.24 15.48 14.40	09.49 14.40
10	03.31 04.42-04.58/16 23.23	05.00 21.54 20.08	06.30 07.32-07.49/17 20.08	07.54 08.56-09.21/25 18.25	08.27 15.45 14.39	09.51 14.39
11	03.33 04.42-04.57/15 23.21	05.03 21.51 20.05	06.33 07.31-07.49/18 20.05	07.56 08.56-09.20/24 18.21	08.30 15.42 14.38	09.53 14.38
12	03.36 04.43-04.57/14 23.19	05.06 21.47 20.01	06.35 07.30-07.49/19 20.01	07.59 08.57-09.19/22 18.18	08.33 15.39 14.37	09.55 14.37
13	03.38 04.44-04.56/12 23.16	05.09 21.44 19.58	06.38 07.29-07.49/20 19.58	08.02 08.57-09.18/21 18.15	08.36 15.36 14.36	09.56 14.36
14	03.41 04.46-04.55/9 23.14	05.12 21.41 19.54	06.41 07.29-07.48/19 19.54	08.05 08.58-09.16/18 18.11	08.39 15.34 14.36	09.58 14.36
15	03.44 04.48-04.53/5 23.11	05.15 21.37 19.51	06.44 07.30-07.48/18 19.51	08.08 08.59-09.14/15 18.08	08.43 15.31 14.35	09.59 14.35
16	03.46 23.09	05.18 21.34 19.48	06.46 07.29-07.46/17 19.48	08.11 09.02-09.11/9 18.05	08.46 15.28 14.35	10.01 14.35
17	03.49 23.06	05.21 21.31 19.44	06.49 07.30-07.45/15 19.44	08.14 18.01	08.49 15.25 14.35	10.02 14.35
18	03.52 23.04	05.24 21.27 19.41	06.52 07.32-07.43/11 19.41	08.17 17.58	08.52 15.23 14.35	10.03 14.35
19	03.55 23.01	05.27 21.24 19.37	06.55 07.35-07.40/5 19.37	08.20 17.55	08.55 15.20 14.35	10.04 14.35
20	03.57 22.58	05.30 21.21 19.34	06.57 19.34	08.23 17.51	08.58 15.17 14.35	10.05 14.35
21	04.00 22.56	05.33 21.17 19.30	07.00 19.30	08.26 17.48	09.01 15.15 14.35	10.06 14.35
22	04.03 22.53	05.36 21.14 19.27	07.03 19.27	08.29 17.45	09.04 15.12 14.35	10.06 14.35
23	04.06 22.50	05.39 21.10 19.23	07.06 19.23	08.32 17.41	09.07 15.10 14.36	10.07 14.36
24	04.09 22.47	05.41 21.07 19.20	07.09 19.20	08.35 17.38	09.10 15.08 14.37	10.07 14.37
25	04.12 22.44	05.44 21.04 19.16	07.11 19.16	07.38 16.35	09.13 15.05 14.37	10.07 14.37
26	04.15 22.41	05.47 21.00 19.13	07.14 19.13	07.41 16.32	09.16 15.03 14.38	10.07 14.38
27	04.18 22.38	05.50 20.57 19.09	07.17 19.09	07.44 16.28	09.19 15.01 14.39	10.07 14.39
28	04.21 22.35	05.53 20.53 19.06	07.20 19.06	07.47 16.25	09.22 14.59 14.41	10.07 14.41
29	04.24 22.32	05.56 20.50 19.03	07.23 19.03	07.50 16.22	09.24 14.57 14.42	10.07 14.42
30	04.27 22.29	05.59 20.46 18.59	07.25 18.59	07.53 16.19	09.27 14.55 14.43	10.06 14.43
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.45
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	250	0	192	324	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 76 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1200)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.29	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.41
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.38	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.09	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.08	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.41	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 77 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210,0 m (TOT: 300,0 m) (1201)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32 16.26-16.49/23	06.46	05.04	03.32	03.15	04.34	06.05	07.28 17.08-17.21/13	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29 16.26-16.50/24	06.42	05.00	03.30	03.16	04.37	06.08	07.31 17.05-17.23/18	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25 16.25-16.50/25	06.39	04.57	03.28	03.18	04.40	06.11	07.34 17.04-17.24/20	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22 16.25-16.51/26	06.36	04.54	03.26	03.19	04.43	06.13	07.37 17.02-17.25/23	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19 16.24-16.50/26	06.32	04.51	03.24	03.21	04.46	06.16	07.40 17.01-17.26/25	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15 16.24-16.50/26	06.29	04.47	03.22	03.23	04.49	06.19	07.42 17.01-17.26/25	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12 16.24-16.50/26	06.25	04.44	03.20	03.25	04.52	06.22	07.45 17.00-17.26/26	08.18	09.44
	15.00	16.32	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.35	15.55	14.44
8	09.57	08.40	07.08 16.24-16.48/24	06.22	04.41	03.18	03.28	04.55	06.25	07.48 17.00-17.26/26	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.27	22.00	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05 16.25-16.48/23	06.18	04.38	03.17	03.30	04.58	06.27	07.51 16.59-17.26/27	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02 16.25-16.46/21	06.15	04.35	03.15	03.32	05.01	06.30	07.54 16.59-17.25/26	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58 16.26-16.45/19	06.11	04.31	03.14	03.34	05.04	06.33	07.57 17.00-17.24/24	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55 16.28-16.43/15	06.08	04.28	03.12	03.37	05.07	06.36	08.00 17.00-17.23/23	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.18	15.40	14.38
13	09.48	08.24	06.51 16.31-16.41/10	06.05	04.25	03.11	03.39	05.10	06.38	08.02 17.00-17.22/22	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05 17.01-17.21/20	08.39	09.58
	15.18	16.54	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08 17.02-17.19/17	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11 17.04-17.16/12	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.07	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.07	03.07	03.55	05.27	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.21	14.35
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.30	17.48	15.16	14.36
22	09.28	07.55	06.20	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.55	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.44	21.15	22.46	23.43	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.45 16.35-16.41/6	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.35	15.06	14.38
26	09.17	07.42 16.32-16.45/13	06.07	05.20	03.47	03.09	04.16	05.48	07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	16.32	15.04	14.39
27	09.15	07.39 16.29-16.47/18	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	16.29	15.02	14.40
28	09.12	07.35 16.28-16.48/20	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.00	17.37	18.59	21.30	23.00	23.41	22.35	20.53	19.06	16.26	14.59	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26 17.12-17.18/6	07.53	09.27	10.06
	16.07		20.04	21.36	23.06	23.39	22.29	20.47	18.59	16.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	57	288	0	0	0	0	0	6	347	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.04/3.4.388

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 78 - VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1202)

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48 10.04 14.50 10.03 14.52 10.02 14.54 10.01 14.56 10.00 14.58 09.58 15.00 09.57 15.03 09.55 15.05 09.54 15.08 09.52 15.10 09.50 15.13 09.48 15.15 09.46 15.18 09.44 15.21 09.42 15.24 09.40 15.27 09.37 15.30 09.35 15.33 09.33 15.36 09.30 15.39 09.28 15.42 09.25 15.45 09.23 15.48 09.20 15.51 09.18 15.54 09.15 15.57 09.12 16.00 09.09 16.04 09.07 16.07 09.04 16.10	09.01 16.13 08.58 16.16 08.55 16.20 08.52 16.23 08.49 16.26 08.46 16.29 08.43 16.32 08.40 16.35 08.37 16.39 08.34 16.42 08.31 16.45 08.28 16.48 08.24 16.51 08.21 16.54 08.18 16.58 08.15 17.01 08.12 17.04 08.08 17.07 08.05 17.10 08.02 17.13 07.59 17.16 07.55 17.19 07.52 17.22 07.49 17.25 07.46 17.28 07.42 17.31 07.39 17.34 07.36 17.37 06.56 20.02 06.53 20.04 06.49 20.07	07.32 17.40 07.29 17.43 07.25 17.46 07.22 17.49 07.19 17.52 07.15 17.55 07.12 17.58 07.09 18.01 07.05 18.04 07.02 18.07 06.58 18.10 06.55 18.13 06.51 18.16 06.48 18.19 06.45 18.21 06.41 18.24 06.38 18.27 06.34 18.30 06.31 18.33 06.27 18.36 06.24 18.39 06.20 18.42 06.17 18.44 06.14 18.47 06.10 18.50 06.07 18.53 06.03 18.56 06.00 18.59 19.14-19.18/4 21.33 19.10-19.23/13 20.04 19.07-19.24/17 20.07	06.46 19.06-19.26/20 20.10 06.42 19.04-19.26/22 20.13 06.39 19.03-19.27/24 20.16 06.36 19.02-19.27/25 20.19 06.32 19.01-19.27/26 20.22 06.29 19.01-19.27/26 20.25 06.25 19.01-19.27/26 20.28 06.22 19.01-19.26/25 20.28 06.18 19.01-19.25/24 20.33 06.15 19.02-19.25/23 20.36 06.11 19.02-19.23/21 20.39 06.08 19.03-19.22/19 20.42 06.04 19.05-19.20/15 20.45 06.01 19.06-19.17/11 20.48 05.58 20.51 05.54 20.54 05.51 20.57 05.47 21.00 05.44 21.03 05.41 21.06 05.37 21.09 05.34 21.12 05.30 21.15 05.27 21.18 05.24 21.21 05.20 21.24 05.17 21.27 05.14 21.30 05.10 21.33 05.07 21.36 23.06 03.35 23.08	05.04 21.39 05.00 21.42 04.57 21.45 04.54 21.48 04.51 21.51 04.47 21.54 04.44 21.57 04.41 22.01 04.38 22.04 04.34 22.07 04.31 22.10 04.28 22.13 04.25 22.16 04.22 22.19 04.19 22.22 04.16 22.25 04.13 22.28 04.10 22.31 04.07 22.34 04.04 22.37 04.01 22.40 03.58 22.43 03.55 22.46 03.53 22.49 03.50 22.52 03.47 22.55 03.44 22.50 03.41 22.47 03.40 22.44 03.39 22.42 03.37 22.45 03.34 22.48 03.31 22.52 03.28 23.00 03.12 23.03 03.13 23.04 22.59 23.39 22.29 04.31 22.26	03.32 23.11 03.30 23.14 03.28 23.16 03.26 23.18 03.24 23.21 03.22 23.23 03.20 23.25 03.18 23.27 03.17 23.27 03.16 23.29 03.15 23.32 03.14 23.34 03.13 23.36 03.12 23.37 03.11 23.39 03.10 23.41 03.07 23.42 03.07 23.43 03.07 23.44 03.07 23.45 03.07 23.46 03.07 23.47 03.07 23.48 03.07 23.49 03.07 23.50 03.07 23.51 03.07 23.52 03.07 23.53 03.07 23.54 03.07 23.55 03.07 23.56 03.07 23.57 03.07 23.58 03.07 23.59 03.07 24.00 24.01 24.02 24.03	04.34 22.23 04.37 22.20 04.40 22.17 04.43 22.13 04.46 22.10 04.49 22.07 04.52 22.04 04.55 22.01 04.58 21.57 05.01 21.54 05.04 21.51 05.07 21.47 05.10 21.44 05.16 21.38 05.19 21.34 05.22 21.31 05.24 21.27 05.27 21.24 05.33 21.21 05.33 21.17 05.36 21.14 05.39 21.11 05.42 21.07 05.45 21.04 05.48 21.00 05.51 20.57 05.54 20.50 05.59 20.47 06.02 20.43	06.05 19.01-19.22/21 20.40 06.08 19.00-19.23/23 20.36 06.11 18.59-19.23/24 20.33 06.13 18.58-19.23/25 20.29 06.16 18.57-19.23/26 20.26 06.19 18.57-19.23/26 20.22 06.22 18.56-19.22/26 20.19 06.25 18.57-19.22/25 20.16 06.27 18.57-19.21/24 20.12 06.30 18.57-19.19/22 20.09 06.33 18.58-19.18/20 20.05 06.36 18.59-19.17/18 20.02 06.39 19.00-19.14/14 19.58 06.41 19.03-19.10/7 19.55 06.44 19.51 06.47 19.48 06.50 19.44 06.52 19.41 06.55 19.37 06.58 19.34 07.01 19.30 07.03 19.27 07.06 19.24 07.09 19.20 07.12 19.17 07.14 19.13 07.17 19.10 07.20 19.06 07.23 19.03 07.26 18.59	07.28 18.56 07.31 18.53 07.34 18.49 07.37 18.46 07.40 18.42 07.42 18.39 07.45 18.35 07.48 18.32 07.51 18.29 07.54 18.25 07.57 18.22 08.00 18.19 08.02 18.15 08.05 18.12 08.08 18.08 08.11 18.05 08.14 18.02 08.17 17.58 08.23 17.52 08.26 17.48 08.29 17.45 08.32 17.42 08.35 17.39 08.38 17.36 08.41 16.32 08.44 16.29 08.47 16.26 08.50 16.23 08.53 16.19 08.56 16.16	07.59 16.13 08.02 16.10 08.05 16.07 08.08 16.04 08.12 16.01 08.15 15.58 08.18 15.55 08.21 15.52 08.24 15.49 08.27 15.46 08.30 15.43 08.33 15.40 08.36 15.37 08.40 15.34 08.43 15.31 08.46 15.29 08.49 15.26 08.52 15.23 08.55 15.21 08.58 15.18 09.01 15.16 09.04 15.13 09.07 15.11 09.10 15.08 09.13 15.06 09.16 15.04 09.19 15.02 09.21 14.59 09.24 14.57 09.27 14.55 09.28 14.46	09.30 14.53 09.32 14.52 09.35 14.50 09.37 14.48 09.40 14.46 09.42 14.45 09.44 14.42 09.49 14.41 09.51 14.40 09.53 14.39 09.54 14.38 09.56 14.37 09.58 14.36 09.59 14.36 10.01 14.36 10.02 14.36 10.03 14.35 10.04 14.35 10.05 14.36 10.06 14.36 10.06 14.36 10.07 14.37 10.07 14.37 10.07 14.37 10.07 14.38 10.07 14.38 10.07 14.39 10.07 14.40 10.07 14.40 10.07 14.41 10.07 14.41 10.07 14.42 10.07 14.43 10.07 14.44 10.06 14.44 10.06 14.46	
Potential sun hours	179	241	363	448	562	610	598	504	392	301	307	204
Sum of minutes with flicker	0	0	34	307	0	0	0	46	301	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 79 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1203)  
 Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		17.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 80 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1204)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.13	07.32 17.40	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.37	04.34 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.29 14.54
2	10.40 14.50	08.58 16.17	07.29 17.43	06.43 20.13	05.01 21.42	03.31 23.13	03.17 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.25 17.46	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.16	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.18	03.20 23.33	04.43 22.13	06.14 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.20	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.11 16.01	09.39 14.47
6	09.59 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.48 21.54	03.22 23.23	03.24 23.30	04.49 22.07	06.19 20.22	07.43 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.44 21.57	03.20 23.25	03.26 23.28	04.52 22.04	06.22 20.19	07.45 18.36	08.18 15.55	09.44 14.44
8	09.56 15.03	08.40 16.36	07.09 18.01	06.22 20.30	04.41 22.00	03.19 23.27	03.28 23.26	04.55 22.00	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.18 20.33	04.38 22.03	03.17 23.29	03.30 23.24	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.48 14.41
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.16 23.30	03.32 23.22	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	09.50 14.40
11	09.52 15.11	08.31 16.45	06.58 18.10	06.12 20.39	04.32 22.10	03.14 23.32	03.35 23.20	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	03.37 23.18	05.07 21.47	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.39
13	09.48 15.16	08.24 16.51	06.51 18.16	06.05 20.45	04.25 22.16	03.12 23.35	03.40 23.16	05.10 21.44	06.39 19.58	08.02 18.15	08.36 15.37	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.37	03.42 23.13	05.13 21.41	06.41 19.55	08.05 18.12	08.39 15.35	09.57 14.37
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.10 23.38	03.45 23.11	05.16 21.37	06.44 19.51	08.08 18.09	08.42 15.32	09.59 14.37
16	09.42 15.24	08.15 17.01	06.41 18.24	05.54 20.54	04.16 22.25	03.09 23.39	03.48 23.08	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.00 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.44	08.14 18.02	08.49 15.26	10.01 14.36
18	09.37 15.30	08.08 17.07	06.34 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.03	05.25 21.27	06.52 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.08 23.41	03.56 23.01	05.28 21.24	06.55 19.37	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.27 18.36	05.41 21.06	04.04 22.37	03.07 23.42	03.59 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.04 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.42	03.57 22.55	05.33 21.17	07.01 19.31	08.26 17.49	09.01 15.16	10.05 14.36
22	09.28 15.42	07.55 17.19	06.21 18.42	05.34 21.12	03.59 22.43	03.07 23.42	04.04 22.52	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.37
23	09.25 15.45	07.52 17.22	06.17 18.44	05.31 21.15	03.56 22.46	03.08 23.42	04.07 22.50	05.39 21.10	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.37
24	09.23 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.42	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.45 17.28	06.10 18.50	05.24 21.21	03.50 22.52	03.09 23.42	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.06	10.07 14.39
26	09.17 15.54	07.42 17.31	06.07 18.53	05.20 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.15 19.13	07.41 17.32	09.16 15.04	10.07 14.40
27	09.15 15.58	07.39 17.34	06.03 18.56	05.17 21.27	03.45 22.57	03.10 23.41	04.19 22.38	05.51 20.57	07.17 19.10	07.44 17.29	09.18 15.02	10.07 14.41
28	09.12 16.01	07.35 17.37	06.00 18.59	05.14 21.30	03.42 23.00	03.11 23.40	04.22 22.35	05.54 20.53	07.20 19.06	07.47 17.26	09.21 15.00	10.07 14.42
29	09.09 16.04		06.56 20.02	05.10 21.33	03.40 23.03	03.12 23.39	04.25 22.32	05.57 20.50	07.23 19.03	07.50 17.23	09.24 14.58	10.06 14.43
30	09.06 16.07		06.53 20.05	05.07 21.36	03.38 23.05	03.14 23.38	04.28 22.29	05.59 20.47	07.26 19.00	07.53 17.20	09.27 14.56	10.06 14.45
31	09.04 16.10		06.49 20.07		03.35 23.08		04.31 22.26	06.02 20.43		07.56 17.16		10.05 14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 81 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1205)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	09.44
	15.00	16.32	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	09.58
	15.18	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.38	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.35	15.06	14.38
26	09.18	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.39
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.40
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.41	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 82 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1206)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.41	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.14	20.30	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.01
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.06
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 83 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1207)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.14	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.37	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.30 14.54
2	10.40 14.50	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.31 23.13	03.17 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	04.54 21.48	03.26 23.18	03.20 23.33	04.43 22.13	06.14 20.29	07.37 18.46	08.08 16.04	09.37 14.49
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.20	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	09.59 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.48 21.54	03.22 23.23	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.44 21.57	03.21 23.25	03.26 23.28	04.52 22.04	06.22 20.19	07.45 18.36	08.18 15.55	09.44 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.06	08.37 16.39	07.05 18.04	06.19 20.33	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.48 14.42
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.16 23.31	03.33 23.22	05.01 21.54	06.30 20.09	07.54 18.26	08.27 15.47	09.50 14.40
11	09.52 15.11	08.31 16.45	06.58 18.10	06.12 20.39	04.32 22.10	03.14 23.32	03.35 23.20	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.29 22.13	03.13 23.34	03.37 23.18	05.07 21.47	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.39
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	04.25 22.16	03.12 23.35	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.36 15.37	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.37	03.42 23.13	05.13 21.41	06.42 19.55	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.22	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.10 23.38	03.45 23.11	05.16 21.38	06.44 19.51	08.08 18.09	08.43 15.32	09.59 14.37
16	09.42 15.24	08.15 17.01	06.41 18.25	05.55 20.54	04.16 22.25	03.09 23.39	03.48 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.00 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	10.02 14.36
18	09.37 15.30	08.09 17.07	06.34 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.03	05.25 21.27	06.53 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.08 23.41	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	04.04 22.37	03.07 23.42	03.59 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.19	10.05 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.02 22.40	03.07 23.42	04.02 22.55	05.34 21.17	07.01 19.31	08.26 17.49	09.01 15.16	10.05 14.36
22	09.28 15.42	07.56 17.19	06.21 18.42	05.34 21.12	03.59 22.43	03.08 23.42	04.04 22.53	05.37 21.14	07.04 19.27	08.29 17.45	09.04 15.14	10.06 14.37
23	09.25 15.45	07.52 17.23	06.17 18.45	05.31 21.15	03.56 22.46	03.08 23.42	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.37
24	09.23 15.48	07.49 17.26	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.42	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.09 23.42	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.06	10.07 14.39
26	09.18 15.55	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.15 19.13	07.41 17.32	09.16 15.04	10.07 14.40
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.57	03.10 23.41	04.19 22.38	05.51 20.57	07.17 19.10	07.44 17.29	09.19 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.43 23.00	03.11 23.40	04.22 22.35	05.54 20.54	07.20 19.07	07.47 17.26	09.21 15.00	10.07 14.42
29	09.09 16.04		06.56 20.02	05.11 21.33	03.40 23.03	03.12 23.40	04.25 22.32	05.57 20.50	07.23 19.03	07.50 17.23	09.24 14.58	10.07 14.43
30	09.07 16.07		06.53 20.05	05.07 21.36	03.38 23.06	03.14 23.39	04.28 22.29	06.00 20.47	07.26 19.00	07.53 17.20	09.27 14.56	10.06 14.45
31	09.04 16.10		06.50 20.08		03.35 23.08		04.31 22.26	06.02 20.43		07.56 17.17		10.06 14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset WTG: 84 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1208)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.47	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.32	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.18	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.20	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 85 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1209)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.01 16.12	07.32 17.40	06.45 20.10	05.03 21.39	03.31 23.11	03.13 23.38	04.33 22.23	06.04 20.39	07.28 18.55	07.59 16.12	09.30 14.52
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.14	03.15 23.37	04.36 22.20	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.16	04.56 21.45	03.27 23.16	03.16 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.35 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.19	03.18 23.34	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.31 20.21	04.50 21.51	03.23 23.21	03.20 23.32	04.45 22.10	06.16 20.26	07.39 18.42	08.11 16.00	09.40 14.45
6	10.00 14.57	08.46 16.28	07.15 17.55	06.28 20.24	04.46 21.54	03.21 23.23	03.22 23.31	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 14.59	08.43 16.32	07.11 17.58	06.25 20.27	04.43 21.57	03.19 23.25	03.24 23.29	04.51 22.04	06.21 20.19	07.45 18.35	08.18 15.54	09.44 14.43
8	09.57 15.02	08.40 16.35	07.08 18.01	06.21 20.30	04.40 22.00	03.17 23.27	03.26 23.27	04.54 22.00	06.24 20.15	07.48 18.31	08.21 15.51	09.47 14.41
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.15 23.29	03.28 23.25	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.49 14.40
10	09.54 15.07	08.34 16.41	07.01 18.06	06.14 20.36	04.34 22.07	03.14 23.31	03.31 23.23	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.51 14.39
11	09.52 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.30 22.10	03.12 23.33	03.33 23.21	05.03 21.51	06.32 20.05	07.56 18.21	08.30 15.42	09.53 14.38
12	09.50 15.12	08.27 16.47	06.54 18.12	06.07 20.42	04.27 22.13	03.11 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.36	03.38 23.16	05.09 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.36
14	09.46 15.17	08.21 16.54	06.48 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.14	05.12 21.41	06.41 19.54	08.05 18.11	08.39 15.33	09.58 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	04.18 22.22	03.08 23.39	03.43 23.11	05.15 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.54	04.15 22.25	03.07 23.40	03.46 23.09	05.18 21.34	06.46 19.47	08.11 18.04	08.46 15.28	10.01 14.35
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.57	04.12 22.28	03.06 23.41	03.49 23.06	05.21 21.31	06.49 19.44	08.14 18.01	08.49 15.25	10.02 14.34
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 20.59	04.09 22.31	03.06 23.41	03.52 23.04	05.24 21.27	06.52 19.40	08.17 17.58	08.52 15.23	10.03 14.34
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 21.02	04.06 22.34	03.06 23.42	03.54 23.01	05.27 21.24	06.55 19.37	08.20 17.54	08.55 15.20	10.04 14.34
20	09.33 15.35	08.02 17.12	06.27 18.35	05.40 21.05	04.03 22.37	03.05 23.43	03.57 22.58	05.30 21.20	06.57 19.33	08.23 17.51	08.58 15.17	10.05 14.34
21	09.30 15.38	07.58 17.15	06.23 18.38	05.36 21.08	04.00 22.40	03.05 23.43	05.00 22.55	05.33 21.17	07.00 19.30	08.26 17.48	09.01 15.15	10.06 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.11	03.57 22.43	03.05 23.43	04.03 22.53	05.35 21.14	07.03 19.27	08.29 17.45	09.04 15.12	10.06 14.35
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 21.14	03.54 22.46	03.06 23.43	04.06 22.50	05.38 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.07 14.36
24	09.23 15.47	07.48 17.25	06.13 18.47	05.26 21.17	03.52 22.49	03.06 23.43	04.09 22.47	05.41 21.07	07.08 19.20	08.34 17.38	09.10 15.07	10.07 14.36
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 21.20	03.49 22.52	03.07 23.43	03.54 22.44	05.27 21.03	06.55 19.16	08.20 17.35	08.55 15.05	10.04 14.37
26	09.17 15.53	07.42 17.31	06.06 18.53	05.20 21.24	03.46 22.55	03.07 23.42	04.15 22.41	05.47 21.00	07.14 19.13	07.41 18.31	09.16 15.03	10.07 14.38
27	09.15 15.56	07.38 17.34	06.03 18.55	05.16 21.27	03.44 22.58	03.08 23.42	04.18 22.38	05.50 20.57	07.17 19.09	07.44 18.28	09.19 15.01	10.07 14.39
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 21.30	03.41 23.00	03.09 23.41	04.21 22.35	05.53 20.53	07.20 19.06	07.47 18.25	09.21 14.58	10.07 14.40
29	09.09 16.03	07.32 17.34	05.56 19.01	05.10 21.33	03.38 23.03	03.10 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 18.22	09.24 14.56	10.07 14.42
30	09.06 16.06	07.29 17.37	05.53 19.04	05.06 21.36	03.36 23.06	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 18.19	09.27 14.54	10.06 14.43
31	09.04 16.09	07.27 17.40	05.51 19.07	05.04 21.39	03.34 23.09	03.11 23.40	04.30 22.26	06.01 20.43	07.56 18.16	09.28 14.56	10.08 14.45	10.06 14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset  
 WTG: 86 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1210)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		05.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		05.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		05.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

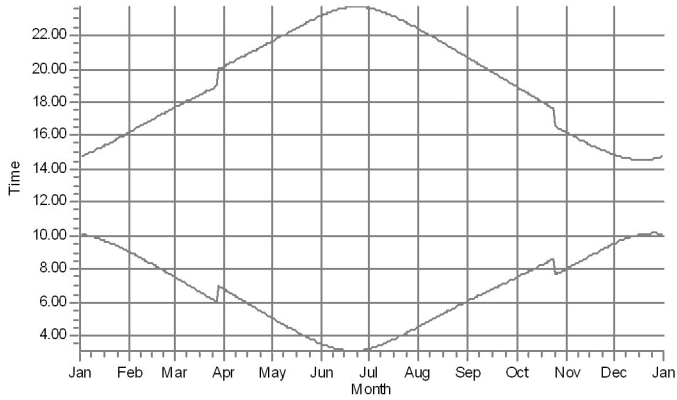
Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



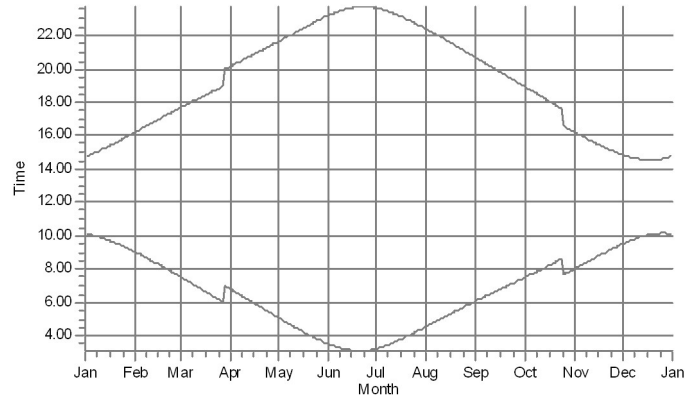
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

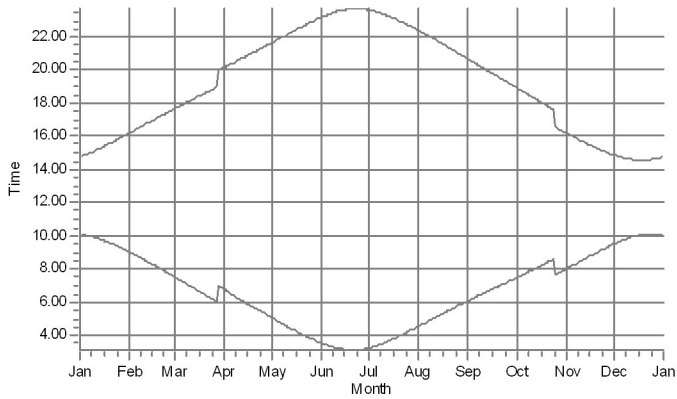
1: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (579)



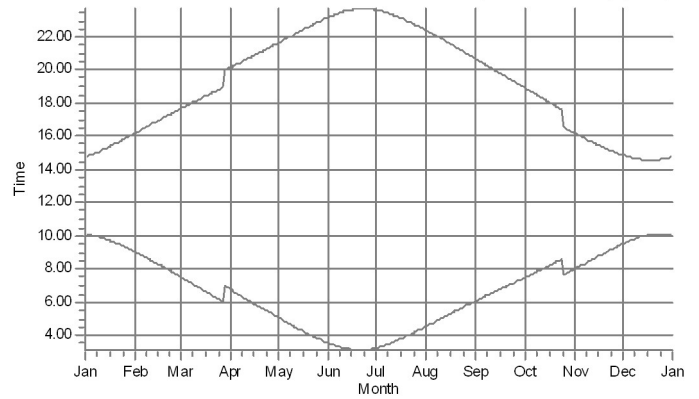
2: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (580)



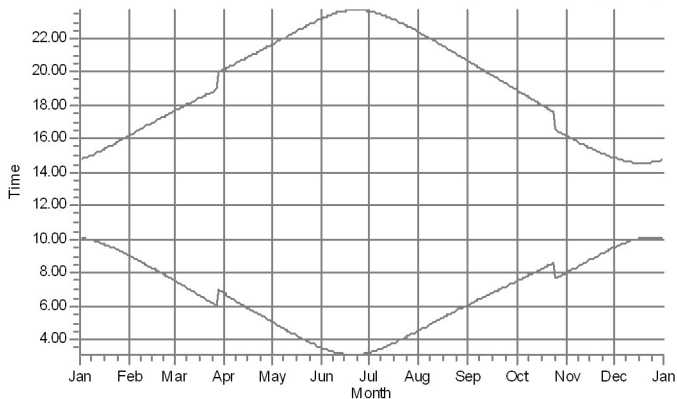
3: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (581)



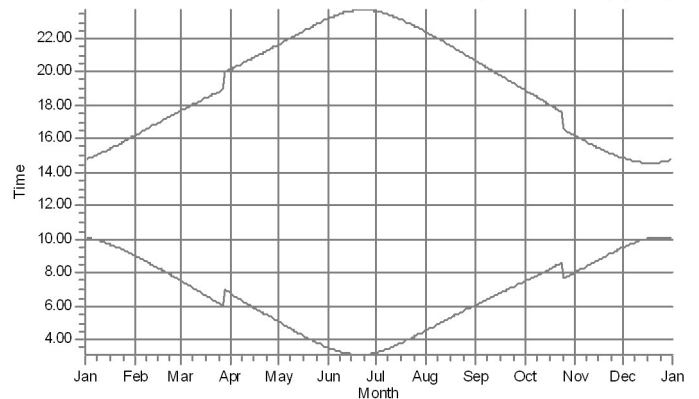
4: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (582)



5: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (583)



6: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (584)

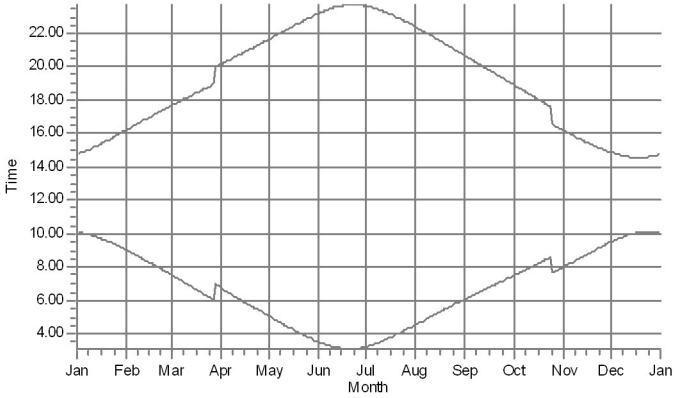


Shadow receptors

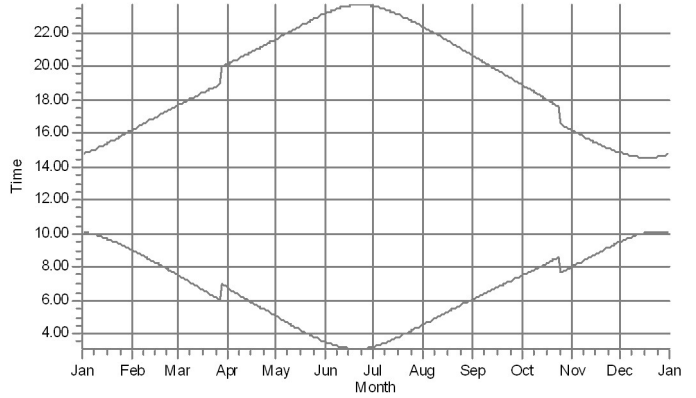
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

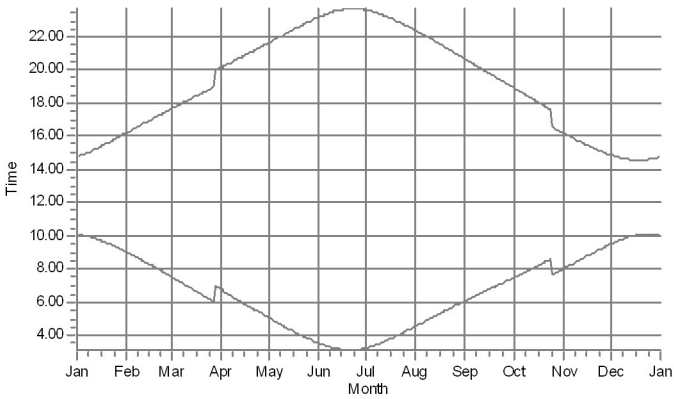
7: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (585)



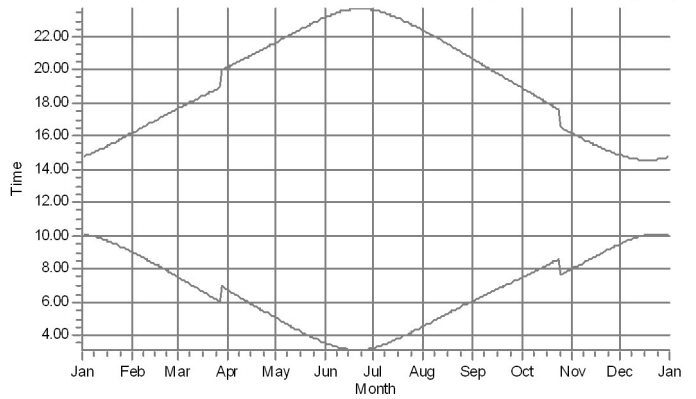
8: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (586)



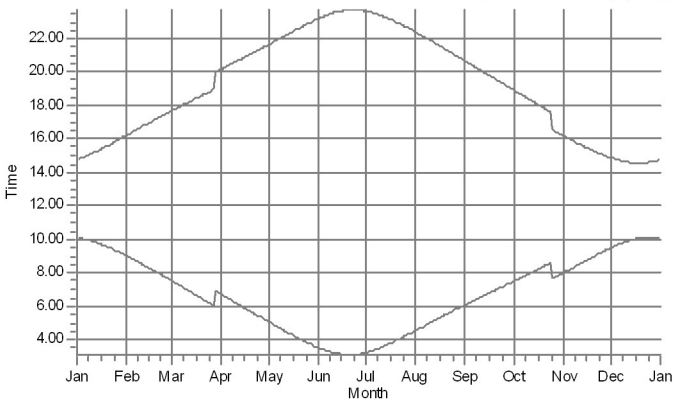
9: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (587)



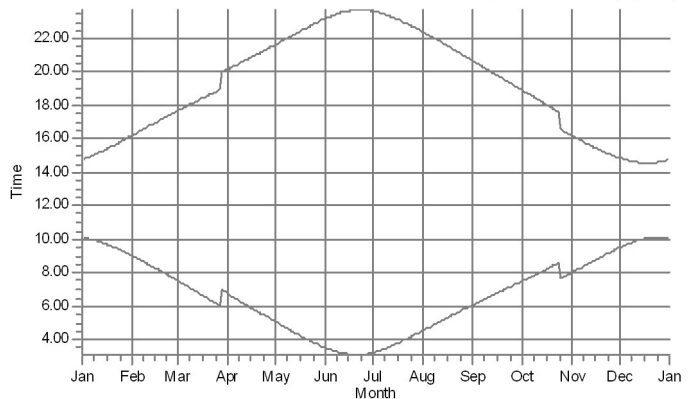
10: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (588)



11: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (589)



12: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (590)

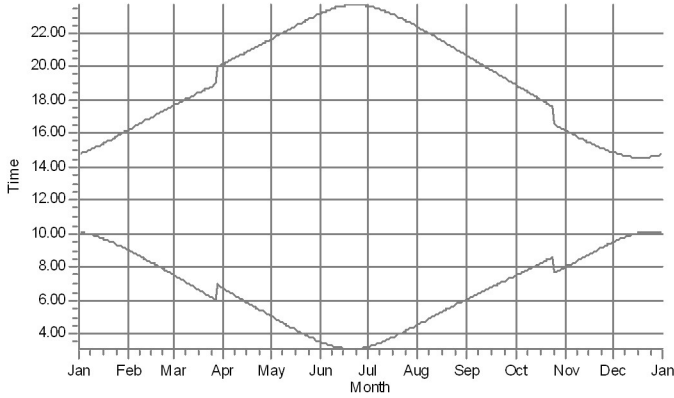


Shadow receptors

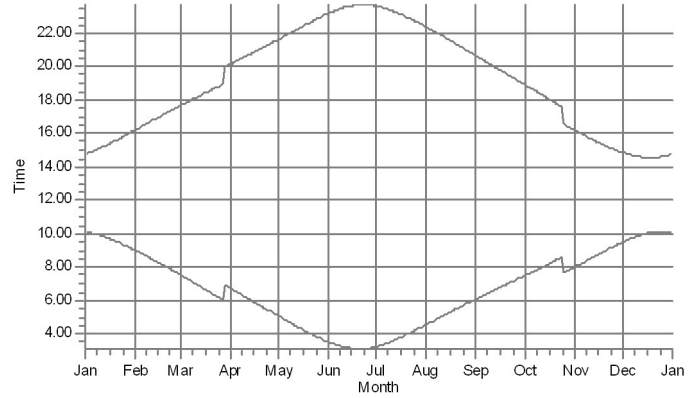
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

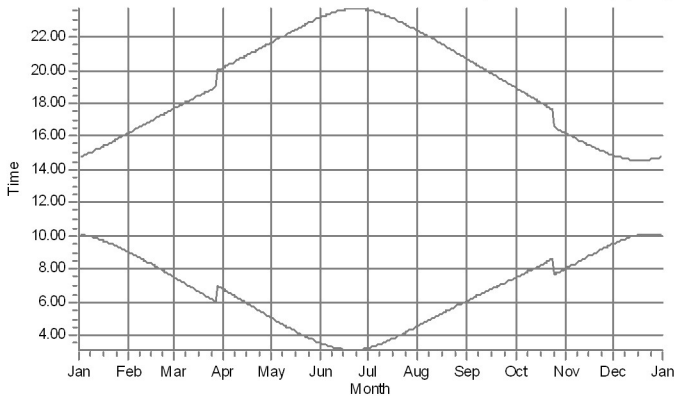
13: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (591)



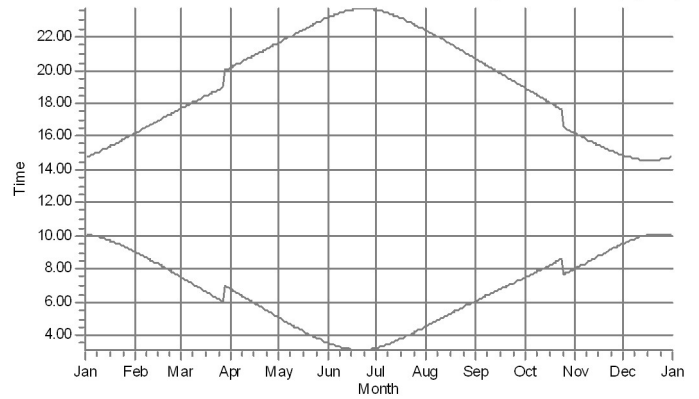
14: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (592)



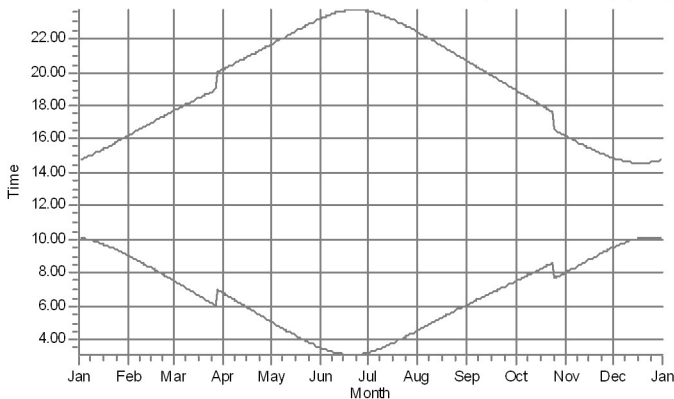
15: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (593)



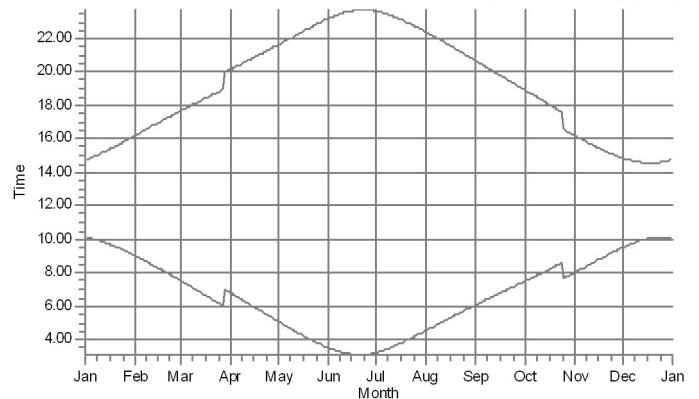
16: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (594)



17: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (595)



18: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (596)

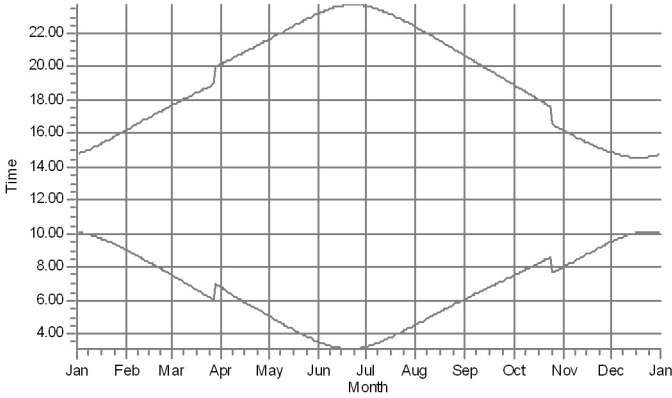


Shadow receptors

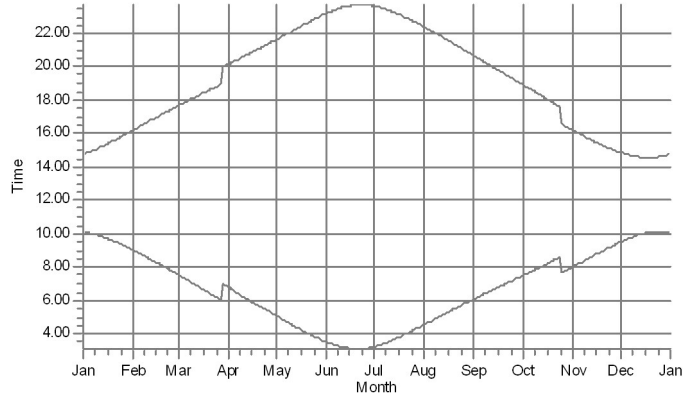
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

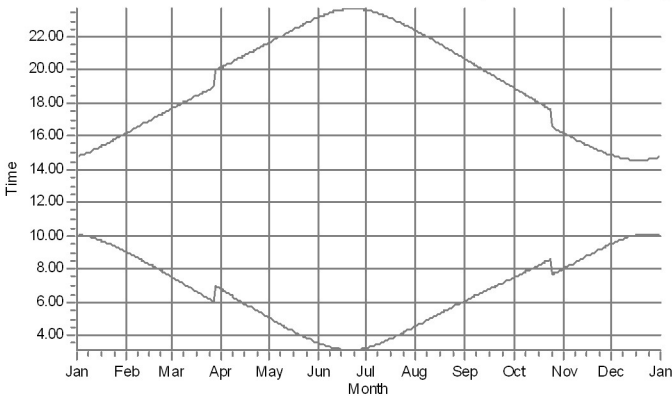
19: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (597)



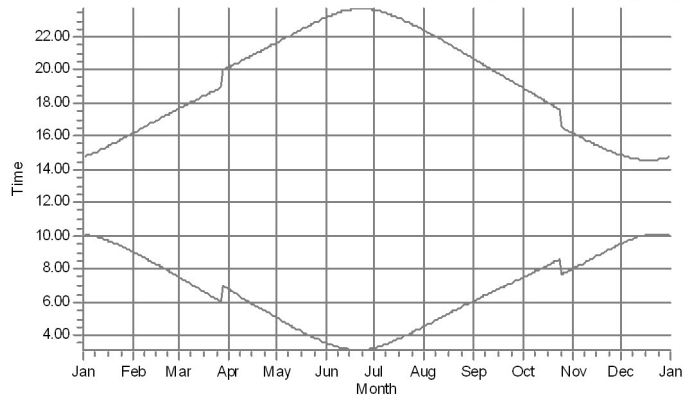
20: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (598)



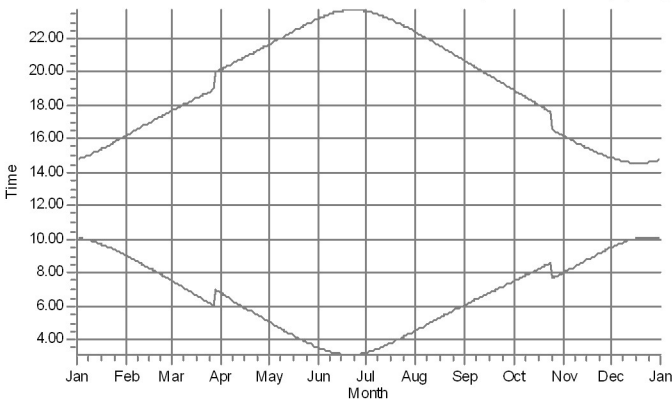
21: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (599)



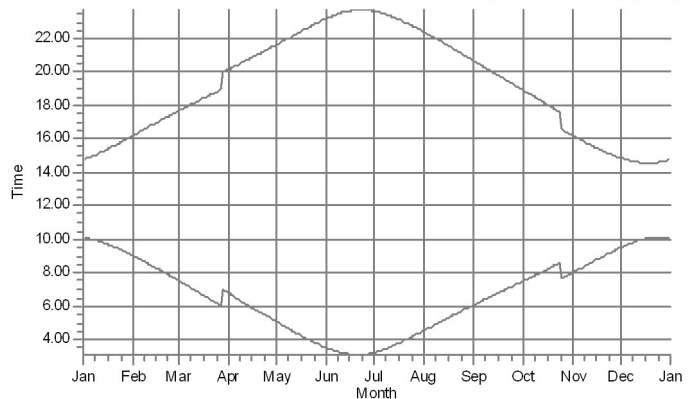
22: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (600)



23: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (601)



24: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (602)

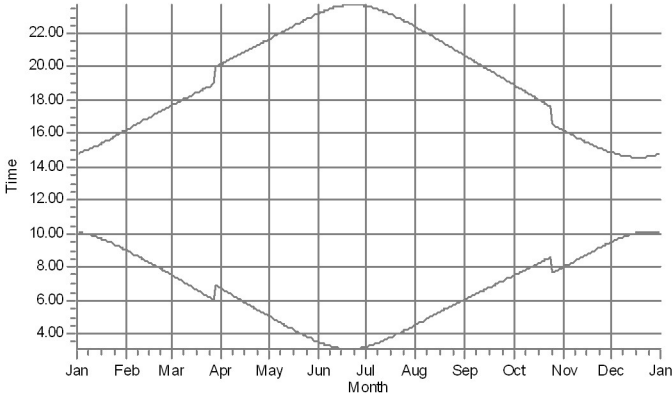


Shadow receptors

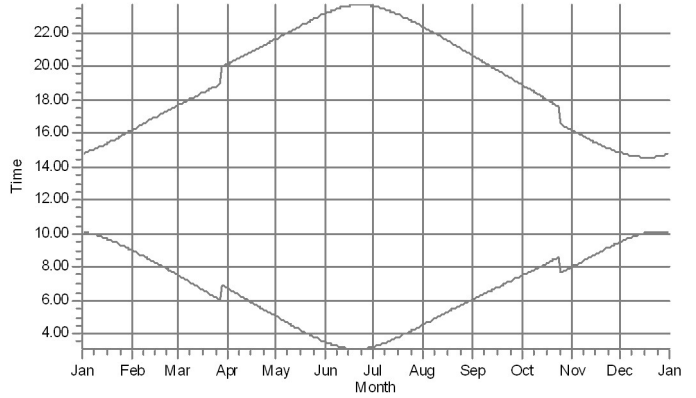
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

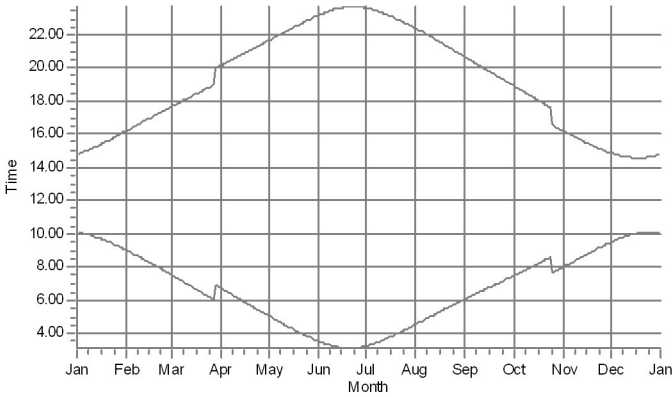
25: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (624)



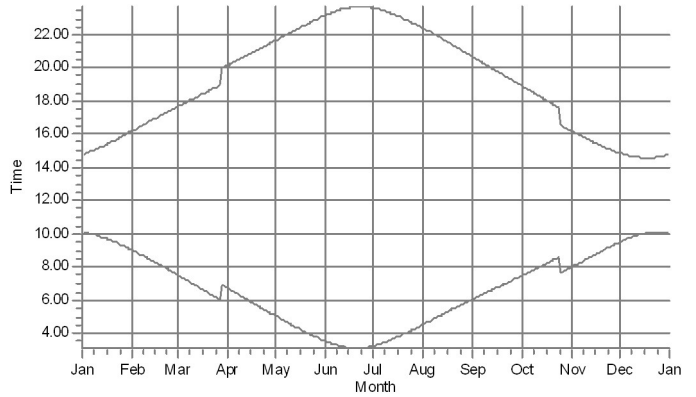
26: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (625)



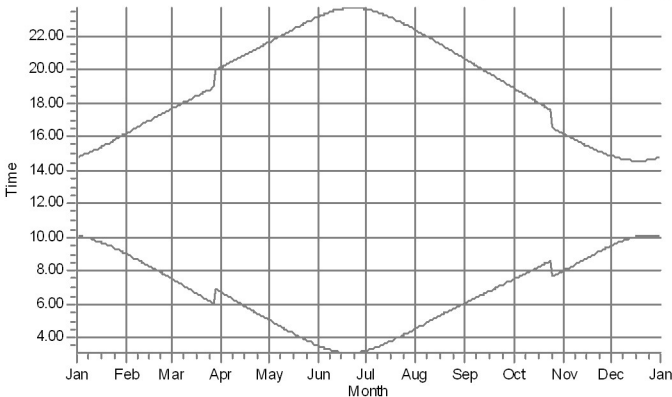
27: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (626)



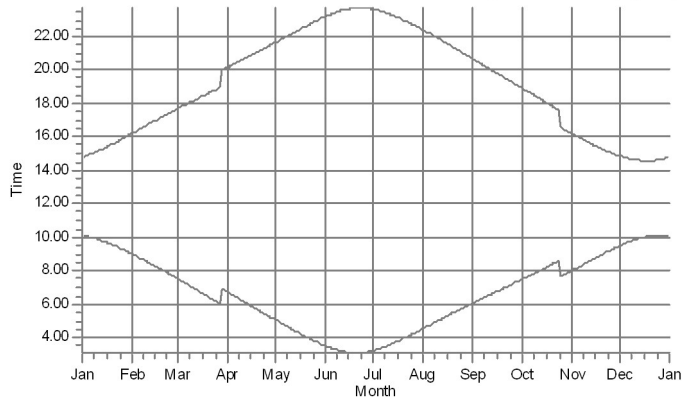
28: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (627)



29: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (628)



30: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (629)

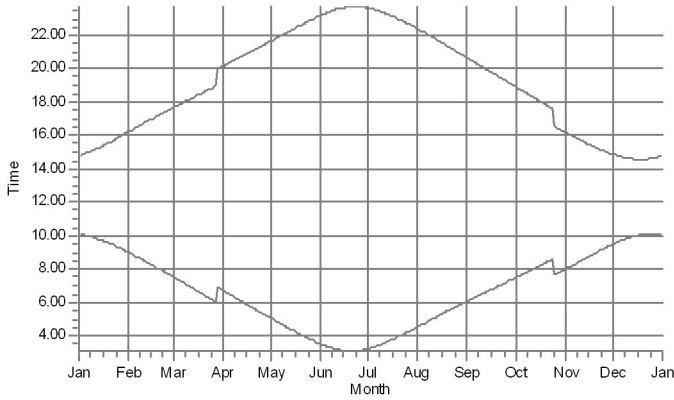


Shadow receptors

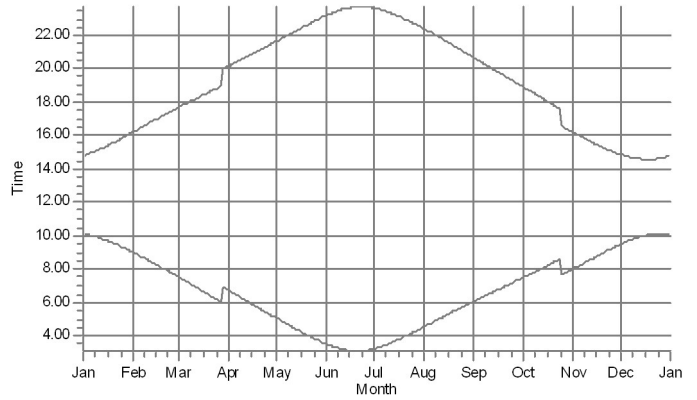
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

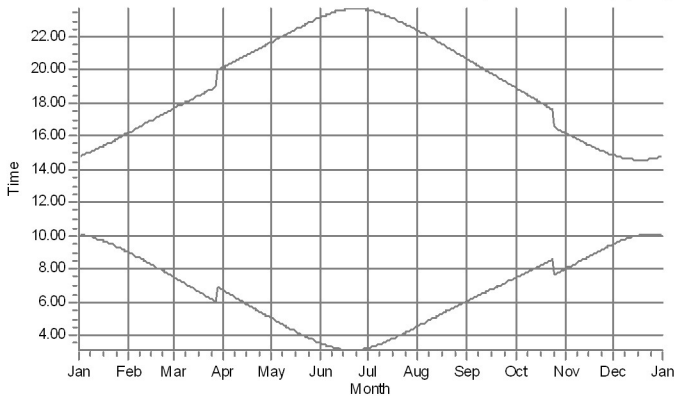
31: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (630)



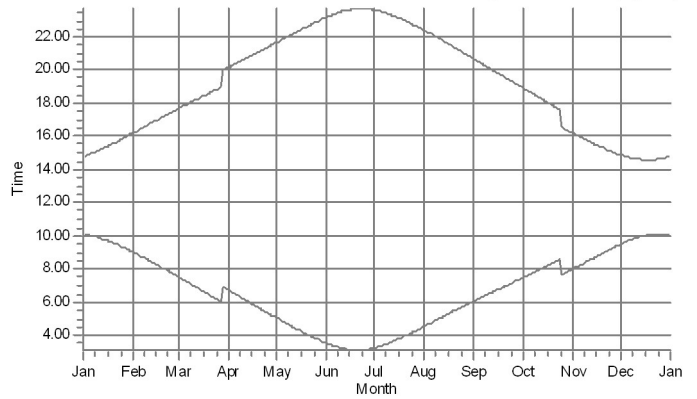
32: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (631)



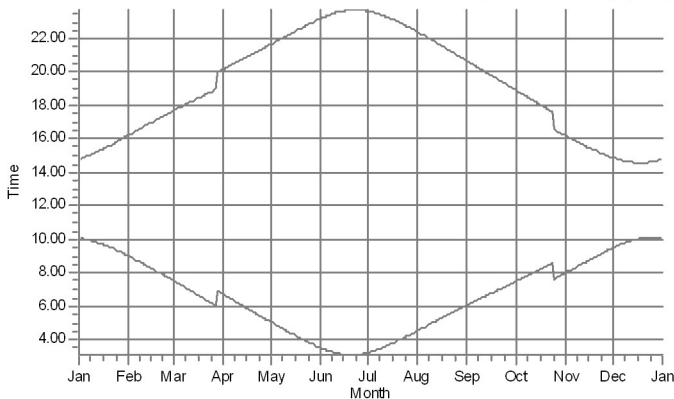
33: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (632)



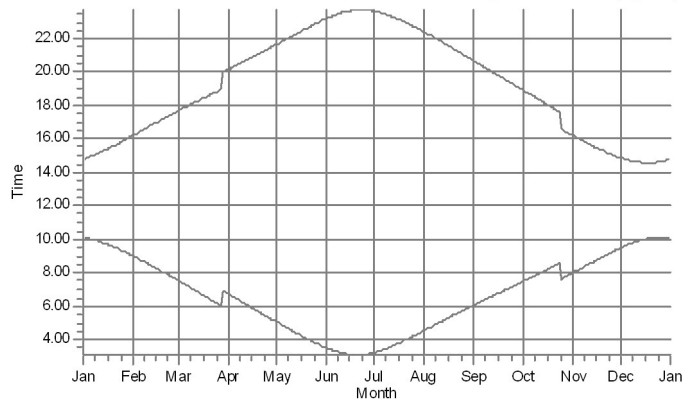
34: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (633)



35: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (634)



36: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (635)

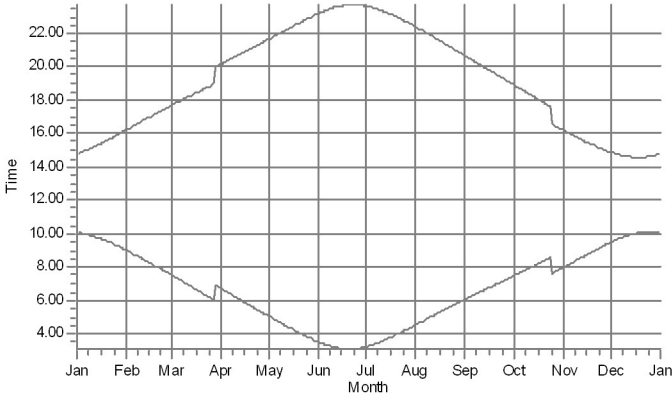


Shadow receptors

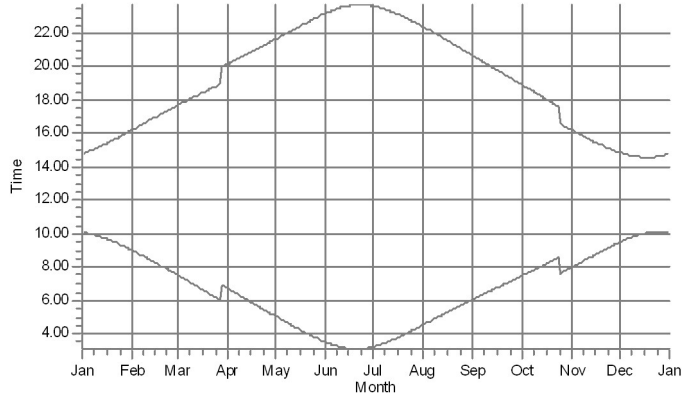
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

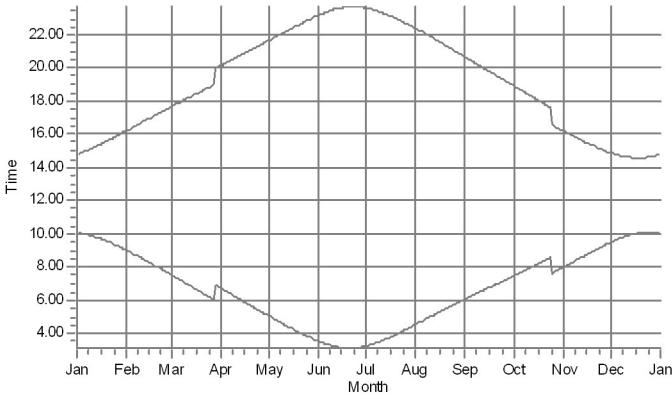
37: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (636)



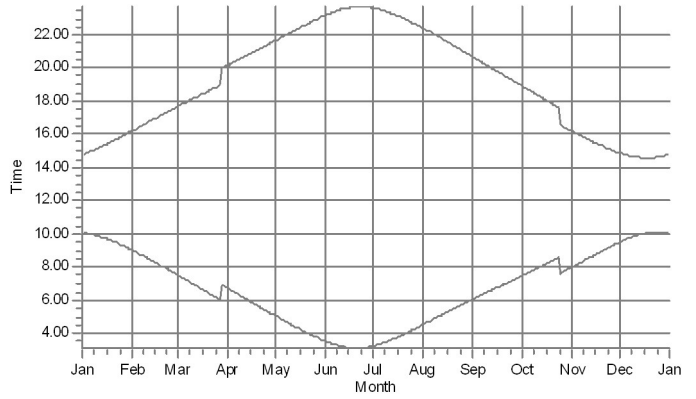
38: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (637)



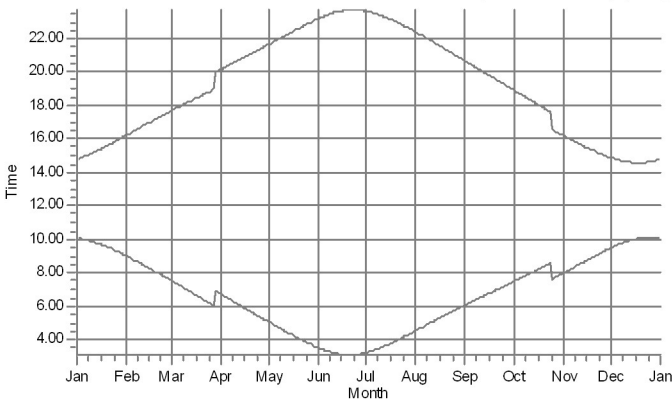
39: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (638)



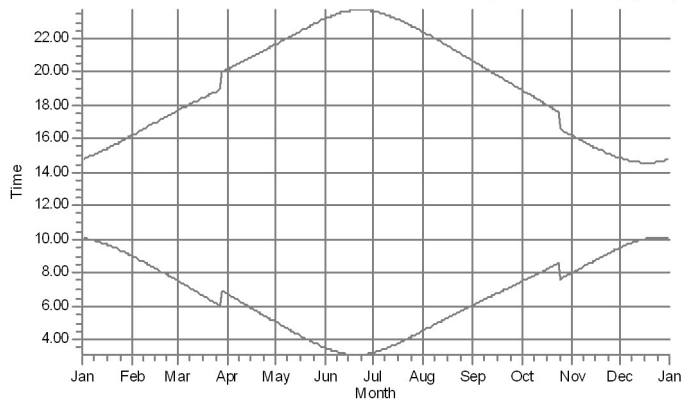
40: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (639)



41: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (640)



42: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (641)

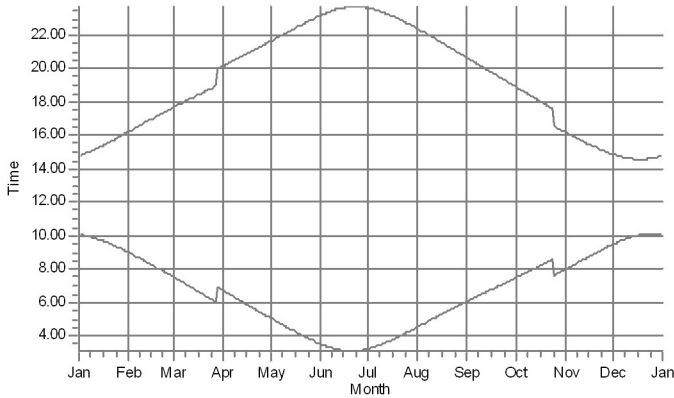


Shadow receptors

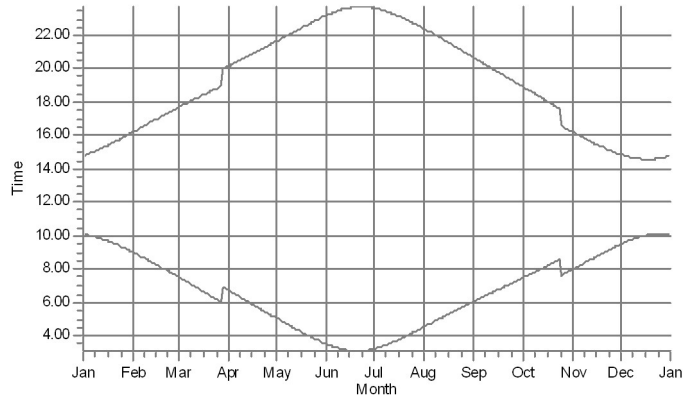
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

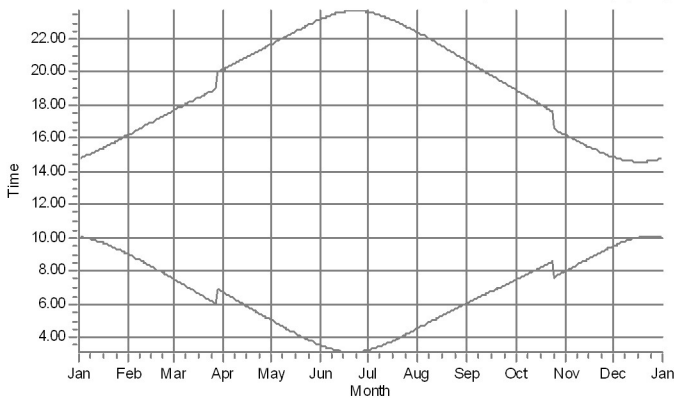
43: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (642)



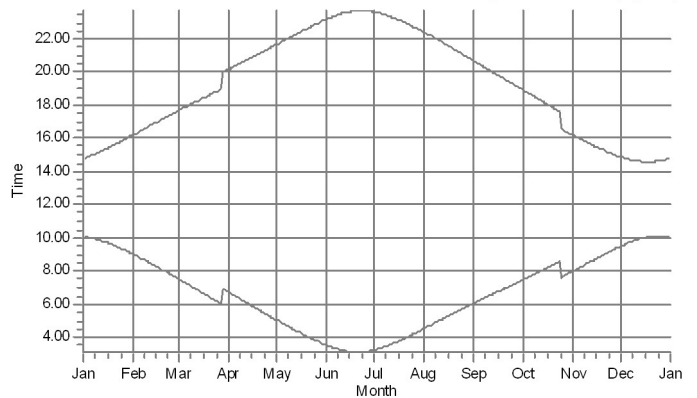
44: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (643)



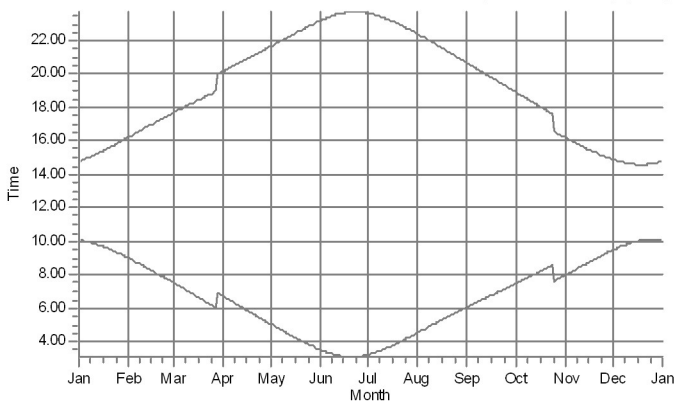
45: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (644)



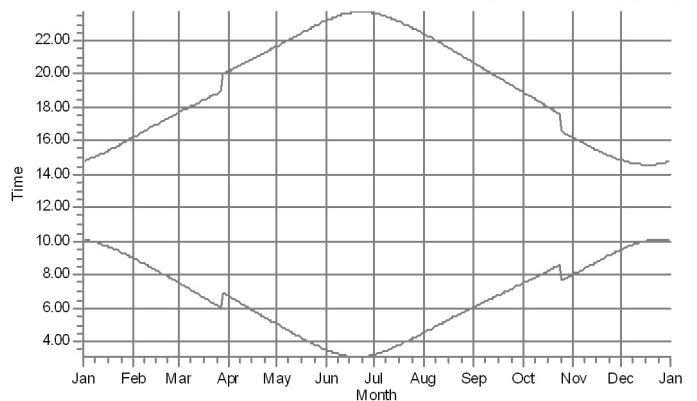
46: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (645)



47: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (646)



48: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (647)



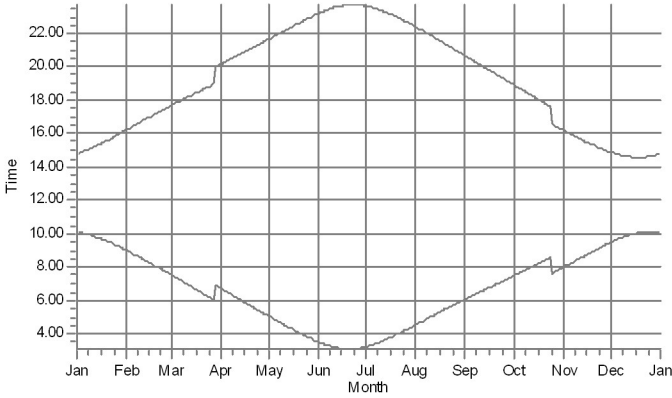
Shadow receptors



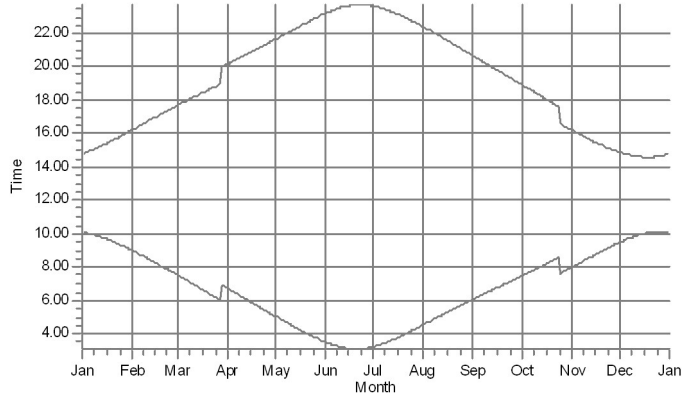
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

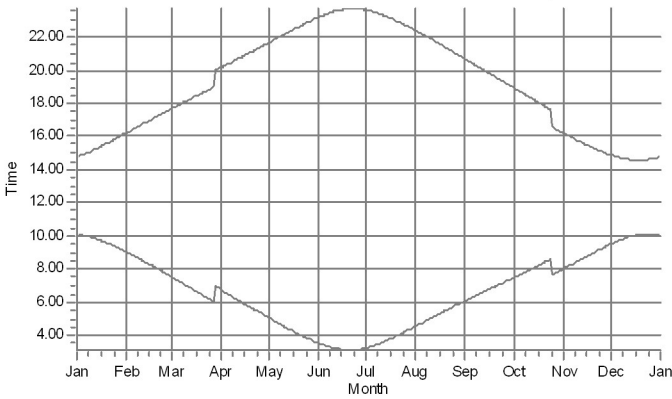
49: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (648)



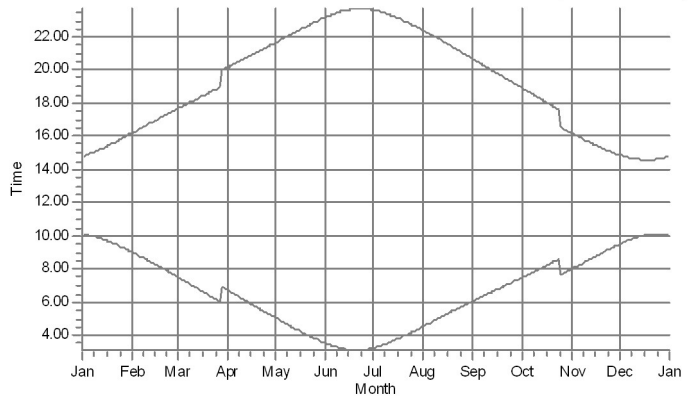
50: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (649)



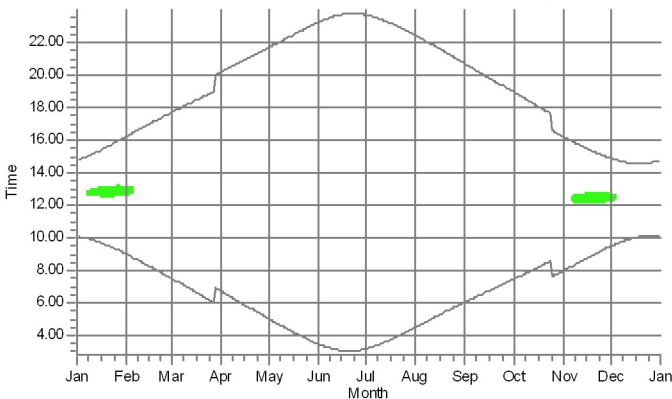
51: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



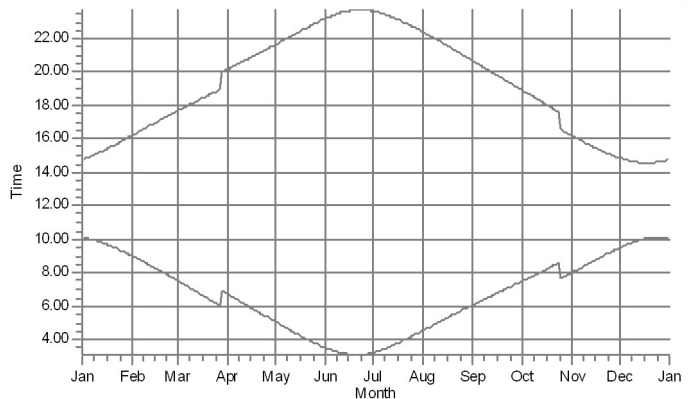
52: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



53: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



54: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



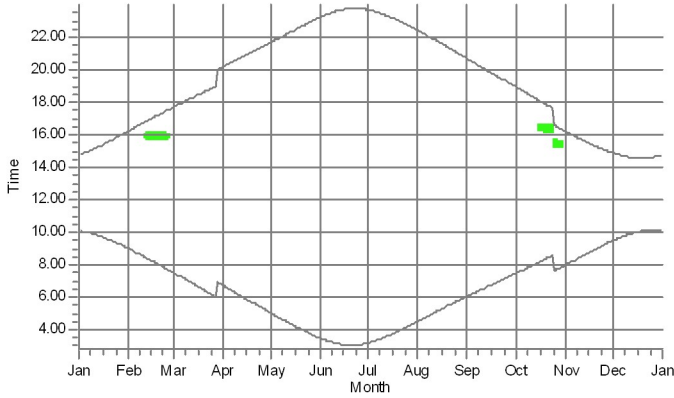
Shadow receptors

R: Lomarakenus R (Peuraneva,Valvatintie)

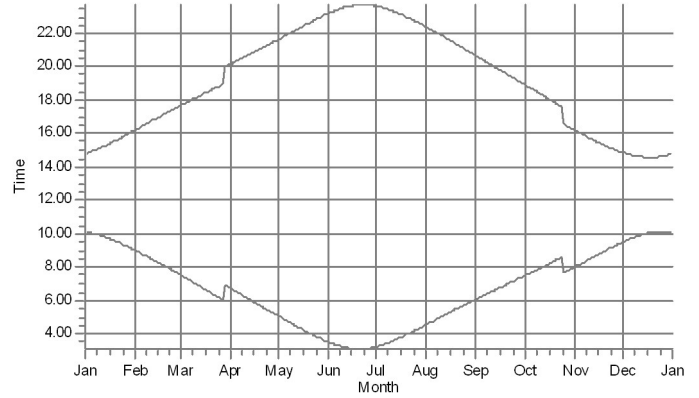
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

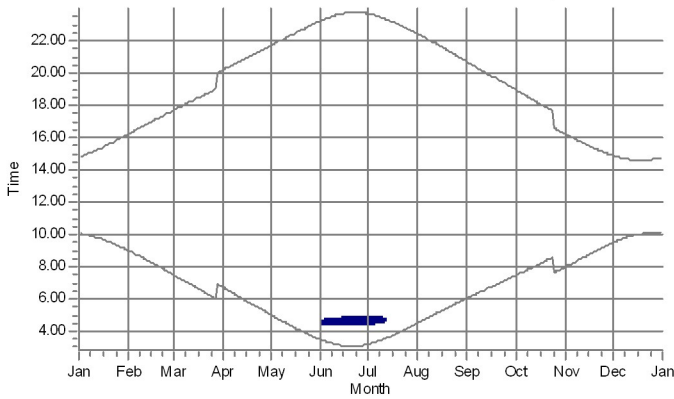
55: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



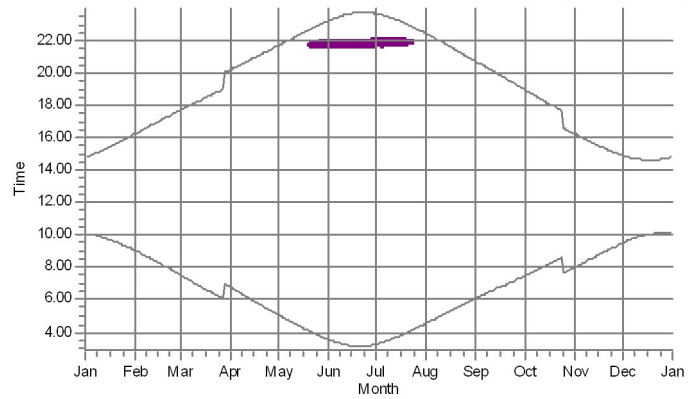
56: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



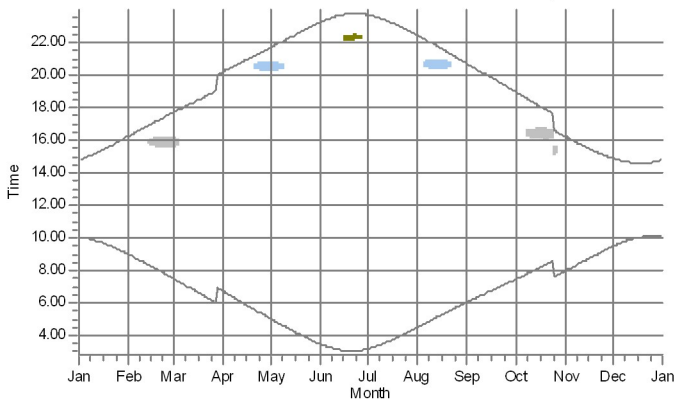
57: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



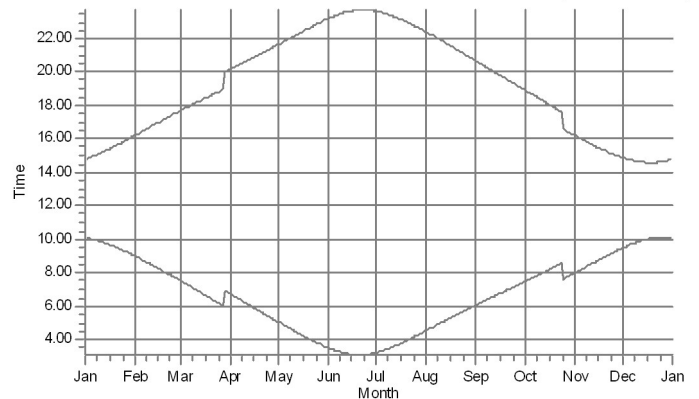
58: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



59: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



60: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



### Shadow receptors

G: Asuinrakennus G (Hautakoskentie 455)  
J: Lomarakenus J (Katajajarventie 49)

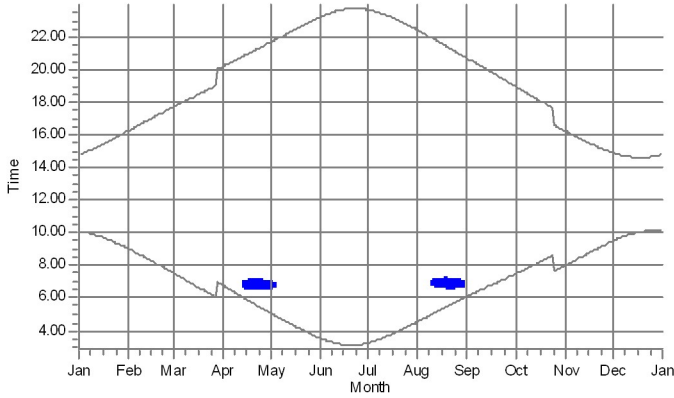
K: Lomarakenus K (Silostenlampi)  
L: Lomarakenus L (Harjunpaantie 215)

O: Lomarakenus O (Harjunpaantie 398)  
R: Lomarakenus R (Peuraneva,Valvatintie)

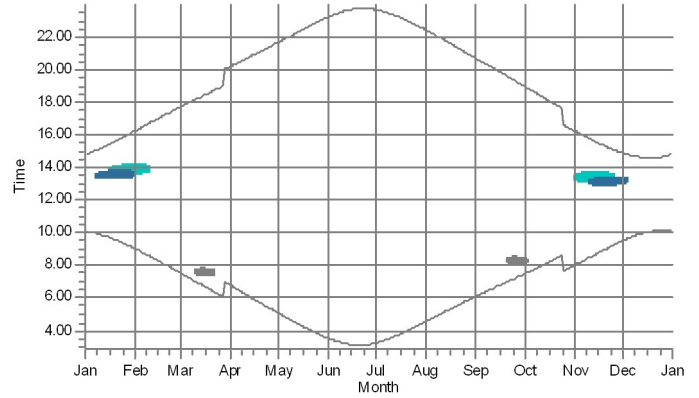
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

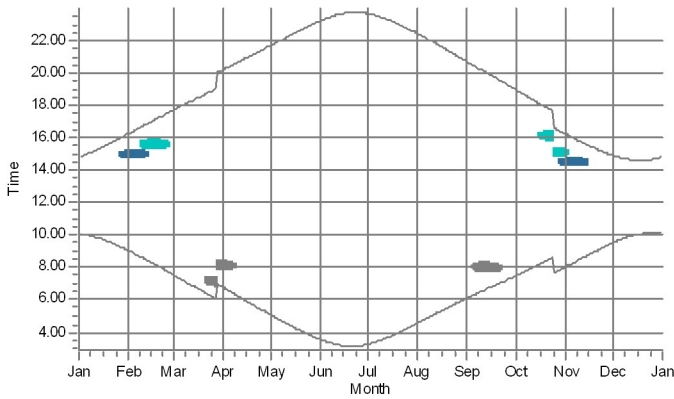
61: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



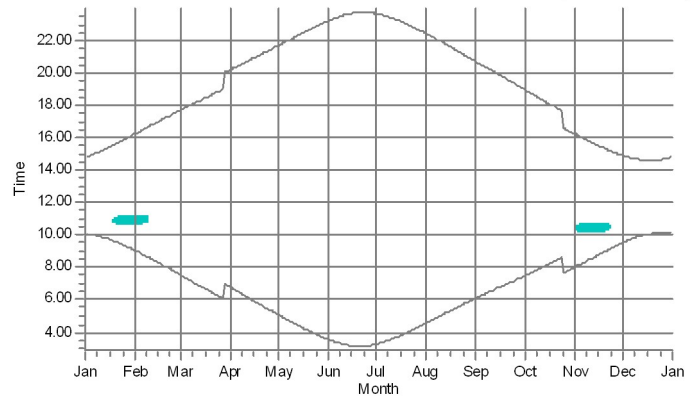
62: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



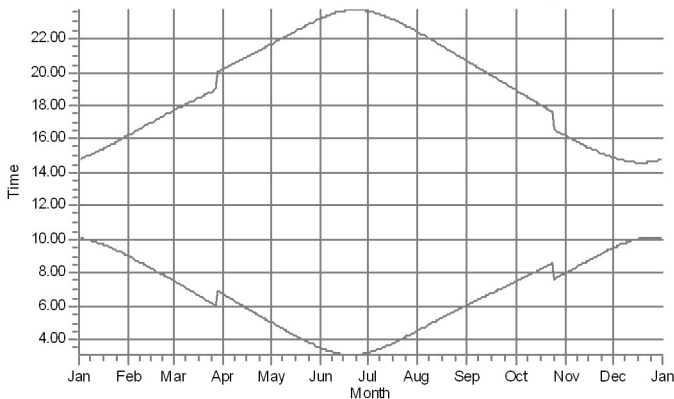
63: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



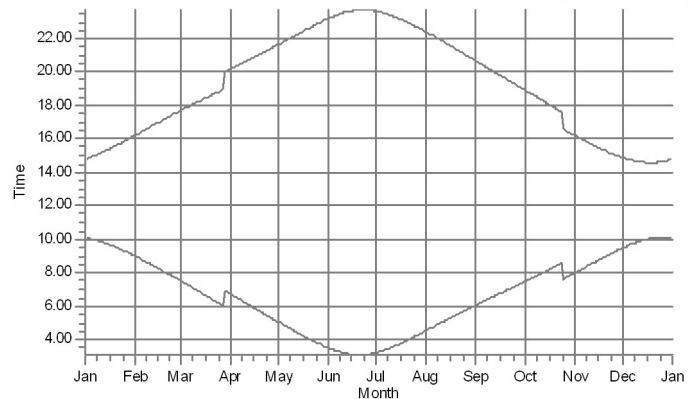
64: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



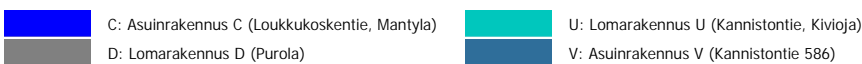
65: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



66: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



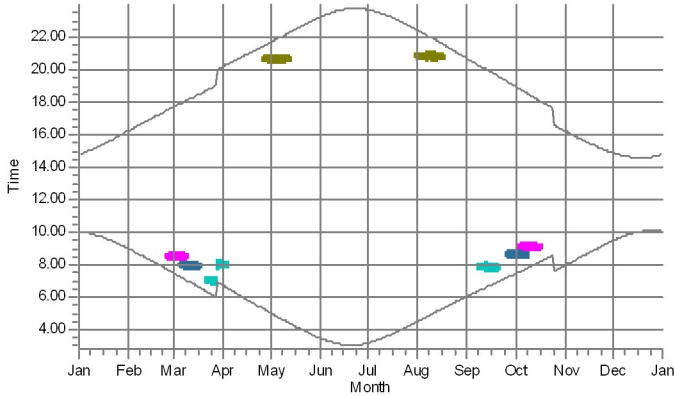
Shadow receptors



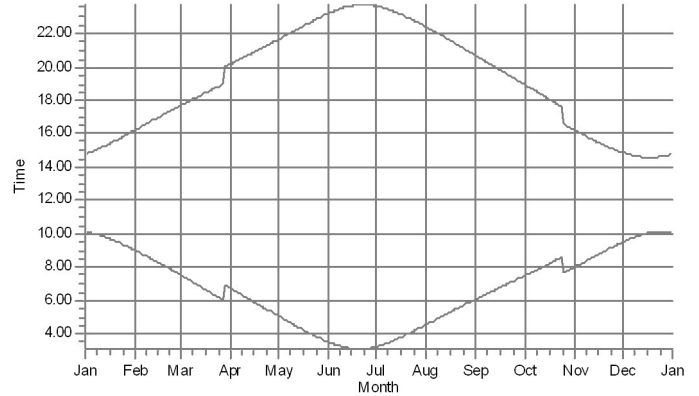
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

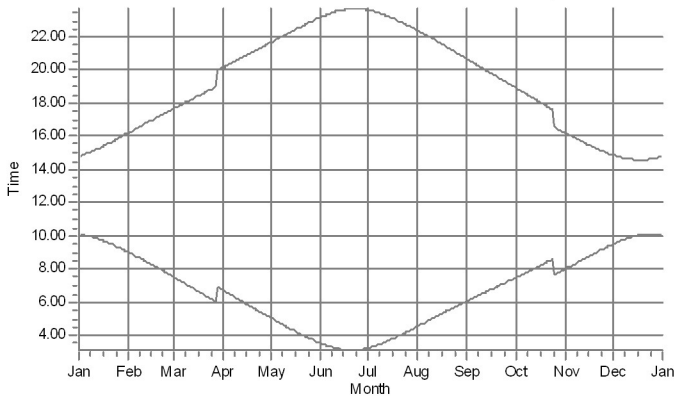
67: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



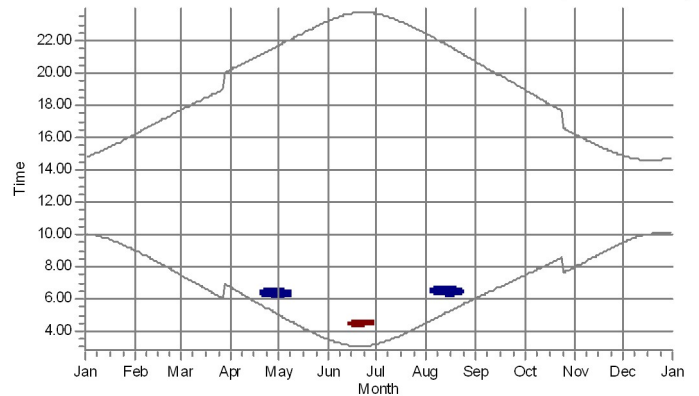
68: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



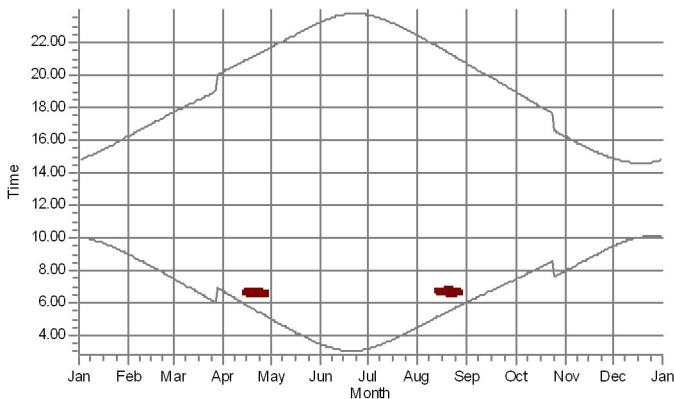
69: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



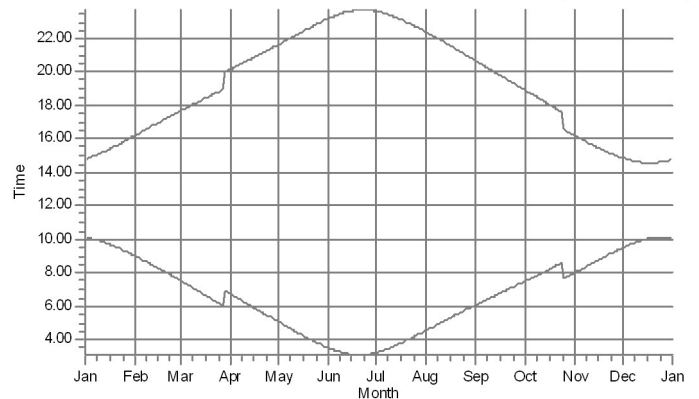
70: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



71: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



72: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



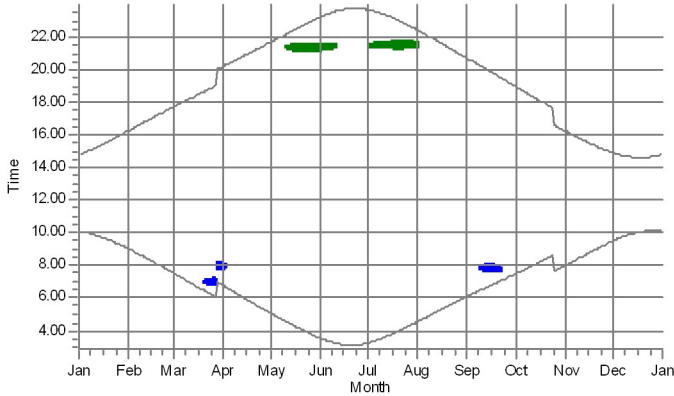
### Shadow receptors

<span style="display: inline-block; width: 15px; height: 15px; background-color: magenta; border: 1px solid black;"></span> E: Asuinrakennus E (Kannistontie 557)	<span style="display: inline-block; width: 15px; height: 15px; background-color: darkred; border: 1px solid black;"></span> H: Asuinrakennus H (Hautakoskentie 544)	<span style="display: inline-block; width: 15px; height: 15px; background-color: cyan; border: 1px solid black;"></span> U: Lomarakennus U (Kannistontie, Kivioja)
<span style="display: inline-block; width: 15px; height: 15px; background-color: darkblue; border: 1px solid black;"></span> G: Asuinrakennus G (Hautakoskentie 455)	<span style="display: inline-block; width: 15px; height: 15px; background-color: olive; border: 1px solid black;"></span> J: Lomarakennus J (Katajarventie 49)	<span style="display: inline-block; width: 15px; height: 15px; background-color: blue; border: 1px solid black;"></span> V: Asuinrakennus V (Kannistontie 586)

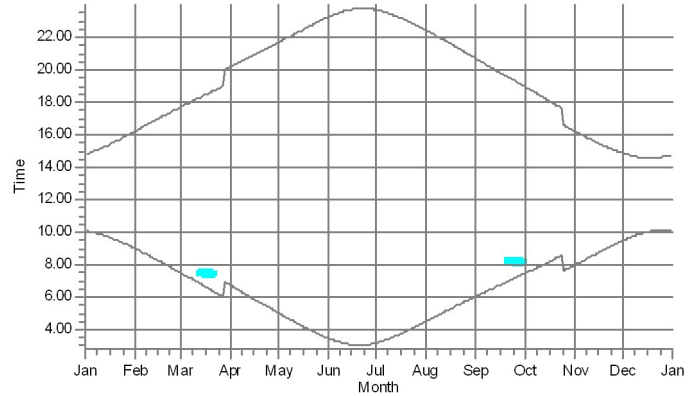
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

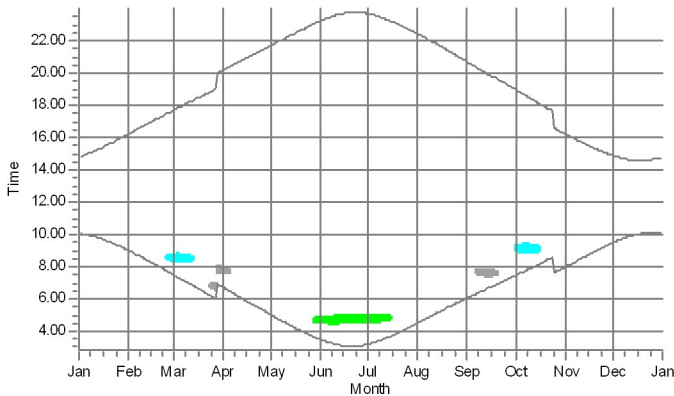
73: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



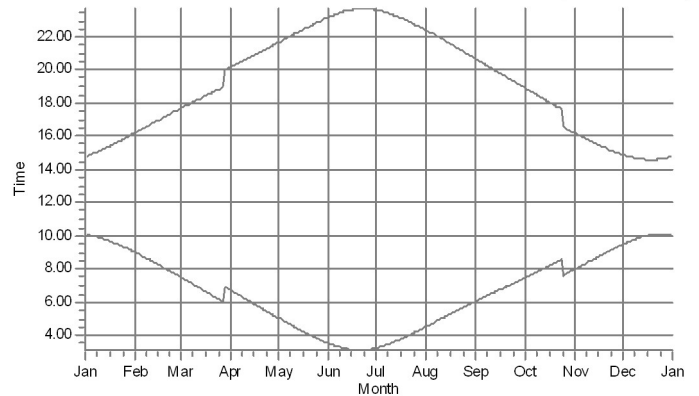
74: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



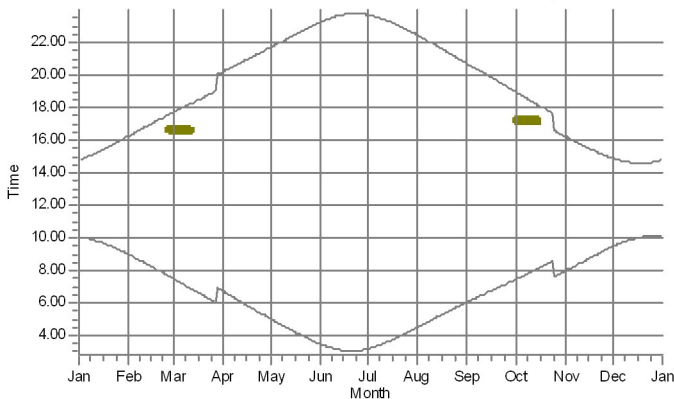
75: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



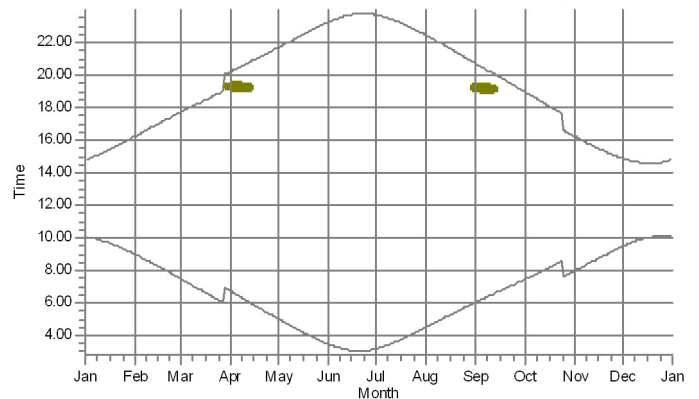
76: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)








77: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



78: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



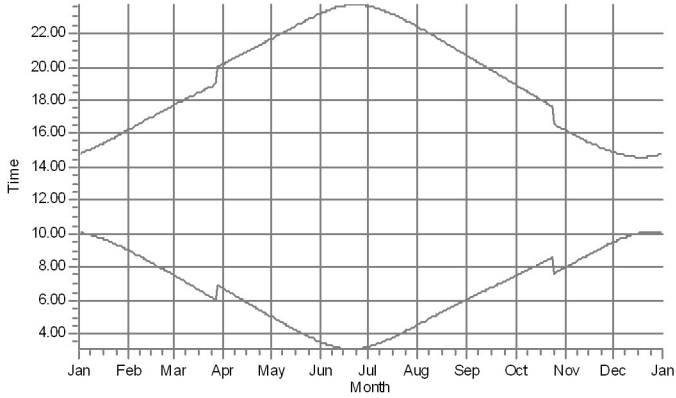
### Shadow receptors

 A: Lomarakenus A (Kuuslammentie)	 J: Lomarakenus J (Katajajarventie 49)	 M: Lomarakenus M (Hakala, Iso-Mottonen)
 C: Asuinrakennus C (Loukkukoskentie, Mantyla)	 P: Asuinrakennus P (Hautakoskentie 135)	

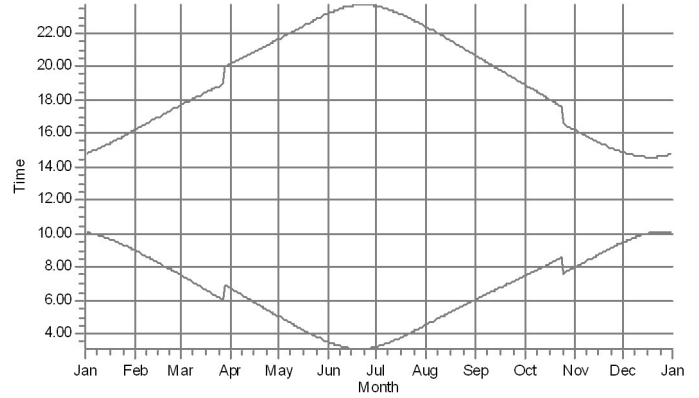
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

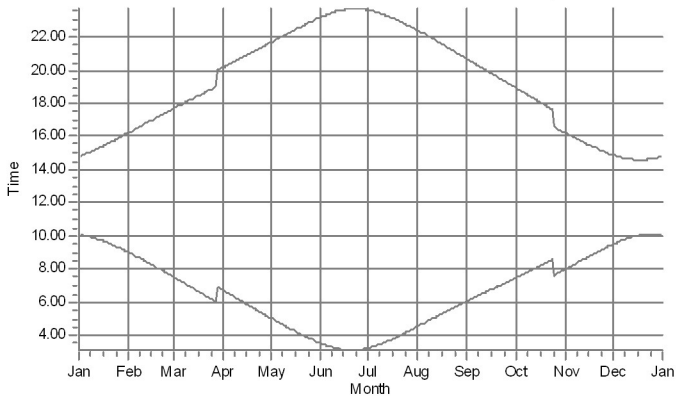
79: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



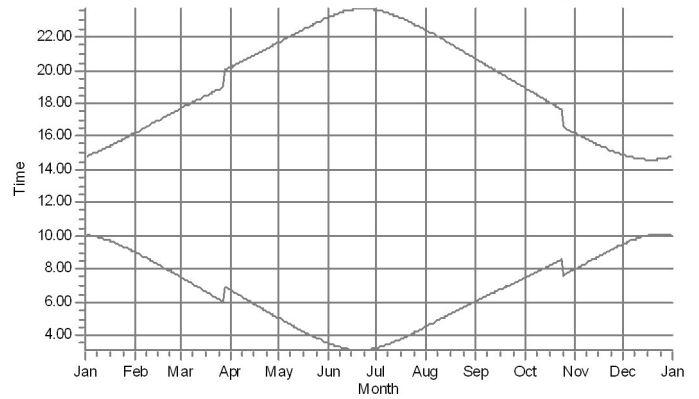
80: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



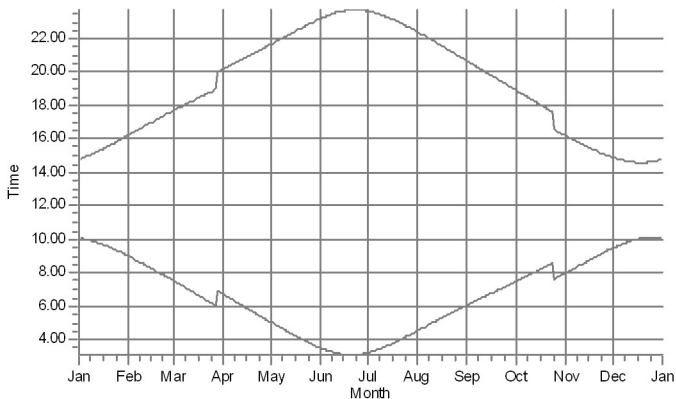
81: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



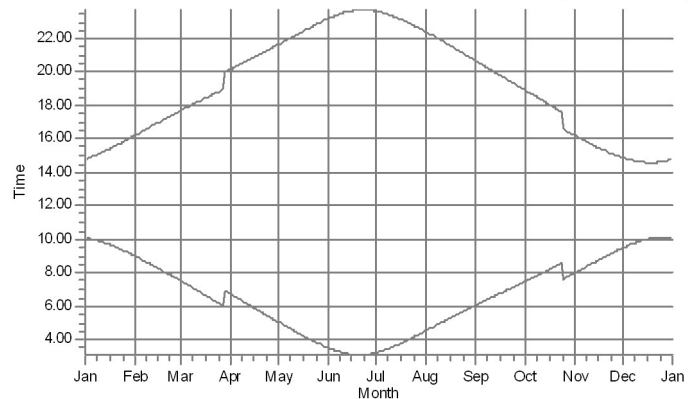
82: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



83: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



84: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)

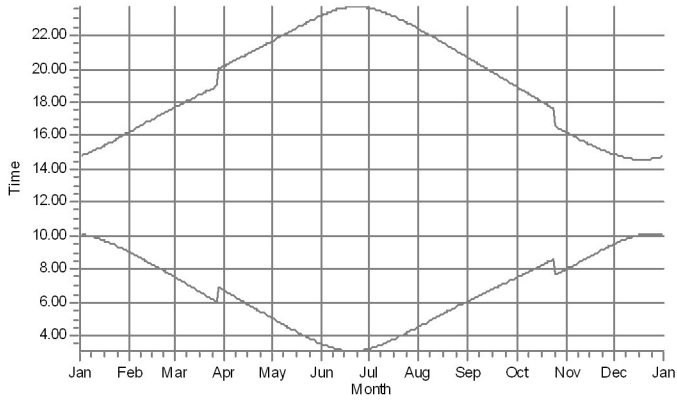


Shadow receptors

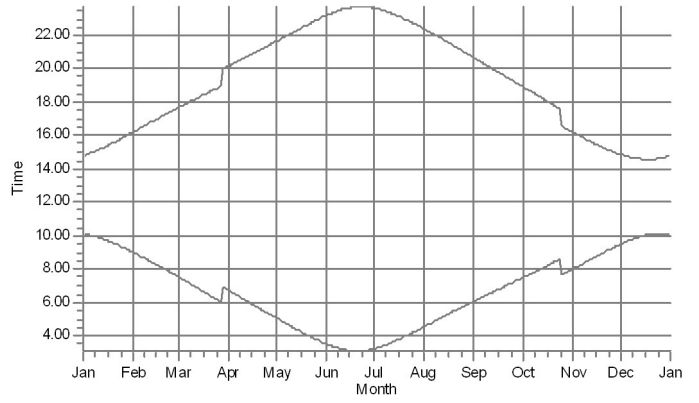
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset

85: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



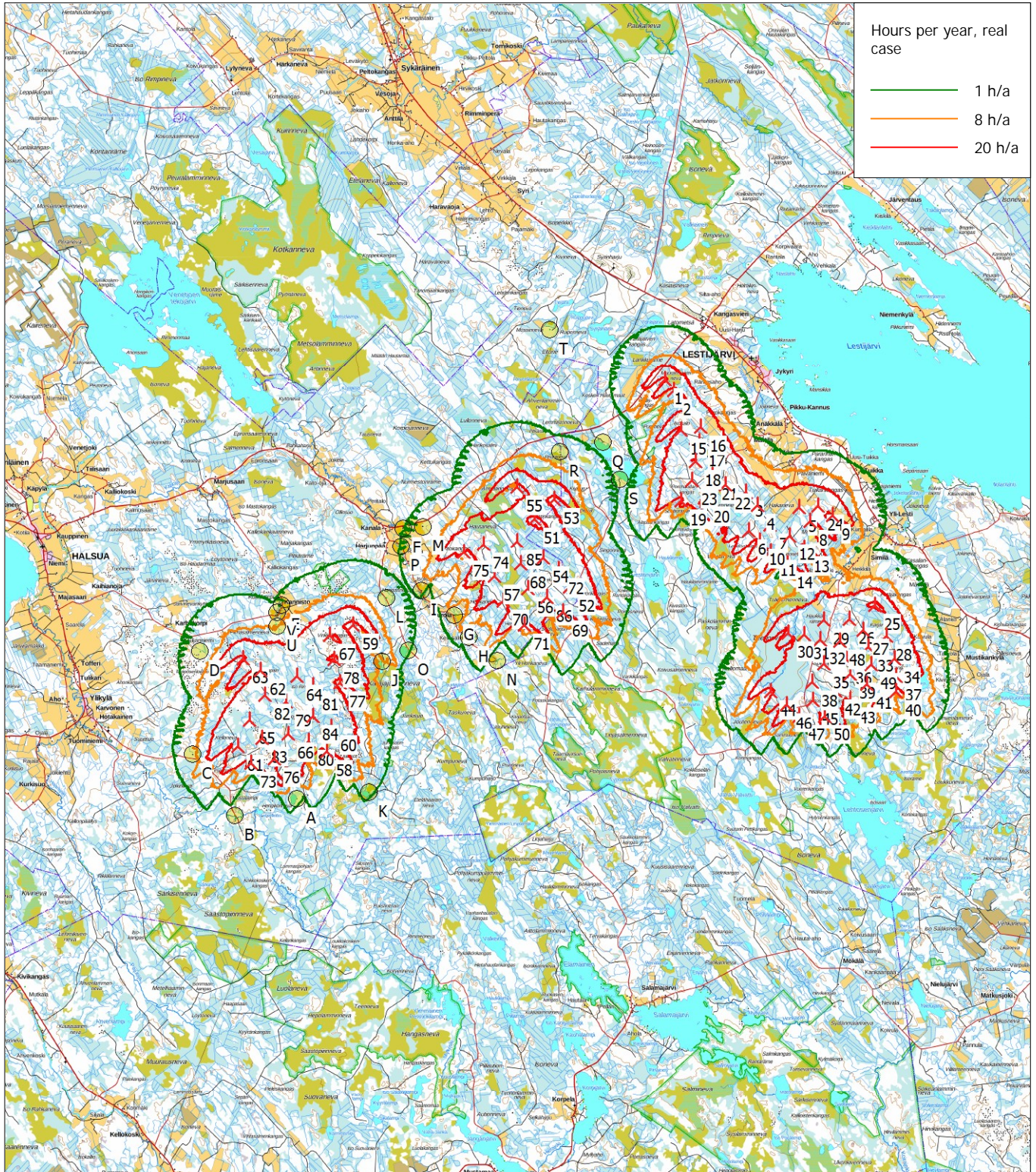
86: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

## SHADOW - Map

Calculation: Halsua\_Generic RD200x36xHH210\_no forest\_20210402 + yhteisvaikutukset



Map: aastokarttarasteri 100K , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 375 570 North: 7 038 420

▲ New WTG      ● Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)



14.4.2021

---

**Liite 7: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset “real case, Luke forest”**

## SHADOW - Main Result

Calculation: Halsua\_Generic RD180x36xHH210\_Luke forest\_20210402

### Assumptions for shadow calculations

Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

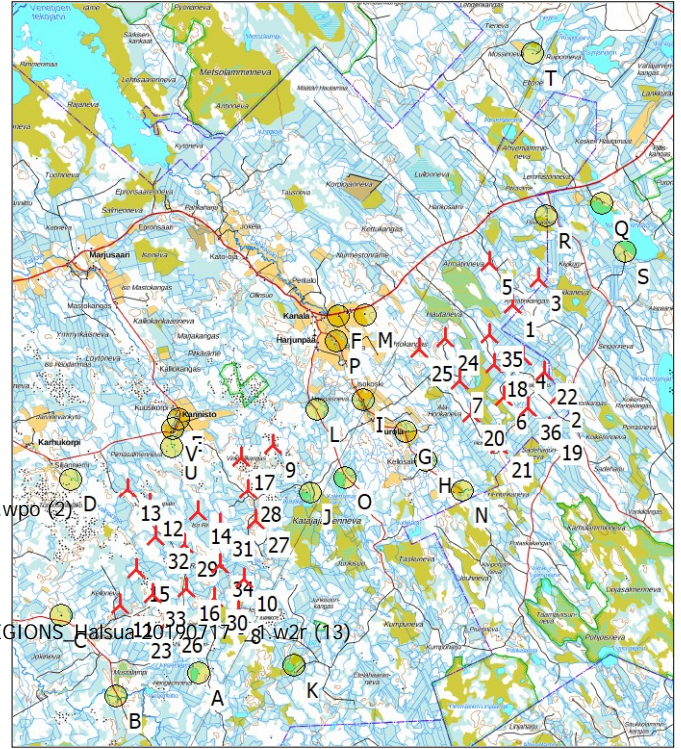
Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)  
 Area object(s) used in calculation:  
 Area object (Puuston pituus): (9)  
 Area object (Puuston pituus): (10)  
 Area object (Puuston pituus): (11)  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REGIONS\_Halsua\_20190717\_sl.w2r (13)  
 Obstacles used in calculation  
 Eye height for map: 1,5 m  
 Grid resolution: 10,0 m

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89



Scale 1:200 000  
 New WTG Shadow receptor

### WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
1	376 145	7 040 853	169,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
2	377 373	7 038 465	172,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
3	376 837	7 041 535	170,2	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
4	376 444	7 039 476	167,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
5	375 536	7 041 980	165,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
6	375 916	7 038 416	167,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
7	374 748	7 038 849	162,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
8	368 911	7 032 725	165,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
9	369 826	7 037 147	157,3	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
10	369 062	7 033 588	162,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
11	365 799	7 032 897	160,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
12	366 591	7 035 576	153,3	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
13	365 986	7 036 968	147,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
14	367 861	7 035 366	155,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
15	366 214	7 033 846	157,3	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
16	367 557	7 033 342	160,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
17	369 000	7 036 800	160,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
18	375 673	7 039 283	164,1	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
19	377 129	7 037 609	175,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
20	375 066	7 037 992	164,7	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
21	375 806	7 037 151	168,9	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
22	376 995	7 039 070	171,8	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
23	366 276	7 032 332	162,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
24	374 380	7 039 957	161,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
25	373 695	7 039 683	159,3	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
26	367 076	7 032 483	160,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
27	369 380	7 035 142	160,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
28	369 173	7 035 951	160,4	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
29	367 493	7 034 489	157,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
30	368 275	7 033 089	162,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
31	368 432	7 035 039	155,7	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
32	366 741	7 034 702	155,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
33	366 662	7 033 192	157,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
34	368 431	7 033 972	157,5	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
35	375 546	7 040 069	165,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
36	376 570	7 038 123	172,0	VESTAS V162-5.6 HH210 5...Yes	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4

## Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Kuuslammentie)	367 873	7 031 085	163,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243	7 032 622	153,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Purola)	364 501	7 036 228	143,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Kannistontie 557)	367 345	7 037 828	140,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Lestijarventie 1468)	371 569	7 040 539	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Hautakoskentie 455)	373 347	7 037 488	155,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Hautakoskentie 544)	373 867	7 036 728	157,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Hautakoskentie 289)	372 224	7 038 341	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Katajarventie 49)	370 829	7 035 870	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus K (Silostenlampi)	370 383	7 031 311	170,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Harjunpaantie 215)	370 996	7 038 086	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

## Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	Lomarakennus A (Kuuslammentie)	4:29
B	Lomarakennus B (Loukkukoskentie 700)	0:00
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	0:00
D	Lomarakennus D (Purola)	0:00
E	Asuinrakennus E (Kannistontie 557)	1:37
F	Asuinrakennus F (Lestijarventie 1468)	0:00
G	Asuinrakennus G (Hautakoskentie 455)	2:33
H	Asuinrakennus H (Hautakoskentie 544)	2:19
I	Asuinrakennus I (Hautakoskentie 289)	4:00
J	Lomarakennus J (Katajarventie 49)	7:14
K	Lomarakennus K (Silostenlampi)	5:46
L	Lomarakennus L (Harjunpaantie 215)	2:48
M	Lomarakennus M (Hakala, Iso-Mottonen)	2:07
N	Lomarakennus N (Hautakoski)	0:00
O	Lomarakennus O (Harjunpaantie 398)	1:56
P	Asuinrakennus P (Hautakoskentie 135)	1:14
Q	Lomarakennus Q (Lemmistonrannantie)	0:00
R	Lomarakennus R (Peuraneva,Valvatintie)	1:47
S	Lomarakennus S (Talonpaikantie 141)	0:00
T	Lomarakennus T (Ruipontie)	0:00
U	Lomarakennus U (Kannistontie, Kivioja)	0:00
V	Asuinrakennus V (Kannistontie 586)	1:30

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1175)	0:00	0:00
2	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1176)	0:00	0:00
3	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1177)	0:00	0:00
4	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1178)	0:00	0:00
5	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1179)	9:04	1:47
6	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1180)	0:00	0:00
7	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1181)	0:00	0:00
8	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1182)	21:42	5:46
9	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)	24:07	5:02
10	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184)	0:00	0:00
11	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)	0:00	0:00
12	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)	0:00	0:00
13	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)	0:00	0:00
14	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)	0:00	0:00
15	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)	0:00	0:00
16	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190)	0:00	0:00
17	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)	26:07	5:27
18	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)	0:00	0:00
19	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)	0:00	0:00
20	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)	14:03	3:04
21	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)	8:58	1:48
22	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1196)	0:00	0:00
23	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)	17:28	4:29
24	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1198)	0:00	0:00
25	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)	32:05	7:22
26	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200)	0:00	0:00
27	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1201)	11:38	2:15
28	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202)	11:28	2:24
29	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203)	0:00	0:00
30	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)	0:00	0:00
31	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)	0:00	0:00
32	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206)	0:00	0:00
33	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207)	0:00	0:00
34	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)	0:00	0:00
35	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)	0:00	0:00
36	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.



## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: B - Lomarakennus B (Loukkukoskentie 700)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.01	07.32	06.46	05.04	03.33	03.16	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.14	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.51	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.58	03.29	03.19	04.40	06.11	07.34	08.05	09.34
	14.53	16.20	17.47	20.16	21.45	23.15	23.35	22.16	20.33	18.49	16.07	14.51
4	10.02	08.52	07.22	06.36	04.54	03.27	03.21	04.43	06.14	07.37	08.08	09.37
	14.55	16.23	17.50	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.00	08.49	07.19	06.32	04.51	03.25	03.22	04.46	06.17	07.40	08.11	09.39
	14.57	16.27	17.53	20.22	21.51	23.20	23.31	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.56	20.25	21.54	23.22	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.26	04.45	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.24	23.28	22.04	20.19	18.36	15.55	14.44
8	09.56	08.40	07.09	06.22	04.42	03.19	03.29	04.55	06.25	07.48	08.21	09.46
	15.04	16.36	18.01	20.31	22.00	23.26	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.18	03.31	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.03	23.28	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.31	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.26	15.46	14.41
11	09.51	08.31	06.58	06.12	04.32	03.15	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.46	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.14	03.38	05.07	06.36	08.00	08.33	09.54
	15.14	16.49	18.13	20.42	22.13	23.33	23.18	21.47	20.02	18.19	15.41	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.16	15.38	14.38
14	09.46	08.21	06.48	06.02	04.23	03.11	03.43	05.13	06.42	08.06	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.36	23.13	21.41	19.55	18.12	15.35	14.38
15	09.44	08.18	06.45	05.58	04.20	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.22	16.58	18.22	20.51	22.22	23.37	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.17	03.10	03.48	05.19	06.47	08.11	08.46	10.00
	15.25	17.01	18.25	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.37
17	09.39	08.12	06.38	05.51	04.14	03.09	03.51	05.22	06.50	08.14	08.49	10.01
	15.28	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.27	14.37
18	09.37	08.09	06.35	05.48	04.11	03.09	03.54	05.25	06.53	08.17	08.52	10.02
	15.30	17.07	18.30	21.00	22.31	23.40	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.08	03.08	03.56	05.28	06.55	08.20	08.55	10.03
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.56	15.21	14.36
20	09.33	08.02	06.28	05.41	04.05	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.14	18.36	21.06	22.37	23.41	22.58	21.21	19.34	17.52	15.19	14.37
21	09.30	07.59	06.24	05.38	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.17	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.37
22	09.28	07.55	06.21	05.34	03.59	03.08	04.05	05.37	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.08	05.40	07.06	08.32	09.07	10.06
	15.46	17.23	18.45	21.15	22.46	23.42	22.49	21.11	19.24	17.42	15.11	14.38
24	09.23	07.49	06.14	05.28	03.54	03.09	04.11	05.42	07.09	08.35	09.10	10.06
	15.49	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.14	05.45	07.12	07.38	09.13	10.07
	15.52	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.54	23.41	22.41	21.00	19.13	16.33	15.05	14.40
27	09.15	07.39	06.03	05.17	03.46	03.11	04.19	05.51	07.18	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.12	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	16.23	14.58	14.44
30	09.06		06.53	05.08	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.36		04.31	06.03		07.56		10.05
	16.11		20.08		23.08		22.26	20.43		16.17		14.47
Potential sun hours	180	241	363	448	561	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 Shadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.49	16.14	17.41	20.11	21.39	23.11	23.38	22.23	20.40	18.56	16.14	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.32	08.02	09.32
	14.51	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.37	18.53	16.11	14.52
3	10.03	08.55	07.26	06.39	04.58	03.29	03.19	04.40	06.11	07.34	08.06	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.50	16.07	14.51
4	10.02	08.52	07.22	06.36	04.54	03.27	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.34	22.14	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.33	04.51	03.25	03.22	04.46	06.17	07.40	08.12	09.40
	14.57	16.27	17.53	20.22	21.51	23.21	23.32	22.10	20.26	18.43	16.01	14.47
6	10.00	08.46	07.16	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.56	20.25	21.55	23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.26	04.45	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.59	20.28	21.58	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.18	03.31	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.54	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.31	07.54	08.27	09.51
	15.08	16.42	18.07	20.37	22.07	23.31	23.23	21.54	20.09	18.26	15.46	14.41
11	09.52	08.31	06.59	06.12	04.32	03.15	03.35	05.04	06.33	07.57	08.30	09.53
	15.11	16.46	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.13	03.38	05.07	06.36	08.00	08.33	09.54
	15.14	16.49	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.41	14.39
13	09.48	08.25	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.59	18.16	15.38	14.38
14	09.46	08.22	06.48	06.02	04.23	03.11	03.43	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.38
15	09.44	08.18	06.45	05.58	04.20	03.10	03.45	05.16	06.44	08.09	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.52	18.09	15.32	14.37
16	09.42	08.15	06.42	05.55	04.17	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.25	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.06	15.29	14.37
17	09.40	08.12	06.38	05.51	04.14	03.09	03.51	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.28	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.27	14.36
18	09.38	08.09	06.35	05.48	04.11	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.08	03.08	03.56	05.28	06.56	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.56	15.21	14.36
20	09.33	08.02	06.28	05.41	04.05	03.08	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.14	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.38	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.17	18.39	21.09	22.40	23.42	22.55	21.18	19.31	17.49	15.16	14.37
22	09.28	07.56	06.21	05.34	03.59	03.08	04.05	05.37	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43	23.42	22.53	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.08	05.40	07.07	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.38
24	09.23	07.49	06.14	05.28	03.53	03.09	04.10	05.43	07.09	08.35	09.10	10.07
	15.49	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.11	05.24	03.51	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.52	17.29	18.51	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.18	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.01	19.14	16.33	15.04	14.40
27	09.15	07.39	06.04	05.18	03.45	03.11	04.19	05.51	07.18	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.12	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.10		06.57	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.58	14.44
30	09.07		06.53	05.08	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.36		04.31	06.03		07.56		10.06
	16.11		20.08		23.08		22.26	20.43		16.17		14.47
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.32/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: D - Lomarakennus D (Puola)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.33	06.46	05.04	03.33	03.15	04.34	06.05	07.29	08.00	09.30
	14.48	16.14	17.41	20.11	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.32	08.03	09.33
	14.50	16.17	17.44	20.13	21.42	23.14	23.37	22.20	20.37	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.06	09.35
	14.52	16.20	17.47	20.16	21.46	23.16	23.36	22.17	20.33	18.50	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.38
	14.54	16.23	17.50	20.19	21.49	23.19	23.34	22.14	20.30	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.17	07.40	08.12	09.40
	14.56	16.26	17.53	20.22	21.52	23.21	23.33	22.11	20.26	18.43	16.01	14.47
6	10.00	08.46	07.16	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.56	20.25	21.55	23.23	23.31	22.07	20.23	18.39	15.58	14.45
7	09.59	08.43	07.12	06.26	04.44	03.20	03.26	04.52	06.22	07.46	08.18	09.45
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.49	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.56	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.34	22.04	23.29	23.25	21.58	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.31	07.54	08.27	09.51
	15.08	16.42	18.07	20.37	22.07	23.31	23.23	21.54	20.09	18.26	15.46	14.40
11	09.52	08.31	06.59	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.31	09.53
	15.11	16.45	18.10	20.40	22.10	23.33	23.21	21.51	20.06	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.34	09.55
	15.13	16.49	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.45	19.59	18.16	15.37	14.38
14	09.46	08.22	06.48	06.01	04.22	03.10	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.09	08.43	10.00
	15.21	16.58	18.22	20.51	22.22	23.39	23.12	21.38	19.52	18.09	15.32	14.37
16	09.42	08.15	06.42	05.55	04.16	03.09	03.47	05.19	06.47	08.12	08.46	10.01
	15.24	17.01	18.25	20.54	22.26	23.40	23.09	21.35	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.28	20.57	22.29	23.41	23.07	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.35	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.32	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.36	08.06	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.52	15.19	14.36
21	09.31	07.59	06.24	05.38	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.06
	15.39	17.16	18.39	21.09	22.41	23.43	22.56	21.18	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.37	07.04	08.29	09.04	10.07
	15.42	17.20	18.42	21.12	22.44	23.43	22.53	21.14	19.27	17.46	15.14	14.37
23	09.26	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.07	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.47	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49	23.43	22.47	21.08	19.20	17.39	15.09	14.38
25	09.21	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.08
	15.51	17.29	18.51	21.21	22.52	23.43	22.44	21.04	19.17	16.36	15.06	14.39
26	09.18	07.43	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.08
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.01	19.14	16.33	15.04	14.40
27	09.15	07.39	06.04	05.17	03.45	03.10	04.19	05.51	07.18	07.44	09.19	10.08
	15.58	17.35	18.56	21.27	22.58	23.42	22.39	20.57	19.10	16.29	15.02	14.41
28	09.13	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07
	16.01	17.38	18.59	21.30	23.01	23.41	22.36	20.54	19.07	16.26	15.00	14.42
29	09.10		06.57	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.25	10.07
	16.04		20.02	21.33	23.04	23.40	22.32	20.50	19.03	16.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	06.00	07.26	07.53	09.27	10.07
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.09		22.26	20.44		16.17		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)



## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: E - Asuinrakennus E (Kannistontie 557)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48 10.04	09.01 16.13 08.58	07.32 17.40 20	08.23 (17) 20.10 06.43	05.04 21.39 05.00	03.32 23.11 03.30	03.14 23.38 03.16	04.34 22.23 04.37	06.05 20.40 06.08	07.29 18.56 07.31		07.59 16.13 08.02
2	14.50 10.03	16.16 08.55	17.43 07.26	21 08.43 (17) 20.13 06.39	21.42 04.57	23.14 03.28	23.37 03.17	22.20 04.40	20.36 06.11	18.53 07.34	09.08 (17)	16.10 08.06
3	14.52 10.02	16.20 08.52	17.46 07.22	22 08.44 (17) 20.16 06.36	21.45 04.54	23.16 03.26	23.36 03.19	22.17 04.43	20.33 06.13	18.49 07.37	1 09.09 (17)	16.07 08.09
4	14.54 10.01	16.23 08.49	17.49 07.19	22 08.43 (17) 20.19 06.32	21.48 04.51	23.19 03.24	23.34 03.21	22.14 04.46	20.30 06.16	18.46 07.40	11 09.14 (17)	16.04 08.12
5	14.56 10.00	16.26 08.46	17.52 07.15	21 08.42 (17) 20.22 06.29	21.52 04.47	23.21 03.22	23.33 03.23	22.11 04.49	20.26 06.19	18.42 07.43	16 09.16 (17)	16.01 08.15
6	14.58 09.59	16.29 08.43	17.55 07.12	20 08.42 (17) 20.25 06.25	21.55 04.44	23.23 03.20	23.31 03.25	22.07 04.52	20.23 06.22	18.39 07.46	18 09.17 (17)	15.58 08.18
7	15.00 09.57	16.32 08.40	17.58 07.09	19 08.41 (17) 20.28 06.22	21.58 04.41	23.25 03.18	23.29 03.27	22.04 04.55	20.19 06.25	18.36 07.48	20 09.18 (17)	15.55 08.21
8	15.03 09.56	16.36 08.37	18.01 07.05	17 08.40 (17) 20.31 06.18	22.01 04.38	23.28 03.16	23.27 03.30	22.01 04.58	20.16 06.28	18.32 07.51	21 09.18 (17)	15.52 08.24
9	15.05 09.54	16.39 08.34	18.04 07.02	14 08.38 (17) 20.34 06.15	22.04 04.34	23.29 03.15	23.25 03.32	21.58 05.01	20.12 06.30	18.29 07.54	22 09.18 (17)	15.49 08.27
10	15.08 09.52	16.42 08.31	18.07 06.58	8 08.35 (17) 20.36 06.11	22.07 04.31	23.31 03.13	23.23 03.34	21.54 05.04	20.09 06.33	18.25 07.57	22 09.18 (17)	15.46 08.30
11	15.10 09.50	16.45 08.28	18.10 06.55	18.10 06.08	22.10 04.28	23.33 03.12	23.21 03.37	21.51 05.07	20.05 06.36	18.22 08.00	21 09.17 (17)	15.43 08.34
12	15.13 09.48	16.48 08.25	18.13 06.52	20.42 06.05	22.13 04.25	23.35 03.11	23.19 03.39	21.48 05.10	20.02 06.39	18.19 08.03	21 09.17 (17)	15.40 08.37
13	15.15 09.46	16.51 08.22	18.16 06.48	20.45 06.01	22.16 04.22	23.36 03.10	23.16 03.42	21.44 05.13	19.58 06.41	18.15 08.06	20 09.16 (17)	15.37 08.40
14	15.18 09.44	16.54 08.18	18.19 06.45	20.48 05.58	22.19 04.19	23.37 03.09	23.14 03.44	21.41 05.16	19.55 06.44	18.12 08.08	19 09.15 (17)	15.34 08.43
15	15.21 09.42	16.58 08.15	18.22 06.41	20.51 05.54	22.22 04.16	23.39 03.08	23.12 03.47	21.38 05.19	19.51 06.47	18.09 08.11	16 09.13 (17)	15.32 08.46
16	15.24 09.40	17.01 08.12	18.24 06.38	20.54 05.51	22.25 04.13	23.40 03.08	23.09 03.50	21.34 05.22	19.48 06.50	18.05 08.14	12 09.12 (17)	15.29 08.49
17	15.27 09.38	17.04 08.09	18.27 06.34	20.57 05.47	22.29 04.10	23.41 03.07	23.07 03.53	21.31 05.25	19.45 06.52	18.02 08.17	7 09.09 (17)	15.26 08.52
18	15.30 09.36	17.07 08.05	18.30 06.31	21.00 05.44	22.32 04.07	23.42 03.07	23.04 03.55	21.28 05.27	19.41 06.55	17.58 08.20		15.23 08.55
19	15.33 09.33	17.10 08.02	18.33 06.28	21.03 05.41	22.35 04.04	23.42 03.07	23.01 03.58	21.24 05.30	19.38 06.58	17.55 08.23		15.21 08.58
20	15.36 09.31	17.13 07.59	18.36 06.24	21.06 05.37	22.38 04.01	23.43 03.07	22.59 04.01	21.21 05.33	19.34 07.01	17.52 08.26		15.18 09.01
21	15.39 09.28	17.16 07.56	18.39 06.21	21.09 05.34	22.41 03.58	23.43 03.07	22.56 04.04	21.18 05.36	19.31 07.04	17.49 08.29		15.16 09.04
22	15.42 09.26	17.19 07.52	18.42 06.17	21.12 05.30	22.44 03.55	23.43 03.07	22.53 04.07	21.14 05.39	19.27 07.06	17.45 08.32		15.13 09.07
23	15.45 09.23	17.22 07.49	18.45 06.14	21.15 05.27	22.46 03.53	23.43 03.07	22.50 04.10	21.11 05.42	19.24 07.09	17.42 08.35		15.11 09.10
24	15.48 09.21	17.25 07.46	18.47 06.10	21.18 05.24	22.49 03.50	23.43 03.08	22.47 04.13	21.07 05.45	19.20 07.12	17.39 07.38		15.08 09.13
25	15.51 09.18	17.28 07.42	9 08.29 (17) 18.50 06.07	21.21 05.20	22.52 03.47	23.43 03.09	22.44 04.16	21.04 05.48	19.17 07.15	16.35 07.41		15.06 09.16
26	15.54 09.15	17.31 07.39	14 08.40 (17) 18.53 06.03	21.24 05.17	22.55 03.45	23.42 03.09	22.41 04.19	21.01 05.51	19.13 07.17	16.32 07.44		15.04 09.19
27	15.57 09.12	17.34 07.36	17 08.42 (17) 18.56 06.00	21.27 05.14	22.58 03.42	23.42 03.10	22.38 04.22	20.57 05.54	19.10 07.20	16.29 07.47		15.01 09.22
28	16.00 09.10	17.37 07.33	19 08.42 (17) 18.59 06.56	21.30 05.10	23.01 03.39	23.41 03.12	22.35 04.25	20.54 05.56	19.06 07.23	16.26 07.50		14.59 09.25
29	16.04 09.07		20.02 06.53	21.33 05.07	23.04 03.37	23.40 03.13	22.32 04.28	20.50 05.59	19.03 07.26	16.23 07.53		14.57 09.27
30	16.07 09.04		20.05 06.49	21.36 05.07	23.06 03.36	23.39 03.13	22.29 04.28	20.47 05.59	19.00 07.26	16.19 07.53		14.55 09.27
31	16.10 Potential sun hours	241	363	448	562	610	598	504	392	307	247	147
	Total, worst case										247	
	Sun reduction	0.33									0.35	
	Oper. time red.	0.93									0.93	
	Wind dir. red.	0.64									0.64	
	Total reduction	0.20									0.21	
	Total, real	12									51	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: F - Asuinrakennus F (Lestijarventie 1468)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.03	03.32	03.13	04.33	06.05	07.28	07.59	09.30
	14.47	16.13	17.40	20.10	21.39	23.12	23.38	22.23	20.40	18.56	16.13	14.53
2	10.04	08.58	07.29	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.33
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.10	14.51
3	10.04	08.55	07.25	06.39	04.57	03.27	03.17	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.17	23.36	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.37	08.09	09.38
	14.53	16.22	17.49	20.19	21.48	23.19	23.34	22.14	20.29	18.45	16.03	14.47
5	10.01	08.49	07.19	06.32	04.50	03.23	03.20	04.45	06.16	07.40	08.12	09.40
	14.55	16.25	17.52	20.22	21.51	23.21	23.33	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.19	07.42	08.15	09.42
	14.57	16.29	17.55	20.25	21.55	23.23	23.31	22.07	20.22	18.39	15.57	14.44
7	09.59	08.43	07.12	06.25	04.44	03.19	03.24	04.51	06.22	07.45	08.18	09.45
	15.00	16.32	17.58	20.27	21.58	23.26	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.01	23.28	23.27	22.01	20.15	18.32	15.51	14.41
9	09.56	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.30	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.02	06.15	04.34	03.14	03.31	05.00	06.30	07.54	08.27	09.51
	15.07	16.41	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.33	05.03	06.33	07.57	08.30	09.53
	15.09	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.42	14.38
12	09.50	08.28	06.55	06.08	04.28	03.11	03.36	05.06	06.35	08.00	08.33	09.55
	15.12	16.48	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.18	15.39	14.37
13	09.48	08.25	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.37	09.57
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	08.05	08.40	09.58
	15.18	16.54	18.18	20.48	22.19	23.38	23.14	21.41	19.55	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.44	08.08	08.43	10.00
	15.20	16.57	18.21	20.51	22.22	23.39	23.12	21.38	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.47	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.48	18.05	15.28	14.35
17	09.40	08.12	06.38	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.07	21.31	19.44	18.01	15.26	14.35
18	09.38	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.07	18.30	21.00	22.32	23.42	23.04	21.28	19.41	17.58	15.23	14.35
19	09.35	08.05	06.31	05.44	04.06	03.06	03.55	05.27	06.55	08.20	08.55	10.04
	15.32	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.37	17.55	15.20	14.35
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.58	08.23	08.58	10.05
	15.35	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.51	15.18	14.35
21	09.31	07.59	06.24	05.37	04.00	03.06	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.16	18.39	21.09	22.41	23.43	22.56	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.58	03.06	04.03	05.36	07.03	08.29	09.04	10.07
	15.41	17.19	18.41	21.12	22.44	23.43	22.53	21.14	19.27	17.45	15.13	14.35
23	09.26	07.52	06.17	05.30	03.55	03.06	04.06	05.39	07.06	08.32	09.07	10.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.23	17.42	15.10	14.36
24	09.23	07.49	06.13	05.27	03.52	03.06	04.09	05.42	07.09	08.35	09.10	10.07
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.45	07.12	07.38	09.13	10.08
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.04	19.16	16.35	15.05	14.37
26	09.18	07.42	06.06	05.20	03.47	03.08	04.15	05.47	07.14	07.41	09.16	10.08
	15.54	17.31	18.53	21.24	22.55	23.43	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.39	06.03	05.17	03.44	03.09	04.18	05.50	07.17	07.44	09.19	10.08
	15.57	17.34	18.56	21.27	22.58	23.42	22.38	20.57	19.10	16.29	15.01	14.39
28	09.12	07.35	06.00	05.13	03.41	03.10	04.21	05.53	07.20	07.47	09.22	10.07
	16.00	17.37	18.59	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.10		06.56	05.10	03.39	03.11	04.24	05.56	07.23	07.50	09.25	10.07
	16.03		20.01	21.33	23.04	23.41	22.32	20.50	19.03	16.22	14.57	14.42
30	09.07		06.53	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.07
	16.06		20.04	21.36	23.06	23.40	22.29	20.47	18.59	16.19	14.55	14.43
31	09.04		06.49		03.34		04.30	06.02		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.16		14.45
Potential sun hours	178	241	363	448	562	611	599	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna.riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: H - Asuinrakennus H (Hautakoskentie 544)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes sub-rows for sun rise, sun set, minutes with flicker, and total reduction. Includes summary rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: I - Asuinrakennus I (Hautakoskentie 289)
Assumptions for shadow calculations
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 15 columns (months) and 31 rows of daily data. Includes sub-rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.32/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: J - Lomarakennus J (Katajajarventie 49)  
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June								
1	10.05	09.01	07.32	16.26 (27)	06.46	19.06 (28)	05.04	20.28 (17)	03.32					
	14.48	16.13	17.40	23	16.49 (27)	20.10	20	19.26 (28)	21.39	20	20.48 (17)	23.11		
2	10.04	08.58	07.29	16.26 (27)	06.42	19.04 (28)	05.00	20.27 (17)	03.30					
	14.50	16.16	17.43	24	16.50 (27)	20.13	22	19.26 (28)	21.42	21	20.48 (17)	23.13		
3	10.03	08.55	07.25	16.25 (27)	06.39	19.03 (28)	04.57	20.27 (17)	03.28					
	14.52	16.19	17.46	25	16.50 (27)	20.16	24	19.27 (28)	21.45	21	20.48 (17)	23.16		
4	10.02	08.52	07.22	16.25 (27)	06.35	19.02 (28)	04.54	20.28 (17)	03.26					
	14.54	16.23	17.49	26	16.51 (27)	20.19	25	19.27 (28)	21.48	21	20.49 (17)	23.18		
5	10.01	08.49	07.19	16.24 (27)	06.32	19.01 (28)	04.50	20.28 (17)	03.24					
	14.56	16.26	17.52	26	16.50 (27)	20.22	26	19.27 (28)	21.51	21	20.49 (17)	23.21		
6	09.59	08.46	07.15	16.24 (27)	06.28	19.01 (28)	04.47	20.27 (17)	03.22					
	14.58	16.29	17.55	26	16.50 (27)	20.25	26	19.27 (28)	21.54	21	20.48 (17)	23.23		
7	09.58	08.43	07.12	16.24 (27)	06.25	19.01 (28)	04.44	20.28 (17)	03.20					
	15.00	16.32	17.58	26	16.50 (27)	20.27	26	19.27 (28)	21.57	20	20.48 (17)	23.25		
8	09.57	08.40	07.08	16.24 (27)	06.22	19.01 (28)	04.41	20.28 (17)	03.18					
	15.02	16.35	18.01	24	16.48 (27)	20.30	25	19.26 (28)	22.00	19	20.47 (17)	23.27		
9	09.55	08.37	07.05	16.25 (27)	06.18	19.01 (28)	04.38	20.29 (17)	03.16					
	15.05	16.39	18.04	23	16.48 (27)	20.33	24	19.25 (28)	22.04	18	20.47 (17)	23.29		
10	09.53	08.34	07.02	16.25 (27)	06.15	19.02 (28)	04.34	20.30 (17)	03.15					
	15.07	16.42	18.07	21	16.46 (27)	20.36	23	19.25 (28)	22.07	16	20.46 (17)	23.31		
11	09.52	08.31	06.58	16.26 (27)	06.11	19.02 (28)	04.31	20.30 (17)	03.13					
	15.10	16.45	18.10	19	16.45 (27)	20.39	21	19.23 (28)	22.10	14	20.44 (17)	23.32		
12	09.50	08.27	06.55	16.28 (27)	06.08	19.03 (28)	04.28	20.33 (17)	03.12					
	15.13	16.48	18.13	15	16.43 (27)	20.42	19	19.22 (28)	22.13	11	20.44 (17)	23.34		
13	09.48	08.24	06.51	16.31 (27)	06.04	19.05 (28)	04.25	20.35 (17)	03.11					
	15.15	16.51	18.16	10	16.41 (27)	20.45	15	19.20 (28)	22.16	6	20.41 (17)	23.36		
14	09.46	08.21	06.48	16.31 (27)	06.01	19.06 (28)	04.22	20.37 (17)	03.10					
	15.18	16.54	18.18	11	16.42 (27)	20.48	11	19.17 (28)	22.19	11	20.42 (17)	23.37		
15	09.44	08.18	06.44	16.32 (27)	05.58	19.07 (28)	04.19	20.38 (17)	03.09					
	15.21	16.57	18.21	11	16.43 (27)	20.51	11	19.18 (28)	22.22	11	20.43 (17)	23.38		
16	09.42	08.15	06.41	16.33 (27)	05.54	19.08 (28)	04.16	20.39 (17)	03.08					
	15.24	17.01	18.24	12	16.44 (27)	20.54	12	19.19 (28)	22.25	12	20.44 (17)	23.39	2	22.19 (9)
17	09.40	08.12	06.38	16.34 (27)	05.51	19.09 (28)	04.13	20.40 (17)	03.08					
	15.27	17.04	18.27	13	16.45 (27)	20.57	13	19.20 (28)	22.28	13	20.45 (17)	23.40	4	22.19 (9)
18	09.37	08.08	06.34	16.35 (27)	05.47	19.10 (28)	04.10	20.41 (17)	03.07					
	15.30	17.07	18.30	14	16.46 (27)	21.00	14	19.21 (28)	22.31	14	20.46 (17)	23.41	5	22.20 (9)
19	09.35	08.05	06.31	16.36 (27)	05.44	19.11 (28)	04.07	20.42 (17)	03.07					
	15.33	17.10	18.33	15	16.47 (27)	21.03	15	19.22 (28)	22.34	15	20.47 (17)	23.42	6	22.21 (9)
20	09.33	08.02	06.27	16.37 (27)	05.40	19.12 (28)	04.04	20.43 (17)	03.07					
	15.36	17.13	18.36	16	16.48 (27)	21.06	16	19.23 (28)	22.37	16	20.48 (17)	23.42	6	22.21 (9)
21	09.30	07.59	06.24	16.38 (27)	05.37	19.13 (28)	04.01	20.44 (17)	03.07					
	15.39	17.16	18.39	17	16.49 (27)	21.09	17	19.24 (28)	22.40	17	20.49 (17)	23.42	7	22.22 (9)
22	09.28	07.55	06.20	16.39 (27)	05.34	19.14 (28)	03.58	20.45 (17)	03.07					
	15.42	17.19	18.41	18	16.50 (27)	21.12	18	19.25 (28)	22.43	18	20.50 (17)	23.43	7	22.23 (9)
23	09.25	07.52	06.17	16.40 (27)	05.30	19.15 (28)	03.55	20.46 (17)	03.07					
	15.45	17.22	18.44	19	16.51 (27)	21.15	19	19.26 (28)	22.46	19	20.51 (17)	23.43	6	22.22 (9)
24	09.23	07.49	06.13	16.41 (27)	05.27	19.16 (28)	03.53	20.47 (17)	03.07					
	15.48	17.25	18.47	20	16.52 (27)	21.18	20	19.27 (28)	22.49	20	20.52 (17)	23.43	6	22.22 (9)
25	09.20	07.45	06.10	16.42 (27)	05.24	19.17 (28)	03.50	20.48 (17)	03.08					
	15.51	17.28	6	16.41 (27)	18.50	21.21	21	19.28 (28)	22.52	21	20.53 (17)	23.42	5	22.22 (9)
26	09.17	07.42	06.07	16.43 (27)	05.20	19.18 (28)	03.47	20.49 (17)	03.09					
	15.54	17.31	13	16.45 (27)	18.53	21.24	8	20.43 (17)	22.55	8	20.49 (17)	23.42	3	22.22 (9)
27	09.15	07.39	06.03	16.44 (27)	05.17	19.19 (28)	03.44	20.50 (17)	03.09					
	15.57	17.34	18	16.47 (27)	18.56	21.27	13	20.45 (17)	22.57	13	20.50 (17)	23.41		
28	09.12	07.35	06.00	16.48 (27)	05.13	19.20 (28)	03.42	20.51 (17)	03.10					
	16.00	17.37	20	16.48 (27)	18.59	21.30	15	20.46 (17)	23.00	15	20.51 (17)	23.41		
29	09.09	07.32	05.56	16.49 (27)	05.10	19.21 (28)	03.39	20.52 (17)	03.12					
	16.03	17.40	21	16.49 (27)	18.62	21.33	17	20.47 (17)	23.03	17	20.52 (17)	23.40		
30	09.06	07.27	05.53	16.50 (27)	05.07	19.22 (28)	03.37	20.53 (17)	03.13					
	16.07	17.43	22	16.50 (27)	18.64	21.36	19	20.48 (17)	23.06	19	20.53 (17)	23.39		
31	09.04	07.22	05.49	16.51 (27)	05.04	19.23 (28)	03.35	20.54 (17)	03.13					
	16.10	17.49	23	16.51 (27)	18.67	21.39	21	20.49 (17)	23.08	21	20.54 (17)	23.39		
Potential sun hours	179	241	363	448	562	610								
Total, worst case			57	322	379	229								57
Sun reduction			0,33	0,32	0,41	0,48								0,49
Oper. time red.			0,93	0,93	0,93	0,93								0,93
Wind dir. red.			0,62	0,62	0,62	0,63								0,65
Total reduction			0,19	0,19	0,24	0,28								0,30
Total, real			11	60	90	64								17

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.32/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: J - Lomarakennus J (Katajajarventie 49)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December			
1	03.14	04.33	20.42 (17)	06.05	19.01 (28)	07.28	17.08 (27)	07.59	09.30
	23.38	22.23	12 20.54 (17)	20.40	21 19.22 (28)	18.56	13 17.21 (27)	16.13	14.53
2	03.16	04.36	20.41 (17)	06.08	19.00 (28)	07.31	17.05 (27)	08.02	09.32
	23.36	22.20	15 20.56 (17)	20.36	23 19.23 (28)	18.52	18 17.23 (27)	16.10	14.51
3	03.17	04.39	20.39 (17)	06.10	18.59 (28)	07.34	17.04 (27)	08.05	09.35
	23.35	22.16	17 20.56 (17)	20.33	24 19.23 (28)	18.49	20 17.24 (27)	16.07	14.50
4	03.19	04.43	20.39 (17)	06.13	18.58 (28)	07.37	17.02 (27)	08.08	09.37
	23.34	22.13	18 20.57 (17)	20.29	25 19.23 (28)	18.46	23 17.25 (27)	16.04	14.48
5	03.21	04.46	20.38 (17)	06.16	18.57 (28)	07.40	17.01 (27)	08.11	09.40
	23.32	22.10	19 20.57 (17)	20.26	26 19.23 (28)	18.42	25 17.26 (27)	16.01	14.46
6	03.23	04.49	20.37 (17)	06.19	18.57 (28)	07.42	17.01 (27)	08.15	09.42
	23.30	22.07	21 20.58 (17)	20.22	26 19.23 (28)	18.39	25 17.26 (27)	15.58	14.45
7	03.25	04.52	20.36 (17)	06.22	18.56 (28)	07.45	17.00 (27)	08.18	09.44
	23.29	22.04	22 20.58 (17)	20.19	26 19.22 (28)	18.35	26 17.26 (27)	15.55	14.43
8	03.27	04.55	20.37 (17)	06.24	18.57 (28)	07.48	17.00 (27)	08.21	09.46
	23.27	22.00	21 20.58 (17)	20.15	25 19.22 (28)	18.32	26 17.26 (27)	15.52	14.42
9	03.30	04.58	20.37 (17)	06.27	18.57 (28)	07.51	16.59 (27)	08.24	09.49
	23.25	21.57	21 20.58 (17)	20.12	24 19.21 (28)	18.29	27 17.26 (27)	15.49	14.41
10	03.32	05.01	20.36 (17)	06.30	18.57 (28)	07.54	16.59 (27)	08.27	09.51
	23.23	21.54	22 20.58 (17)	20.08	22 19.19 (28)	18.25	26 17.25 (27)	15.46	14.40
11	03.34	05.04	20.37 (17)	06.33	18.58 (28)	07.57	17.00 (27)	08.30	09.52
	23.20	21.51	21 20.58 (17)	20.05	20 19.18 (28)	18.22	24 17.24 (27)	15.43	14.39
12	03.37	05.07	20.36 (17)	06.36	18.59 (28)	07.59	17.00 (27)	08.33	09.54
	23.18	21.47	20 20.56 (17)	20.02	18 19.17 (28)	18.18	23 17.23 (27)	15.40	14.38
13	03.39	05.10	20.37 (17)	06.38	19.00 (28)	08.02	17.00 (27)	08.36	09.56
	23.16	21.44	19 20.56 (17)	19.58	14 19.14 (28)	18.15	22 17.22 (27)	15.37	14.37
14	03.42	05.13	20.38 (17)	06.41	19.03 (28)	08.05	17.01 (27)	08.39	09.58
	23.14	21.41	17 20.55 (17)	19.55	7 19.10 (28)	18.12	20 17.21 (27)	15.34	14.37
15	03.44	05.15	20.38 (17)	06.44		08.08	17.02 (27)	08.43	09.59
	23.11	21.37	15 20.53 (17)	19.51		18.08	17 17.19 (27)	15.31	14.36
16	03.47	05.18	20.40 (17)	06.47		08.11	17.04 (27)	08.46	10.00
	23.09	21.34	12 20.52 (17)	19.48		18.05	12 17.16 (27)	15.29	14.36
17	03.50	05.21	20.43 (17)	06.49		08.14		08.49	10.02
	23.06	21.31	6 20.49 (17)	19.44		18.02		15.26	14.35
18	03.52	05.24		06.52		08.17		08.52	10.03
	23.03	21.27		19.41		17.58		15.23	14.35
19	03.55	05.27		06.55		08.20		08.55	10.04
	23.01	21.24		19.37		17.55		15.21	14.35
20	03.58	05.30		06.58		08.23		08.58	10.05
	22.58	21.21		19.34		17.52		15.18	14.35
21	04.01	05.33		07.00		08.26		09.01	10.05
	22.55	21.17		19.30		17.48		15.16	14.36
22	04.04	05.36		07.03		08.29		09.04	10.06
	22.53	21.14		19.27		17.45		15.13	14.36
23	04.07	05.39		07.06		08.32		09.07	10.06
	22.50	21.10		19.23		17.42		15.11	14.37
24	04.10	05.42		07.09		08.35		09.10	10.07
	22.47	21.07		19.20		17.39		15.08	14.37
25	04.13	05.45		07.12		07.38		09.13	10.07
	22.44	21.04		19.17		16.35		15.06	14.38
26	04.15	05.48		07.14		07.41		09.16	10.07
	22.41	21.00		19.13		16.32		15.04	14.39
27	04.18	05.51		07.17		07.44		09.19	10.07
	22.38	20.57		19.10		16.29		15.01	14.40
28	04.21	05.53		07.20		07.47		09.21	10.07
	22.35	20.53		19.06		16.26		14.59	14.41
29	04.24	05.56	19.07 (28)	07.23		07.50		09.24	10.07
	22.32	20.50	11 19.18 (28)	19.03		16.22		14.57	14.43
30	04.27	05.59	19.04 (28)	07.25	17.12 (27)	07.53		09.27	10.06
	22.29	20.46	16 19.20 (28)	18.59	6 17.18 (27)	16.19		14.55	14.44
31	04.30	06.02	19.03 (28)			07.56			10.06
	22.26	20.43	19 19.22 (28)			16.16			14.46
Potential sun hours	598	504		392		307		204	147
Total, worst case	8	344		307		347			
Sun reduction	0,38	0,32		0,33		0,35			
Oper. time red.	0,93	0,93		0,93		0,93			
Wind dir. red.	0,63	0,63		0,62		0,62			
Total reduction	0,23	0,19		0,19		0,20			
Total, real	2	64		58		69			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------





Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
OsMontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: L - Lomarakennus L (Harjunpaantie 215)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes potential sun hours, total, worst case, sun reduction, oper. time red., wind dir. red., total reduction, and total, real.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: M - Lomarakenus M (Hakala, Iso-Mottonen)
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). It includes potential sun hours, total reduction, and real total for each day.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)



SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: N - Lomarakennus N (Hautakoski)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns: January, February, March, April, May, June, July, August, September, October, November, December. It contains shadow calculation data for 31 days, including sunrise/sunset times, potential sun hours, and various reduction metrics.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker
First time (hh:mm) with flicker Last time (hh:mm) with flicker
(WTG causing flicker first time) (WTG causing flicker last time)













SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: T - Lomarakennus T (Ruipontie)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Contains numerical data for sun hours and reduction values.

Table layout: For each day in each month the following matrix apply

Matrix with columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm), Minutes with flicker, First time (hh:mm) with flicker, Last time (hh:mm) with flicker, (WTG causing flicker first time), (WTG causing flicker last time)

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: U - Lomarakennus U (Kannistontie, Kivioja)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns (months) and 31 rows (days). Each cell contains two values representing sun rise and sun set times. Includes summary rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402Shadow receptor: V - Asuinrakennus V (Kannistentie 586) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum 537 395 365 414 594 798 1009 1106 957 759 614 627 8175

Main data table with columns for months (January to December) and rows for each day of the year (1 to 31), including shadow calculation data and summary rows.

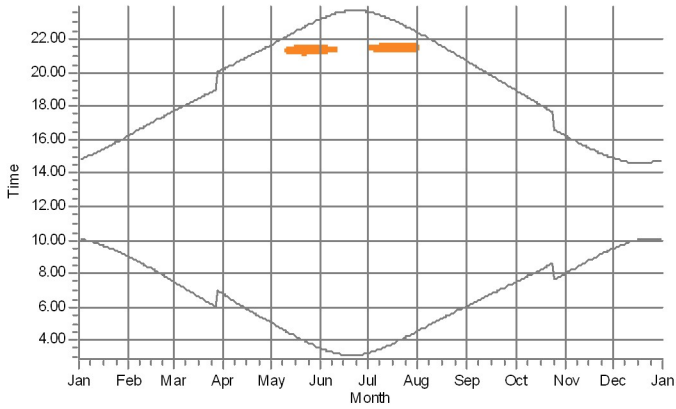
Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

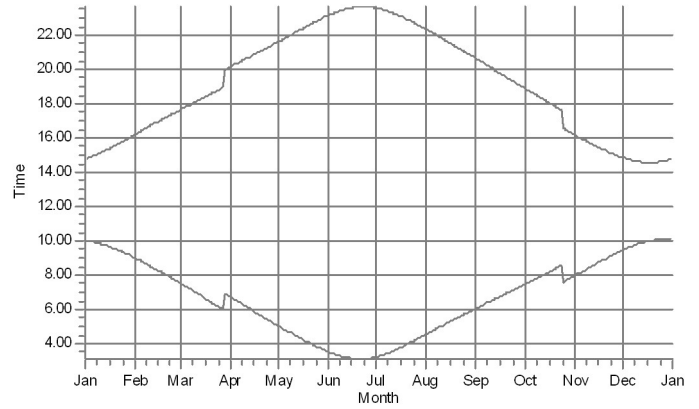
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

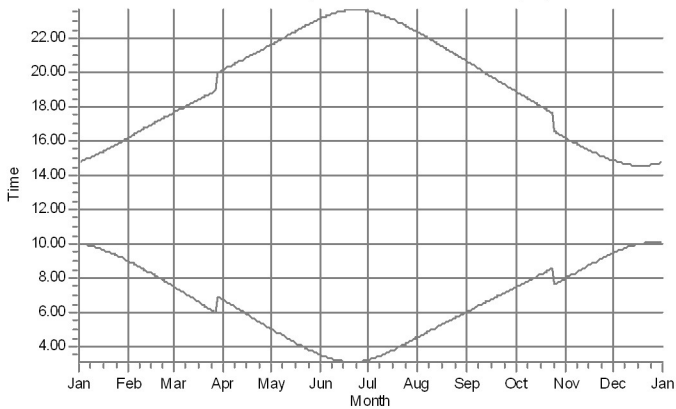
A: Lomarakenus A (Kuuslammentie)



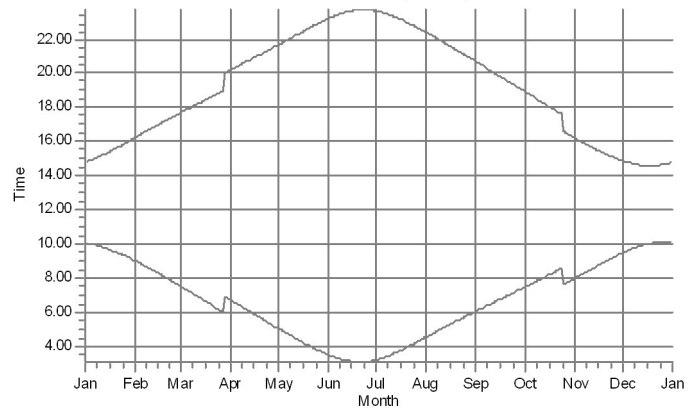
B: Lomarakenus B (Loukkukoskentie 700)



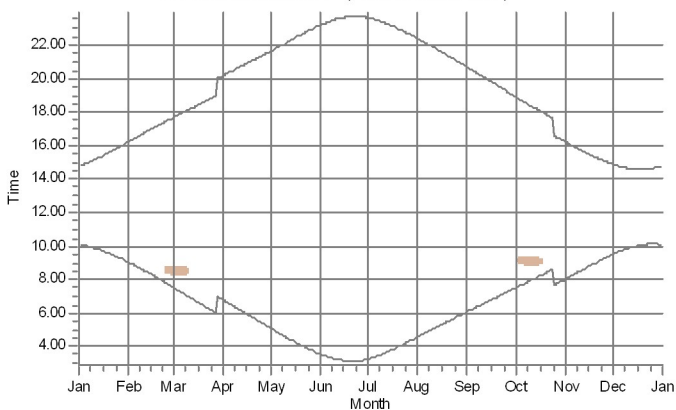
C: Asuinrakennus C (Loukkukoskentie, Mantyla)



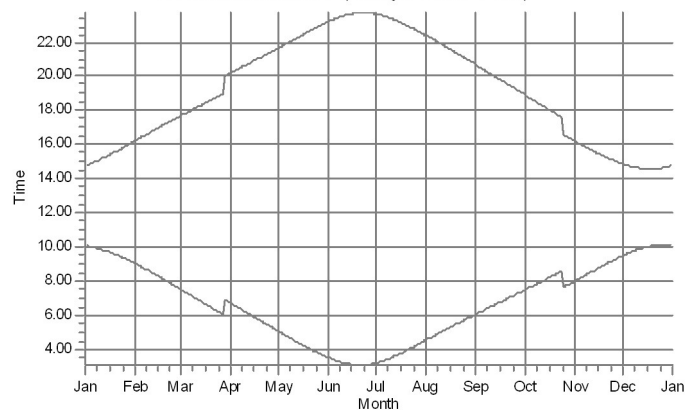
D: Lomarakenus D (Purola)



E: Asuinrakennus E (Kannistontie 557)



F: Asuinrakennus F (Lestjarventie 1468)



WTGs

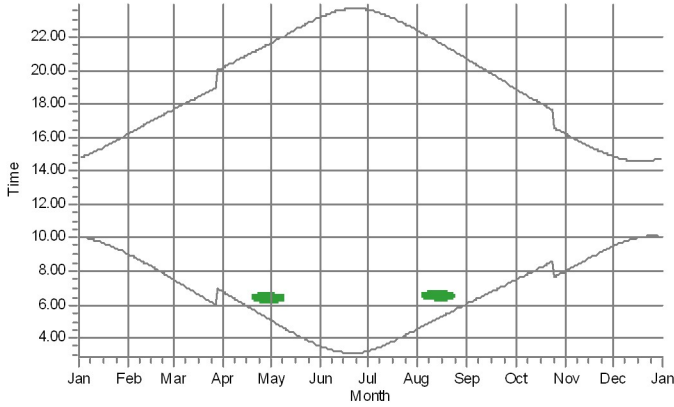
17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)

23: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1197)

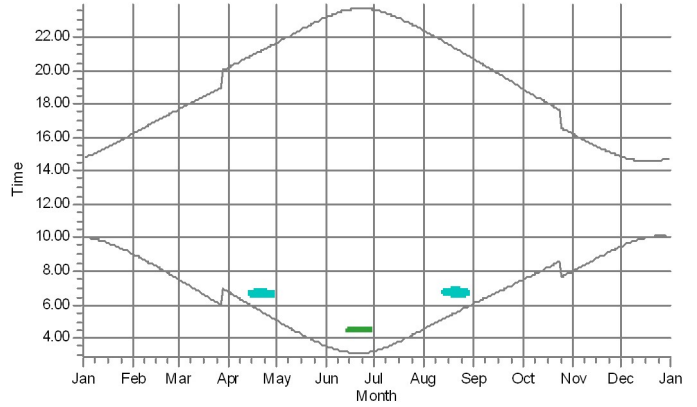
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

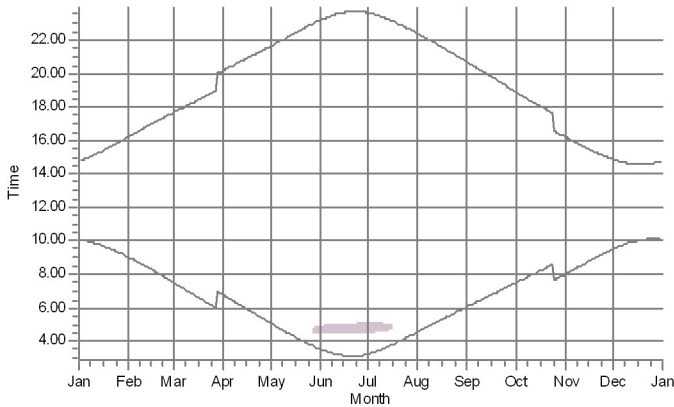
G: Asuinrakennus G (Hautakoskentie 455)



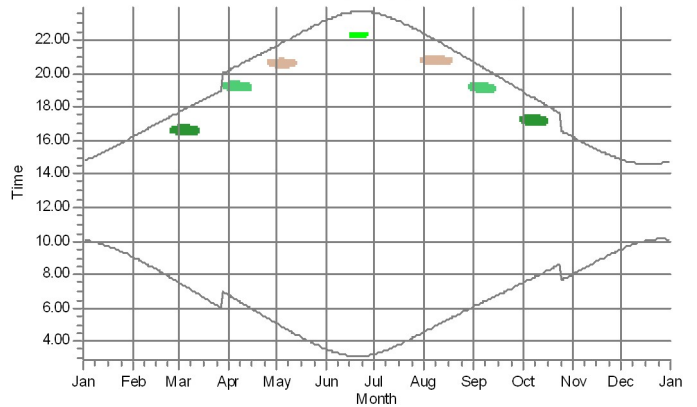
H: Asuinrakennus H (Hautakoskentie 544)



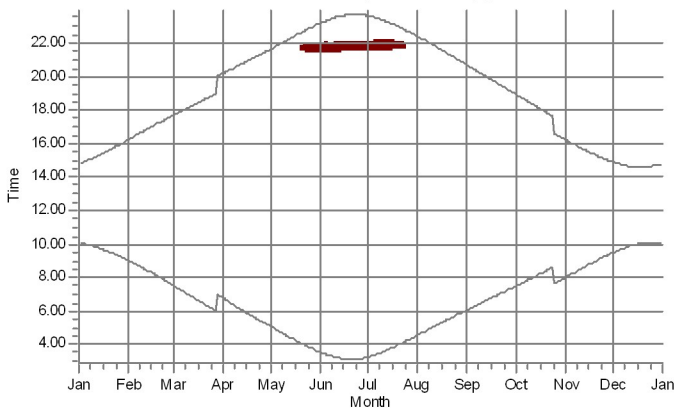
I: Asuinrakennus I (Hautakoskentie 289)



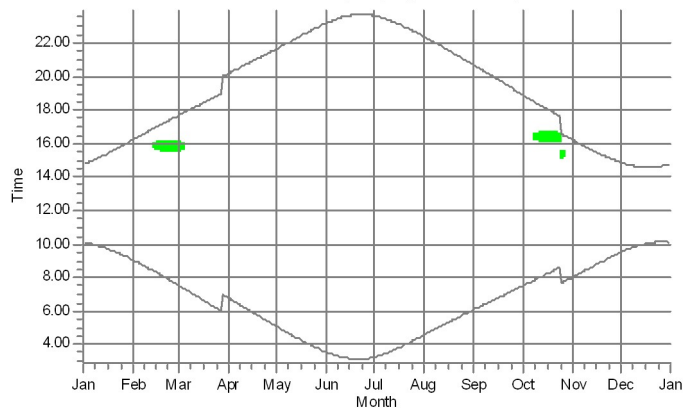
J: Lomarakennus J (Katajarventie 49)



K: Lomarakennus K (Silostenlampi)



L: Lomarakennus L (Harjunpaantie 215)

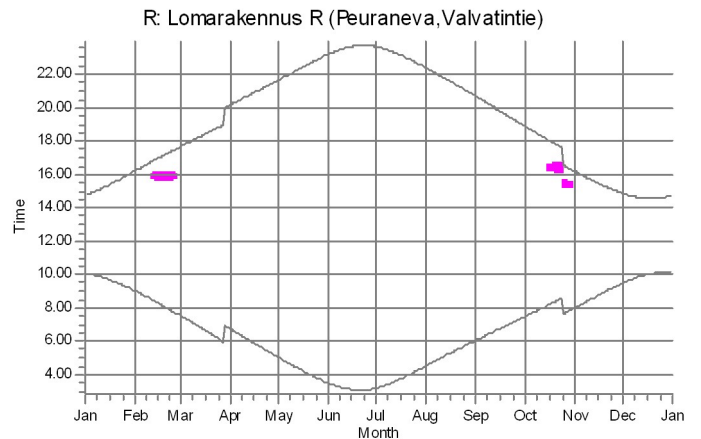
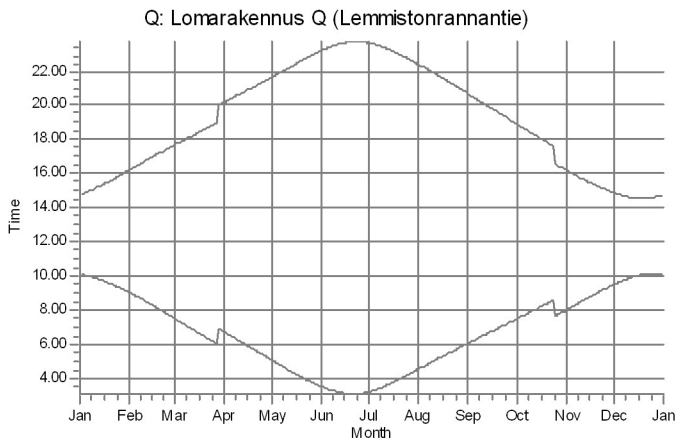
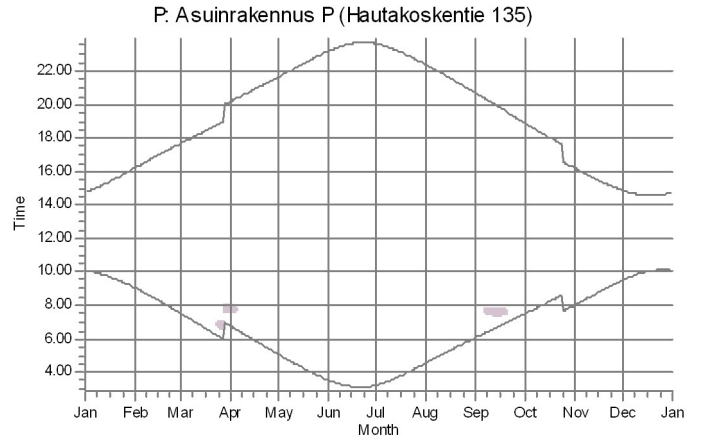
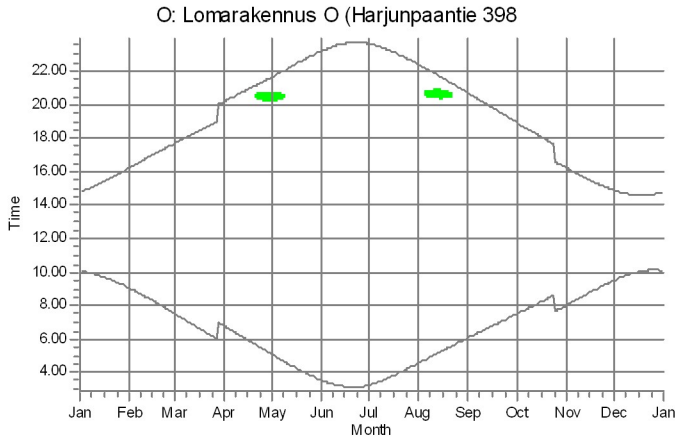
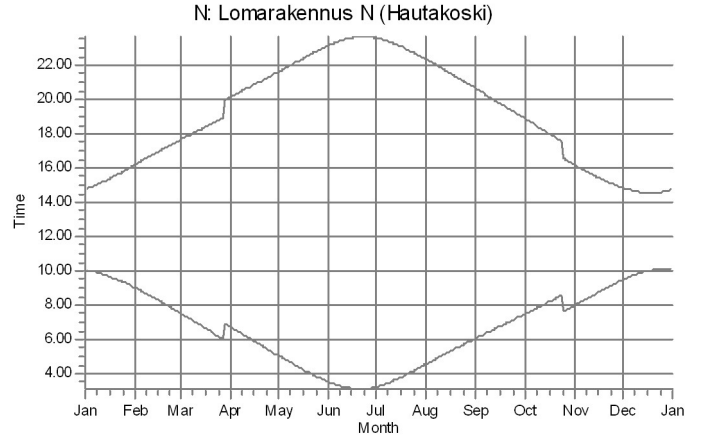
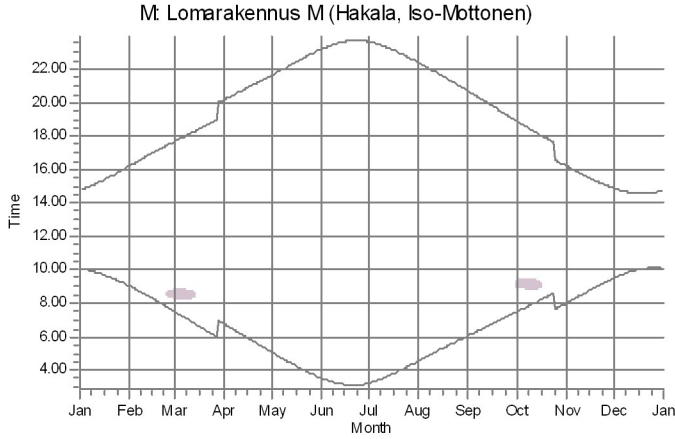


WTGs

- |  |  |   |
|--|--|---|
| <p>8: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1182)</p> <p>9: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)</p> <p>17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)</p> | <p>20: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1194)</p> <p>21: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1195)</p> <p>25: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)</p> | <p>27: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1201)</p> <p>28: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1202)</p> |
|--|--|---|

## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

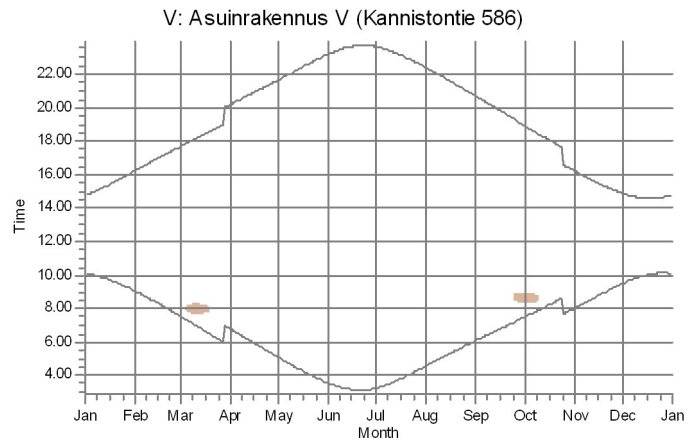
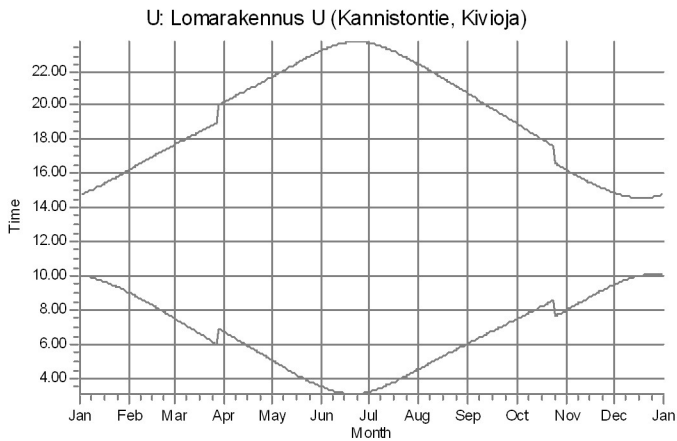
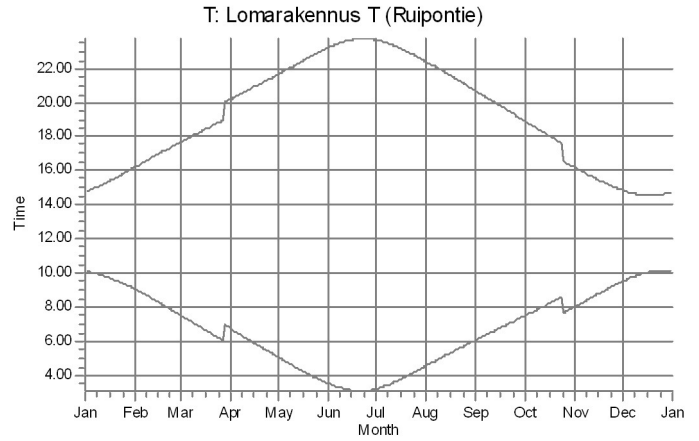
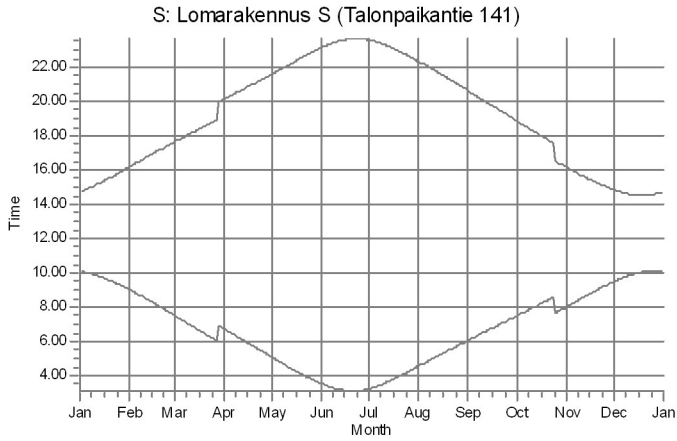


WTGS

5: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1179)    9: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)    25: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)

## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402



WTGs

17: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)





SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 2 - VESTAS V162-5.6 HH210 5600 180.0 !OI hub: 210,0 m (TOT: 300,0 m) (1176)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns (January to December) and 31 rows of data. Each cell contains a time range (Sun rise to Sun set) or a numerical value representing minutes with flicker. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month | Sun rise (hh:mm) | Sun set (hh:mm) | First time (hh:mm) with flicker | Last time (hh:mm) with flicker | Minutes with flicker



SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 3 - VESTAS V162-5.6 HH210 5600 180.0 !OI hub: 210,0 m (TOT: 300,0 m) (1177) Sunshine probability S (Average daily sunshine hours) [UMEA]

Assumptions for shadow calculations

Table with months Jan-Dec and values: 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

Table with directions N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum and corresponding values.

Main calendar table with columns for months (January to December) and rows for days 1-31, showing sun rise/set times and potential sun hours.

Table layout: For each day in each month the following matrix apply

Table layout matrix showing Day in month, Sun rise, Sun set, and First/Last time with flicker/Minutes with flicker.









Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 8 - VESTAS V162-5.6 HH210 5600 180.0 !OI hub: 210,0 m (TOT: 300,0 m) (1182)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (hh:mm) and a numerical value representing shadow calculation results. Includes a summary row for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 9 - VESTAS V162-5.6 HH210 5600 180.0 !OI hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	15.40-16.03/23 17.40	06.46 20.10	05.04 21.39	20.19-20.40/21 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	15.41-16.02/21 17.43	06.42 20.13	05.00 21.42	20.20-20.39/19 23.14
3	10.03 14.51	08.55 16.19	07.25 17.46	15.42-16.00/18 17.46	06.39 20.16	04.57 21.45	20.20-20.39/19 23.16
4	10.02 14.53	08.52 16.23	07.22 17.49	15.45-15.58/13 17.49	06.35 20.19	04.54 21.48	20.20-20.38/18 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52		06.32 20.22	04.50 21.51	20.22-20.38/16 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55		06.29 20.25	04.47 21.54	20.23-20.36/13 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58		06.25 20.28	04.44 21.58	20.25-20.34/9 23.25
8	09.57 15.02	08.40 16.35	07.08 18.01		06.22 20.30	04.41 22.01	20.28-20.30/2 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04		06.18 20.33	04.37 22.04	23.29
10	09.54 15.07	08.34 16.42	07.02 18.07		06.15 20.36	04.34 22.07	23.31
11	09.52 15.10	08.31 16.45	06.58 18.10		06.11 20.39	04.31 22.10	23.33
12	09.50 15.13	08.28 16.48	06.55 18.13		06.08 20.42	04.28 22.13	23.34
13	09.48 15.15	08.24 16.51	06.51 18.16		06.04 20.45	04.25 22.16	23.36
14	09.46 15.18	08.21 16.54	15.51-15.55/4 18.18	06.48 18.18	06.01 20.48	04.22 22.19	23.37
15	09.44 15.21	08.18 16.57	15.46-15.59/13 18.21	06.45 18.21	05.58 20.51	04.19 22.22	23.38
16	09.42 15.24	08.15 17.01	15.44-16.02/18 18.24	06.41 18.24	05.54 20.54	04.16 22.25	23.39
17	09.40 15.27	08.12 17.04	15.42-16.03/21 18.27	06.38 18.27	05.51 20.57	04.13 22.28	23.40
18	09.38 15.30	08.08 17.07	15.42-16.05/23 18.30	06.34 18.30	05.47 21.00	04.10 22.31	23.41
19	09.35 15.32	08.05 17.10	15.40-16.05/25 18.33	06.31 18.33	05.44 21.03	04.07 22.34	23.42
20	09.33 15.35	08.02 17.13	15.39-16.06/27 18.36	06.27 18.36	05.40 21.06	04.04 22.37	23.42
21	09.30 15.39	07.59 17.16	15.39-16.07/28 18.39	06.24 18.39	05.37 21.09	04.01 22.40	23.43
22	09.28 15.42	07.55 17.19	15.38-16.06/28 18.42	06.20 18.42	05.34 21.12	20.29-20.33/4 22.43	23.43
23	09.25 15.45	07.52 17.22	15.39-16.07/28 18.44	06.17 18.44	05.30 21.15	20.25-20.35/10 22.46	23.43
24	09.23 15.48	07.49 17.25	15.38-16.07/29 18.47	06.14 18.47	05.27 21.18	20.23-20.38/15 22.49	23.43
25	09.20 15.51	07.45 17.28	15.38-16.07/29 18.50	06.10 18.50	05.24 21.21	20.22-20.39/17 22.52	23.43
26	09.18 15.54	07.42 17.31	15.38-16.06/28 18.53	06.07 18.53	05.20 21.24	20.21-20.40/19 22.55	23.42
27	09.15 15.57	07.39 17.34	15.38-16.05/27 18.56	06.03 18.56	05.17 21.27	20.20-20.40/20 22.58	23.42
28	09.12 16.00	07.35 17.37	15.39-16.05/26 18.59	06.00 18.59	05.13 21.30	20.20-20.40/20 23.00	23.41
29	09.09 16.03			06.56 20.02	05.10 21.33	20.20-20.40/20 23.03	23.40
30	09.07 16.07			06.53 20.04	05.07 21.36	20.19-20.40/21 23.06	23.39
31	09.04 16.10			06.49 20.07		03.34 23.09	
Potential sun hours	179	241	363	448	562	610	57
Sum of minutes with flicker	0	354	75	146	117		

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 9 - VESTAS V162-5.6 HH210 5600 180.0 !OI hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.33 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.36 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.39 22.17	06.10 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 22.13	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	03.21 23.32	04.46 22.10	20.36-20.42/6 20.26	06.16 18.42	07.40 16.01	08.12 14.46
6	03.23 23.31	04.49 22.07	20.34-20.45/11 20.22	06.19 18.39	07.42 15.58	08.15 14.45
7	03.25 23.29	04.52 22.04	20.32-20.46/14 20.19	06.22 18.35	07.45 15.55	08.18 14.43
8	03.27 23.27	04.55 22.01	20.31-20.47/16 20.16	06.25 18.32	07.48 15.52	08.21 14.42
9	03.29 23.25	04.58 21.57	20.29-20.47/18 20.12	06.27 18.29	07.51 15.49	16.22-16.31/9 14.41
10	03.32 23.23	05.01 21.54	20.29-20.48/19 20.09	06.30 18.25	07.54 15.46	16.18-16.34/16 14.40
11	03.34 23.21	05.04 21.51	20.29-20.49/20 20.05	06.33 18.22	07.57 15.43	16.16-16.35/19 14.39
12	03.37 23.18	05.07 21.47	20.28-20.48/20 20.02	06.36 18.18	08.00 15.40	16.14-16.36/22 14.38
13	03.39 23.16	05.10 21.44	20.28-20.49/21 19.58	06.38 18.15	08.02 15.37	16.13-16.37/24 14.37
14	03.42 23.14	05.13 21.41	20.28-20.49/21 19.55	06.41 18.12	08.05 15.34	16.12-16.37/25 14.36
15	03.44 23.11	05.16 21.38	20.27-20.48/21 19.51	06.44 18.08	08.08 15.31	16.11-16.38/27 14.36
16	03.47 23.09	05.18 21.34	20.28-20.47/19 19.48	06.47 18.05	08.11 15.29	16.10-16.38/28 14.36
17	03.50 23.06	05.21 21.31	20.29-20.47/18 19.44	06.50 18.02	08.14 15.26	16.10-16.39/29 14.35
18	03.52 23.04	05.24 21.27	20.29-20.45/16 19.41	06.52 17.58	08.17 15.23	16.10-16.38/28 14.35
19	03.55 23.01	05.27 21.24	20.30-20.44/14 19.37	06.55 17.55	08.20 15.21	16.09-16.38/29 14.35
20	03.58 22.58	05.30 21.21	20.31-20.40/9 19.34	06.58 17.52	08.23 15.18	16.09-16.37/28 14.35
21	04.01 22.56	05.33 21.17	20.34-20.37/3 19.30	07.01 17.48	08.26 15.15	16.09-16.36/27 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	16.10-16.36/26 15.13	09.04 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	16.11-16.35/24 15.11	09.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	16.11-16.34/23 15.08	09.10 14.37
25	04.12 22.44	05.45 21.04	07.12 19.17	07.38 16.35	15.13-15.33/20 15.06	09.13 14.38
26	04.15 22.41	05.48 21.00	07.14 19.13	07.41 16.32	15.14-15.31/17 15.04	09.16 14.39
27	04.18 22.38	05.51 20.57	07.17 19.10	07.44 16.29	15.17-15.28/11 15.01	09.19 14.40
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.43
30	04.27 22.29	05.59 20.47	07.26 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	266	0	432	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 12 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300,0 m) (1186)
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months (January to December) and 31 rows for days. Each cell contains two values representing sun rise and sun set times. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker













## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 17 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	08.23-08.43/20 20.10	06.46 20.10	05.04 21.39	20.28-20.48/20 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	08.22-08.43/21 20.13	06.42 20.13	05.00 21.42	20.27-20.48/21 23.14
3	10.03 14.52	08.55 16.20	07.25 17.46	08.22-08.44/22 20.16	06.39 20.16	04.57 21.45	20.27-20.48/21 23.16
4	10.02 14.54	08.52 16.23	07.22 17.49	08.21-08.43/22 20.19	06.36 20.19	04.54 21.48	20.28-20.49/21 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52	08.00-08.02/2 20.22	06.32 20.22	04.50 21.51	20.28-20.49/21 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55	07.56-08.07/11 20.25	06.29 20.25	04.47 21.54	20.27-20.48/21 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58	07.53-08.08/15 20.28	06.25 20.28	04.44 21.58	20.28-20.48/20 23.25
8	09.57 15.03	08.40 16.35	07.09 18.01	07.52-08.10/18 20.30	06.22 20.30	04.41 22.01	20.28-20.47/19 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04	07.50-08.10/20 20.33	06.18 20.33	04.38 22.04	20.29-20.47/18 23.29
10	09.54 15.07	08.34 16.42	07.02 18.07	07.50-08.11/21 20.36	06.15 20.36	04.34 22.07	20.30-20.46/16 23.31
11	09.52 15.10	08.31 16.45	06.58 18.10	07.49-08.11/22 20.39	06.11 20.39	04.31 22.10	20.30-20.44/14 23.33
12	09.50 15.13	08.28 16.48	06.55 18.13	07.49-08.11/22 20.42	06.08 20.42	04.28 22.13	20.33-20.44/11 23.34
13	09.48 15.15	08.25 16.51	06.51 18.16	07.49-08.10/21 20.45	06.04 20.45	04.25 22.16	20.35-20.41/6 23.36
14	09.46 15.18	08.21 16.54	06.48 18.19	07.49-08.10/21 20.48	06.01 20.48	04.22 22.19	20.30-20.41/6 23.37
15	09.44 15.21	08.18 16.58	06.45 18.21	07.49-08.08/19 20.51	05.58 20.51	04.19 22.22	20.30-20.41/6 23.38
16	09.42 15.24	08.15 17.01	06.41 18.24	07.51-08.08/17 20.54	05.54 20.54	04.16 22.25	20.30-20.41/6 23.39
17	09.40 15.27	08.12 17.04	06.38 18.27	07.51-08.05/14 20.57	05.51 20.57	04.13 22.28	20.30-20.41/6 23.40
18	09.38 15.30	08.09 17.07	06.34 18.30	07.54-08.03/9 21.00	05.47 21.00	04.10 22.31	20.30-20.41/6 23.41
19	09.35 15.33	08.05 17.10	06.31 18.33	21.03	05.44 21.03	04.07 22.34	20.30-20.41/6 23.42
20	09.33 15.36	08.02 17.13	06.27 18.36	21.06	05.41 21.06	04.04 22.37	20.30-20.41/6 23.42
21	09.30 15.39	07.59 17.16	06.24 18.39	21.09	05.37 21.09	04.01 22.40	20.30-20.41/6 23.43
22	09.28 15.42	07.55 17.19	06.20 18.42	21.12	05.34 21.12	03.58 22.43	20.30-20.41/6 23.43
23	09.25 15.45	07.52 17.22	06.17 18.44	21.15	05.30 21.15	03.55 22.46	20.30-20.41/6 23.43
24	09.23 15.48	07.49 17.25	06.14 18.47	21.18	05.27 21.18	03.53 22.49	20.30-20.41/6 23.43
25	09.20 15.51	07.46 17.28	06.10 18.50	21.21	05.24 21.21	03.50 22.52	20.30-20.41/6 23.43
26	09.18 15.54	07.42 17.31	06.07 18.53	21.24	05.20 21.24	03.47 22.55	20.30-20.41/6 23.42
27	09.15 15.57	07.39 17.34	06.03 18.56	21.27	05.17 21.27	03.45 22.58	20.30-20.41/6 23.42
28	09.12 16.00	07.36 17.37	06.00 18.59	21.30	05.14 21.30	03.42 23.01	20.30-20.41/6 23.41
29	09.09 16.04		06.56 20.02	21.33	05.10 21.33	03.39 23.03	20.30-20.41/6 23.40
30	09.07 16.07		06.53 20.05	21.36	05.07 21.36	03.37 23.06	20.29-20.48/19 23.39
31	09.04 16.10		06.49 20.07			03.35 23.09	
Potential sun hours	179	241	363	448	562	610	0
Sum of minutes with flicker	0	59	416	72	229	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 17 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.34 20.42-20.54/12 22.23	06.05 20.40	07.28 08.28-08.49/21 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.37 20.41-20.56/15 22.20	06.08 20.36	07.31 08.27-08.49/22 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.40 20.39-20.56/17 22.17	06.11 20.33	07.34 08.27-08.49/22 18.49 09.08-09.09/1	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 20.39-20.57/18 22.13	06.13 20.29	07.37 08.28-08.48/20 18.46 09.03-09.14/11	08.09 16.04	09.37 14.48
5	03.21 23.32	04.46 20.38-20.57/19 22.10	06.16 20.26	07.40 08.28-08.47/19 18.42 09.00-09.16/16	08.12 16.01	09.40 14.46
6	03.23 23.31	04.49 20.37-20.58/21 22.07	06.19 20.22	07.43 08.29-08.46/17 18.39 08.59-09.17/18	08.15 15.58	09.42 14.45
7	03.25 23.29	04.52 20.36-20.58/22 22.04	06.22 20.19	07.45 08.30-08.44/14 18.35 08.58-09.18/20	08.18 15.55	09.44 14.43
8	03.27 23.27	04.55 20.37-20.58/21 22.01	06.25 20.16	07.48 08.33-08.41/8 18.32 08.57-09.18/21	08.21 15.52	09.47 14.42
9	03.30 23.25	04.58 20.37-20.58/21 21.57	06.27 20.12	07.51 08.56-09.18/22 18.29	08.24 15.49	09.49 14.41
10	03.32 23.23	05.01 20.36-20.58/22 21.54	06.30 20.09	07.54 08.56-09.18/22 18.25	08.27 15.46	09.51 14.40
11	03.34 23.21	05.04 20.37-20.58/21 21.51	06.33 20.05	07.57 08.56-09.17/21 18.22	08.30 15.43	09.53 14.39
12	03.37 23.18	05.07 20.36-20.56/20 21.48	06.36 20.02	08.00 08.56-09.17/21 18.19	08.33 15.40	09.55 14.38
13	03.39 23.16	05.10 20.37-20.56/19 21.44	06.39 19.58	08.03 08.56-09.16/20 18.15	08.37 15.37	09.56 14.37
14	03.42 23.14	05.13 20.38-20.55/17 21.41	06.41 19.55	08.05 08.56-09.15/19 18.12	08.40 15.34	09.58 14.37
15	03.44 23.11	05.16 20.38-20.53/15 21.38	06.44 19.51	08.08 08.57-09.13/16 18.08	08.43 15.31	09.59 14.36
16	03.47 23.09	05.19 20.40-20.52/12 21.34	06.47 19.48	08.11 09.00-09.12/12 18.05	08.46 15.29	10.01 14.36
17	03.50 23.06	05.22 20.43-20.49/6 21.31	06.50 19.44	08.14 09.02-09.09/7 18.02	08.49 15.26	10.02 14.35
18	03.53 23.04	05.24 21.28	06.52 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	03.55 23.01	05.27 21.24	06.55 19.37	08.20 17.55	08.55 15.21	10.04 14.35
20	03.58 22.58	05.30 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.35
21	04.01 22.56	05.33 21.17	07.01 19.31	08.26 17.48	09.01 15.16	10.06 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.08	10.07 14.37
25	04.13 22.44	05.45 21.04	07.12 08.37-08.44/7 19.17	07.38 16.35	09.13 15.06	10.07 14.38
26	04.16 22.41	05.48 21.00	07.15 08.34-08.47/13 19.13	07.41 16.32	09.16 15.04	10.07 14.39
27	04.19 22.38	05.51 20.57	07.17 08.32-08.48/16 19.10	07.44 16.29	09.19 15.01	10.07 14.40
28	04.22 22.35	05.53 20.54	07.20 08.31-08.49/18 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.25 22.32	05.56 20.50	07.23 08.30-08.50/20 19.03	07.50 16.23	09.24 14.57	10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 08.29-08.50/21 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.31 20.44-20.52/8 22.26	06.02 20.43	 	07.56 16.16	 	10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	8	298	95	390	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 20 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1194)
Assumptions for shadow calculations

Shine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a matrix of values representing sun rise, sun set, and shadow calculations for each day.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 21 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1195)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). It contains numerical values representing shadow calculations and sun hours.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker











Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.32/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 25 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300,0 m) (1199)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05 14.47	09.01 16.13	07.32 17.40	08.23-08.45/22 20.10	06.45 07.38-07.57/19 20.10	05.03 21.39	03.31 23.11	04.35-04.49/14
2	10.04 14.49	08.58 16.16	07.29 17.43	08.23-08.46/23 20.13	06.42 07.38-07.55/17 20.13	05.00 21.42	03.29 23.14	04.35-04.50/15
3	10.03 14.51	08.55 16.19	07.25 17.46	08.22-08.46/24 20.16	06.39 07.39-07.54/15 20.16	04.56 21.45	03.27 23.16	04.34-04.51/17
4	10.02 14.53	08.52 16.22	07.22 17.49	08.22-08.47/25 20.19	06.35 07.41-07.53/12 20.19	04.53 21.48	03.25 23.19	04.34-04.52/18
5	10.01 14.55	08.49 16.25	07.18 17.52	08.21-08.46/25 20.21	06.32 07.43-07.49/6 20.21	04.50 21.51	03.23 23.21	04.34-04.52/18
6	10.00 14.57	08.46 16.29	07.15 17.55	08.21-08.46/25 20.24	06.28 20.24	04.47 21.54	03.21 23.23	04.34-04.53/19
7	09.58 14.59	08.43 16.32	07.12 17.58	08.21-08.45/24 20.27	06.25 20.27	04.43 21.57	03.19 23.25	04.33-04.53/20
8	09.57 15.02	08.40 16.35	07.08 18.01	08.21-08.44/23 20.30	06.21 20.30	04.40 22.00	03.17 23.27	04.33-04.53/20
9	09.55 15.04	08.37 16.38	07.05 18.04	08.22-08.44/22 20.33	06.18 20.33	04.37 22.04	03.16 23.29	04.33-04.54/21
10	09.54 15.07	08.34 16.41	07.01 18.07	08.22-08.42/20 20.36	06.14 20.36	04.34 22.07	03.14 23.31	04.34-04.55/21
11	09.52 15.09	08.31 16.44	06.58 18.09	08.23-08.41/18 20.39	06.11 20.39	04.31 22.10	03.13 23.33	04.33-04.55/22
12	09.50 15.12	08.27 16.48	06.55 18.12	08.25-08.38/13 20.42	06.07 20.42	04.27 22.13	03.11 23.35	04.33-04.55/22
13	09.48 15.15	08.24 16.51	06.51 18.15	08.29-08.34/5 20.45	06.04 20.45	04.24 22.16	03.10 23.36	04.34-04.56/22
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	06.01 20.48	04.21 22.19	03.09 23.37	04.34-04.56/22
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 20.51	05.57 20.51	04.18 22.22	03.08 23.39	04.34-04.56/22
16	09.42 15.23	08.15 17.00	06.41 18.24	05.54 20.54	05.54 20.54	04.15 22.25	03.07 23.40	04.34-04.56/22
17	09.40 15.26	08.11 17.03	06.37 18.27	05.50 20.57	05.50 20.57	04.12 22.28	03.07 23.41	04.34-04.56/22
18	09.38 15.29	08.08 17.06	06.34 18.30	05.47 21.00	05.47 21.00	04.09 22.31	03.06 23.41	04.34-04.57/23
19	09.35 15.32	08.05 17.09	06.30 18.33	05.43 21.03	05.43 21.03	04.06 22.34	03.06 23.42	04.35-04.57/22
20	09.33 15.35	08.02 17.13	06.27 18.35	05.40 21.06	05.40 21.06	04.03 22.37	03.06 23.43	04.35-04.57/22
21	09.30 15.38	07.58 17.16	06.24 18.38	05.37 21.09	05.37 21.09	04.00 22.40	03.06 23.43	04.35-04.57/22
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 21.12	05.33 21.12	03.57 22.43	03.06 23.43	04.35-04.57/22
23	09.25 15.44	07.52 17.22	06.17 18.44	05.30 21.15	05.30 21.15	03.55 22.46	03.06 23.43	04.36-04.58/22
24	09.23 15.47	07.49 17.25	06.13 18.47	06.49-06.50/1 21.18	05.26 21.18	03.52 22.49	03.06 23.43	04.35-04.58/23
25	09.20 15.50	07.45 17.28	06.10 18.50	06.45-06.55/10 21.21	05.23 21.21	03.49 22.52	03.07 23.43	04.36-04.59/23
26	09.18 15.54	07.42 17.31	06.06 18.53	06.42-06.56/14 21.24	05.20 21.24	03.46 22.55	03.08 23.42	04.36-04.58/22
27	09.15 15.57	07.39 17.34	06.03 18.56	06.41-06.57/16 21.27	05.16 21.27	03.44 22.58	03.09 23.42	04.36-04.59/23
28	09.12 16.00	07.35 17.37	05.59 18.58	06.40-06.58/18 21.30	05.13 21.30	03.41 23.01	03.10 23.41	04.37-04.59/22
29	09.09 16.03		06.56 20.01	07.39-07.58/19 21.33	05.10 21.33	03.39 23.03	03.11 23.40	04.37-04.59/22
30	09.07 16.06		06.52 20.04	07.39-07.58/19 21.36	05.06 21.36	03.36 23.06	03.12 23.39	04.38-04.59/21
31	09.04 16.09		06.49 20.07	07.38-07.57/19 21.39		03.34 23.09		04.36-04.49/13
Potential sun hours	179	241	363	448	562	611	626	
Sum of minutes with flicker	0	48	385	69	31	626		

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 25 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.13 04.38-04.59/21 23.38	04.33 22.23	06.04 20.39	07.28 09.05-09.16/11 18.56	07.59 16.13	09.30 14.53
2	03.15 04.38-04.59/21 23.37	04.36 22.20	06.07 20.36	07.31 09.03-09.18/15 18.52	08.02 16.09	09.32 14.51
3	03.17 04.38-04.59/21 23.35	04.39 22.17	06.10 20.33	07.34 09.01-09.20/19 18.49	08.05 16.06	09.35 14.49
4	03.18 04.38-04.59/21 23.34	04.42 22.13	06.13 20.29	07.37 08.59-09.21/22 18.45	08.08 16.03	09.37 14.47
5	03.20 04.39-04.59/20 23.32	04.45 22.10	06.16 20.26	07.39 08.58-09.21/23 18.42	08.11 16.00	09.40 14.46
6	03.22 04.39-04.59/20 23.31	04.48 22.07	06.19 20.22	07.42 08.58-09.22/24 18.38	08.15 15.57	09.42 14.44
7	03.24 04.40-04.59/19 23.29	04.51 22.04	06.21 07.38-07.44/6 20.19	07.45 08.57-09.22/25 18.35	08.18 15.54	09.44 14.43
8	03.26 04.40-04.58/18 23.27	04.54 22.00	06.24 07.35-07.47/12 20.15	07.48 08.56-09.22/26 18.32	08.21 15.51	09.47 14.41
9	03.29 04.41-04.59/18 23.25	04.57 21.57	06.27 07.34-07.49/15 20.12	07.51 08.56-09.21/25 18.28	08.24 15.48	09.49 14.40
10	03.31 04.42-04.58/16 23.23	05.00 21.54	06.30 07.32-07.49/17 20.08	07.54 08.56-09.21/25 18.25	08.27 15.45	09.51 14.39
11	03.33 04.42-04.57/15 23.21	05.03 21.51	06.33 07.31-07.49/18 20.05	07.56 08.56-09.20/24 18.21	08.30 15.42	09.53 14.38
12	03.36 04.43-04.57/14 23.19	05.06 21.47	06.35 07.30-07.49/19 20.01	07.59 08.57-09.19/22 18.18	08.33 15.39	09.55 14.37
13	03.38 04.44-04.56/12 23.16	05.09 21.44	06.38 07.29-07.49/20 19.58	08.02 08.57-09.18/21 18.15	08.36 15.36	09.56 14.36
14	03.41 04.46-04.55/9 23.14	05.12 21.41	06.41 07.29-07.48/19 19.54	08.05 08.58-09.16/18 18.11	08.39 15.34	09.58 14.36
15	03.44 04.48-04.53/5 23.11	05.15 21.37	06.44 07.30-07.48/18 19.51	08.08 08.59-09.14/15 18.08	08.43 15.31	09.59 14.35
16	03.46 23.09	05.18 21.34	06.46 07.29-07.46/17 19.48	08.11 09.02-09.11/9 18.05	08.46 15.28	10.01 14.35
17	03.49 23.06	05.21 21.31	06.49 07.30-07.45/15 19.44	08.14 18.01	08.49 15.25	10.02 14.35
18	03.52 23.04	05.24 21.27	06.52 07.32-07.43/11 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	03.55 23.01	05.27 21.24	06.55 07.35-07.40/5 19.37	08.20 17.55	08.55 15.20	10.04 14.35
20	03.57 22.58	05.30 21.21	06.57 19.34	08.23 17.51	08.58 15.17	10.05 14.35
21	04.00 22.56	05.33 21.17	07.00 19.30	08.26 17.48	09.01 15.15	10.06 14.35
22	04.03 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.12	10.06 14.35
23	04.06 22.50	05.39 21.10	07.06 19.23	08.32 17.41	09.07 15.10	10.07 14.36
24	04.09 22.47	05.41 21.07	07.09 19.20	08.35 17.38	09.10 15.08	10.07 14.37
25	04.12 22.44	05.44 21.04	07.11 19.16	07.38 16.35	09.13 15.05	10.07 14.37
26	04.15 22.41	05.47 21.00	07.14 19.13	07.41 16.32	09.16 15.03	10.07 14.38
27	04.18 22.38	05.50 20.57	07.17 19.09	07.44 16.28	09.19 15.01	10.07 14.39
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.25	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.42
30	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.55	10.06 14.43
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.45
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	250	0	192	324	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 27 - VESTAS V162-5.6 HH210 5600 180.0 IO! hub: 210.0 m (TOT: 300.0 m) (1201)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Columns contain sun rise and set times, and rows contain potential sun hours and sum of minutes with flicker.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 28 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1202)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains sun rise and set times, and a 'Sum of minutes with flicker' row at the bottom.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 29 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300.0 m) (1203)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes sub-headers for sun rise, sun set, and potential sun hours. A summary row at the bottom shows 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker









Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 32 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300,0 m) (1206)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes 'Potential sun hours' and 'Sum of minutes with flicker' at the bottom.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 19.32/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402WTG: 33 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210.0 m (TOT: 300,0 m) (1207)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains two values representing sunrise and sunset times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





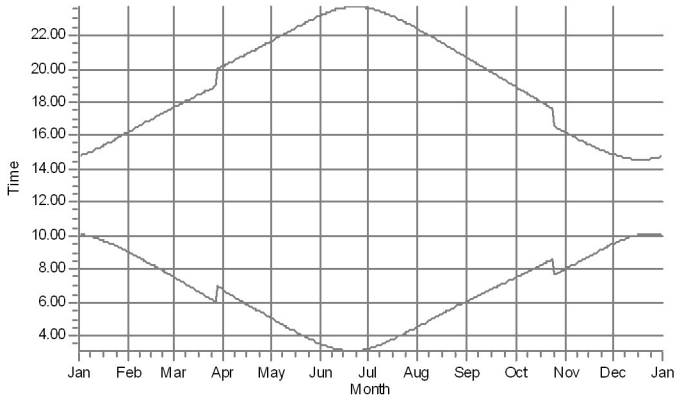




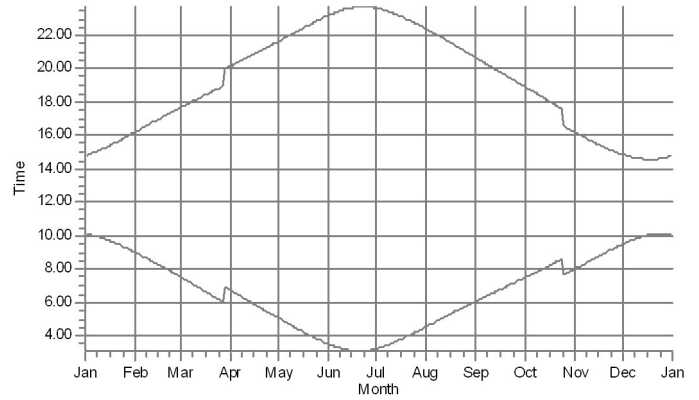
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

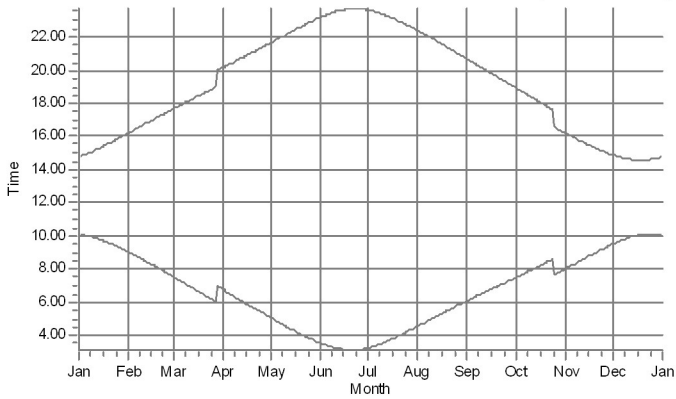
1: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



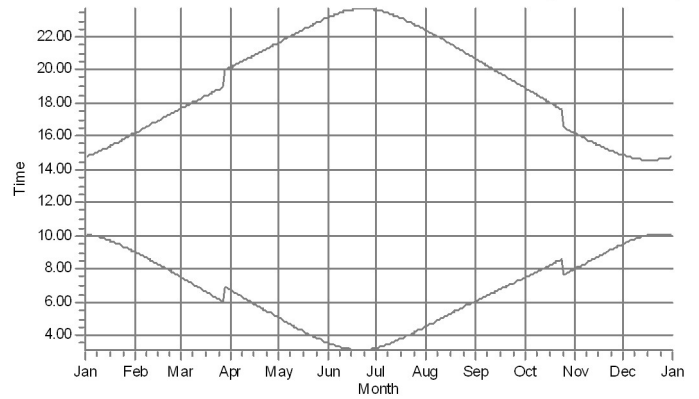
2: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



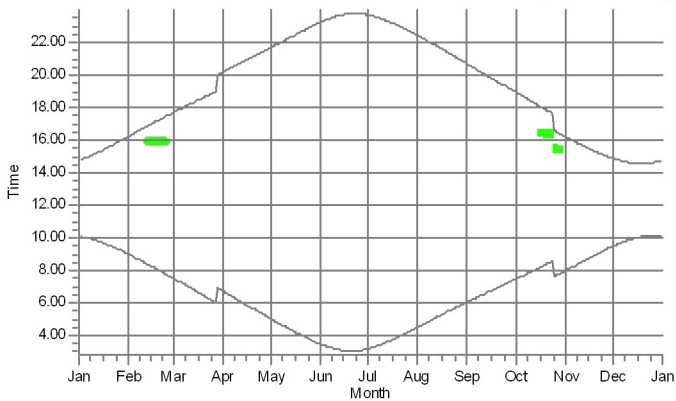
3: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



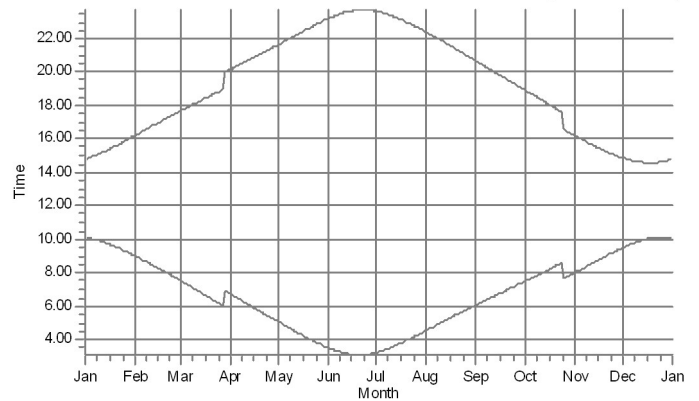
4: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



5: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



6: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



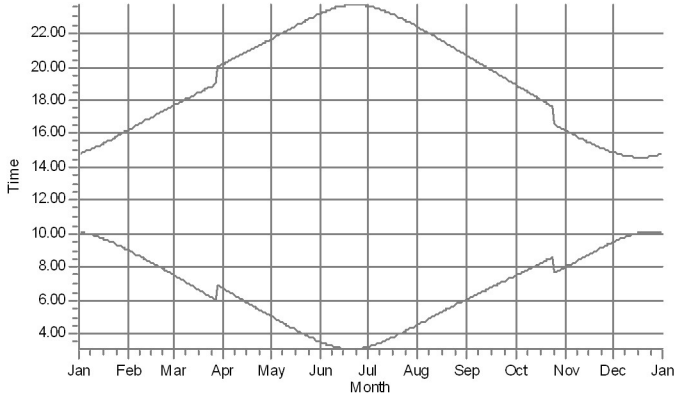
Shadow receptors

R: Lomarakennus R (Peuraneva,Valvatintie)

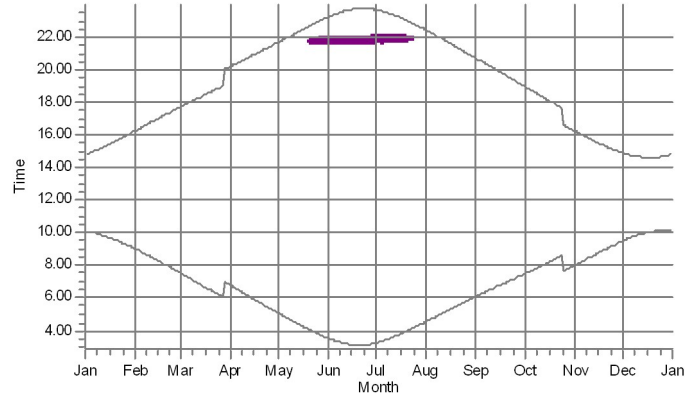
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

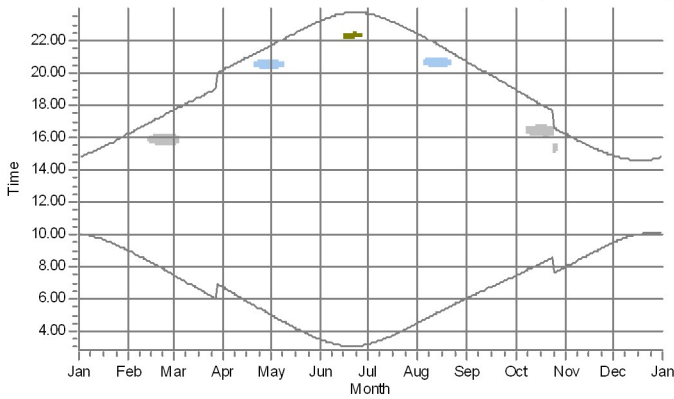
7: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



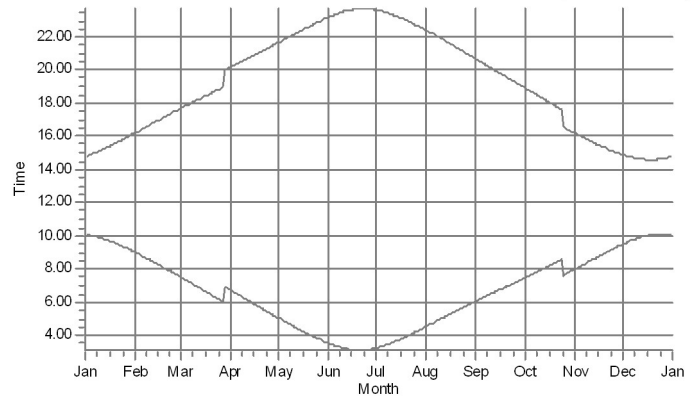
8: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



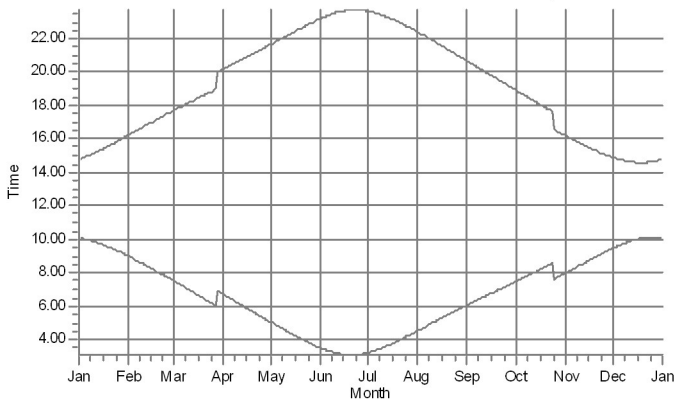
9: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



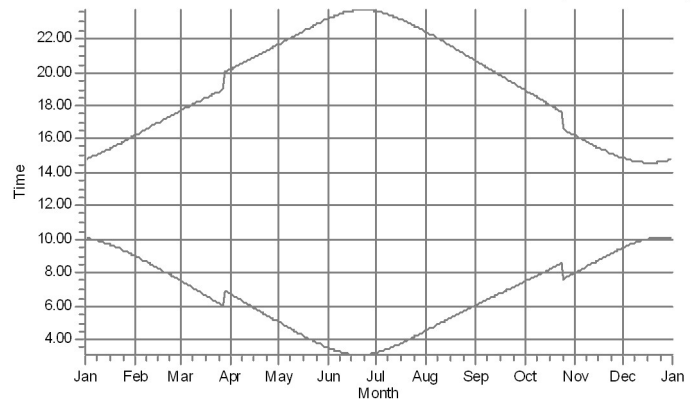
10: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



11: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



12: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

J: Lomarakenus J (Katajajarventie 49)  
K: Lomarakenus K (Silostenlampi)

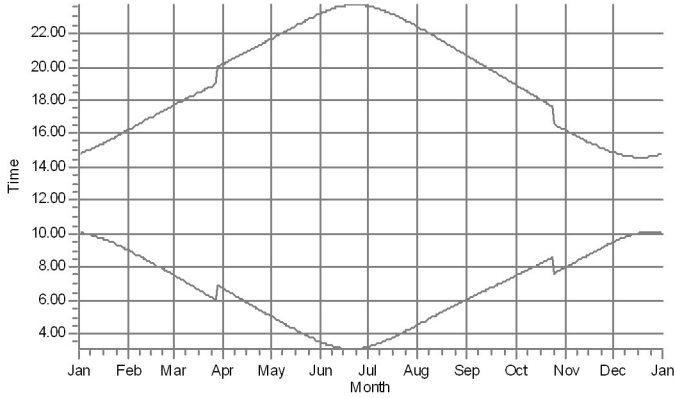
L: Lomarakenus L (Harjunpaantie 215)  
O: Lomarakenus O (Harjunpaantie 398)



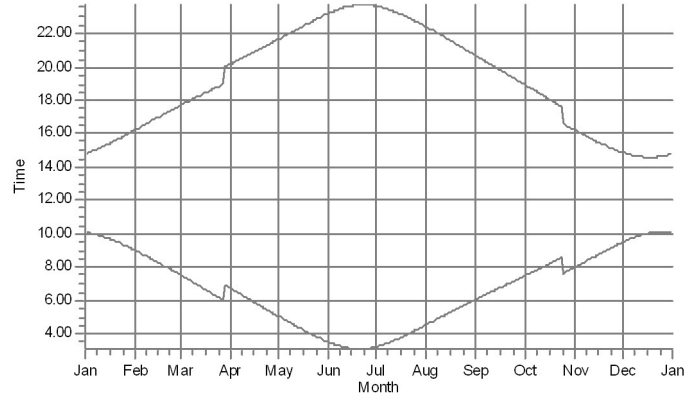
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

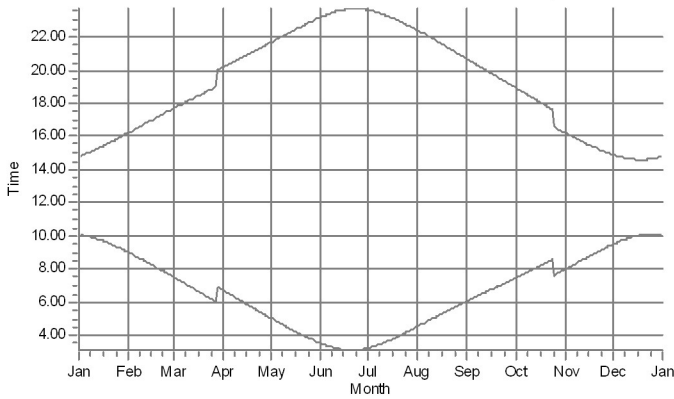
13: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



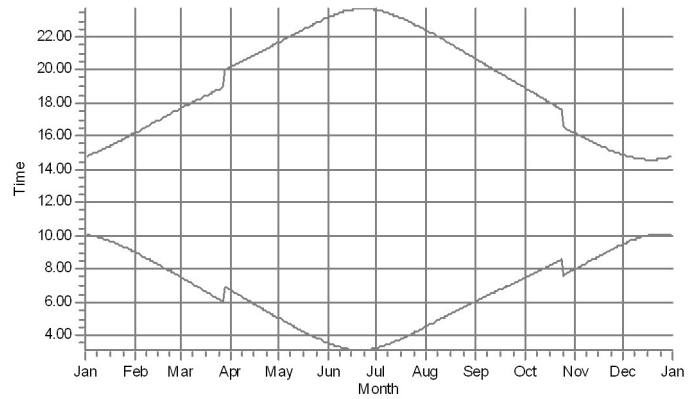
14: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



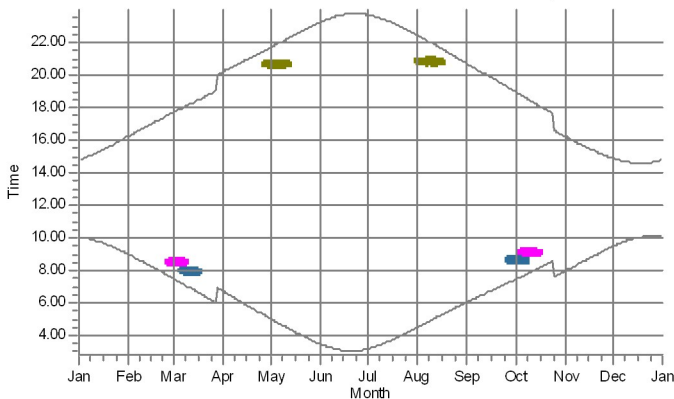
15: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



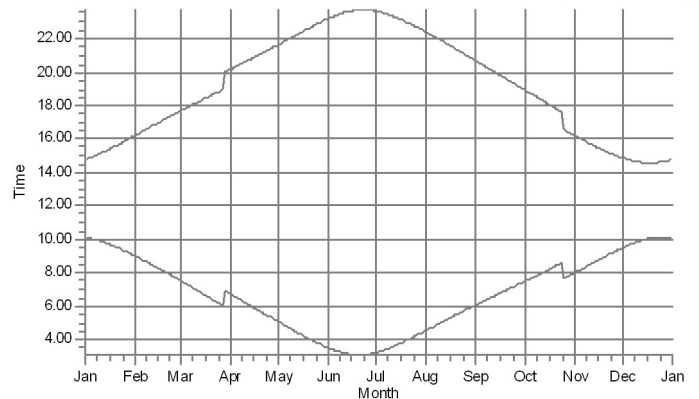
16: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



17: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



18: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors



E: Asuinrakennus E (Kannistontie 557)



J: Lomarakenus J (Katajarventie 49)

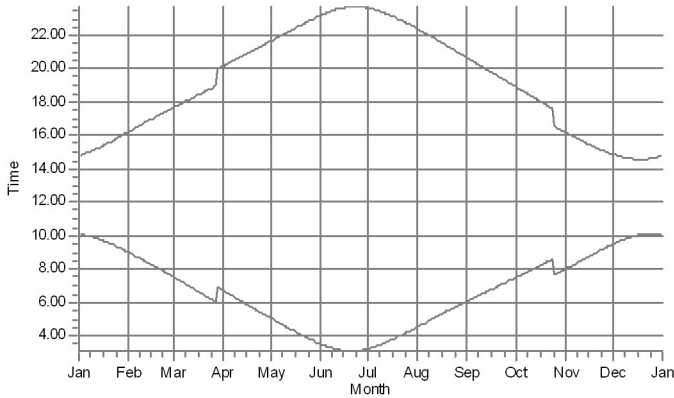


V: Asuinrakennus V (Kannistontie 586)

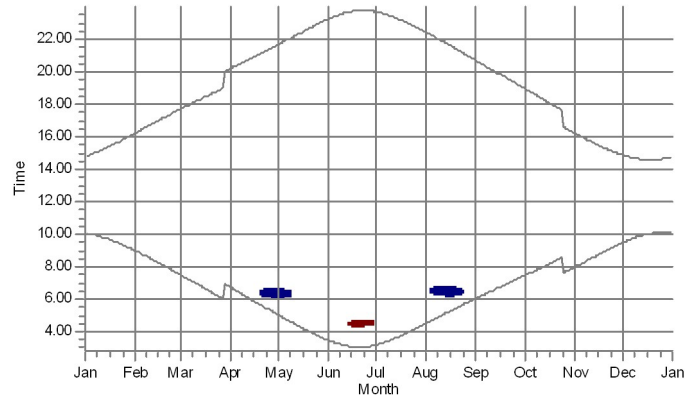
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

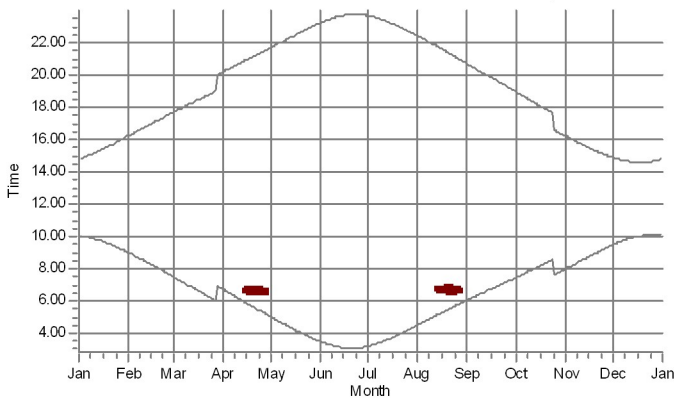
19: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



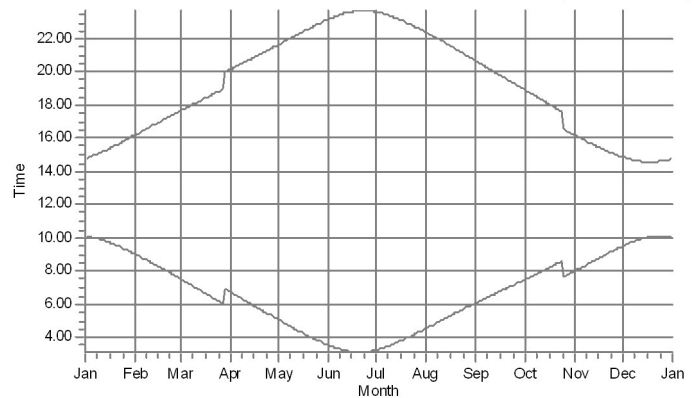
20: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



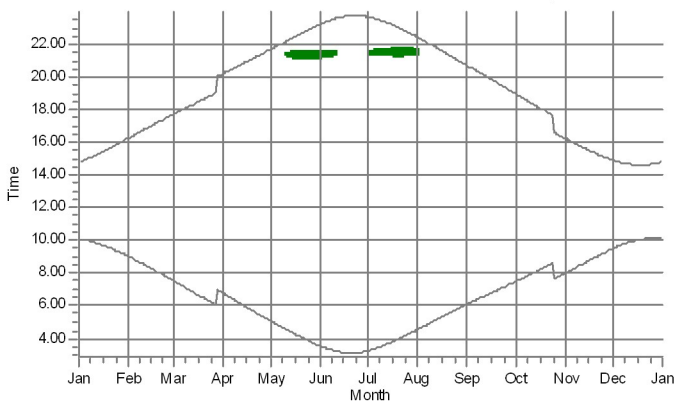
21: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



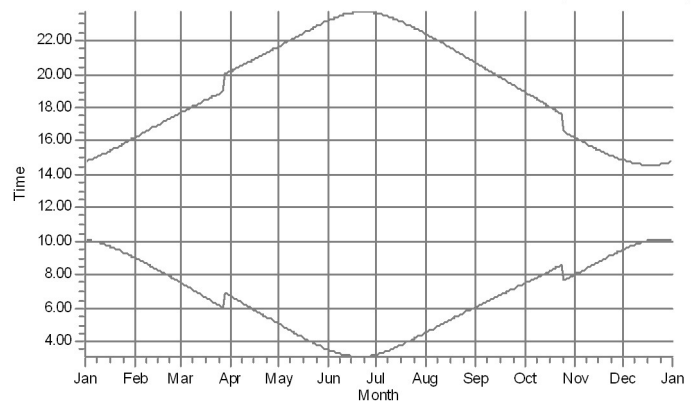
22: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



23: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



24: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



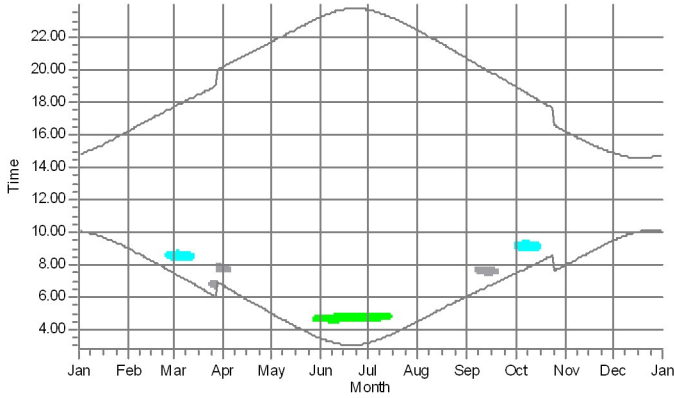
Shadow receptors

- A: Lomarakennus A (Kuuslammentie)
- G: Asuinrakennus G (Hautakoskentie 455)
- H: Asuinrakennus H (Hautakoskentie 544)

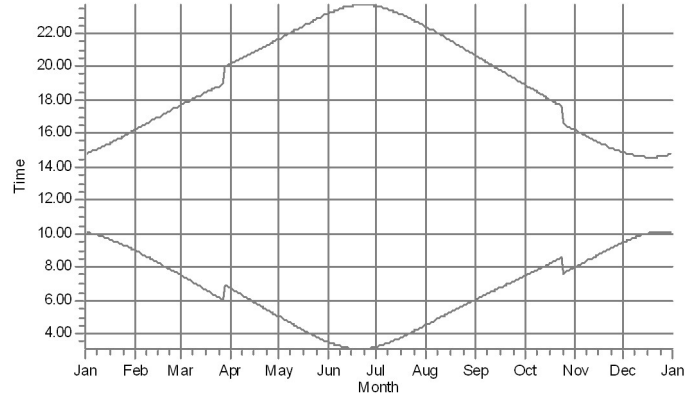
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

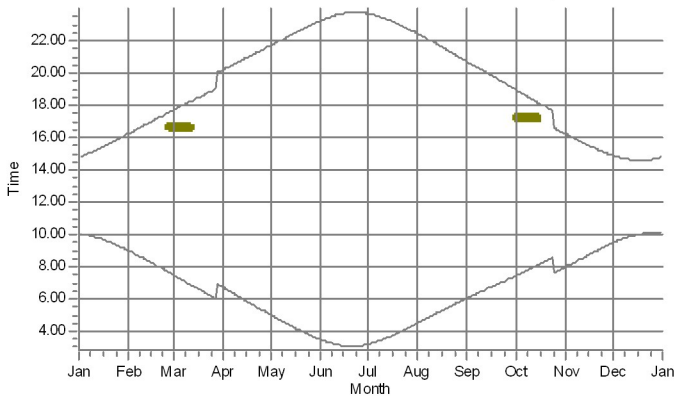
25: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



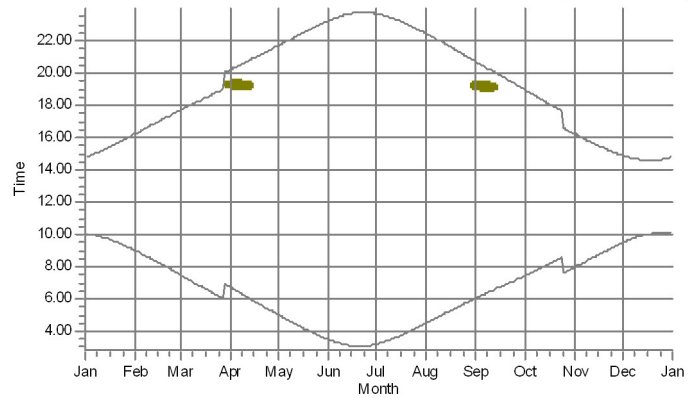
26: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



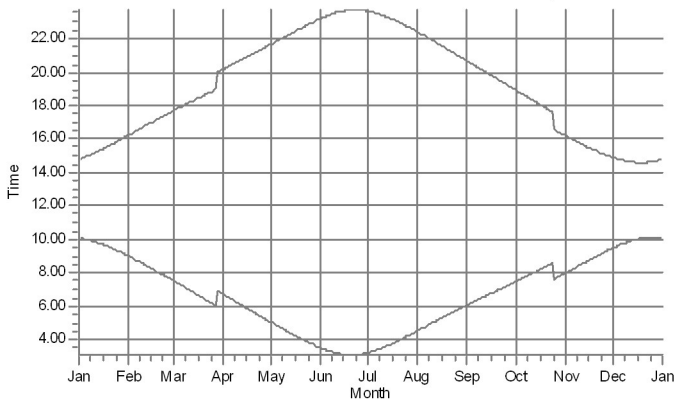
27: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



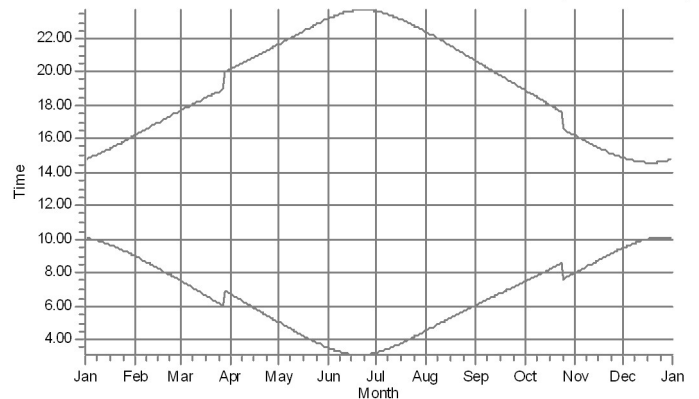
28: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



29: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



30: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



### Shadow receptors

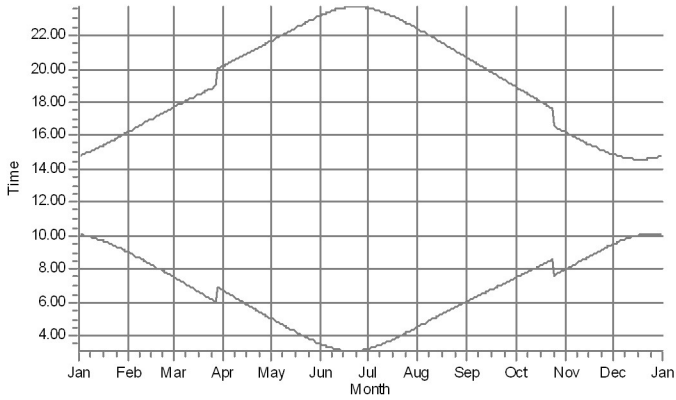
■ I: Asuinrakennus I (Hautakoskentie 289)  
■ J: Lomarakenus J (Katajarventie 49)

■ M: Lomarakenus M (Hakala, Iso-Mottonen)  
■ P: Asuinrakennus P (Hautakoskentie 135)

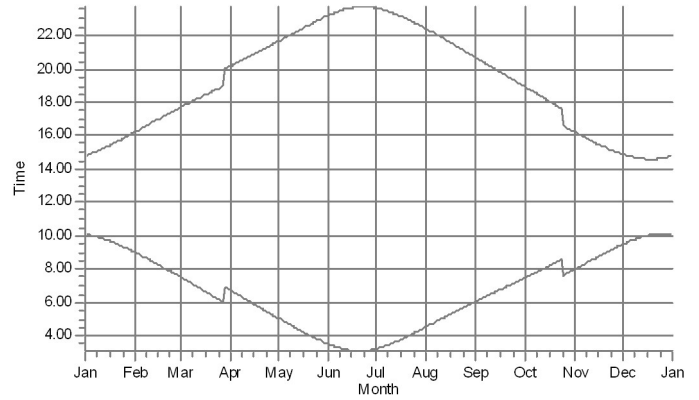
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402

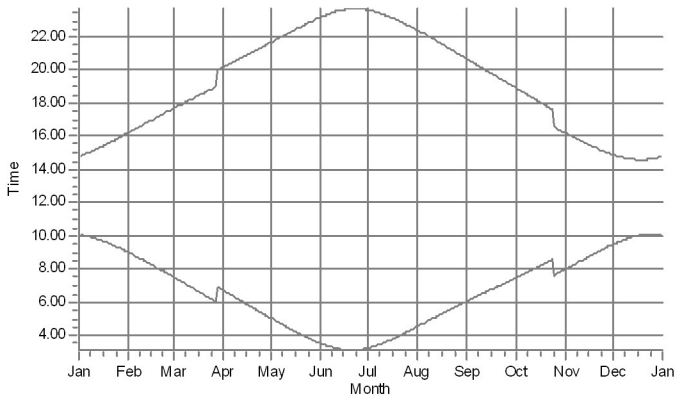
31: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



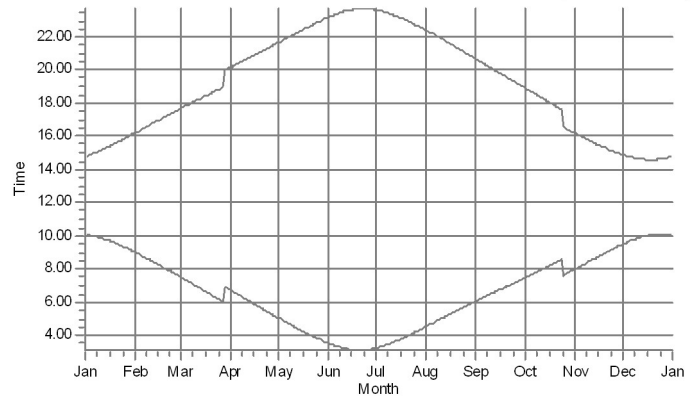
32: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



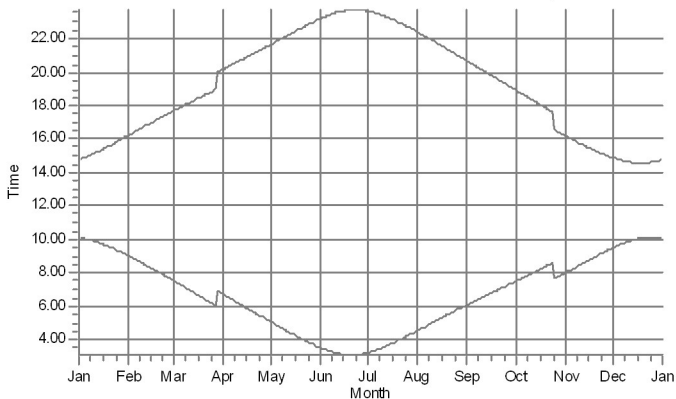
33: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



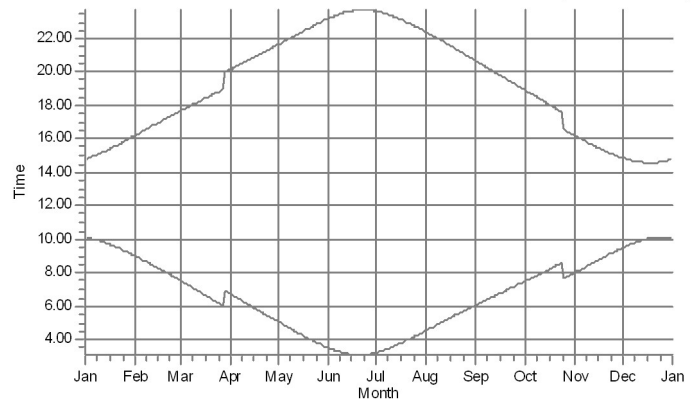
34: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



35: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



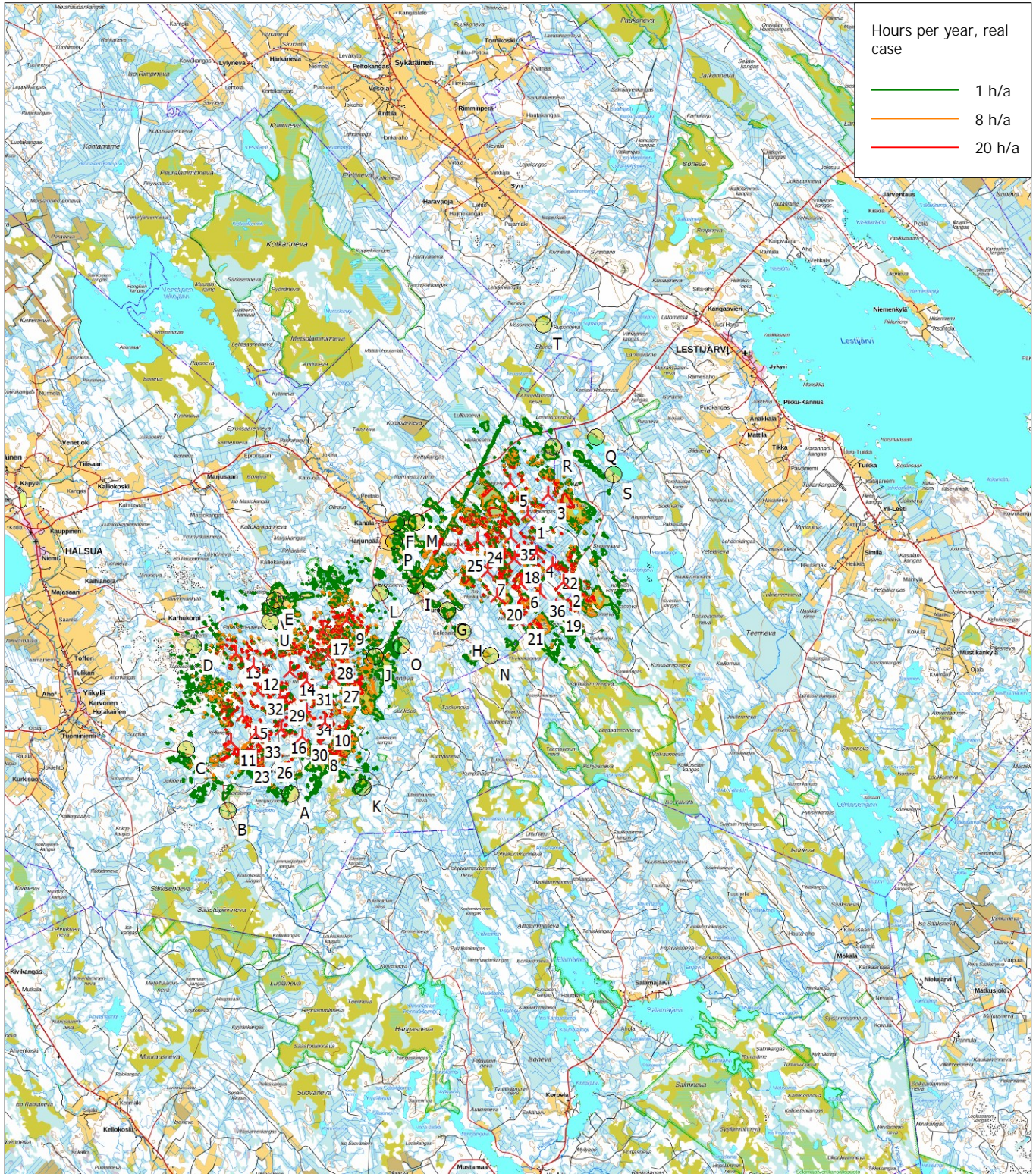
36: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

## SHADOW - Map

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402



New WTG

Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wpo (2)

14.4.2021

---

**Liite 8: Halsuan tuulivoimahanke – Varjostusmallinnusten tulokset “real case, Luke forest” yhteisvaikutushankkeiden kanssa**

## SHADOW - Main Result

Calculation: Halsua\_Generic RD180x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset Assumptions for shadow calculations

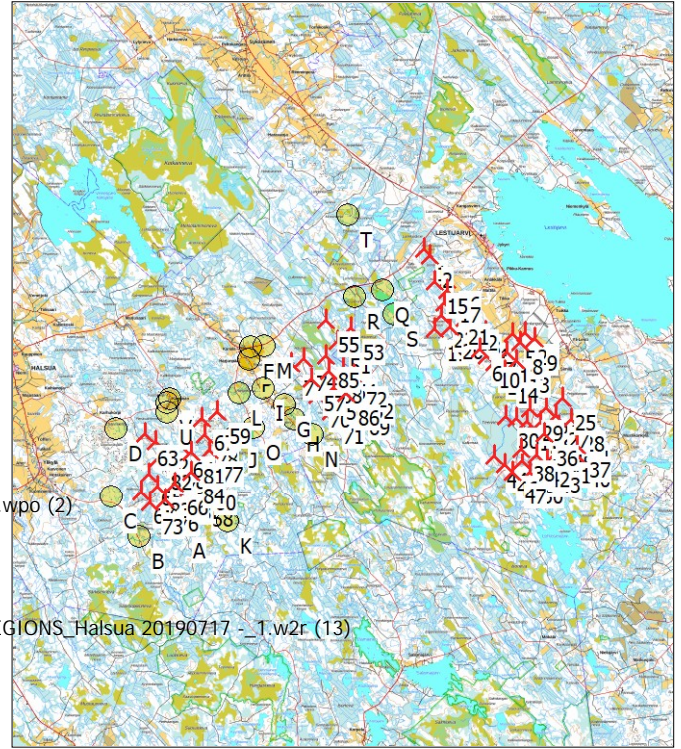
Maximum distance for influence  
 Calculate only when more than 20 % of sun is covered by the blade  
 Please look in WTG table

Minimum sun height over horizon for influence 3 °  
 Day step for calculation 1 days  
 Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [UMEA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:  
 Height contours used: Height Contours: CONTOURLINE\_Halsua 20190717\_0.wypo (2)  
 Area object(s) used in calculation:  
 Area object (Puuston pituus): (9)  
 Area object (Puuston pituus): (10)  
 Area object (Puuston pituus): (11)  
 Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REGIONS\_Halsua 20190717\_-\_1.w2r (13)  
 Obstacles used in calculation  
 Eye height for map: 1,5 m  
 Grid resolution: 10,0 m



Scale 1:400 000  
 New WTG Shadow receptor

All coordinates are in  
 Finish TM ETRS-TM35FIN-ETRS89

### WTGs

	East	North	Z	Row data/Description	WTG type			Shadow data					
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]	
			[m]										
1	380 684	7 045 698	150,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
2	381 007	7 045 328	151,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
3	383 517	7 041 785	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
4	383 921	7 041 331	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
5	385 377	7 041 252	150,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
6	383 621	7 040 446	163,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
7	384 366	7 040 664	153,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
8	385 748	7 040 770	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
9	386 533	7 040 991	152,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
10	384 006	7 040 089	165,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
11	384 378	7 039 713	160,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
12	385 046	7 040 278	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
13	385 544	7 039 842	150,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
14	384 960	7 039 279	160,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
15	381 256	7 043 966	155,6	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
16	381 931	7 044 063	150,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
17	381 895	7 043 549	152,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
18	381 752	7 042 851	156,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
19	381 247	7 041 502	170,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
20	382 062	7 041 595	168,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
21	382 350	7 042 369	157,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
22	382 800	7 042 046	162,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
23	381 625	7 042 211	167,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
24	386 021	7 041 317	150,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
25	388 010	7 037 832	155,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
26	387 110	7 037 362	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
27	387 614	7 036 963	158,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
28	388 428	7 036 760	158,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
29	386 241	7 037 319	157,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	
30	384 992	7 036 878	159,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4	

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
31	385 558	7 036 812	158,2	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
32	386 107	7 036 645	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
33	387 785	7 036 395	165,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
34	388 702	7 035 986	165,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
35	386 237	7 035 806	166,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
36	387 014	7 035 959	168,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
37	388 741	7 035 374	167,8	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
38	385 820	7 034 376	164,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
39	387 147	7 035 440	168,9	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
40	388 745	7 034 846	166,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
41	387 731	7 035 082	167,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
42	386 636	7 034 860	172,3	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
43	387 159	7 034 572	171,4	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
44	384 386	7 034 826	160,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
45	385 843	7 034 542	172,5	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
46	384 948	7 034 376	163,7	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
47	385 365	7 033 972	170,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
48	386 798	7 036 582	164,1	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
49	387 892	7 035 785	165,2	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
50	386 250	7 033 976	169,0	VESTAS V150-4.2 4200 15...	Yes	VESTAS	V150-4.2-4 200	4 200	150,0	165,0	1 901	10,4
51	376 145	7 040 853	169,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
52	377 373	7 038 465	172,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
53	376 837	7 041 535	170,2	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
54	376 444	7 039 476	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
55	375 536	7 041 980	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
56	375 916	7 038 416	167,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
57	374 748	7 038 849	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
58	368 911	7 032 725	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
59	369 826	7 037 147	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
60	369 062	7 033 588	162,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
61	365 799	7 032 897	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
62	366 591	7 035 576	153,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
63	365 986	7 035 968	147,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
64	367 861	7 035 366	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
65	366 214	7 033 846	157,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
66	367 557	7 033 342	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
67	369 000	7 036 800	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
68	375 673	7 039 283	164,1	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
69	377 129	7 037 609	175,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
70	375 066	7 037 992	164,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
71	375 806	7 037 151	168,9	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
72	376 995	7 039 070	171,8	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
73	366 276	7 032 332	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
74	374 380	7 039 957	161,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
75	373 695	7 039 683	159,3	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
76	367 076	7 032 483	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
77	369 380	7 035 142	160,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
78	369 173	7 035 951	160,4	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
79	367 493	7 034 489	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
80	368 275	7 033 089	162,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
81	368 432	7 035 039	155,7	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
82	366 741	7 034 702	155,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
83	366 662	7 033 192	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
84	368 431	7 033 972	157,5	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
85	375 546	7 040 069	165,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4
86	376 570	7 038 123	172,0	VESTAS V162-5.6 HH210 5...	Yes	VESTAS	V162-5.6 HH210-5 600	5 600	180,0	210,0	2 239	10,4

### Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l. [m]	of window [°]		(ZVI) a.g.l. [m]
A	Lomarakenus A (Kuuslammentie)	367 873	7 031 085	163,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakenus B (Loukkukoskentie 700)	365 699	7 030 495	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...



## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	[°]		(ZVI) a.g.l.
										[m]
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	364 243	7 032 622	153,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Purola)	364 501	7 036 228	143,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Kannistontie 557)	367 345	7 037 828	140,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Lestijarventie 1468)	371 569	7 040 539	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Hautakoskentie 455)	373 347	7 037 488	155,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Hautakoskentie 544)	373 867	7 036 728	157,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Hautakoskentie 289)	372 224	7 038 341	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Katajarventie 49)	370 829	7 035 870	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus K (Silostenlampi)	370 383	7 031 311	170,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Lomarakennus L (Harjunpaantie 215)	370 996	7 038 086	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Hakala, Iso-Mottonen)	372 265	7 040 574	147,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Lomarakennus N (Hautakoski)	374 845	7 035 914	162,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Lomarakennus O (Harjunpaantie 398)	371 749	7 036 270	166,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Asuinrakennus P (Hautakoskentie 135)	371 498	7 039 888	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Lomarakennus Q (Lemmistonrannantie)	378 528	7 043 527	160,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Peuraneva,Valvatintie)	377 034	7 043 182	165,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Lomarakennus S (Talonpaikantie 141)	379 124	7 042 238	160,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Ruipontie)	376 687	7 047 472	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
U	Lomarakennus U (Kannistontie, Kivioja)	367 174	7 037 088	144,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
V	Asuinrakennus V (Kannistontie 586)	367 193	7 037 585	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

## Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Kuuslammentie)	4:29
B	Lomarakennus B (Loukkukoskentie 700)	0:00
C	Asuinrakennus C (Loukkukoskentie, Mantyla)	0:00
D	Lomarakennus D (Purola)	0:00
E	Asuinrakennus E (Kannistontie 557)	1:37
F	Asuinrakennus F (Lestijarventie 1468)	0:00
G	Asuinrakennus G (Hautakoskentie 455)	2:33
H	Asuinrakennus H (Hautakoskentie 544)	2:19
I	Asuinrakennus I (Hautakoskentie 289)	4:00
J	Lomarakennus J (Katajarventie 49)	7:14
K	Lomarakennus K (Silostenlampi)	5:46
L	Lomarakennus L (Harjunpaantie 215)	2:48
M	Lomarakennus M (Hakala, Iso-Mottonen)	2:07
N	Lomarakennus N (Hautakoski)	0:00
O	Lomarakennus O (Harjunpaantie 398)	1:56
P	Asuinrakennus P (Hautakoskentie 135)	1:14
Q	Lomarakennus Q (Lemmistonrannantie)	0:00
R	Lomarakennus R (Peuraneva,Valvatintie)	1:47
S	Lomarakennus S (Talonpaikantie 141)	0:00
T	Lomarakennus T (Ruipontie)	0:00
U	Lomarakennus U (Kannistontie, Kivioja)	0:00
V	Asuinrakennus V (Kannistontie 586)	1:30

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (579)	0:00	0:00
2	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (580)	0:00	0:00
3	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (581)	0:00	0:00
4	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (582)	0:00	0:00
5	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (583)	0:00	0:00
6	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (584)	0:00	0:00
7	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (585)	0:00	0:00
8	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (586)	0:00	0:00
9	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (587)	0:00	0:00
10	VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (588)	0:00	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
11	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (589)	0:00	0:00
12	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (590)	0:00	0:00
13	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (591)	0:00	0:00
14	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (592)	0:00	0:00
15	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (593)	0:00	0:00
16	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (594)	0:00	0:00
17	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (595)	0:00	0:00
18	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (596)	0:00	0:00
19	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (597)	0:00	0:00
20	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (598)	0:00	0:00
21	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (599)	0:00	0:00
22	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (600)	0:00	0:00
23	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (601)	0:00	0:00
24	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (602)	0:00	0:00
25	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (624)	0:00	0:00
26	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (625)	0:00	0:00
27	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (626)	0:00	0:00
28	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (627)	0:00	0:00
29	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (628)	0:00	0:00
30	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (629)	0:00	0:00
31	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (630)	0:00	0:00
32	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (631)	0:00	0:00
33	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (632)	0:00	0:00
34	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (633)	0:00	0:00
35	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (634)	0:00	0:00
36	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (635)	0:00	0:00
37	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (636)	0:00	0:00
38	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (637)	0:00	0:00
39	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (638)	0:00	0:00
40	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (639)	0:00	0:00
41	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (640)	0:00	0:00
42	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (641)	0:00	0:00
43	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (642)	0:00	0:00
44	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (643)	0:00	0:00
45	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (644)	0:00	0:00
46	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (645)	0:00	0:00
47	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (646)	0:00	0:00
48	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (647)	0:00	0:00
49	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (648)	0:00	0:00
50	VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (649)	0:00	0:00
51	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1175)	0:00	0:00
52	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1176)	0:00	0:00
53	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1177)	0:00	0:00
54	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1178)	0:00	0:00
55	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1179)	9:04	1:47
56	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1180)	0:00	0:00
57	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1181)	0:00	0:00
58	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1182)	21:42	5:46
59	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)	24:07	5:02
60	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184)	0:00	0:00
61	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)	0:00	0:00
62	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)	0:00	0:00
63	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)	0:00	0:00
64	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)	0:00	0:00
65	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)	0:00	0:00
66	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190)	0:00	0:00
67	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)	26:07	5:27
68	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)	0:00	0:00
69	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)	0:00	0:00
70	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)	14:03	3:04
71	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)	8:58	1:48
72	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1196)	0:00	0:00
73	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)	17:28	4:29
74	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1198)	0:00	0:00
75	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)	32:05	7:22
76	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200)	0:00	0:00

To be continued on next page...

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Main Result

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
77	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1201)	11:38	2:15
78	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202)	11:28	2:24
79	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203)	0:00	0:00
80	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)	0:00	0:00
81	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)	0:00	0:00
82	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206)	0:00	0:00
83	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207)	0:00	0:00
84	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)	0:00	0:00
85	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)	0:00	0:00
86	VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukseShadow receptor: A - Lomarakenus A (Kuuslammentie)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December		
1	10.04	09.01	07.32	06.46	05.04	03.33	21.11 (73)	03.15	04.34	21.25 (73)	06.05	07.28	07.59	09.29
2	14.49	16.14	17.41	20.10	21.39	23.10	18 21.29 (73)	23.37	22.23	8 21.33 (73)	20.40	18.56	16.13	14.54
3	10.04	08.58	07.29	06.43	05.01	03.31	21.13 (73)	03.17	21.25 (73)	06.08	07.31	08.02	09.32	
4	14.50	16.17	17.44	20.13	21.42	23.13	17 21.30 (73)	23.36	4 21.29 (73)	22.19	20.36	18.53	16.10	14.52
5	10.03	08.55	07.25	06.39	04.57	03.29	21.13 (73)	03.19	21.24 (73)	04.40	06.11	07.34	08.05	09.34
6	14.52	16.20	17.46	20.16	21.45	23.15	16 21.29 (73)	23.34	7 21.31 (73)	22.16	20.33	18.49	16.07	14.50
7	10.02	08.52	07.22	06.36	04.54	03.27	21.14 (73)	03.20	21.23 (73)	04.43	06.14	07.37	08.08	09.37
8	14.54	16.23	17.49	20.19	21.48	23.18	15 21.29 (73)	23.33	8 21.31 (73)	22.13	20.29	18.46	16.04	14.49
9	10.00	08.49	07.19	06.32	04.51	03.25	21.15 (73)	03.22	21.23 (73)	04.46	06.16	07.40	08.11	09.39
10	14.56	16.26	17.52	20.22	21.51	23.20	14 21.29 (73)	23.31	10 21.33 (73)	22.10	20.26	18.42	16.01	14.47
11	09.59	08.46	07.15	06.29	04.48	03.23	21.16 (73)	03.24	21.22 (73)	04.49	06.19	07.43	08.14	09.42
12	14.59	16.29	17.55	20.25	21.54	23.22	12 21.28 (73)	23.30	12 21.34 (73)	22.07	20.22	18.39	15.58	14.46
13	09.58	08.43	07.12	06.25	04.44	03.21	21.16 (73)	03.26	21.22 (73)	04.52	06.22	07.45	08.18	09.44
14	15.01	16.33	17.58	20.28	21.57	23.21	11 21.27 (73)	23.28	13 21.35 (73)	22.04	20.19	18.36	15.55	14.44
15	09.56	08.40	07.09	06.22	04.41	03.19	21.17 (73)	03.28	21.21 (73)	04.55	06.25	07.48	08.21	09.46
16	15.03	16.36	18.01	20.30	22.00	23.26	9 21.26 (73)	23.26	14 21.35 (73)	22.00	20.16	18.32	15.52	14.43
17	09.55	08.37	07.05	06.18	04.38	03.17	21.19 (73)	03.30	21.21 (73)	04.58	06.28	07.51	08.24	09.48
18	15.06	16.39	18.04	20.33	22.03	23.28	8 21.27 (73)	23.24	15 21.36 (73)	21.57	20.12	18.29	15.49	14.42
19	09.53	08.34	07.02	06.15	04.35	03.16	21.20 (73)	03.33	21.20 (73)	05.01	06.30	07.54	08.27	09.50
20	15.08	16.42	18.07	20.36	22.06	23.30	6 21.26 (73)	23.22	17 21.37 (73)	21.54	20.09	18.25	15.46	14.41
21	09.51	08.31	06.58	06.12	04.32	3 21.19 (73)	03.15	03.35	21.19 (73)	05.04	06.33	07.57	08.30	09.52
22	15.11	16.45	18.10	20.39	22.09	2 21.21 (73)	23.32	23.20	18 21.37 (73)	21.51	20.05	18.22	15.43	14.40
23	09.50	08.27	06.55	06.08	04.29	2 21.14 (73)	03.13	03.38	21.19 (73)	05.07	06.36	08.00	08.33	09.54
24	15.13	16.48	18.13	20.42	22.13	10 21.24 (73)	23.33	23.18	19 21.38 (73)	21.47	20.02	18.19	15.40	14.39
25	09.48	08.24	06.51	06.05	04.26	2 21.12 (73)	03.12	03.40	21.19 (73)	05.10	06.39	08.02	08.36	09.56
26	15.16	16.52	18.16	20.45	22.16	13 21.25 (73)	23.35	23.15	19 21.38 (73)	21.44	19.58	18.15	15.38	14.38
27	09.46	08.21	06.48	06.01	04.22	2 21.12 (73)	03.11	03.43	21.19 (73)	05.13	06.41	08.05	08.39	09.57
28	15.19	16.55	18.19	20.48	22.19	15 21.27 (73)	23.36	23.13	20 21.39 (73)	21.41	19.55	18.12	15.35	14.37
29	09.44	08.18	06.45	05.58	04.19	2 21.10 (73)	03.10	03.45	21.19 (73)	05.16	06.44	08.08	08.42	09.59
30	15.22	16.58	18.22	20.51	22.22	18 21.28 (73)	23.37	23.11	20 21.39 (73)	21.37	19.51	18.09	15.32	14.37
31	09.42	08.15	06.41	05.54	04.16	2 21.10 (73)	03.09	03.48	21.19 (73)	05.19	06.47	08.11	08.45	10.00
1	15.24	17.01	18.24	20.54	22.25	19 21.29 (73)	23.39	23.08	21 21.40 (73)	21.34	19.48	18.05	15.29	14.37
2	09.39	08.12	06.38	05.51	04.13	2 21.10 (73)	03.09	03.51	21.18 (73)	05.22	06.50	08.14	08.49	10.01
3	15.27	17.04	18.27	20.57	22.28	20 21.30 (73)	23.39	23.06	22 21.40 (73)	21.31	19.44	18.02	15.27	14.36
4	09.37	08.08	06.34	05.48	04.10	2 21.09 (73)	03.08	03.53	21.18 (73)	05.25	06.52	08.17	08.52	10.02
5	15.30	17.07	18.30	21.00	22.31	21 21.30 (73)	23.40	23.03	22 21.40 (73)	21.27	19.41	17.59	15.24	14.36
6	09.35	08.05	06.31	05.44	04.07	2 21.09 (73)	03.08	03.56	21.19 (73)	05.28	06.55	08.20	08.55	10.03
7	15.33	17.10	18.33	21.03	22.34	21 21.30 (73)	23.41	23.00	22 21.41 (73)	21.24	19.37	17.55	15.21	14.36
8	09.32	08.02	06.27	05.41	04.05	2 21.09 (73)	03.08	03.59	21.19 (73)	05.31	06.58	08.23	08.58	10.04
9	15.36	17.13	18.36	21.06	22.37	22 21.31 (73)	23.41	22.58	22 21.41 (73)	21.21	19.34	17.52	15.19	14.36
10	09.30	07.59	06.24	05.37	04.02	2 21.08 (73)	03.08	04.02	21.18 (73)	05.34	07.01	08.26	09.01	10.05
11	15.39	17.16	18.39	21.09	22.40	22 21.30 (73)	23.42	22.55	23 21.41 (73)	21.17	19.31	17.49	15.16	14.37
12	09.28	07.55	06.21	05.34	03.59	2 21.08 (73)	03.08	04.05	21.18 (73)	05.36	07.04	08.29	09.04	10.06
13	15.42	17.19	18.42	21.12	22.43	23 21.31 (73)	23.42	22.52	23 21.41 (73)	21.14	19.27	17.45	15.14	14.37
14	09.25	07.52	06.17	05.31	03.56	2 21.09 (73)	03.08	04.07	21.19 (73)	05.39	07.06	08.32	09.07	10.06
15	15.45	17.22	18.44	21.15	22.46	22 21.31 (73)	23.42	22.49	22 21.41 (73)	21.10	19.24	17.42	15.11	14.38
16	09.23	07.49	06.14	05.27	03.53	2 21.09 (73)	03.08	04.10	21.19 (73)	05.42	07.09	08.35	09.10	10.06
17	15.48	17.25	18.47	21.18	22.49	22 21.31 (73)	23.42	22.47	22 21.41 (73)	21.07	19.20	17.39	15.09	14.38
18	09.20	07.45	06.10	05.24	03.51	2 21.09 (73)	03.09	04.13	21.19 (73)	05.45	07.12	07.38	09.13	10.07
19	15.51	17.29	18.50	21.21	22.51	22 21.31 (73)	23.42	22.44	21 21.40 (73)	21.04	19.17	17.36	15.07	14.39
20	09.17	07.42	06.07	05.21	03.48	2 21.09 (73)	03.10	04.16	21.20 (73)	05.48	07.15	07.41	09.15	10.07
21	15.55	17.32	18.53	21.24	22.54	22 21.31 (73)	23.41	22.41	21 21.41 (73)	21.00	19.13	17.32	15.04	14.40
22	09.15	07.39	06.03	05.17	03.45	2 21.09 (73)	03.11	04.19	21.20 (73)	05.51	07.17	07.44	09.18	10.07
23	15.58	17.35	18.56	21.27	22.57	22 21.31 (73)	23.41	22.38	20 21.40 (73)	20.57	19.10	17.29	15.02	14.41
24	09.12	07.35	06.00	05.14	03.43	2 21.10 (73)	03.12	04.22	21.21 (73)	05.54	07.20	07.47	09.21	10.06
25	16.01	17.38	18.59	21.30	23.00	20 21.30 (73)	23.40	22.35	19 21.40 (73)	20.53	19.06	17.26	15.00	14.42
26	09.09	07.32	06.01	05.11	03.40	2 21.10 (73)	03.13	04.25	21.22 (73)	05.57	07.23	07.50	09.24	10.06
27	16.04	17.41	19.02	21.33	23.03	20 21.30 (73)	23.39	22.32	16 21.38 (73)	20.50	19.03	17.23	14.58	14.44
28	09.06	07.29	06.03	05.07	03.38	2 21.11 (73)	03.14	04.28	21.22 (73)	05.59	07.26	07.53	09.27	10.06
29	16.07	17.44	19.05	21.36	23.05	20 21.31 (73)	23.38	22.29	15 21.37 (73)	20.47	19.00	17.20	14.56	14.45
30	09.03	07.26	06.00	05.05	03.35	2 21.11 (73)	03.13	04.31	21.24 (73)	06.02	07.26	07.56	09.27	10.05
31	16.10	17.47	19.08	21.37	23.06	19 21.30 (73)	23.39	22.26	12 21.36 (73)	20.43	19.00	17.20	14.56	14.45
Potential sun hours	179	241	363	448	561	609	597	504	392	307	204	148		
Total, worst case					395	126	519	8						
Sun reduction					0,48	0,49	0,39	0,32						
Oper. time red.					0,93	0,93	0,93	0,93						
Wind dir. red.					0,64	0,64	0,64	0,64						
Total reduction														

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset Shadow receptor: B - Lomarakennus B (Loukkukoskentie 700)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.49	09.01 16.14	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.16 23.37	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.14	09.29 14.54
2	10.04 14.51	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.31 23.13	03.17 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.53	08.55 16.20	07.26 17.47	06.39 20.16	04.58 21.45	03.29 23.15	03.19 23.35	04.40 22.16	06.11 20.33	07.34 18.49	08.05 16.07	09.34 14.51
4	10.02 14.55	08.52 16.23	07.22 17.50	06.36 20.19	04.54 21.48	03.27 23.18	03.21 23.33	04.43 22.13	06.14 20.29	07.37 18.46	08.08 16.04	09.37 14.49
5	10.00 14.57	08.49 16.27	07.19 17.53	06.32 20.22	04.51 21.51	03.25 23.20	03.22 23.31	04.46 22.10	06.17 20.26	07.40 18.43	08.11 16.01	09.39 14.47
6	09.59 14.59	08.46 16.30	07.15 17.56	06.29 20.25	04.48 21.54	03.23 23.22	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	09.58 15.01	08.43 16.33	07.12 17.58	06.26 20.28	04.45 21.57	03.21 23.24	03.26 23.28	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.44 14.44
8	09.56 15.04	08.40 16.36	07.09 18.01	06.22 20.31	04.42 22.00	03.19 23.26	03.29 23.26	04.55 22.00	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.06	08.37 16.39	07.05 18.04	06.19 20.33	04.38 22.03	03.18 23.28	03.31 23.24	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.48 14.42
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.16 23.30	03.33 23.22	05.01 21.54	06.31 20.09	07.54 18.26	08.27 15.46	09.50 14.41
11	09.51 15.11	08.31 16.46	06.58 18.10	06.12 20.39	04.32 22.10	03.15 23.32	03.35 23.20	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.40
12	09.50 15.14	08.28 16.49	06.55 18.13	06.08 20.42	04.29 22.13	03.14 23.33	03.38 23.18	05.07 21.47	06.36 20.02	08.00 18.19	08.33 15.41	09.54 14.39
13	09.48 15.16	08.24 16.52	06.52 18.16	06.05 20.45	04.26 22.16	03.12 23.35	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.16	08.36 15.38	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.02 20.48	04.23 22.19	03.11 23.36	03.43 23.13	05.13 21.41	06.42 19.55	08.06 18.12	08.39 15.35	09.57 14.38
15	09.44 15.22	08.18 16.58	06.45 18.22	05.58 20.51	04.20 22.22	03.10 23.37	03.45 23.11	05.16 21.37	06.44 19.51	08.08 18.09	08.42 15.32	09.59 14.37
16	09.42 15.25	08.15 17.01	06.41 18.25	05.55 20.54	04.17 22.25	03.10 23.39	03.48 23.08	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.00 14.37
17	09.39 15.28	08.12 17.04	06.38 18.27	05.51 20.57	04.14 22.28	03.09 23.40	03.51 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.27	10.01 14.37
18	09.37 15.30	08.09 17.07	06.35 18.30	05.48 21.00	04.11 22.31	03.09 23.40	03.54 23.03	05.25 21.27	06.53 19.41	08.17 17.59	08.52 15.24	10.02 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.08 22.34	03.08 23.41	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.56	08.55 15.21	10.03 14.36
20	09.33 15.36	08.02 17.14	06.28 18.36	05.41 21.06	04.05 22.37	03.08 23.41	03.59 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.19	10.04 14.37
21	09.30 15.39	07.59 17.17	06.24 18.39	05.38 21.09	04.02 22.40	03.08 23.42	04.02 22.55	05.34 21.17	07.01 19.31	08.26 17.49	09.01 15.16	10.05 14.37
22	09.28 15.42	07.55 17.20	06.21 18.42	05.34 21.12	03.59 22.43	03.08 23.42	04.05 22.52	05.37 21.14	07.04 19.27	08.29 17.46	09.04 15.14	10.06 14.37
23	09.25 15.46	07.52 17.23	06.17 18.45	05.31 21.15	03.56 22.46	03.08 23.42	04.08 22.49	05.40 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.38
24	09.23 15.49	07.49 17.26	06.14 18.48	05.28 21.18	03.54 22.49	03.09 23.42	04.11 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.06 14.38
25	09.20 15.52	07.46 17.29	06.10 18.50	05.24 21.21	03.51 22.52	03.09 23.42	04.14 22.44	05.45 21.04	07.12 19.17	07.38 16.36	09.13 15.07	10.07 14.39
26	09.17 15.55	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.54	03.10 23.41	04.16 22.41	05.48 21.00	07.15 19.13	07.41 16.33	09.16 15.05	10.07 14.40
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.46 22.57	03.11 23.41	04.19 22.38	05.51 20.57	07.18 19.10	07.44 16.29	09.18 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.43 23.00	03.12 23.40	04.22 22.35	05.54 20.54	07.20 19.07	07.47 16.26	09.21 15.00	10.07 14.42
29	09.09 16.04		06.57 20.02	05.11 21.33	03.40 23.03	03.13 23.39	04.25 22.32	05.57 20.50	07.23 19.03	07.50 16.23	09.24 14.58	10.06 14.44
30	09.06 16.07		06.53 20.05	05.08 21.36	03.38 23.05	03.14 23.38	04.28 22.29	06.00 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.45
31	09.04 16.11		06.50 20.08	05.08 21.36	03.36 23.08	03.14 23.38	04.31 22.26	06.03 20.43	07.56 16.17		10.05 14.47	
Potential sun hours	180	241	363	448	561	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset Shadow receptor: C - Asuinrakennus C (Loukkukoskentie, Mantyla)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.49	16.14	17.41	20.11	21.39	23.11	23.38	22.23	20.40	18.56	16.14	14.54
2	10.04	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.32	08.02	09.32
	14.51	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.37	18.53	16.11	14.52
3	10.03	08.55	07.26	06.39	04.58	03.29	03.19	04.40	06.11	07.34	08.06	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.50	16.07	14.51
4	10.02	08.52	07.22	06.36	04.54	03.27	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.34	22.14	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.33	04.51	03.25	03.22	04.46	06.17	07.40	08.12	09.40
	14.57	16.27	17.53	20.22	21.51	23.21	23.32	22.10	20.26	18.43	16.01	14.47
6	10.00	08.46	07.16	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.30	17.56	20.25	21.55	23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.26	04.45	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.59	20.28	21.58	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.18	03.31	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.54	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.31	07.54	08.27	09.51
	15.08	16.42	18.07	20.37	22.07	23.31	23.23	21.54	20.09	18.26	15.46	14.41
11	09.52	08.31	06.59	06.12	04.32	03.15	03.35	05.04	06.33	07.57	08.30	09.53
	15.11	16.46	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.13	03.38	05.07	06.36	08.00	08.33	09.54
	15.14	16.49	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.41	14.39
13	09.48	08.25	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.59	18.16	15.38	14.38
14	09.46	08.22	06.48	06.02	04.23	03.11	03.43	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.38
15	09.44	08.18	06.45	05.58	04.20	03.10	03.45	05.16	06.44	08.09	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.52	18.09	15.32	14.37
16	09.42	08.15	06.42	05.55	04.17	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.25	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.06	15.29	14.37
17	09.40	08.12	06.38	05.51	04.14	03.09	03.51	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.28	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.27	14.36
18	09.38	08.09	06.35	05.48	04.11	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.08	03.08	03.56	05.28	06.56	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.56	15.21	14.36
20	09.33	08.02	06.28	05.41	04.05	03.08	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.14	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.38	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.17	18.39	21.09	22.40	23.42	22.55	21.18	19.31	17.49	15.16	14.37
22	09.28	07.56	06.21	05.34	03.59	03.08	04.05	05.37	07.04	08.29	09.04	10.06
	15.42	17.20	18.42	21.12	22.43	23.42	22.53	21.14	19.27	17.46	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.08	05.40	07.07	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.38
24	09.23	07.49	06.14	05.28	03.53	03.09	04.10	05.43	07.09	08.35	09.10	10.07
	15.49	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.11	05.24	03.51	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.52	17.29	18.51	21.21	22.52	23.42	22.44	21.04	19.17	16.36	15.07	14.39
26	09.18	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.01	19.14	16.33	15.04	14.40
27	09.15	07.39	06.04	05.18	03.45	03.11	04.19	05.51	07.18	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	16.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.12	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	16.26	15.00	14.42
29	09.10		06.57	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	16.23	14.58	14.44
30	09.07		06.53	05.08	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.36		04.31	06.03		07.56		10.06
	16.11		20.08		23.08		22.26	20.43		16.17		14.47
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
--------------	------------------	-----------------	----------------------	---------------------------------	--------------------------------	----------------------------------	---------------------------------

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetShadow receptor: D - Lomarakenus D (Purola)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.33	06.46	05.04	03.33	03.15	04.34	06.05	07.29	08.00	09.30
	14.48	16.14	17.41	20.11	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.04	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.32	08.03	09.33
	14.50	16.17	17.44	20.13	21.42	23.14	23.37	22.20	20.37	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.06	09.35
	14.52	16.20	17.47	20.16	21.46	23.16	23.36	22.17	20.33	18.50	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.38
	14.54	16.23	17.50	20.19	21.49	23.19	23.34	22.14	20.30	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.17	07.40	08.12	09.40
	14.56	16.26	17.53	20.22	21.52	23.21	23.33	22.11	20.26	18.43	16.01	14.47
6	10.00	08.46	07.16	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.56	20.25	21.55	23.23	23.31	22.07	20.23	18.39	15.58	14.45
7	09.59	08.43	07.12	06.26	04.44	03.20	03.26	04.52	06.22	07.46	08.18	09.45
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.49	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.56	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.34	22.04	23.29	23.25	21.58	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.31	07.54	08.27	09.51
	15.08	16.42	18.07	20.37	22.07	23.31	23.23	21.54	20.09	18.26	15.46	14.40
11	09.52	08.31	06.59	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.31	09.53
	15.11	16.45	18.10	20.40	22.10	23.33	23.21	21.51	20.06	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.34	09.55
	15.13	16.49	18.13	20.42	22.13	23.35	23.19	21.48	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.45	19.59	18.16	15.37	14.38
14	09.46	08.22	06.48	06.01	04.22	03.10	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.09	08.43	10.00
	15.21	16.58	18.22	20.51	22.22	23.39	23.12	21.38	19.52	18.09	15.32	14.37
16	09.42	08.15	06.42	05.55	04.16	03.09	03.47	05.19	06.47	08.12	08.46	10.01
	15.24	17.01	18.25	20.54	22.26	23.40	23.09	21.35	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.28	20.57	22.29	23.41	23.07	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.35	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.32	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.36	08.06	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.35	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.38	23.43	22.59	21.21	19.34	17.52	15.19	14.36
21	09.31	07.59	06.24	05.38	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.06
	15.39	17.16	18.39	21.09	22.41	23.43	22.56	21.18	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.37	07.04	08.29	09.04	10.07
	15.42	17.20	18.42	21.12	22.44	23.43	22.53	21.14	19.27	17.46	15.14	14.37
23	09.26	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.07	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.47	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49	23.43	22.47	21.08	19.20	17.39	15.09	14.38
25	09.21	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.08
	15.51	17.29	18.51	21.21	22.52	23.43	22.44	21.04	19.17	16.36	15.06	14.39
26	09.18	07.43	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.08
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.01	19.14	16.33	15.04	14.40
27	09.15	07.39	06.04	05.17	03.45	03.10	04.19	05.51	07.18	07.44	09.19	10.08
	15.58	17.35	18.56	21.27	22.58	23.42	22.39	20.57	19.10	16.29	15.02	14.41
28	09.13	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07
	16.01	17.38	18.59	21.30	23.01	23.41	22.36	20.54	19.07	16.26	15.00	14.42
29	09.10		06.57	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.25	10.07
	16.04		20.02	21.33	23.04	23.40	22.32	20.50	19.03	16.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	06.00	07.26	07.53	09.27	10.07
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	16.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.09		22.26	20.44		16.17		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.49/3.4.388

## SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset Shadow receptor: E - Asuinrakennus E (Kannistontie 557)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48 10.04	09.01 16.13 08.58	07.32 17.40 08.43 (67)	06.46 20.10 06.43	05.04 21.39 05.00	03.32 23.11 03.30	03.14 23.38 03.16	04.34 22.23 04.37	06.05 20.40 06.08	07.29 18.56 07.31		07.59 16.13 08.02
2	14.50 10.03	16.16 08.55	17.43 07.26	21 08.43 (67) 20.13 06.39	21.42 04.57	23.14 03.28	23.37 03.17	22.20 04.40	20.36 06.11	18.53 07.34	09.08 (67)	16.10 08.06
3	14.52 10.02	16.20 08.52	17.46 07.22	22 08.44 (67) 20.16 06.36	21.45 04.54	23.16 03.26	23.36 03.19	22.17 04.43	20.33 06.13	18.49 07.37	1 09.09 (67)	16.07 08.09
4	14.54 10.01	16.23 08.49	17.49 07.19	22 08.43 (67) 20.19 06.32	21.48 04.51	23.19 03.24	23.34 03.21	22.14 04.46	20.30 06.16	18.46 07.40	11 09.14 (67)	16.04 08.12
5	14.56 10.00	16.26 08.46	17.52 07.15	21 08.42 (67) 20.22 06.29	21.52 04.47	23.21 03.22	23.33 03.23	22.11 04.49	20.26 06.19	18.42 07.43	16 09.16 (67)	16.01 08.15
6	14.58 09.59	16.29 08.43	17.55 07.12	20 08.42 (67) 20.25 06.25	21.55 04.44	23.23 03.20	23.31 03.25	22.07 04.52	20.23 06.22	18.39 07.46	18 09.17 (67)	15.58 08.18
7	15.00 09.57	16.32 08.40	17.58 07.09	19 08.41 (67) 20.28 06.22	21.58 04.41	23.25 03.18	23.29 03.27	22.04 04.55	20.19 06.25	18.36 07.48	20 09.18 (67)	15.55 08.21
8	15.03 09.56	16.36 08.37	18.01 07.05	17 08.40 (67) 20.31 06.18	22.01 04.38	23.28 03.16	23.27 03.30	22.01 04.58	20.16 06.28	18.32 07.51	21 09.18 (67)	15.52 08.24
9	15.05 09.54	16.39 08.34	18.04 07.02	14 08.38 (67) 20.34 06.15	22.04 04.34	23.29 03.15	23.25 03.32	21.58 05.01	20.12 06.30	18.29 07.54	22 09.18 (67)	15.49 08.27
10	15.08 09.52	16.42 08.31	18.07 06.58	8 08.35 (67) 20.36 06.11	22.07 04.31	23.31 03.13	23.23 03.34	21.54 05.04	20.09 06.33	18.25 07.57	22 09.18 (67)	15.46 08.30
11	15.10 09.50	16.45 08.28	18.10 06.55	06.11 20.39	04.31 22.10	03.13 23.33	03.34 23.21	05.04 21.51	06.33 20.05	07.57 18.22	21 09.17 (67)	15.43 08.35
12	15.13 09.48	16.48 08.25	18.13 06.52	20.42 06.05	22.13 04.25	23.32 03.11	03.37 03.39	05.07 05.10	06.36 06.39	08.00 08.03	21 09.17 (67)	15.40 08.37
13	15.15 09.46	16.51 08.22	18.16 06.48	20.45 06.01	22.16 04.22	23.36 03.10	23.16 03.42	21.44 05.13	19.58 06.41	18.15 08.06	20 09.16 (67)	15.37 08.40
14	15.18 09.44	16.54 08.18	18.19 06.45	20.48 05.58	22.19 04.19	23.37 03.09	23.14 03.44	21.41 05.16	19.55 06.44	18.12 08.08	19 09.15 (67)	15.34 08.43
15	15.21 09.42	16.58 08.15	18.22 06.41	20.51 05.54	22.22 04.16	23.39 03.08	23.12 03.47	21.38 05.19	19.51 06.47	18.09 08.11	16 09.13 (67)	15.32 08.46
16	15.24 09.40	17.01 08.12	18.24 06.38	20.54 05.51	22.25 04.13	23.40 03.08	23.09 03.50	21.34 05.22	19.48 06.50	18.05 08.14	12 09.12 (67)	15.29 08.49
17	15.27 09.38	17.04 08.09	18.27 06.34	20.57 05.47	22.29 04.10	23.41 03.07	23.07 03.53	21.31 05.25	19.45 06.52	18.02 08.17	7 09.09 (67)	15.26 08.52
18	15.30 09.36	17.07 08.05	18.30 06.31	21.00 05.44	22.32 04.07	23.42 03.07	23.04 03.55	21.28 05.27	19.41 06.55	17.58 08.20		15.23 08.55
19	15.33 09.33	17.10 08.02	18.33 06.28	21.03 05.41	22.35 04.04	23.42 03.07	23.01 03.58	21.24 05.30	19.38 06.58	17.55 08.23		15.21 08.58
20	15.36 09.31	17.13 07.59	18.36 06.24	21.06 05.37	22.38 04.01	23.43 03.07	22.59 04.01	21.21 05.33	19.34 07.01	17.52 08.26		15.18 09.01
21	15.39 09.28	17.16 07.56	18.39 06.21	21.09 05.34	22.41 03.58	23.43 03.07	22.56 04.04	21.18 05.36	19.31 07.04	17.49 08.29		15.16 09.04
22	15.42 09.26	17.19 07.52	18.42 06.17	21.12 05.30	22.44 03.55	23.43 03.07	22.53 04.07	21.14 05.39	19.27 07.06	17.45 08.32		15.13 09.07
23	15.45 09.23	17.22 07.49	18.45 06.14	21.15 05.27	22.46 03.53	23.43 03.07	22.50 04.10	21.11 05.42	19.24 07.09	17.42 08.35		15.11 09.10
24	15.48 09.21	17.25 07.46	18.47 06.10	21.18 05.24	22.49 03.50	23.43 03.08	22.47 04.13	21.07 05.45	19.20 07.12	17.39 07.38		15.08 09.13
25	15.51 09.18	17.28 07.42	9 08.29 (67) 18.50 06.07	21.21 05.20	22.52 03.47	23.43 03.09	22.44 04.16	21.04 05.48	19.17 07.15	16.35 07.41		15.06 09.16
26	15.54 09.15	17.31 07.39	14 08.40 (67) 18.53 06.03	21.24 05.17	22.55 03.45	23.42 03.09	22.41 04.19	21.01 05.51	19.13 07.17	16.32 07.44		15.04 09.19
27	15.57 09.12	17.34 07.36	17 08.42 (67) 18.56 06.00	21.27 05.14	22.58 03.42	23.42 03.10	22.38 04.22	20.57 05.54	19.10 07.20	16.29 07.47		15.01 09.22
28	16.00 09.10	17.37 07.33	19 08.42 (67) 18.59 06.56	21.30 05.10	23.01 03.39	23.41 03.12	22.35 04.25	20.54 05.56	19.06 07.23	16.26 07.50		14.59 09.25
29	16.04 09.07		20.02 06.53	21.33 05.07	23.04 03.37	23.40 03.13	22.32 04.28	20.50 05.59	19.03 07.26	16.23 07.53		14.57 09.27
30	16.07 09.04		20.05 06.49	21.36 20.08	23.06 23.09	23.39	22.29 04.31	20.47 06.02	19.00 07.56	16.19 07.56		14.55 14.44
31	16.10		20.08		23.09		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	247	204
Total, worst case		59	184								247	147
Sun reduction		0.33	0.32							0.35		
Oper. time red.		0.93	0.93							0.93		
Wind dir. red.		0.64	0.64							0.64		
Total reduction		0.20	0.19							0.21		
Total, real		12	35							51		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		







Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukseShadow receptor: H - Asuinrakennus H (Hautakoskentie 544)
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes sub-rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'. Contains numerical values for sun hours and reduction percentages.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)













Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukseShadow receptor: M - Lomarakenus M (Hakala, Iso-Mottonen)
Assumptions for shadow calculations
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Includes sub-rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
OsMontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukseShadow receptor: O - Lomarakenus O (Harjunpaantie 398
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns (months) and 31 rows (days). Contains shadow calculation data including sun hours, reduction factors, and operational times.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukseShadow receptor: P - Asuinrakennus P (Hautakoskentie 135)
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). It includes potential sun hours, total worst case, sun reduction, operational time reduction, wind direction reduction, total reduction, and total real sun hours.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)











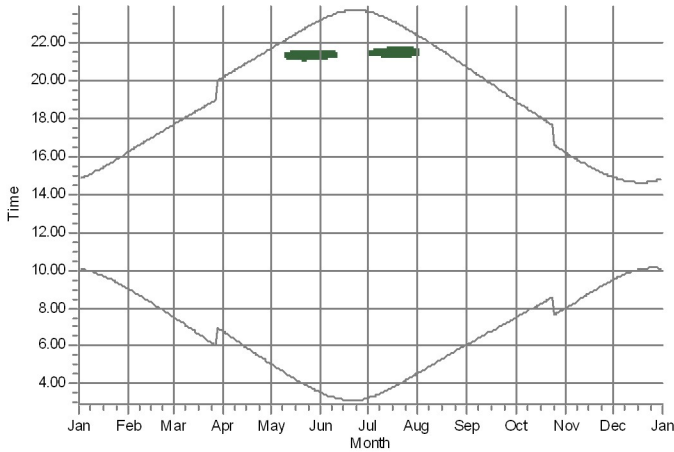




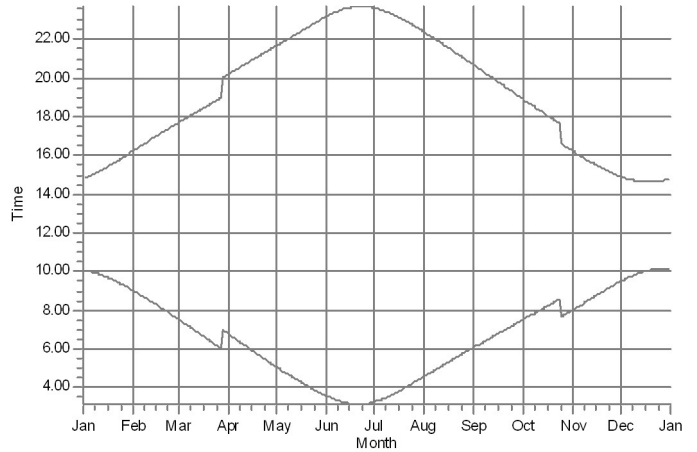
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

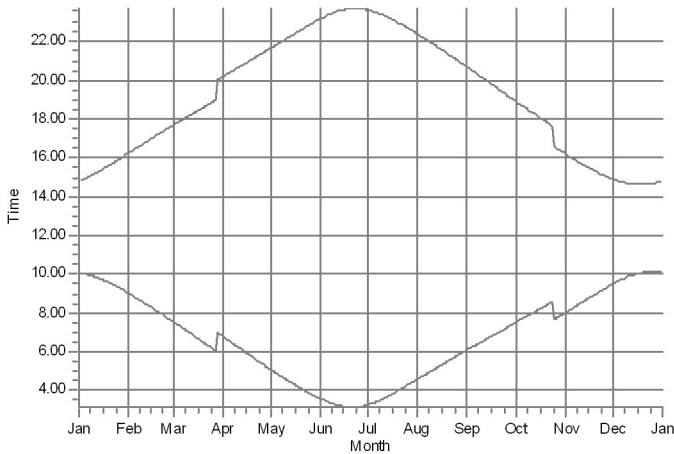
A: Lomarakenus A (Kuuslammentie)



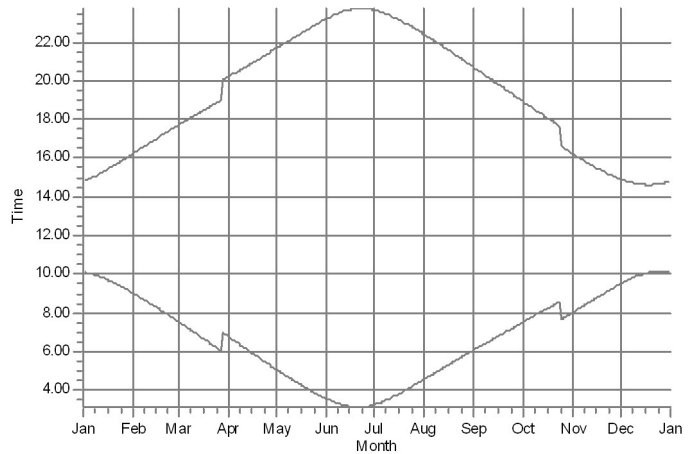
B: Lomarakenus B (Loukkukoskentie 700)



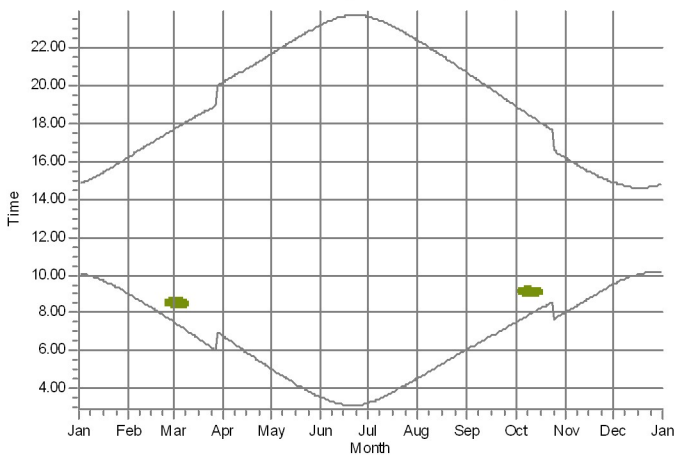
C: Asuinrakennus C (Loukkukoskentie, Mantyla)



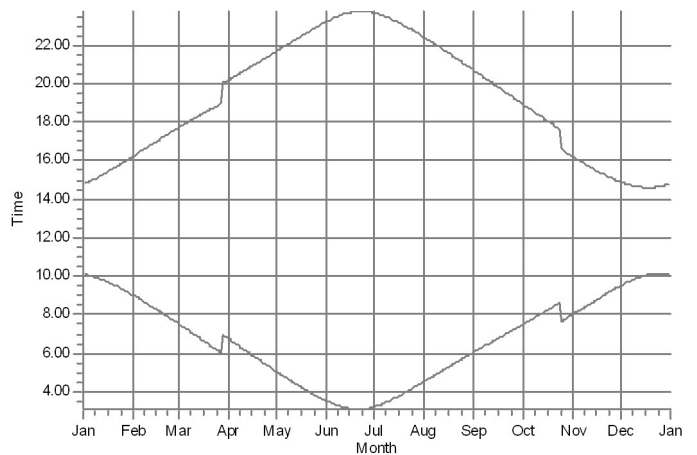
D: Lomarakenus D (Purola)



E: Asuinrakennus E (Kannistontie 557)



F: Asuinrakennus F (Lestjarventie 1468)

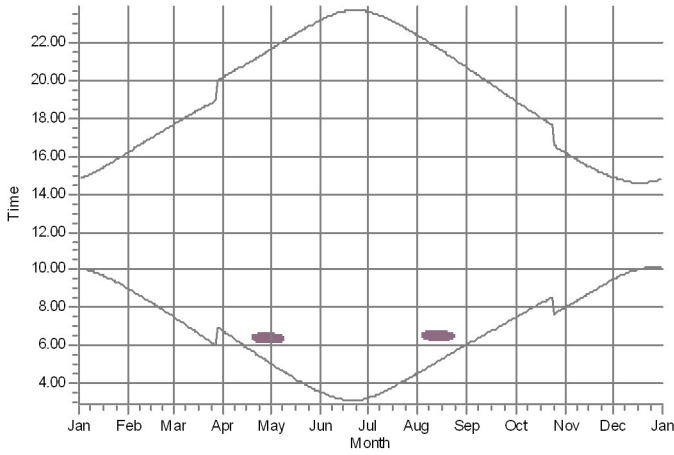


WTG: 67: VESTAS V162-S-6 HH210 5600 180.0 I/OI hub: 210.0 m (TOT: 300.0 m) (1197) 73: VESTAS V162-S-6 HH210 5600 180.0 I/OI hub: 210.0 m (TOT: 300.0 m) (1197)

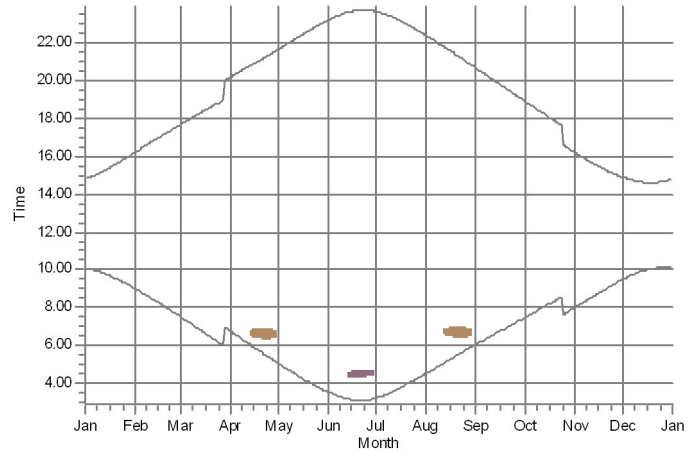
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

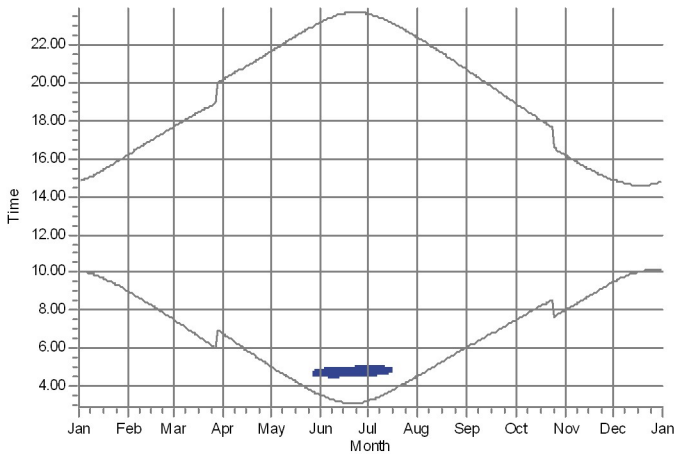
G: Asuinrakennus G (Hautakoskentie 455)



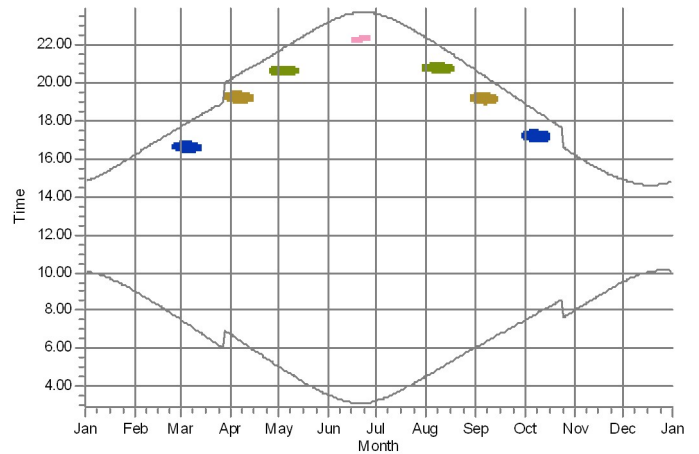
H: Asuinrakennus H (Hautakoskentie 544)



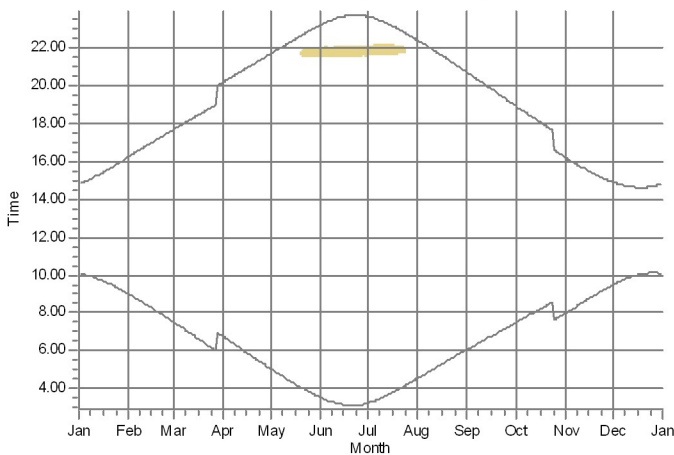
I: Asuinrakennus I (Hautakoskentie 289)



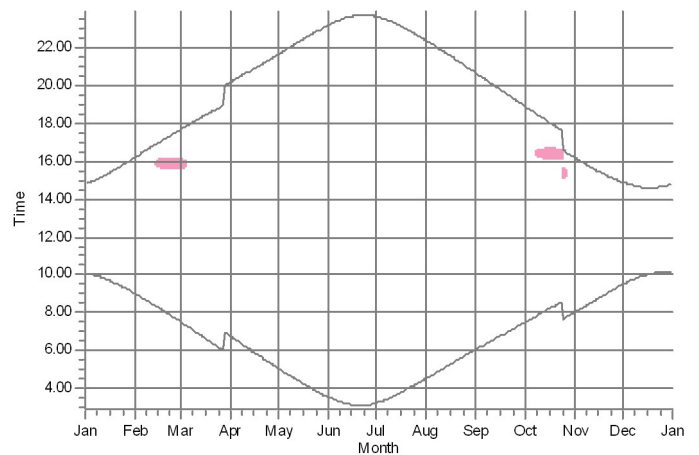
J: Lomarakennus J (Katajarventie 49)



K: Lomarakennus K (Silostenlampi)



L: Lomarakennus L (Harjunpaantie 215)

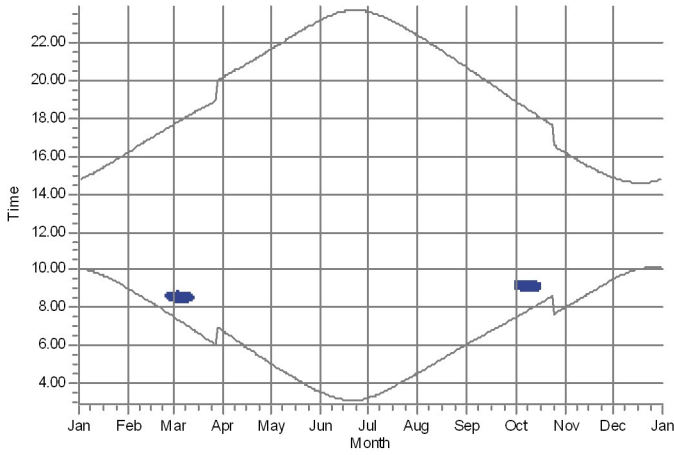


58: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1182)	67: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1191)	71: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1195)	77: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1201)
59: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)	70: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1194)	75: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)	78: VESTAS V162-5.6 HRQ10 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1202)

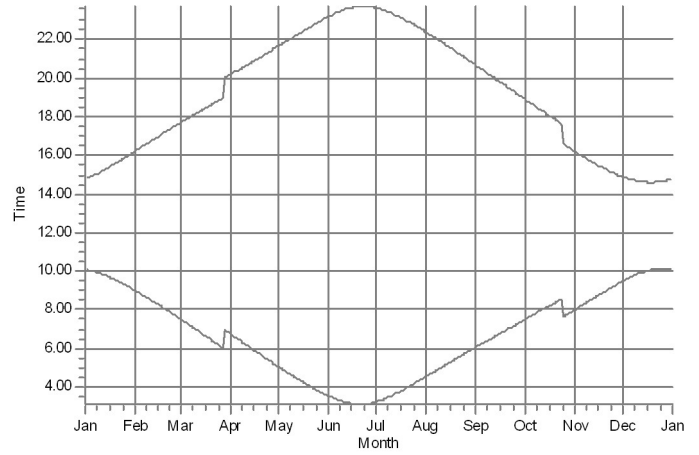
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

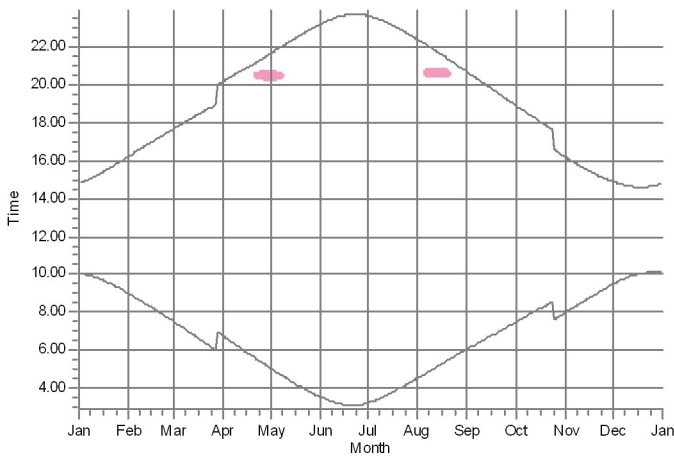
M: Lomarakenus M (Hakala, Iso-Mottonen)



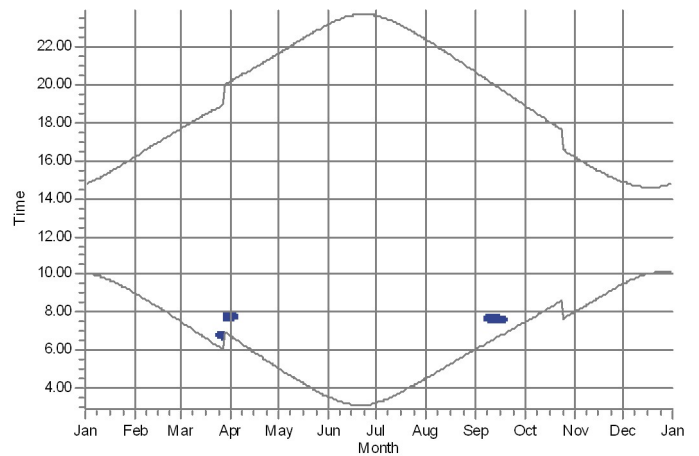
N: Lomarakenus N (Hautakoski)



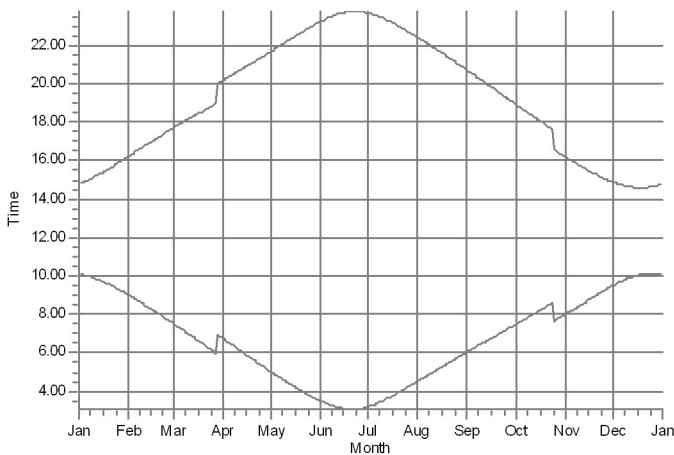
O: Lomarakenus O (Harjunpaantie 398)



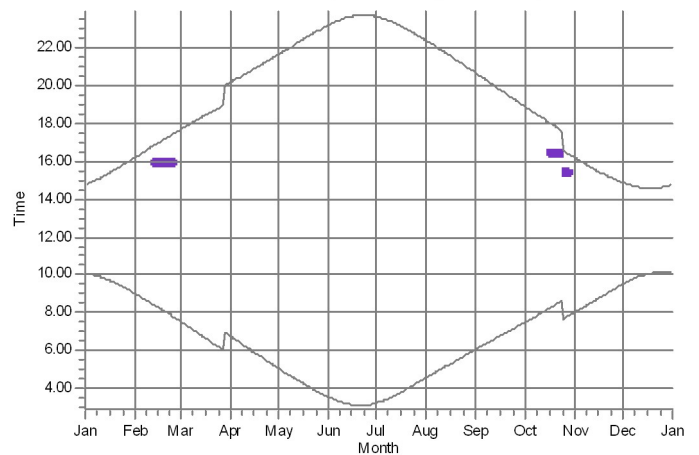
P: Asuinrakennus P (Hautakoskentie 135)



Q: Lomarakenus Q (Lemmistonrannantie)



R: Lomarakenus R (Peuraneva, Valvatintie)



WTG:

55: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1179)

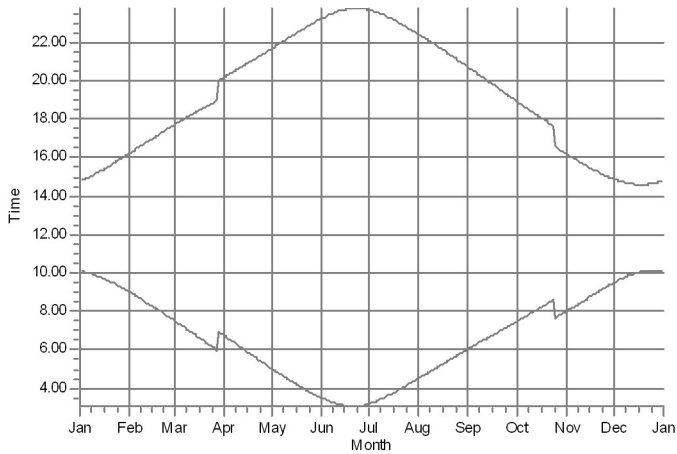
59: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1183)

75: VESTAS V162-5.6 HH210 5600 180.0 IOI hub: 210.0 m (TOT: 300.0 m) (1199)

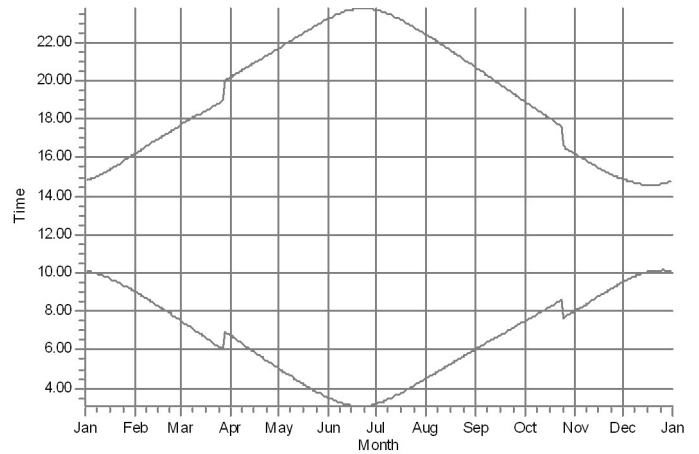
## SHADOW - Calendar, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

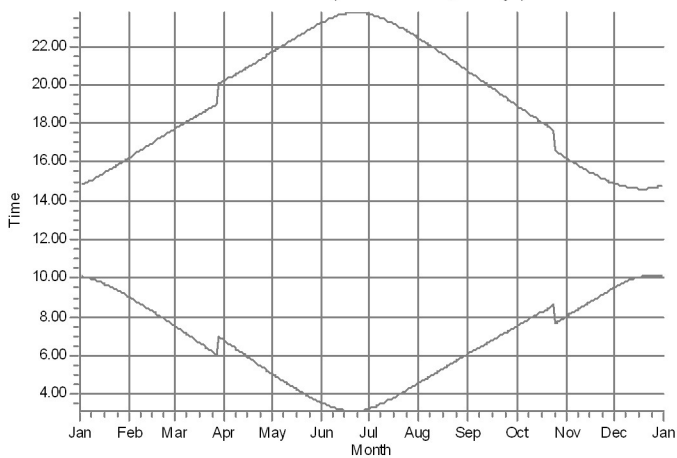
S: Lomarakennus S (Talonpaikantie 141)



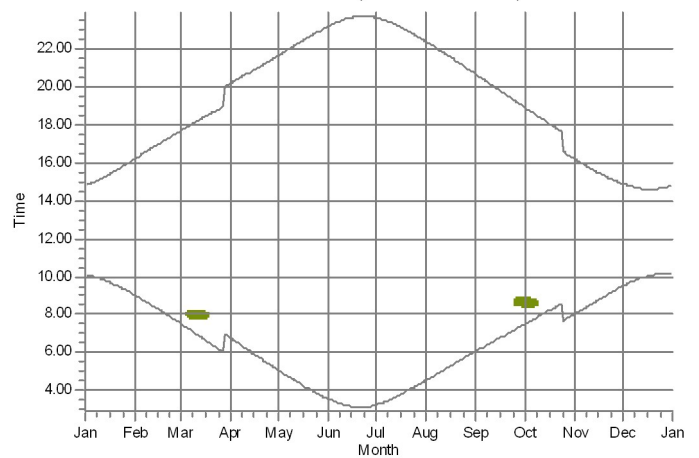
T: Lomarakennus T (Ruipontie)



U: Lomarakennus U (Kannistontie, Kivioja)



V: Asuinrakennus V (Kannistontie 586)



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 1 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (579)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months (January to December) and 31 rows for days. Each cell contains sun rise and set times (hh:mm) for each hour of the day. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





# SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 3 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (581) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

## Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.46	09.00 16.12	07.31 17.39	06.45 20.09	05.02 21.38	03.30 23.11	03.12 23.38	04.32 22.22	06.04 20.39	07.27 18.55	07.58 16.12	09.29 14.52
2	10.04 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.37	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.03 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.56 21.44	03.26 23.16	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.05 16.05	09.34 14.48
4	10.02 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.48	03.24 23.18	03.17 23.34	04.41 22.13	06.12 20.28	07.36 18.45	08.08 16.02	09.37 14.46
5	10.01 14.54	08.48 16.24	07.18 17.51	06.31 20.21	04.49 21.51	03.22 23.21	03.19 23.32	04.44 22.10	06.15 20.25	07.39 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.28	07.14 17.54	06.27 20.24	04.46 21.54	03.20 23.23	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.38	08.14 15.56	09.42 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.27	04.42 21.57	03.18 23.25	03.23 23.29	04.50 22.03	06.21 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.27	04.53 22.00	06.23 20.15	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.28 23.25	04.56 21.57	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.01 18.06	06.14 20.35	04.33 22.06	03.13 23.31	03.30 23.22	04.59 21.53	06.29 20.08	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.44	06.57 18.09	06.10 20.38	04.30 22.09	03.11 23.33	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.21	08.29 15.41	09.52 14.37
12	09.50 15.11	08.27 16.47	06.54 18.12	06.07 20.41	04.27 22.12	03.10 23.34	03.35 23.18	05.05 21.47	06.34 20.01	07.59 18.17	08.33 15.38	09.54 14.36
13	09.48 15.14	08.24 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.36	03.37 23.16	05.08 21.43	06.37 19.57	08.01 18.14	08.36 15.36	09.56 14.35
14	09.46 15.16	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.44 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.22	03.07 23.38	03.42 23.11	05.14 21.37	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.25	03.06 23.39	03.45 23.08	05.17 21.33	06.46 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.37 18.26	05.49 20.56	04.11 22.28	03.05 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.02 14.34
18	09.37 15.28	08.08 17.05	06.33 18.29	05.46 20.59	04.08 22.31	03.05 23.41	03.51 23.03	05.23 21.27	06.51 19.40	08.16 17.57	08.51 15.22	10.03 14.33
19	09.35 15.31	08.04 17.09	06.30 18.32	05.43 21.02	04.05 22.34	03.05 23.42	03.53 23.01	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.04 14.33
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.04 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.17	10.05 14.34
21	09.30 15.37	07.58 17.15	06.23 18.38	05.36 21.08	03.59 22.40	03.04 23.43	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.43	03.04 23.43	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.46	03.05 23.43	04.05 22.49	05.38 21.10	07.05 19.22	08.31 17.41	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.26 21.17	03.51 22.49	03.05 23.43	04.08 22.46	05.41 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.07 14.35
25	09.20 15.49	07.45 17.27	06.09 18.49	05.22 21.20	03.48 22.52	03.06 23.42	04.11 22.44	05.43 21.03	07.11 19.16	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.53	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.41	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.38	05.49 20.56	07.16 19.09	07.43 16.28	09.18 15.00	10.07 14.38
28	09.11 15.59	07.35 17.36	05.59 18.58	05.12 21.29	03.40 23.00	03.08 23.41	04.20 22.35	05.52 20.53	07.19 19.05	07.46 16.24	09.21 14.58	10.07 14.39
29	09.09 16.02		06.55 20.01	05.09 21.32	03.38 23.03	03.09 23.40	04.23 22.32	05.55 20.49	07.22 19.02	07.49 16.21	09.24 14.56	10.06 14.41
30	09.06 16.05		06.52 20.03	05.05 21.35	03.35 23.06	03.11 23.39	04.26 22.28	05.58 20.46	07.25 18.58	07.52 16.18	09.26 14.54	10.06 14.42
31	09.03 16.08		06.48 20.06		03.33 23.08		04.29 22.25	06.01 20.42		07.55 16.15		10.05 14.44
Potential sun hours	178	241	363	449	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
--------------	------------------	---------------------------------	--------------------------------	----------------------

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 4 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (582)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.12	07.31 17.39	06.45 20.09	05.02 21.38	03.30 23.11	03.12 23.38	04.32 22.22	06.04 20.39	07.27 18.55	07.58 16.12	09.29 14.52
2	10.04 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.03 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.56 21.44	03.26 23.16	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.02 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.34	04.41 22.13	06.12 20.28	07.36 18.44	08.08 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.18 17.51	06.31 20.21	04.49 21.51	03.22 23.20	03.19 23.32	04.44 22.10	06.15 20.25	07.39 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.28	07.14 17.54	06.27 20.24	04.46 21.54	03.20 23.23	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.38	08.14 15.56	09.42 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.27	04.42 21.57	03.18 23.25	03.23 23.28	04.50 22.03	06.20 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.15	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.28 23.24	04.56 21.57	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.01 18.06	06.13 20.35	04.33 22.06	03.13 23.31	03.30 23.22	04.59 21.53	06.29 20.08	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.44	06.57 18.09	06.10 20.38	04.30 22.09	03.11 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.21	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.12	06.07 20.41	04.27 22.12	03.10 23.34	03.35 23.18	05.05 21.47	06.34 20.01	07.59 18.17	08.33 15.38	09.54 14.36
13	09.48 15.14	08.24 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.36	03.37 23.16	05.08 21.43	06.37 19.57	08.01 18.14	08.36 15.36	09.56 14.35
14	09.46 15.16	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.43 23.11	05.14 21.37	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.25	03.06 23.39	03.45 23.08	05.17 21.33	06.46 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.37 18.26	05.49 20.56	04.11 22.28	03.06 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.01 14.34
18	09.37 15.28	08.08 17.05	06.33 18.29	05.46 20.59	04.08 22.31	03.05 23.41	03.51 23.03	05.23 21.27	06.51 19.40	08.16 17.57	08.51 15.22	10.03 14.33
19	09.35 15.31	08.04 17.09	06.30 18.32	05.43 21.02	04.05 22.34	03.05 23.42	03.53 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.04 14.33
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.04 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.17	10.04 14.34
21	09.30 15.37	07.58 17.15	06.23 18.38	05.36 21.08	03.59 22.40	03.04 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.43	03.05 23.43	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.46	03.05 23.43	04.05 22.49	05.38 21.10	07.05 19.22	08.31 17.41	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.26 21.17	03.51 22.49	03.05 23.43	04.08 22.46	05.41 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.07 14.35
25	09.20 15.49	07.45 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.43 21.03	07.11 19.16	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.53	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.41	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.38	05.49 20.56	07.16 19.09	07.43 16.28	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.59 18.58	05.12 21.29	03.40 23.00	03.08 23.41	04.20 22.35	05.52 20.53	07.19 19.05	07.46 16.24	09.21 14.58	10.07 14.40
29	09.09 16.02		06.55 20.01	05.09 21.32	03.38 23.03	03.10 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.24 14.56	10.06 14.41
30	09.06 16.05		06.52 20.03	05.05 21.35	03.35 23.05	03.11 23.39	04.26 22.28	05.58 20.46	07.24 18.58	07.52 16.18	09.26 14.54	10.06 14.42
31	09.03 16.08		06.48 20.06		03.33 23.08		04.29 22.25	06.01 20.42		07.55 16.15		10.05 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month    Sun rise (hh:mm)    First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
Sun set (hh:mm)    First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 5 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (583) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.03	07.27	07.58	09.29
	14.46	16.11	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.11	14.51
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.55	03.26	03.15	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.07	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.38	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.41
	14.56	16.27	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.14	03.27	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.00	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.07	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.11	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.43	18.08	20.38	22.09	23.32	23.20	21.50	20.04	18.20	15.41	14.37
12	09.49	08.27	06.54	06.06	04.26	03.10	03.35	05.05	06.34	07.58	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.47	20.00	18.17	15.38	14.36
13	09.47	08.23	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.16	21.43	19.57	18.14	15.35	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.42	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.45	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.36	05.49	04.11	03.05	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.27	23.40	23.06	21.30	19.43	18.00	15.24	14.33
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.31	23.41	23.03	21.26	19.40	17.57	15.22	14.33
19	09.34	08.04	06.30	05.42	04.05	03.05	03.53	05.26	06.54	08.19	08.54	10.03
	15.31	17.08	18.32	21.02	22.34	23.42	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.04	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.16	14.33
21	09.30	07.58	06.23	05.36	03.59	03.04	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.04	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.53	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.40	15.09	14.35
24	09.22	07.48	06.12	05.25	03.51	03.05	04.08	05.40	07.08	08.34	09.09	10.07
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.35
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.10	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.06	04.14	05.46	07.13	07.40	09.15	10.07
	15.52	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.08	16.27	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.41	22.34	20.52	19.05	16.24	14.58	14.39
29	09.09		06.55	05.09	03.37	03.09	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.00	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.55	14.41
30	09.06		06.51	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.53	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 6 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (584)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.12	07.31 17.39	06.45 20.09	05.02 21.38	03.30 23.11	03.12 23.38	04.32 22.22	06.04 20.39	07.27 18.55	07.58 16.12	09.29 14.52
2	10.04 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.09	09.32 14.50
3	10.03 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.56 21.44	03.26 23.16	03.16 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.02 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.13	06.12 20.28	07.36 18.45	08.08 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.18 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.39 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.28	07.14 17.54	06.27 20.24	04.46 21.54	03.20 23.23	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.38	08.14 15.56	09.42 14.43
7	09.58 14.59	08.42 16.31	07.11 17.57	06.24 20.27	04.43 21.57	03.18 23.25	03.23 23.32	04.50 22.03	06.21 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.15	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.15 23.29	03.28 23.24	04.56 21.57	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.01 18.06	06.14 20.35	04.33 22.06	03.13 23.31	03.30 23.22	04.59 21.53	06.29 20.08	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.44	06.57 18.09	06.10 20.38	04.30 22.09	03.12 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.21	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.12	06.07 20.41	04.27 22.12	03.10 23.34	03.35 23.18	05.05 21.47	06.34 20.01	07.59 18.17	08.33 15.38	09.54 14.36
13	09.47 15.14	08.24 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.16	05.08 21.43	06.37 19.57	08.01 18.14	08.36 15.36	09.56 14.36
14	09.45 15.17	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.11	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.43 23.11	05.14 21.37	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.46 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.37 18.26	05.49 20.56	04.11 22.28	03.06 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.25	10.01 14.34
18	09.37 15.28	08.08 17.06	06.33 18.29	05.46 20.59	04.08 22.31	03.05 23.41	03.51 23.03	05.23 21.27	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.34
19	09.35 15.31	08.04 17.09	06.30 18.32	05.43 21.02	04.05 22.34	03.05 23.42	03.54 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.34
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.05 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.17	10.04 14.34
21	09.30 15.37	07.58 17.15	06.23 18.38	05.36 21.08	03.59 22.40	03.05 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.57 22.43	03.05 23.43	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.12	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.46	03.05 23.43	04.05 22.49	05.38 21.10	07.05 19.22	08.31 17.41	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.26 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.41 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.07 14.36
25	09.19 15.49	07.45 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.44 21.03	07.11 19.16	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.53	07.41 17.30	06.05 18.52	05.19 21.23	03.46 22.54	03.07 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.16 21.26	03.43 22.57	03.08 23.41	04.17 22.37	05.49 20.56	07.16 19.09	07.43 16.28	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.59 18.58	05.12 21.29	03.40 23.00	03.09 23.40	04.20 22.34	05.52 20.53	07.19 19.05	07.46 16.24	09.21 14.58	10.07 14.40
29	09.09 16.02		06.55 20.01	05.09 21.32	03.38 23.03	03.10 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.24 14.56	10.06 14.41
30	09.06 16.05		06.52 20.03	05.06 21.35	03.35 23.05	03.11 23.39	04.26 22.28	05.58 20.46	07.25 18.58	07.52 16.18	09.26 14.54	10.06 14.42
31	09.03 16.08		06.48 20.06		03.33 23.08		04.29 22.25	06.01 20.42		07.55 16.15		10.05 14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 7 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (585)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04	09.00	07.31	06.45	05.02	03.30	03.12	04.32	06.04	07.27	07.58	09.29
	14.46	16.12	17.39	20.09	21.38	23.11	23.38	22.22	20.39	18.55	16.12	14.52
2	10.04	08.57	07.28	06.41	04.59	03.28	03.14	04.35	06.06	07.30	08.01	09.32
	14.48	16.15	17.42	20.12	21.41	23.13	23.36	22.19	20.35	18.51	16.08	14.50
3	10.03	08.54	07.24	06.38	04.56	03.26	03.16	04.38	06.09	07.33	08.04	09.34
	14.50	16.18	17.45	20.15	21.44	23.16	23.35	22.16	20.32	18.48	16.05	14.48
4	10.01	08.51	07.21	06.34	04.52	03.24	03.17	04.41	06.12	07.36	08.08	09.37
	14.52	16.21	17.48	20.18	21.47	23.18	23.33	22.13	20.28	18.44	16.02	14.46
5	10.00	08.48	07.18	06.31	04.49	03.22	03.19	04.44	06.15	07.39	08.11	09.39
	14.54	16.24	17.51	20.21	21.50	23.20	23.32	22.09	20.25	18.41	15.59	14.45
6	09.59	08.45	07.14	06.27	04.46	03.20	03.21	04.47	06.18	07.41	08.14	09.42
	14.56	16.28	17.54	20.24	21.54	23.23	23.30	22.06	20.21	18.38	15.56	14.43
7	09.58	08.42	07.11	06.24	04.42	03.18	03.23	04.50	06.20	07.44	08.17	09.44
	14.58	16.31	17.57	20.26	21.57	23.25	23.28	22.03	20.18	18.34	15.53	14.42
8	09.56	08.39	07.07	06.20	04.39	03.16	03.25	04.53	06.23	07.47	08.20	09.46
	15.01	16.34	18.00	20.29	22.00	23.27	23.26	22.00	20.14	18.31	15.50	14.40
9	09.55	08.36	07.04	06.17	04.36	03.15	03.28	04.56	06.26	07.50	08.23	09.48
	15.03	16.37	18.03	20.32	22.03	23.29	23.24	21.56	20.11	18.27	15.47	14.39
10	09.53	08.33	07.01	06.13	04.33	03.13	03.30	04.59	06.29	07.53	08.26	09.50
	15.06	16.40	18.06	20.35	22.06	23.31	23.22	21.53	20.08	18.24	15.44	14.38
11	09.51	08.30	06.57	06.10	04.30	03.12	03.32	05.02	06.32	07.56	08.29	09.52
	15.08	16.44	18.09	20.38	22.09	23.32	23.20	21.50	20.04	18.21	15.41	14.37
12	09.49	08.27	06.54	06.07	04.27	03.10	03.35	05.05	06.34	07.59	08.32	09.54
	15.11	16.47	18.11	20.41	22.12	23.34	23.18	21.47	20.01	18.17	15.38	14.36
13	09.47	08.24	06.50	06.03	04.23	03.09	03.37	05.08	06.37	08.01	08.36	09.56
	15.14	16.50	18.14	20.44	22.15	23.35	23.16	21.43	19.57	18.14	15.36	14.35
14	09.45	08.20	06.47	06.00	04.20	03.08	03.40	05.11	06.40	08.04	08.39	09.57
	15.16	16.53	18.17	20.47	22.18	23.37	23.13	21.40	19.54	18.10	15.33	14.35
15	09.43	08.17	06.43	05.56	04.17	03.07	03.43	05.14	06.43	08.07	08.42	09.59
	15.19	16.56	18.20	20.50	22.21	23.38	23.11	21.37	19.50	18.07	15.30	14.34
16	09.41	08.14	06.40	05.53	04.14	03.06	03.45	05.17	06.46	08.10	08.45	10.00
	15.22	16.59	18.23	20.53	22.24	23.39	23.08	21.33	19.47	18.04	15.27	14.34
17	09.39	08.11	06.37	05.49	04.11	03.06	03.48	05.20	06.48	08.13	08.48	10.01
	15.25	17.02	18.26	20.56	22.28	23.40	23.06	21.30	19.43	18.00	15.24	14.34
18	09.37	08.07	06.33	05.46	04.08	03.05	03.51	05.23	06.51	08.16	08.51	10.02
	15.28	17.05	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.57	15.22	14.33
19	09.34	08.04	06.30	05.43	04.05	03.05	03.54	05.26	06.54	08.19	08.54	10.03
	15.31	17.09	18.32	21.02	22.34	23.41	23.00	21.23	19.36	17.54	15.19	14.33
20	09.32	08.01	06.26	05.39	04.02	03.05	03.56	05.29	06.57	08.22	08.57	10.04
	15.34	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.50	15.17	14.34
21	09.30	07.58	06.23	05.36	03.59	03.05	03.59	05.32	06.59	08.25	09.00	10.05
	15.37	17.15	18.37	21.08	22.40	23.42	22.55	21.16	19.29	17.47	15.14	14.34
22	09.27	07.54	06.19	05.32	03.56	03.05	04.02	05.35	07.02	08.28	09.03	10.06
	15.40	17.18	18.40	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.11	14.34
23	09.25	07.51	06.16	05.29	03.54	03.05	04.05	05.38	07.05	08.31	09.06	10.06
	15.43	17.21	18.43	21.14	22.46	23.43	22.49	21.10	19.22	17.41	15.09	14.35
24	09.22	07.48	06.12	05.26	03.51	03.05	04.08	05.41	07.08	08.34	09.09	10.06
	15.46	17.24	18.46	21.17	22.48	23.42	22.46	21.06	19.19	17.37	15.07	14.36
25	09.19	07.44	06.09	05.22	03.48	03.06	04.11	05.43	07.11	07.37	09.12	10.07
	15.49	17.27	18.49	21.20	22.51	23.42	22.43	21.03	19.15	16.34	15.04	14.36
26	09.17	07.41	06.05	05.19	03.45	03.07	04.14	05.46	07.13	07.40	09.15	10.07
	15.53	17.30	18.52	21.23	22.54	23.42	22.40	20.59	19.12	16.31	15.02	14.37
27	09.14	07.38	06.02	05.15	03.43	03.07	04.17	05.49	07.16	07.43	09.18	10.07
	15.56	17.33	18.55	21.26	22.57	23.41	22.37	20.56	19.09	16.28	15.00	14.38
28	09.11	07.34	05.58	05.12	03.40	03.08	04.20	05.52	07.19	07.46	09.21	10.07
	15.59	17.36	18.58	21.29	23.00	23.40	22.34	20.52	19.05	16.24	14.58	14.40
29	09.09		06.55	05.09	03.38	03.10	04.23	05.55	07.22	07.49	09.24	10.06
	16.02		20.00	21.32	23.03	23.40	22.31	20.49	19.02	16.21	14.56	14.41
30	09.06		06.52	05.05	03.35	03.11	04.26	05.58	07.24	07.52	09.26	10.06
	16.05		20.03	21.35	23.05	23.39	22.28	20.46	18.58	16.18	14.54	14.42
31	09.03		06.48		03.33		04.29	06.01		07.55		10.05
	16.08		20.06		23.08		22.25	20.42		16.15		14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
		First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 8 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (586)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.11	07.31 17.39	06.44 20.09	05.02 21.38	03.30 23.10	03.12 23.37	04.32 22.22	06.03 20.39	07.27 18.55	07.58 16.11	09.29 14.51
2	10.03 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.02 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.55 21.44	03.26 23.15	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.13	06.12 20.28	07.36 18.44	08.07 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.17 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.38 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.27	07.14 17.54	06.27 20.23	04.46 21.53	03.20 23.22	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.37	08.14 15.56	09.41 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.26	04.42 21.57	03.18 23.25	03.23 23.32	04.50 22.03	06.20 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.14	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.27 23.24	04.56 21.56	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.00 18.06	06.13 20.35	04.33 22.06	03.13 23.30	03.30 23.22	04.59 21.53	06.29 20.07	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.43	06.57 18.08	06.10 20.38	04.30 22.09	03.11 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.20	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.11	06.06 20.41	04.26 22.12	03.10 23.34	03.35 23.18	05.05 21.46	06.34 20.00	07.58 18.17	08.32 15.38	09.54 14.36
13	09.47 15.14	08.23 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.15	05.08 21.43	06.37 19.57	08.01 18.14	08.35 15.35	09.55 14.35
14	09.45 15.16	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.42 23.11	05.14 21.36	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.45 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.36 18.26	05.49 20.56	04.11 22.27	03.05 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.01 14.33
18	09.37 15.28	08.07 17.05	06.33 18.29	05.46 20.59	04.08 22.30	03.05 23.41	03.51 23.03	05.23 21.26	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.33
19	09.34 15.31	08.04 17.08	06.30 18.32	05.42 21.02	04.05 22.33	03.05 23.41	03.53 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.33
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.04 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.16	10.04 14.33
21	09.30 15.37	07.58 17.15	06.23 18.37	05.36 21.08	03.59 22.40	03.04 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.42	03.04 23.42	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.45	03.05 23.42	04.05 22.49	05.38 21.09	07.05 19.22	08.31 17.40	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.25 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.40 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.06 14.35
25	09.19 15.49	07.44 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.43 21.03	07.10 19.15	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.52	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.37	05.49 20.56	07.16 19.08	07.43 16.27	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.58 18.57	05.12 21.29	03.40 23.00	03.08 23.40	04.20 22.34	05.52 20.52	07.19 19.05	07.46 16.24	09.21 14.58	10.06 14.39
29	09.08 16.02	07.31 17.39	05.55 19.00	05.09 21.32	03.38 23.03	03.09 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.23 14.55	10.06 14.41
30	09.06 16.05	07.29 17.42	05.53 19.03	05.07 21.35	03.36 23.05	03.11 23.39	04.26 22.28	05.58 20.45	07.24 18.58	07.52 16.18	09.26 14.53	10.06 14.42
31	09.03 16.08	07.26 17.45	05.50 19.06	05.04 21.38	03.33 23.08	03.08 23.40	04.29 22.25	06.01 20.42	07.55 16.15	07.59 16.15	09.29 14.53	10.05 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
--------------	------------------	---------------------------------	--------------------------------	----------------------

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 9 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (587)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.11	07.31 17.39	06.44 20.09	05.02 21.38	03.30 23.10	03.12 23.37	04.32 22.22	06.03 20.39	07.27 18.55	07.58 16.11	09.29 14.51
2	10.03 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.08	09.32 14.50
3	10.02 14.50	08.54 16.18	07.24 17.45	06.37 20.15	04.55 21.44	03.26 23.15	03.15 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.12	06.12 20.28	07.36 18.44	08.07 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.17 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.38 18.41	08.10 15.59	09.39 14.44
6	09.59 14.56	08.45 16.27	07.14 17.54	06.27 20.23	04.46 21.53	03.20 23.22	03.21 23.30	04.47 22.06	06.17 20.21	07.41 18.37	08.14 15.56	09.41 14.43
7	09.58 14.58	08.42 16.31	07.11 17.57	06.24 20.26	04.42 21.57	03.18 23.25	03.23 23.28	04.50 22.03	06.20 20.18	07.44 18.34	08.17 15.53	09.44 14.41
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.14	07.47 18.31	08.20 15.50	09.46 14.40
9	09.54 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.14 23.29	03.27 23.24	04.56 21.56	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.00 18.05	06.13 20.35	04.33 22.06	03.13 23.30	03.30 23.22	04.59 21.53	06.29 20.07	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.43	06.57 18.08	06.10 20.38	04.29 22.09	03.11 23.32	03.32 23.20	05.02 21.50	06.31 20.04	07.55 18.20	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.46	06.54 18.11	06.06 20.41	04.26 22.12	03.10 23.34	03.35 23.18	05.05 21.46	06.34 20.00	07.58 18.17	08.32 15.38	09.54 14.36
13	09.47 15.13	08.23 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.15	05.08 21.43	06.37 19.57	08.01 18.14	08.35 15.35	09.55 14.35
14	09.45 15.16	08.20 16.53	06.47 18.17	05.59 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.53	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.42 23.11	05.14 21.36	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.45 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.36 18.26	05.49 20.56	04.11 22.27	03.05 23.40	03.48 23.05	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.24	10.01 14.33
18	09.37 15.28	08.07 17.05	06.33 18.29	05.46 20.59	04.08 22.30	03.05 23.41	03.51 23.03	05.23 21.26	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.33
19	09.34 15.31	08.04 17.08	06.29 18.32	05.42 21.02	04.05 22.33	03.05 23.41	03.53 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.33
20	09.32 15.34	08.01 17.11	06.26 18.34	05.39 21.05	04.02 22.36	03.04 23.42	03.56 22.57	05.29 21.20	06.56 19.33	08.22 17.50	08.57 15.16	10.04 14.33
21	09.30 15.37	07.58 17.15	06.23 18.37	05.36 21.08	03.59 22.39	03.04 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.56 22.42	03.04 23.42	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.11	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.53 22.45	03.05 23.42	04.05 22.49	05.37 21.09	07.05 19.22	08.31 17.40	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.25 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.40 21.06	07.08 19.19	08.34 17.37	09.09 15.06	10.06 14.35
25	09.19 15.49	07.44 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.43 21.03	07.10 19.15	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.52	07.41 17.30	06.05 18.52	05.19 21.23	03.45 22.54	03.06 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.55	07.38 17.33	06.02 18.55	05.15 21.26	03.43 22.57	03.07 23.41	04.17 22.37	05.49 20.56	07.16 19.08	07.43 16.27	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.58 18.57	05.12 21.29	03.40 23.00	03.08 23.40	04.20 22.34	05.52 20.52	07.19 19.05	07.46 16.24	09.21 14.57	10.06 14.39
29	09.08 16.02	07.38 17.40	06.02 19.00	05.15 21.32	03.43 23.02	03.07 23.40	04.17 22.31	05.49 20.49	07.16 19.01	07.43 16.21	09.18 14.55	10.07 14.41
30	09.06 16.05	07.38 17.43	06.02 19.03	05.15 21.35	03.43 23.05	03.07 23.39	04.17 22.28	05.49 20.45	07.16 18.58	07.43 16.18	09.18 14.53	10.07 14.42
31	09.03 16.08	07.38 17.46	06.02 19.06	05.15 21.38	03.43 23.08	03.07 23.38	04.17 22.25	05.49 20.42	07.16 18.55	07.43 16.15	09.18 14.51	10.07 14.44
Potential sun hours	178	241	363	448	563	611	599	504	392	307	203	146
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 10 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (588)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.04 14.46	09.00 16.12	07.31 17.39	06.45 20.09	05.02 21.38	03.31 23.11	03.12 23.37	04.32 22.22	06.04 20.39	07.27 18.55	07.58 16.12	09.29 14.52
2	10.03 14.48	08.57 16.15	07.28 17.42	06.41 20.12	04.59 21.41	03.28 23.13	03.14 23.36	04.35 22.19	06.06 20.35	07.30 18.51	08.01 16.09	09.32 14.50
3	10.03 14.50	08.54 16.18	07.24 17.45	06.38 20.15	04.56 21.44	03.26 23.16	03.16 23.35	04.38 22.16	06.09 20.32	07.33 18.48	08.04 16.05	09.34 14.48
4	10.01 14.52	08.51 16.21	07.21 17.48	06.34 20.18	04.52 21.47	03.24 23.18	03.17 23.33	04.41 22.13	06.12 20.28	07.36 18.44	08.08 16.02	09.37 14.46
5	10.00 14.54	08.48 16.24	07.18 17.51	06.31 20.21	04.49 21.50	03.22 23.20	03.19 23.32	04.44 22.09	06.15 20.25	07.39 18.41	08.11 15.59	09.39 14.45
6	09.59 14.56	08.45 16.28	07.14 17.54	06.27 20.24	04.46 21.54	03.20 23.22	03.21 23.30	04.47 22.06	06.18 20.21	07.41 18.38	08.14 15.56	09.41 14.43
7	09.58 14.59	08.42 16.31	07.11 17.57	06.24 20.26	04.43 21.57	03.18 23.25	03.23 23.28	04.50 22.03	06.21 20.18	07.44 18.34	08.17 15.53	09.44 14.42
8	09.56 15.01	08.39 16.34	07.07 18.00	06.20 20.29	04.39 22.00	03.16 23.27	03.25 23.26	04.53 22.00	06.23 20.14	07.47 18.31	08.20 15.50	09.46 14.40
9	09.55 15.03	08.36 16.37	07.04 18.03	06.17 20.32	04.36 22.03	03.15 23.29	03.28 23.24	04.56 21.56	06.26 20.11	07.50 18.27	08.23 15.47	09.48 14.39
10	09.53 15.06	08.33 16.40	07.01 18.06	06.14 20.35	04.33 22.06	03.13 23.30	03.30 23.22	04.59 21.53	06.29 20.08	07.53 18.24	08.26 15.44	09.50 14.38
11	09.51 15.08	08.30 16.44	06.57 18.09	06.10 20.38	04.30 22.09	03.12 23.32	03.32 23.20	05.02 21.50	06.32 20.04	07.56 18.21	08.29 15.41	09.52 14.37
12	09.49 15.11	08.27 16.47	06.54 18.12	06.07 20.41	04.27 22.12	03.10 23.34	03.35 23.18	05.05 21.47	06.34 20.01	07.59 18.17	08.32 15.38	09.54 14.36
13	09.47 15.14	08.24 16.50	06.50 18.14	06.03 20.44	04.23 22.15	03.09 23.35	03.37 23.15	05.08 21.43	06.37 19.57	08.01 18.14	08.36 15.36	09.56 14.36
14	09.45 15.17	08.20 16.53	06.47 18.17	06.00 20.47	04.20 22.18	03.08 23.37	03.40 23.13	05.11 21.40	06.40 19.54	08.04 18.10	08.39 15.33	09.57 14.35
15	09.43 15.19	08.17 16.56	06.43 18.20	05.56 20.50	04.17 22.21	03.07 23.38	03.43 23.11	05.14 21.37	06.43 19.50	08.07 18.07	08.42 15.30	09.59 14.34
16	09.41 15.22	08.14 16.59	06.40 18.23	05.53 20.53	04.14 22.24	03.06 23.39	03.45 23.08	05.17 21.33	06.46 19.47	08.10 18.04	08.45 15.27	10.00 14.34
17	09.39 15.25	08.11 17.02	06.37 18.26	05.49 20.56	04.11 22.27	03.06 23.40	03.48 23.06	05.20 21.30	06.48 19.43	08.13 18.00	08.48 15.25	10.01 14.34
18	09.37 15.28	08.07 17.06	06.33 18.29	05.46 20.59	04.08 22.31	03.05 23.41	03.51 23.03	05.23 21.27	06.51 19.40	08.16 17.57	08.51 15.22	10.02 14.34
19	09.34 15.31	08.04 17.09	06.30 18.32	05.43 21.02	04.05 22.34	03.05 23.41	03.54 23.00	05.26 21.23	06.54 19.36	08.19 17.54	08.54 15.19	10.03 14.34
20	09.32 15.34	08.01 17.12	06.26 18.35	05.39 21.05	04.02 22.37	03.05 23.42	03.56 22.58	05.29 21.20	06.57 19.33	08.22 17.50	08.57 15.17	10.04 14.34
21	09.30 15.37	07.58 17.15	06.23 18.38	05.36 21.08	03.59 22.40	03.05 23.42	03.59 22.55	05.32 21.16	06.59 19.29	08.25 17.47	09.00 15.14	10.05 14.34
22	09.27 15.40	07.54 17.18	06.19 18.40	05.32 21.11	03.57 22.43	03.05 23.42	04.02 22.52	05.35 21.13	07.02 19.26	08.28 17.44	09.03 15.12	10.06 14.34
23	09.25 15.43	07.51 17.21	06.16 18.43	05.29 21.14	03.54 22.45	03.05 23.42	04.05 22.49	05.38 21.10	07.05 19.22	08.31 17.41	09.06 15.09	10.06 14.35
24	09.22 15.46	07.48 17.24	06.12 18.46	05.26 21.17	03.51 22.48	03.05 23.42	04.08 22.46	05.41 21.06	07.08 19.19	08.34 17.37	09.09 15.07	10.06 14.36
25	09.19 15.49	07.44 17.27	06.09 18.49	05.22 21.20	03.48 22.51	03.06 23.42	04.11 22.43	05.44 21.03	07.11 19.15	07.37 16.34	09.12 15.04	10.07 14.36
26	09.17 15.53	07.41 17.30	06.05 18.52	05.19 21.23	03.46 22.54	03.07 23.42	04.14 22.40	05.46 20.59	07.13 19.12	07.40 16.31	09.15 15.02	10.07 14.37
27	09.14 15.56	07.38 17.33	06.02 18.55	05.16 21.26	03.43 22.57	03.08 23.41	04.17 22.37	05.49 20.56	07.16 19.09	07.43 16.28	09.18 15.00	10.07 14.38
28	09.11 15.59	07.34 17.36	05.59 18.58	05.12 21.29	03.40 23.00	03.09 23.40	04.20 22.34	05.52 20.52	07.19 19.05	07.46 16.24	09.21 14.58	10.06 14.40
29	09.09 16.02	07.31 17.39	05.55 19.00	05.09 21.32	03.38 23.03	03.10 23.40	04.23 22.31	05.55 20.49	07.22 19.02	07.49 16.21	09.24 14.56	10.06 14.41
30	09.06 16.05	07.28 17.42	05.52 19.03	05.05 21.35	03.35 23.05	03.11 23.39	04.26 22.28	05.58 20.46	07.24 18.58	07.52 16.18	09.26 14.54	10.06 14.42
31	09.03 16.08	07.25 17.45	05.49 19.06	05.02 21.38	03.32 23.08	03.08 23.38	04.29 22.25	06.01 20.42	07.55 16.15	09.29 14.51	10.09 14.41	10.05 14.44
Potential sun hours	178	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker











SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 15 - VESTAS V150-4.2 4200 150.0 IO! hub: 165.0 m (TOT: 240.0 m) (593) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns (January to December) and 31 rows of sun hour data. Includes a final row for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Matrix for each day in each month: Day in month, Sun rise (hh:mm), Sun set (hh:mm), First time (hh:mm) with flicker, Last time (hh:mm) with flicker, Minutes with flicker.



SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 17 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (595)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Table with 12 columns (Jan-Dec) and 1 row of sunshine probability values: 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

Table with 13 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 1 row of values: 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

January February March April May June July August September October November December

Main data table with 13 columns (months) and 31 rows (days). Each cell contains two values representing sun rise and set times. Includes a summary row for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Table with 2 columns: Day in month, Sun rise/set (hh:mm), and First/Last time with flicker (hh:mm) / Minutes with flicker.



















Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
OsMontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 26 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (625)
Assumptions for shadow calculations
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months (January to December) and 31 rows for days. It contains numerical data for sunrise, sunset, and shadow calculations. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker











Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 30 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (629)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of values representing sun rise, sun set, and flicker minutes.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker







SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 34 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (633)
Assumptions for shadow calculations

Shine probability S (Average daily sunshine hours) [UMEA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1-31). Includes sub-rows for sun rise and set times, and flicker minutes. Summary row at the bottom shows potential sun hours and flicker minutes for each month.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker







Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 37 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (636)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns (January to December) and 31 rows (1 to 31). Columns include potential sun hours, minutes with flicker, and sunrise/set times for each day.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker









## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 41 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (640)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.03 14.46	08.59 16.12	07.31 17.39	06.44 20.09	05.02 21.37	03.31 23.10	03.13 23.36	04.32 22.21	06.03 20.38	07.27 18.55	07.58 16.12	09.28 14.52
2	10.03 14.48	08.56 16.15	07.27 17.42	06.41 20.12	04.59 21.41	03.29 23.12	03.15 23.35	04.35 22.18	06.06 20.35	07.30 18.51	08.01 16.08	09.31 14.50
31	09.02 16.08	07.36 17.36	06.48 18.57	05.33 21.28	03.07 22.59	01.22 23.37	01.02 22.24	01.01 20.42	01.01 16.15	01.01 16.15	01.01 16.15	01.01 14.44
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker











Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 46 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (645)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months (January to December) and 31 rows for days. Each cell contains two values representing sun rise and sun set times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 47 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (646)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

[January | February | March | April | May | June | July | August | September | October | November | December

Table with 12 columns for months and 31 rows for days. Each cell contains two values representing sun rise and set times. Summary rows at the bottom show total potential sun hours and minutes with flicker for each month.

Table layout: For each day in each month the following matrix apply

Matrix defining the layout of data: Day in month, Sun rise (hh:mm), Sun set (hh:mm), First time (hh:mm) with flicker, Last time (hh:mm) with flicker, Minutes with flicker.



SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutuksetWTG: 49 - VESTAS V150-4.2 4200 150.0 IO! hub: 165,0 m (TOT: 240,0 m) (648) Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 12 columns for months (January-December) and 31 rows for days. Each cell contains two values representing sunrise and sunset times. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 51 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1175)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with 13 columns for months (January-December) and 13 rows for days (1-31). Each cell contains sun rise and set times. Includes summary rows for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker







Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 54 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1178)
Assumptions for shadow calculations
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31), containing sun rise and set times. Includes summary rows for Potential sun hours and Sum of minutes with flicker.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker







Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 57 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1181)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains sun rise and set times and potential sun hours. Includes a summary row for 'Potential sun hours' and 'Sum of minutes with flicker'.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker





### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 59 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	15.40-16.03/23 20.10	06.46 20.10	05.04 21.39	20.19-20.40/21 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	15.41-16.02/21 20.13	06.42 20.13	05.00 21.42	20.20-20.39/19 23.14
3	10.03 14.51	08.55 16.19	07.25 17.46	15.42-16.00/18 20.16	06.39 20.16	04.57 21.45	20.20-20.39/19 23.16
4	10.02 14.53	08.52 16.23	07.22 17.49	15.45-15.58/13 20.19	06.35 20.19	04.54 21.48	20.20-20.38/18 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52		06.32 20.22	04.50 21.51	20.22-20.38/16 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55		06.29 20.25	04.47 21.54	20.23-20.36/13 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58		06.25 20.28	04.44 21.58	20.25-20.34/9 23.25
8	09.57 15.02	08.40 16.35	07.08 18.01		06.22 20.30	04.41 22.01	20.28-20.30/2 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04		06.18 20.33	04.37 22.04	23.29
10	09.54 15.07	08.34 16.42	07.02 18.07		06.15 20.36	04.34 22.07	23.31
11	09.52 15.10	08.31 16.45	06.58 18.10		06.11 20.39	04.31 22.10	23.33
12	09.50 15.13	08.28 16.48	06.55 18.13		06.08 20.42	04.28 22.13	23.34
13	09.48 15.15	08.24 16.51	06.51 18.16		06.04 20.45	04.25 22.16	23.36
14	09.46 15.18	08.21 16.54	06.48 18.18	15.51-15.55/4	06.01 20.48	04.22 22.19	23.37
15	09.44 15.21	08.18 16.57	06.45 18.21	15.46-15.59/13	06.45 20.51	04.19 22.22	23.38
16	09.42 15.24	08.15 17.01	06.41 18.24	15.44-16.02/18	06.41 20.54	04.16 22.25	23.39
17	09.40 15.27	08.12 17.04	06.38 18.27	15.42-16.03/21	06.38 20.57	04.13 22.28	23.40
18	09.38 15.30	08.08 17.07	06.34 18.30	15.42-16.05/23	06.34 21.00	04.10 22.31	23.41
19	09.35 15.32	08.05 17.10	06.31 18.33	15.40-16.05/25	06.31 21.03	04.07 22.34	23.42
20	09.33 15.35	08.02 17.13	06.27 18.36	15.39-16.06/27	06.27 21.06	04.04 22.37	23.42
21	09.30 15.39	07.59 17.16	06.24 18.39	15.39-16.07/28	06.24 21.09	04.01 22.40	23.43
22	09.28 15.42	07.55 17.19	06.20 18.42	15.38-16.06/28	06.20 21.12	03.58 22.43	23.43
23	09.25 15.45	07.52 17.22	06.17 18.44	15.39-16.07/28	06.17 21.15	03.55 22.46	23.43
24	09.23 15.48	07.49 17.25	06.14 18.47	15.38-16.07/29	06.14 21.18	03.52 22.49	23.43
25	09.20 15.51	07.45 17.28	06.10 18.50	15.38-16.07/29	06.10 21.21	03.50 22.52	23.43
26	09.18 15.54	07.42 17.31	06.07 18.53	15.38-16.06/28	06.07 21.24	03.47 22.55	23.42
27	09.15 15.57	07.39 17.34	06.03 18.56	15.38-16.05/27	06.03 21.27	03.44 22.58	23.42
28	09.12 16.00	07.35 17.37	06.00 18.59	15.39-16.05/26	06.00 21.30	03.42 23.00	23.41
29	09.09 16.03		06.56 20.02		05.10 21.33	03.39 23.03	23.40
30	09.07 16.07		06.53 20.04		05.07 21.36	03.37 23.06	23.39
31	09.04 16.10		06.49 20.07			03.34 23.09	
Potential sun hours	179	241	363	448	562	610	57
Sum of minutes with flicker	0	354	75	146	117		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 59 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1183)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.33 22.23	06.05 20.40	07.28 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.36 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.39 22.17	06.10 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 22.13	06.13 20.29	07.37 18.46	08.08 16.04	09.37 14.48
5	03.21 23.32	04.46 22.10	20.36-20.42/6 20.26	06.16 18.42	07.40 16.01	08.12 14.46
6	03.23 23.31	04.49 22.07	20.34-20.45/11 20.22	06.19 18.39	07.42 15.58	08.15 14.45
7	03.25 23.29	04.52 22.04	20.32-20.46/14 20.19	06.22 18.35	07.45 15.55	08.18 14.43
8	03.27 23.27	04.55 22.01	20.31-20.47/16 20.16	06.25 18.32	07.48 15.52	08.21 14.42
9	03.29 23.25	04.58 21.57	20.29-20.47/18 20.12	06.27 18.29	07.51 15.49	16.22-16.31/9 14.41
10	03.32 23.23	05.01 21.54	20.29-20.48/19 20.09	06.30 18.25	07.54 15.46	16.18-16.34/16 14.40
11	03.34 23.21	05.04 21.51	20.29-20.49/20 20.05	06.33 18.22	07.57 15.43	16.16-16.35/19 14.39
12	03.37 23.18	05.07 21.47	20.28-20.48/20 20.02	06.36 18.18	08.00 15.40	16.14-16.36/22 14.38
13	03.39 23.16	05.10 21.44	20.28-20.49/21 19.58	06.38 18.15	08.02 15.37	16.13-16.37/24 14.37
14	03.42 23.14	05.13 21.41	20.28-20.49/21 19.55	06.41 18.12	08.05 15.34	16.12-16.37/25 14.36
15	03.44 23.11	05.16 21.38	20.27-20.48/21 19.51	06.44 18.08	08.08 15.31	16.11-16.38/27 14.36
16	03.47 23.09	05.18 21.34	20.28-20.47/19 19.48	06.47 18.05	08.11 15.29	16.10-16.38/28 14.36
17	03.50 23.06	05.21 21.31	20.29-20.47/18 19.44	06.50 18.02	08.14 15.26	16.10-16.39/29 14.35
18	03.52 23.04	05.24 21.27	20.29-20.45/16 19.41	06.52 17.58	08.17 15.23	16.10-16.38/28 14.35
19	03.55 23.01	05.27 21.24	20.30-20.44/14 19.37	06.55 17.55	08.20 15.21	16.09-16.38/29 14.35
20	03.58 22.58	05.30 21.21	20.31-20.40/9 19.34	06.58 17.52	08.23 15.18	16.09-16.37/28 14.35
21	04.01 22.56	05.33 21.17	20.34-20.37/3 19.30	07.01 17.48	08.26 15.15	16.09-16.36/27 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	16.10-16.36/26 15.13	09.04 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	16.11-16.35/24 15.11	09.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	16.11-16.34/23 15.08	09.10 14.37
25	04.12 22.44	05.45 21.04	07.12 19.17	07.38 16.35	15.13-15.33/20 15.06	09.13 14.38
26	04.15 22.41	05.48 21.00	07.14 19.13	07.41 16.32	15.14-15.31/17 15.04	09.16 14.39
27	04.18 22.38	05.51 20.57	07.17 19.10	07.44 16.29	15.17-15.28/11 15.01	09.19 14.40
28	04.21 22.35	05.53 20.53	07.20 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.24 22.32	05.56 20.50	07.23 19.03	07.50 16.22	09.24 14.57	10.07 14.43
30	04.27 22.29	05.59 20.47	07.26 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	0	266	0	432	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 60 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1184)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.42	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.47	03.22	03.24	04.49	06.19	07.42	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.32	17.58	20.27	21.57	23.25	23.28	22.04	20.19	18.35	15.55	14.44
8	09.56	08.40	07.08	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.15	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.18	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.30	17.49	15.16	14.36
22	09.28	07.55	06.20	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.35	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.14	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.57	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.35	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.04	21.36	23.05	23.38	22.29	20.47	18.59	17.19	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 61 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1185)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.49	09.01 16.14	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.37	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.30 14.54
2	10.04 14.50	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.31 23.13	03.17 23.36	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	04.58 21.45	03.29 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	04.54 21.48	03.27 23.18	03.20 23.33	04.43 22.13	06.14 20.30	07.37 18.46	08.09 16.04	09.37 14.49
5	10.01 14.56	08.49 16.26	07.19 17.53	06.32 20.22	04.51 21.51	03.24 23.20	03.22 23.32	04.46 22.10	06.17 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	09.59 14.59	08.46 16.30	07.16 17.55	06.29 20.25	04.48 21.54	03.23 23.23	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.46
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.45 21.57	03.21 23.25	03.26 23.28	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.44 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.46 14.43
9	09.55 15.06	08.37 16.39	07.05 18.04	06.19 20.34	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.49 14.42
10	09.53 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.16 23.31	03.33 23.22	05.01 21.54	06.30 20.09	07.54 18.26	08.27 15.46	09.51 14.41
11	09.52 15.11	08.31 16.45	06.59 18.10	06.12 20.39	04.32 22.10	03.14 23.32	03.35 23.20	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.52 14.40
12	09.50 15.13	08.28 16.49	06.55 18.13	06.08 20.42	04.29 22.13	03.13 23.34	03.37 23.18	05.07 21.48	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.39
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	04.26 22.16	03.12 23.35	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.36 15.38	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.37	03.43 23.13	05.13 21.41	06.42 19.55	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.22	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.10 23.38	03.45 23.11	05.16 21.38	06.44 19.52	08.08 18.09	08.43 15.32	09.59 14.37
16	09.42 15.24	08.15 17.01	06.41 18.25	05.55 20.54	04.16 22.25	03.09 23.39	03.48 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.00 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.09 23.40	03.51 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.27	10.02 14.36
18	09.37 15.30	08.09 17.07	06.35 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.03	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.08 23.41	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	04.05 22.37	03.08 23.42	03.59 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.19	10.05 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.38 21.09	04.02 22.40	03.08 23.42	04.02 22.55	05.34 21.17	07.01 19.31	08.26 17.49	09.01 15.16	10.05 14.37
22	09.28 15.42	07.56 17.20	06.21 18.42	05.34 21.12	03.59 22.43	03.08 23.42	04.05 22.53	05.37 21.14	07.04 19.27	08.29 17.46	09.04 15.14	10.06 14.37
23	09.25 15.45	07.52 17.23	06.17 18.45	05.31 21.15	03.56 22.46	03.08 23.42	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.06 14.37
24	09.23 15.48	07.49 17.26	06.14 18.48	05.27 21.18	03.53 22.49	03.08 23.42	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.52	07.46 17.29	06.10 18.50	05.24 21.21	03.51 22.52	03.09 23.42	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.07	10.07 14.39
26	09.18 15.55	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.10 23.42	04.16 22.41	05.48 21.00	07.15 19.13	07.41 17.33	09.16 15.04	10.07 14.40
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.57	03.10 23.41	04.19 22.38	05.51 20.57	07.18 19.10	07.44 17.29	09.19 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.43 23.00	03.11 23.40	04.22 22.35	05.54 20.54	07.20 19.07	07.47 17.26	09.21 15.00	10.07 14.42
29	09.09 16.04	07.33 17.41	05.57 19.02	05.11 21.33	03.40 23.03	03.13 23.40	04.25 22.32	05.57 20.50	07.23 19.03	07.50 17.23	09.24 14.58	10.07 14.43
30	09.07 16.07	07.31 17.44	05.53 19.05	05.07 21.36	03.38 23.06	03.14 23.39	04.28 22.29	06.00 20.47	07.26 19.00	07.53 17.20	09.27 14.56	10.06 14.45
31	09.04 16.10	07.28 17.51	05.50 19.08	05.04 21.39	03.35 23.08	03.11 23.40	04.25 22.26	05.54 20.43	07.20 19.00	07.47 17.17	09.21 14.56	10.06 14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 62 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1186)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.13	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.30 14.54
2	10.40 14.50	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.30 23.14	03.16 23.37	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.06 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.19	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	09.37 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.21	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.12 16.01	09.40 14.47
6	10.00 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.48 21.55	03.22 23.23	03.23 23.31	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.44 21.58	03.20 23.25	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.45 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.47 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.18 20.34	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.49 14.41
10	09.54 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.15 23.31	03.32 23.23	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	09.51 14.40
11	09.52 15.10	08.31 16.45	06.58 18.10	06.12 20.39	04.32 22.10	03.14 23.33	03.35 23.21	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.53 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	03.37 23.18	05.07 21.48	06.36 20.02	08.00 18.19	08.34 15.40	09.55 14.38
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	04.25 22.16	03.11 23.36	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.37 15.37	09.56 14.38
14	09.46 15.18	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.10 23.37	03.42 23.14	05.13 21.41	06.41 19.55	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.09 23.38	03.45 23.11	05.16 21.38	06.44 19.51	08.08 18.09	08.43 15.32	09.59 14.36
16	09.42 15.24	08.15 17.01	06.41 18.25	05.54 20.54	04.16 22.25	03.09 23.39	03.47 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.01 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	10.02 14.36
18	09.38 15.30	08.09 17.07	06.34 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.04	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.42	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	04.04 22.37	03.07 23.42	03.58 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.36
21	09.31 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.43	03.07 22.56	05.33 21.18	07.01 19.31	08.26 17.49	09.01 15.16	10.06 14.36
22	09.28 15.42	07.56 17.19	06.21 18.42	05.34 21.12	03.58 22.43	03.07 23.43	04.04 22.53	05.36 21.14	07.04 19.27	08.29 17.45	09.04 15.13	10.06 14.37
23	09.26 15.45	07.52 17.22	06.17 18.45	05.31 21.15	03.56 22.46	03.07 23.43	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	09.23 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.43	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.43	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.06	10.07 14.39
26	09.18 15.54	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.15 19.13	07.41 17.32	09.16 15.04	10.07 14.39
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.58	03.10 23.42	04.19 22.38	05.51 20.57	07.17 19.10	07.44 17.29	09.19 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.42 23.01	03.11 23.41	04.22 22.35	05.54 20.54	07.20 19.07	07.47 17.26	09.22 15.00	10.07 14.42
29	09.10 16.04		06.56 20.02	05.10 21.33	03.40 23.03	03.12 23.40	04.25 22.32	05.57 20.50	07.23 19.03	07.50 16.23	09.24 14.58	10.07 14.43
30	09.07 16.07		06.53 20.05	05.07 21.36	03.37 23.06	03.13 23.39	04.28 22.29	05.59 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.44
31	09.04 16.10		06.50 20.08		03.35 23.09		04.31 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 63 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1187)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.13	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.30 14.54
2	10.40 14.50	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.30 23.14	03.16 23.37	04.37 22.20	06.08 20.37	07.31 18.53	08.03 16.10	09.33 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.06 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.50	06.36 20.19	04.54 21.48	03.26 23.19	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	09.38 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.52	03.24 23.21	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.43	08.12 16.01	09.40 14.47
6	10.00 14.58	08.46 16.29	07.16 17.55	06.29 20.25	04.48 21.55	03.22 23.23	03.23 23.31	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.44 21.58	03.20 23.25	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.45 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.18 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.47 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.19 20.34	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.58	06.28 20.12	07.51 18.29	08.24 15.49	09.49 14.41
10	09.54 15.08	08.34 16.42	07.02 18.07	06.15 20.37	04.35 22.07	03.15 23.31	03.32 23.23	05.01 21.54	06.30 20.09	07.54 18.26	08.27 15.46	09.51 14.40
11	09.52 15.10	08.31 16.45	06.59 18.10	06.12 20.39	04.32 22.10	03.14 23.33	03.35 23.21	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.53 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	03.37 23.19	05.07 21.48	06.36 20.02	08.00 18.19	08.34 15.40	09.55 14.38
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	04.25 22.16	03.11 23.36	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.37 15.37	09.56 14.38
14	09.46 15.18	08.22 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.10 23.37	03.42 23.14	05.13 21.41	06.42 19.55	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.09 23.38	03.45 23.11	05.16 21.38	06.44 19.52	08.09 18.09	08.43 15.32	09.59 14.36
16	09.42 15.24	08.15 17.01	06.41 18.25	05.54 20.54	04.16 22.25	03.09 23.40	03.47 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.01 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	10.02 14.36
18	09.38 15.30	08.09 17.07	06.35 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.04	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.42	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	04.04 22.38	03.07 23.42	03.58 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.36
21	09.31 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.43	04.01 22.56	05.34 21.18	07.01 19.31	08.26 17.49	09.01 15.16	10.06 14.36
22	09.28 15.42	07.56 17.19	06.21 18.42	05.34 21.12	03.59 22.43	03.07 23.43	04.04 22.53	05.36 21.14	07.04 19.27	08.29 17.45	09.04 15.13	10.06 14.37
23	09.26 15.45	07.52 17.22	06.17 18.45	05.31 21.15	03.56 22.46	03.07 23.43	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.10	10.07 14.37
24	09.23 15.48	07.49 17.26	06.14 18.48	05.27 21.18	03.53 22.49	03.08 23.43	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.43	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.06	10.07 14.39
26	09.18 15.54	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.01	07.15 19.13	07.41 17.32	09.16 15.04	10.08 14.39
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.58	03.10 23.42	04.19 22.38	05.51 20.57	07.18 19.10	07.44 17.29	09.19 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.42 23.01	03.11 23.41	04.22 22.35	05.54 20.54	07.20 19.07	07.47 17.26	09.22 15.00	10.07 14.42
29	09.10 16.04		06.57 20.02	05.11 21.33	03.40 23.03	03.12 23.40	04.25 22.32	05.57 20.50	07.23 19.03	07.50 16.23	09.24 14.58	10.07 14.43
30	09.07 16.07		06.53 20.05	05.07 21.36	03.37 23.06	03.13 23.39	04.28 22.29	05.59 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.07 14.44
31	09.04 16.10		06.50 20.08		03.35 23.09		04.31 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapuisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 64 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1188)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	09.44
	15.00	16.32	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.33	23.21	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	09.58
	15.18	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.01
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.07	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.06
	15.39	17.16	18.39	21.09	22.40	23.43	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.38
26	09.18	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.39
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.40
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.22	10.07
	16.01	17.37	18.59	21.30	23.00	23.41	22.35	20.54	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 65 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1189)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.14	17.41	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.09	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.34	22.13	20.30	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.43	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.46	08.18	09.44
	15.01	16.33	17.58	20.28	21.58	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.47
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.06	16.39	18.04	20.34	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.54	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.26	15.47	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.48	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.37	09.56
	15.16	16.52	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.38	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.07	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.07	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.23	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.48	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.57	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 66 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1190) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

[January | February | March | April | May | June | July | August | September | October | November | December]

	[January]	[February]	[March]	[April]	[May]	[June]	[July]	[August]	[September]	[October]	[November]	[December]
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.48	16.13	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.16	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month    Sun rise (hh:mm)    First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
Sun set (hh:mm)    First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 67 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	
1	10.05 14.48	09.01 16.13	07.32 17.40	08.23-08.43/20 20.10	06.46 20.10	05.04 21.39	20.28-20.48/20 23.11
2	10.04 14.50	08.58 16.16	07.29 17.43	08.22-08.43/21 20.13	06.42 20.13	05.00 21.42	20.27-20.48/21 23.14
3	10.03 14.52	08.55 16.20	07.25 17.46	08.22-08.44/22 20.16	06.39 20.16	04.57 21.45	20.27-20.48/21 23.16
4	10.02 14.54	08.52 16.23	07.22 17.49	08.21-08.43/22 20.19	06.36 20.19	04.54 21.48	20.28-20.49/21 23.19
5	10.01 14.56	08.49 16.26	07.19 17.52	08.00-08.02/2 20.22	06.32 20.22	04.50 21.51	20.28-20.49/21 23.21
6	10.00 14.58	08.46 16.29	07.15 17.55	07.56-08.07/11 20.25	06.29 20.25	04.47 21.54	20.27-20.48/21 23.23
7	09.58 15.00	08.43 16.32	07.12 17.58	07.53-08.08/15 20.28	06.25 20.28	04.44 21.58	20.28-20.48/20 23.25
8	09.57 15.03	08.40 16.35	07.09 18.01	07.52-08.10/18 20.30	06.22 20.30	04.41 22.01	20.28-20.47/19 23.27
9	09.55 15.05	08.37 16.39	07.05 18.04	07.50-08.10/20 20.33	06.18 20.33	04.38 22.04	20.29-20.47/18 23.29
10	09.54 15.07	08.34 16.42	07.02 18.07	07.50-08.11/21 20.36	06.15 20.36	04.34 22.07	20.30-20.46/16 23.31
11	09.52 15.10	08.31 16.45	06.58 18.10	07.49-08.11/22 20.39	06.11 20.39	04.31 22.10	20.30-20.44/14 23.33
12	09.50 15.13	08.28 16.48	06.55 18.13	07.49-08.11/22 20.42	06.08 20.42	04.28 22.13	20.33-20.44/11 23.34
13	09.48 15.15	08.25 16.51	06.51 18.16	07.49-08.10/21 20.45	06.04 20.45	04.25 22.16	20.35-20.41/6 23.36
14	09.46 15.18	08.21 16.54	06.48 18.19	07.49-08.10/21 20.48	06.01 20.48	04.22 22.19	03.10 23.37
15	09.44 15.21	08.18 16.58	06.45 18.21	07.49-08.08/19 20.51	05.58 20.51	04.19 22.22	03.09 23.38
16	09.42 15.24	08.15 17.01	06.41 18.24	07.51-08.08/17 20.54	05.54 20.54	04.16 22.25	03.08 23.39
17	09.40 15.27	08.12 17.04	06.38 18.27	07.51-08.05/14 20.57	05.51 20.57	04.13 22.28	03.08 23.40
18	09.38 15.30	08.09 17.07	06.34 18.30	07.54-08.03/9 21.00	05.47 21.00	04.10 22.31	03.07 23.41
19	09.35 15.33	08.05 17.10	06.31 18.33	21.03	05.44 21.03	04.07 22.34	03.07 23.42
20	09.33 15.36	08.02 17.13	06.27 18.36	21.06	05.41 21.06	04.04 22.37	03.07 23.42
21	09.30 15.39	07.59 17.16	06.24 18.39	21.09	05.37 21.09	04.01 22.40	03.07 23.43
22	09.28 15.42	07.55 17.19	06.20 18.42	21.12	05.34 21.12	03.58 22.43	03.07 23.43
23	09.25 15.45	07.52 17.22	06.17 18.44	21.15	05.30 21.15	03.55 22.46	03.07 23.43
24	09.23 15.48	07.49 17.25	06.14 18.47	21.18	05.27 21.18	03.53 22.49	03.07 23.43
25	09.20 15.51	07.46 17.28	06.10 18.50	21.21	05.24 21.21	03.50 22.52	03.08 23.43
26	09.18 15.54	07.42 17.31	06.07 18.53	21.24	05.20 21.24	03.47 22.55	03.09 23.42
27	09.15 15.57	07.39 17.34	06.03 18.56	21.27	05.17 21.27	03.45 22.58	03.09 23.42
28	09.12 16.00	07.36 17.37	06.00 18.59	21.30	05.14 21.30	03.42 23.01	03.10 23.41
29	09.09 16.04		06.56 20.02	21.33	05.10 21.33	03.39 23.03	03.12 23.40
30	09.07 16.07		06.53 20.05	21.36	05.07 21.36	03.37 23.06	03.13 23.39
31	09.04 16.10		06.49 20.07			03.35 23.09	
Potential sun hours	179	241	363	448	562	610	0
Sum of minutes with flicker	0	59	416	72	229	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 67 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1191)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	July	August	September	October	November	December
1	03.14 23.38	04.34 20.42-20.54/12 22.23	06.05 20.40	07.28 08.28-08.49/21 18.56	07.59 16.13	09.30 14.53
2	03.16 23.37	04.37 20.41-20.56/15 22.20	06.08 20.36	07.31 08.27-08.49/22 18.53	08.02 16.10	09.32 14.51
3	03.17 23.35	04.40 20.39-20.56/17 22.17	06.11 20.33	07.34 08.27-08.49/22 18.49 09.08-09.09/1	08.05 16.07	09.35 14.50
4	03.19 23.34	04.43 20.39-20.57/18 22.13	06.13 20.29	07.37 08.28-08.48/20 18.46 09.03-09.14/11	08.09 16.04	09.37 14.48
5	03.21 23.32	04.46 20.38-20.57/19 22.10	06.16 20.26	07.40 08.28-08.47/19 18.42 09.00-09.16/16	08.12 16.01	09.40 14.46
6	03.23 23.31	04.49 20.37-20.58/21 22.07	06.19 20.22	07.43 08.29-08.46/17 18.39 08.59-09.17/18	08.15 15.58	09.42 14.45
7	03.25 23.29	04.52 20.36-20.58/22 22.04	06.22 20.19	07.45 08.30-08.44/14 18.35 08.58-09.18/20	08.18 15.55	09.44 14.43
8	03.27 23.27	04.55 20.37-20.58/21 22.01	06.25 20.16	07.48 08.33-08.41/8 18.32 08.57-09.18/21	08.21 15.52	09.47 14.42
9	03.30 23.25	04.58 20.37-20.58/21 21.57	06.27 20.12	07.51 08.56-09.18/22 18.29	08.24 15.49	09.49 14.41
10	03.32 23.23	05.01 20.36-20.58/22 21.54	06.30 20.09	07.54 08.56-09.18/22 18.25	08.27 15.46	09.51 14.40
11	03.34 23.21	05.04 20.37-20.58/21 21.51	06.33 20.05	07.57 08.56-09.17/21 18.22	08.30 15.43	09.53 14.39
12	03.37 23.18	05.07 20.36-20.56/20 21.48	06.36 20.02	08.00 08.56-09.17/21 18.19	08.33 15.40	09.55 14.38
13	03.39 23.16	05.10 20.37-20.56/19 21.44	06.39 19.58	08.03 08.56-09.16/20 18.15	08.37 15.37	09.56 14.37
14	03.42 23.14	05.13 20.38-20.55/17 21.41	06.41 19.55	08.05 08.56-09.15/19 18.12	08.40 15.34	09.58 14.37
15	03.44 23.11	05.16 20.38-20.53/15 21.38	06.44 19.51	08.08 08.57-09.13/16 18.08	08.43 15.31	09.59 14.36
16	03.47 23.09	05.19 20.40-20.52/12 21.34	06.47 19.48	08.11 09.00-09.12/12 18.05	08.46 15.29	10.01 14.36
17	03.50 23.06	05.22 20.43-20.49/6 21.31	06.50 19.44	08.14 09.02-09.09/7 18.02	08.49 15.26	10.02 14.35
18	03.53 23.04	05.24 21.28	06.52 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	03.55 23.01	05.27 21.24	06.55 19.37	08.20 17.55	08.55 15.21	10.04 14.35
20	03.58 22.58	05.30 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.35
21	04.01 22.56	05.33 21.17	07.01 19.31	08.26 17.48	09.01 15.16	10.06 14.36
22	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.36
23	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.08	10.07 14.37
25	04.13 22.44	05.45 21.04	07.12 08.37-08.44/7 19.17	07.38 16.35	09.13 15.06	10.07 14.38
26	04.16 22.41	05.48 21.00	07.15 08.34-08.47/13 19.13	07.41 16.32	09.16 15.04	10.07 14.39
27	04.19 22.38	05.51 20.57	07.17 08.32-08.48/16 19.10	07.44 16.29	09.19 15.01	10.07 14.40
28	04.22 22.35	05.53 20.54	07.20 08.31-08.49/18 19.06	07.47 16.26	09.22 14.59	10.07 14.41
29	04.25 22.32	05.56 20.50	07.23 08.30-08.50/20 19.03	07.50 16.23	09.24 14.57	10.07 14.43
30	04.28 22.29	05.59 20.47	07.26 08.29-08.50/21 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	04.31 20.44-20.52/8 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	8	298	95	390	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 -  
 Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
 FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 68 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1192)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	06.48	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.01
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.06
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.36	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.53	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.53	21.23	22.55	23.42	22.41	21.00	19.13	16.32	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.44	09.18	10.07
	15.57	17.34	18.55	21.26	22.58	23.42	22.38	20.57	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.00	23.41	22.35	20.53	19.06	16.25	14.59	14.40
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.49/3.4.388

# SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 69 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1193)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

## Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.38	23.11	23.37	22.22	20.39	18.55	16.12	14.53
2	10.04	08.57	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.34
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.21	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.33	22.13	20.29	18.45	16.03	14.47
5	10.00	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.26	22.00	20.15	18.31	15.51	14.41
9	09.55	08.36	07.04	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.23	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.24	21.57	20.11	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.12	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.44	22.16	23.35	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.41	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.01
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.16	08.51	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.35
19	09.35	08.05	06.30	05.43	04.06	03.06	03.55	05.27	06.54	08.19	08.54	10.04
	15.32	17.09	18.32	21.02	22.34	23.41	23.00	21.24	19.37	17.54	15.20	14.35
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.04
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.27	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.42	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.42	22.47	21.07	19.19	17.38	15.08	14.37
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.12	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.54	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.40	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.49	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.52	09.27	10.06
	16.06		20.04	21.35	23.05	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		06.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 70 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1194)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

#### Assumptions for shadow calculations

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	July	August	September	October	November	December			
1	10.05	09.01	07.32	06.45	05.03	06.12-06.36/24	03.32	03.14	04.33	06.04	07.28	07.59	09.29		
	14.47	16.13	17.40	20.10	21.39		23.11	23.38	22.23	20.39	18.56	16.12	14.53		
2	10.04	08.58	07.28	06.42	05.00	06.12-06.35/23	03.29	03.15	04.36	06.07	07.31	08.02	09.32		
	14.49	16.16	17.43	20.13	21.42		23.13	23.36	22.19	20.36	18.52	16.09	14.51		
3	10.03	08.55	07.25	06.38	04.56	06.12-06.34/22	03.27	03.17	04.39	06.10	07.34	08.05	09.35		
	14.51	16.19	17.46	20.16	21.45		23.16	23.35	22.16	20.32	18.49	16.06	14.49		
4	10.02	08.52	07.22	06.35	04.53	06.13-06.33/20	03.25	03.19	04.42	06.30-06.35/5	06.13	07.36	08.08	09.37	
	14.53	16.22	17.49	20.18	21.48		23.18	23.34	22.13	20.29	18.45	16.03	14.47		
5	10.01	08.49	07.18	06.32	04.50	06.13-06.32/19	03.23	03.20	04.45	06.27-06.39/12	06.16	07.39	08.11	09.40	
	14.55	16.25	17.52	20.21	21.51		23.21	23.32	22.10	20.26	18.42	16.00	14.46		
6	09.59	08.46	07.15	06.28	04.47	06.15-06.32/17	03.21	03.22	04.48	06.25-06.40/15	06.18	07.42	08.14	09.42	
	14.57	16.29	17.55	20.24	21.54		23.23	23.30	22.07	20.22	18.38	15.57	14.44		
7	09.58	08.43	07.11	06.25	04.43	06.16-06.30/14	03.19	03.24	04.51	06.24-06.41/17	06.21	07.45	08.17	09.44	
	15.00	16.32	17.58	20.27	21.57		23.25	23.29	22.03	20.19	18.35	15.54	14.43		
8	09.57	08.40	07.08	06.21	04.40	06.18-06.28/10	03.17	03.27	04.54	06.23-06.43/20	06.24	07.48	08.21	09.46	
	15.02	16.35	18.01	20.30	22.00		23.27	23.27	22.00	20.15	18.32	15.51	14.42		
9	09.55	08.37	07.05	06.18	04.37		03.16	03.29	04.57	06.22-06.43/21	06.27	07.51	08.24	09.48	
	15.04	16.38	18.03	20.33	22.03		23.29	23.25	21.57	20.12	18.28	15.48	14.40		
10	09.53	08.34	07.01	06.14	04.34		03.14	03.31	05.00	06.21-06.44/23	06.30	07.53	08.27	09.50	
	15.07	16.41	18.06	20.36	22.06		23.31	23.23	21.54	20.08	18.25	15.45	14.39		
11	09.52	08.30	06.58	06.11	04.31		03.13	03.34	05.03	06.21-06.44/23	06.32	07.56	08.30	09.52	
	15.09	16.44	18.09	20.39	22.10		23.33	23.20	21.50	20.05	18.21	15.42	14.38		
12	09.50	08.27	06.54	06.07	04.28		03.11	03.36	05.06	06.20-06.44/24	06.35	07.59	08.33	09.54	
	15.12	16.48	18.12	20.42	22.13		23.34	23.18	21.47	20.01	18.18	15.39	14.37		
13	09.48	08.24	06.51	06.04	04.24		03.10	03.38	05.09	06.20-06.44/24	06.38	08.02	08.36	09.56	
	15.15	16.51	18.15	20.45	22.16		23.36	23.16	21.44	19.58	18.15	15.36	14.37		
14	09.46	08.21	06.48	06.01	04.21	03.09	04.27-04.31/4	03.41	05.12	06.19-06.44/25	06.41	08.05	08.39	09.58	
	15.18	16.54	18.18	20.48	22.19		23.37	23.13	21.40	19.54	18.11	15.34	14.36		
15	09.44	08.18	06.44	05.57	04.18	03.08	04.27-04.32/5	03.44	05.15	06.19-06.44/25	06.44	08.08	08.42	09.59	
	15.20	16.57	18.21	20.51	22.22		23.38	23.11	21.37	19.51	18.08	15.31	14.35		
16	09.42	08.15	06.41	05.54	04.15	03.08	04.26-04.33/7	03.46	05.18	06.20-06.44/24	06.46	08.11	08.45	10.00	
	15.23	17.00	18.24	20.53	22.25		23.39	23.09	21.34	19.47	18.05	15.28	14.35		
17	09.39	08.11	06.37	05.50	04.12	03.07	04.26-04.34/8	03.49	05.21	06.19-06.42/23	06.49	08.14	08.49	10.02	
	15.26	17.03	18.27	20.56	22.28		23.40	23.06	21.30	19.44	18.01	15.25	14.35		
18	09.37	08.08	06.34	05.47	04.09	03.06	04.26-04.34/8	03.52	05.24	06.20-06.42/22	06.52	08.17	08.52	10.03	
	15.29	17.06	18.30	20.59	22.31		23.41	23.03	21.27	19.40	17.58	15.23	14.35		
19	09.35	08.05	06.30	05.43	04.06	03.06	04.26-04.35/9	03.55	05.27	06.21-06.41/20	06.55	08.20	08.55	10.04	
	15.32	17.09	18.32	21.02	22.34		23.42	23.01	21.24	19.37	17.55	15.20	14.35		
20	09.33	08.02	06.27	05.40	06.24-06.29/5	04.03	03.06	04.26-04.35/9	03.57	05.30	06.21-06.39/18	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37		23.42	22.58	21.20	19.34	17.51	15.18	14.35		
21	09.30	07.58	06.23	05.37	06.20-06.32/12	04.00	03.06	04.26-04.35/9	04.00	05.33	06.23-06.38/15	07.00	08.25	09.01	10.05
	15.38	17.16	18.38	21.08	22.40		23.43	22.55	21.17	19.30	17.48	15.15	14.35		
22	09.28	07.55	06.20	05.33	06.17-06.33/16	03.58	03.06	04.26-04.35/9	04.03	05.36	06.25-06.36/11	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43		23.43	22.52	21.14	19.27	17.45	15.12	14.35		
23	09.25	07.52	06.17	05.30	06.15-06.34/19	03.55	03.06	04.27-04.36/9	04.06	05.39	06.29-06.31/2	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46		23.43	22.50	21.10	19.23	17.41	15.10	14.36		
24	09.23	07.48	06.13	05.26	06.14-06.35/21	03.52	03.07	04.27-04.35/8	04.09	05.41	07.08	08.34	09.10	10.07	
	15.47	17.25	18.47	21.17	22.49		23.43	22.47	21.07	19.20	17.38	15.08	14.37		
25	09.20	07.45	06.10	05.23	06.13-06.36/23	03.49	03.07	04.28-04.36/8	04.12	05.44	07.11	07.37	09.13	10.07	
	15.50	17.28	18.50	21.20	22.52		23.42	22.44	21.03	19.16	16.35	15.05	14.37		
26	09.17	07.42	06.06	05.20	06.13-06.36/23	03.47	03.08	04.28-04.35/7	04.15	05.47	07.14	07.40	09.16	10.07	
	15.54	17.31	18.53	21.23	22.55		23.42	22.41	21.00	19.13	16.32	15.03	14.38		
27	09.15	07.38	06.03	05.16	06.12-06.36/24	03.44	03.09	04.29-04.35/6	04.18	05.50	07.17	07.44	09.18	10.07	
	15.57	17.34	18.55	21.26	22.57		23.41	22.38	20.57	19.09	16.28	15.01	14.40		
28	09.12	07.35	05.59	05.13	06.12-06.36/24	03.41	03.10	04.30-04.34/4	04.21	05.53	07.20	07.47	09.21	10.07	
	16.00	17.37	18.58	21.30	23.00		23.41	22.35	20.53	19.02	16.25	14.59	14.41		
29	09.09		06.56	05.10	06.12-06.36/24	03.39	03.11		04.24	05.56	07.22	07.50	09.24	10.07	
	16.03		20.01	21.33	23.03		23.40		22.32	20.50	19.02	16.22	14.57	14.42	
30	09.06		06.52	05.06	06.12-06.36/24	03.36	03.12		04.27	05.59	07.25	07.53	09.27	10.06	
	16.06		20.04	21.36	23.06		23.39		22.29	20.46	18.59	16.19	14.55	14.43	
31	09.03		06.49		03.34				04.30	06.02		07.56		10.06	
	16.09		20.07		23.08				22.26	20.43		16.16		14.45	
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	0	147		
Sum of minutes with flicker	0	0	0	215	149	110	0	369	0	0	0	0	0		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 71 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1195)  
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.47	09.00 16.13	07.32 17.40	06.45 20.10	05.03 21.39	03.32 23.11	03.14 23.38	04.33 22.22	06.04 20.39	07.28 18.55	07.59 16.12	09.29 14.53
2	10.04 14.49	08.58 16.16	07.28 17.43	06.42 20.13	05.00 21.42	03.29 23.13	03.15 23.36	04.36 22.19	06.07 20.36	07.31 18.52	08.02 16.09	09.32 14.51
3	10.03 14.51	08.55 16.19	07.25 17.46	06.38 20.15	04.56 21.45	03.27 23.16	03.17 23.35	04.39 22.16	06.10 20.32	07.34 18.49	08.05 16.06	09.34 14.49
4	10.02 14.53	08.52 16.22	07.22 17.49	06.35 20.18	04.53 21.48	03.25 23.18	03.19 23.33	04.42 22.13	06.13 20.29	07.36 18.45	08.08 16.03	09.37 14.47
5	10.01 14.55	08.49 16.25	07.18 17.52	06.32 20.21	04.50 21.51	03.23 23.20	03.20 23.32	04.45 22.10	06.16 20.25	07.39 18.42	08.11 16.00	09.39 14.46
6	09.59 14.57	08.46 16.29	07.15 17.55	06.28 20.24	04.47 21.54	03.21 23.23	03.22 23.30	04.48 22.07	06.18 20.22	07.42 18.38	08.14 15.57	09.42 14.44
7	09.58 15.00	08.43 16.32	07.11 17.58	06.25 20.27	04.43 21.57	03.19 23.25	03.24 23.28	04.51 22.03	06.21 20.19	07.45 18.35	08.17 15.54	09.44 14.43
8	09.56 15.02	08.40 16.35	07.08 18.01	06.21 20.30	04.40 22.00	03.17 23.27	03.27 23.26	04.54 22.00	06.24 20.15	07.48 18.32	08.20 15.51	09.46 14.42
9	09.55 15.04	08.37 16.38	07.05 18.03	06.18 20.33	04.37 22.03	03.16 23.29	03.29 23.24	04.57 21.57	06.27 20.12	07.51 18.28	08.24 15.48	09.48 14.40
10	09.53 15.07	08.33 16.41	07.01 18.06	06.14 20.36	04.34 22.06	03.14 23.31	03.31 23.22	05.00 21.54	06.30 20.08	07.53 18.25	08.27 15.45	09.50 14.39
11	09.51 15.09	08.30 16.44	06.58 18.09	06.11 20.39	04.31 22.09	03.13 23.32	03.34 23.20	05.03 21.50	06.32 20.05	07.56 18.21	08.30 15.42	09.52 14.38
12	09.50 15.12	08.27 16.48	06.54 18.12	06.07 20.42	04.28 22.12	03.12 23.34	03.36 23.18	05.06 21.47	06.35 20.01	07.59 18.18	08.33 15.39	09.54 14.37
13	09.48 15.15	08.24 16.51	06.51 18.15	06.04 20.45	04.24 22.16	03.10 23.35	03.39 23.16	05.09 06.43-06.48/5 21.44	06.38 19.58	08.02 18.15	08.36 15.36	09.56 14.37
14	09.46 15.18	08.21 16.54	06.47 18.18	06.00 20.48	04.21 22.19	03.09 23.37	03.41 23.13	05.12 06.39-06.50/11 21.40	06.41 19.54	08.05 18.11	08.39 15.34	09.57 14.36
15	09.44 15.20	08.18 16.57	06.44 18.21	05.57 06.36-06.46/10 20.50	04.18 22.22	03.08 23.38	03.44 23.11	05.15 06.38-06.52/14 21.37	06.43 19.51	08.08 18.08	08.42 15.31	09.59 14.35
16	09.42 15.23	08.14 17.00	06.41 18.24	05.54 06.34-06.48/14 20.53	04.15 22.25	03.08 23.39	03.46 23.08	05.18 06.37-06.54/17 21.34	06.46 19.47	08.11 18.05	08.45 15.28	10.00 14.35
17	09.39 15.26	08.11 17.03	06.37 18.27	05.50 06.31-06.48/17 20.56	04.12 22.28	03.07 23.40	03.49 23.06	05.21 06.35-06.54/19 21.30	06.49 19.44	08.14 18.01	08.48 15.25	10.01 14.35
18	09.37 15.29	08.08 17.06	06.34 18.30	05.47 06.30-06.49/19 20.59	04.09 22.31	03.06 23.41	03.52 23.03	05.24 06.35-06.55/20 21.27	06.52 19.40	08.17 17.58	08.51 15.23	10.03 14.35
19	09.35 15.32	08.05 17.09	06.30 18.32	05.43 06.29-06.50/21 21.02	04.06 22.34	03.06 23.41	03.55 23.01	05.27 06.34-06.55/21 21.24	06.55 19.37	08.19 17.55	08.55 15.20	10.04 14.35
20	09.32 15.35	08.01 17.12	06.27 18.35	05.40 06.29-06.50/21 21.05	04.03 22.37	03.06 23.42	03.57 22.58	05.30 06.33-06.55/22 21.20	06.57 19.33	08.22 17.51	08.58 15.18	10.04 14.35
21	09.30 15.38	07.58 17.16	06.23 18.38	05.37 06.29-06.50/21 21.08	04.00 22.40	03.06 23.42	04.00 22.55	05.33 06.33-06.55/22 21.17	07.00 19.30	08.25 17.48	09.01 15.15	10.05 14.35
22	09.28 15.41	07.55 17.19	06.20 18.41	05.33 06.28-06.49/21 21.11	03.58 22.43	03.06 23.42	04.03 22.52	05.36 06.33-06.55/22 21.13	07.03 19.27	08.28 17.45	09.04 15.12	10.06 14.36
23	09.25 15.44	07.52 17.22	06.16 18.44	05.30 06.28-06.49/21 21.14	03.55 22.46	03.06 23.43	04.06 22.49	05.38 06.33-06.54/21 21.10	07.06 19.23	08.31 17.41	09.07 15.10	10.06 14.36
24	09.22 15.47	07.48 17.25	06.13 18.47	05.26 06.28-06.49/21 21.17	03.52 22.49	03.07 23.42	04.09 22.47	05.41 06.33-06.53/20 21.07	07.08 19.20	08.34 17.38	09.10 15.08	10.07 14.37
25	09.20 15.50	07.45 17.28	06.10 18.50	05.23 06.28-06.48/20 21.20	03.49 22.52	03.07 23.42	04.12 22.44	05.44 06.34-06.53/19 21.03	07.11 19.16	07.37 16.35	09.13 15.05	10.07 14.38
26	09.17 15.54	07.42 17.31	06.06 18.52	05.20 06.29-06.47/18 21.23	03.47 22.54	03.08 23.42	04.15 22.41	05.47 06.34-06.51/17 21.00	07.14 19.13	07.40 16.32	09.15 15.03	10.07 14.38
27	09.14 15.57	07.38 17.34	06.03 18.55	05.16 06.30-06.46/16 21.26	03.44 22.57	03.09 23.41	04.18 22.38	05.50 06.35-06.50/15 20.56	07.17 19.09	07.43 16.28	09.18 15.01	10.07 14.40
28	09.12 16.00	07.35 17.37	05.59 18.58	05.13 06.31-06.45/14 21.29	03.41 23.00	03.10 23.40	04.21 22.35	05.53 06.37-06.47/10 20.53	07.20 19.06	07.46 16.25	09.21 14.59	10.07 14.41
29	09.09 16.03		06.56 20.01	05.10 06.33-06.42/9 21.32	03.39 23.03	03.11 23.40	04.24 22.32	05.56 20.50	07.22 19.02	07.50 16.22	09.24 14.57	10.06 14.42
30	09.06 16.06		06.52 20.04	05.06 21.36	03.36 23.05	03.12 23.39	04.27 22.29	05.59 20.46	07.25 18.59	07.53 16.19	09.27 14.55	10.06 14.44
31	09.03 16.09		06.49 20.07		03.34 23.08		04.30 22.26	06.01 20.43		07.56 16.16		10.05 14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	263	0	0	0	275	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-	Last time (hh:mm) with flicker/
	Sun set (hh:mm)	Minutes with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 72 - VESTAS V162-5.6 HH210 5600 180.0 !0! hub: 210,0 m (TOT: 300,0 m) (1196)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.37	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.48	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.15	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.25	18.42	16.00	14.45
6	09.59	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.24	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.31	17.57	20.27	21.57	23.25	23.29	22.03	20.18	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.29	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.33	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.14	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.53	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.09	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.22	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.01	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.32	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.18	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.44	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.09	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.19	03.46	03.08	04.15	05.47	07.14	07.40	09.16	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.43	09.18	10.07
	15.56	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.58	14.40
29	09.09		05.56	05.09	03.38	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		05.52	05.06	03.36	03.12	04.27	05.58	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		05.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.08		22.26	20.43		16.15		14.45
Potential sun hours	179	241	363	448	562	611	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 73 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1197)
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). It contains numerical data for potential sun hours and minutes with flicker for each day.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 74 - VESTAS V162-5.6 HH210 5600 180.0 !0! hub: 210,0 m (TOT: 300,0 m) (1198)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.56	16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.19	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.32	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.26	18.42	16.00	14.46
6	10.00	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.12	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.18	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.00	23.27	23.27	22.00	20.15	18.32	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.29	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.54	08.27	09.51
	15.07	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.31	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.55
	15.12	16.48	18.12	20.42	22.13	23.35	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	06.48	06.01	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.44	08.08	08.43	09.59
	15.20	16.57	18.21	20.51	22.22	23.39	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.05	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	21.00	22.31	23.41	23.04	21.27	19.41	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.06	22.37	23.43	22.58	21.21	19.34	17.51	15.17	14.35
21	09.30	07.58	06.24	05.37	04.00	03.06	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.16	18.38	21.09	22.40	23.43	22.56	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.36	07.03	08.29	09.04	10.06
	15.41	17.19	18.41	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.17	05.30	03.55	03.06	04.06	05.38	07.06	08.32	09.07	10.07
	15.44	17.22	18.44	21.15	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.49	06.13	05.26	03.52	03.06	04.09	05.41	07.09	08.35	09.10	10.07
	15.47	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.38	09.13	10.07
	15.50	17.28	18.50	21.21	22.52	23.43	22.44	21.03	19.16	17.35	15.05	14.37
26	09.18	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.41	09.16	10.07
	15.53	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.03	14.38
27	09.15	07.39	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.58	23.42	22.38	20.57	19.09	17.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.01	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		06.56	05.10	03.39	03.11	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.04		06.49		03.34		04.30	06.02		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 75 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June		
1	10.05 14.47	09.01 16.13	07.32 17.40	08.23-08.45/22 20.10	06.45 07.38-07.57/19 20.10	05.03 21.39	03.31 23.11	04.35-04.49/14
2	10.04 14.49	08.58 16.16	07.29 17.43	08.23-08.46/23 20.13	06.42 07.38-07.55/17 20.13	05.00 21.42	03.29 23.14	04.35-04.50/15
3	10.03 14.51	08.55 16.19	07.25 17.46	08.22-08.46/24 20.16	06.39 07.39-07.54/15 20.16	04.56 21.45	03.27 23.16	04.34-04.51/17
4	10.02 14.53	08.52 16.22	07.22 17.49	08.22-08.47/25 20.19	06.35 07.41-07.53/12 20.19	04.53 21.48	03.25 23.19	04.34-04.52/18
5	10.01 14.55	08.49 16.25	07.18 17.52	08.21-08.46/25 20.21	06.32 07.43-07.49/6 20.21	04.50 21.51	03.23 23.21	04.34-04.52/18
6	10.00 14.57	08.46 16.29	07.15 17.55	08.21-08.46/25 20.24	06.28 20.24	04.47 21.54	03.21 23.23	04.34-04.53/19
7	09.58 14.59	08.43 16.32	07.12 17.58	08.21-08.45/24 20.27	06.25 20.27	04.43 21.57	03.19 23.25	04.33-04.53/20
8	09.57 15.02	08.40 16.35	07.08 18.01	08.21-08.44/23 20.30	06.21 20.30	04.40 22.00	03.17 23.27	04.33-04.53/20
9	09.55 15.04	08.37 16.38	07.05 18.04	08.22-08.44/22 20.33	06.18 20.33	04.37 22.04	03.16 23.29	04.33-04.54/21
10	09.54 15.07	08.34 16.41	07.01 18.07	08.22-08.42/20 20.36	06.14 20.36	04.34 22.07	03.14 23.31	04.34-04.55/21
11	09.52 15.09	08.31 16.44	06.58 18.09	08.23-08.41/18 20.39	06.11 20.39	04.31 22.10	03.13 23.33	04.33-04.55/22
12	09.50 15.12	08.27 16.48	06.55 18.12	08.25-08.38/13 20.42	06.07 20.42	04.27 22.13	03.11 23.35	04.33-04.55/22
13	09.48 15.15	08.24 16.51	06.51 18.15	08.29-08.34/5 20.45	06.04 20.45	04.24 22.16	03.10 23.36	04.34-04.56/22
14	09.46 15.17	08.21 16.54	06.48 18.18	06.01 20.48	06.01 20.48	04.21 22.19	03.09 23.37	04.34-04.56/22
15	09.44 15.20	08.18 16.57	06.44 18.21	06.44 20.51	05.57 20.51	04.18 22.22	03.08 23.39	04.34-04.56/22
16	09.42 15.23	08.15 17.00	06.41 18.24	06.41 20.54	05.54 20.54	04.15 22.25	03.07 23.40	04.34-04.56/22
17	09.40 15.26	08.11 17.03	06.37 18.27	06.37 20.57	05.50 20.57	04.12 22.28	03.07 23.41	04.34-04.56/22
18	09.38 15.29	08.08 17.06	06.34 18.30	06.34 21.00	05.47 21.00	04.09 22.31	03.06 23.41	04.34-04.57/23
19	09.35 15.32	08.05 17.09	06.30 18.33	06.30 21.03	05.43 21.03	04.06 22.34	03.06 23.42	04.35-04.57/22
20	09.33 15.35	08.02 17.13	06.27 18.35	06.27 21.06	05.40 21.06	04.03 22.37	03.06 23.43	04.35-04.57/22
21	09.30 15.38	07.58 17.16	06.24 18.38	06.24 21.09	05.37 21.09	04.00 22.40	03.06 23.43	04.35-04.57/22
22	09.28 15.41	07.55 17.19	06.20 18.41	06.20 21.12	05.33 21.12	03.57 22.43	03.06 23.43	04.35-04.57/22
23	09.25 15.44	07.52 17.22	06.17 18.44	06.17 21.15	05.30 21.15	03.55 22.46	03.06 23.43	04.36-04.58/22
24	09.23 15.47	07.49 17.25	06.13 18.47	06.49-06.50/1 21.18	05.26 21.18	03.52 22.49	03.06 23.43	04.35-04.58/23
25	09.20 15.50	07.45 17.28	06.10 18.50	06.45-06.55/10 21.21	05.23 21.21	03.49 22.52	03.07 23.43	04.36-04.59/23
26	09.18 15.54	07.42 17.31	06.06 18.53	06.42-06.56/14 21.24	05.20 21.24	03.46 22.55	03.08 23.42	04.36-04.58/22
27	09.15 15.57	07.39 17.34	06.03 18.56	06.41-06.57/16 21.27	05.16 21.27	03.44 22.58	03.09 23.42	04.36-04.59/23
28	09.12 16.00	07.35 17.37	05.59 18.58	06.40-06.58/18 21.30	05.13 21.30	03.41 23.01	03.10 23.41	04.37-04.59/22
29	09.09 16.03		06.56 20.01	07.39-07.58/19 21.33	05.10 21.33	03.39 23.03	03.11 23.40	04.37-04.59/22
30	09.07 16.06		06.52 20.04	07.39-07.58/19 21.36	05.06 21.36	03.36 23.06	03.12 23.39	04.38-04.59/21
31	09.04 16.09		06.49 20.07	07.38-07.57/19		03.34 23.09		
Potential sun hours	179	241	363	448	562	611	626	
Sum of minutes with flicker	0	48	385	69	31			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 75 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1199)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	July	August	September	October	November	December
1	03.13 04.38-04.59/21 23.38	04.33 22.23 20.39	06.04 20.39	07.28 09.05-09.16/11 18.56	07.59 16.13 09.30	09.30 14.53
2	03.15 04.38-04.59/21 23.37	04.36 22.20 20.36	06.07 20.36	07.31 09.03-09.18/15 18.52	08.02 16.09 09.32	09.32 14.51
3	03.17 04.38-04.59/21 23.35	04.39 22.17 20.33	06.10 20.33	07.34 09.01-09.20/19 18.49	08.05 16.06 09.35	09.35 14.49
4	03.18 04.38-04.59/21 23.34	04.42 22.13 20.29	06.13 20.29	07.37 08.59-09.21/22 18.45	08.08 16.03 09.37	09.37 14.47
5	03.20 04.39-04.59/20 23.32	04.45 22.10 20.26	06.16 20.26	07.39 08.58-09.21/23 18.42	08.11 16.00 09.40	09.40 14.46
6	03.22 04.39-04.59/20 23.31	04.48 22.07 20.22	06.19 20.22	07.42 08.58-09.22/24 18.38	08.15 15.57 09.42	09.42 14.44
7	03.24 04.40-04.59/19 23.29	04.51 22.04 20.19	06.21 07.38-07.44/6 20.19	07.45 08.57-09.22/25 18.35	08.18 15.54 09.44	09.44 14.43
8	03.26 04.40-04.58/18 23.27	04.54 22.00 20.15	06.24 07.35-07.47/12 20.15	07.48 08.56-09.22/26 18.32	08.21 15.51 09.47	09.47 14.41
9	03.29 04.41-04.59/18 23.25	04.57 21.57 20.12	06.27 07.34-07.49/15 20.12	07.51 08.56-09.21/25 18.28	08.24 15.48 09.49	09.49 14.40
10	03.31 04.42-04.58/16 23.23	05.00 21.54 20.08	06.30 07.32-07.49/17 20.08	07.54 08.56-09.21/25 18.25	08.27 15.45 09.51	09.51 14.39
11	03.33 04.42-04.57/15 23.21	05.03 21.51 20.05	06.33 07.31-07.49/18 20.05	07.56 08.56-09.20/24 18.21	08.30 15.42 09.53	09.53 14.38
12	03.36 04.43-04.57/14 23.19	05.06 21.47 20.01	06.35 07.30-07.49/19 20.01	07.59 08.57-09.19/22 18.18	08.33 15.39 09.55	09.55 14.37
13	03.38 04.44-04.56/12 23.16	05.09 21.44 19.58	06.38 07.29-07.49/20 19.58	08.02 08.57-09.18/21 18.15	08.36 15.36 09.56	09.56 14.36
14	03.41 04.46-04.55/9 23.14	05.12 21.41 19.54	06.41 07.29-07.48/19 19.54	08.05 08.58-09.16/18 18.11	08.39 15.34 09.58	09.58 14.36
15	03.44 04.48-04.53/5 23.11	05.15 21.37 19.51	06.44 07.30-07.48/18 19.51	08.08 08.59-09.14/15 18.08	08.43 15.31 09.59	09.59 14.35
16	03.46 23.09	05.18 21.34 19.48	06.46 07.29-07.46/17 19.48	08.11 09.02-09.11/9 18.05	08.46 15.28 10.01	10.01 14.35
17	03.49 23.06	05.21 21.31 19.44	06.49 07.30-07.45/15 19.44	08.14 18.01	08.49 15.25 10.02	10.02 14.35
18	03.52 23.04	05.24 21.27 19.41	06.52 07.32-07.43/11 19.41	08.17 17.58	08.52 15.23 10.03	10.03 14.35
19	03.55 23.01	05.27 21.24 19.37	06.55 07.35-07.40/5 19.37	08.20 17.55	08.55 15.20 10.04	10.04 14.35
20	03.57 22.58	05.30 21.21 19.34	06.57 19.34	08.23 17.51	08.58 15.17 10.05	10.05 14.35
21	04.00 22.56	05.33 21.17 19.30	07.00 19.30	08.26 17.48	09.01 15.15 10.06	10.06 14.35
22	04.03 22.53	05.36 21.14 19.27	07.03 19.27	08.29 17.45	09.04 15.12 10.06	10.06 14.35
23	04.06 22.50	05.39 21.10 19.23	07.06 19.23	08.32 17.41	09.07 15.10 10.07	10.07 14.36
24	04.09 22.47	05.41 21.07 19.20	07.09 19.20	08.35 17.38	09.10 15.08 10.07	10.07 14.37
25	04.12 22.44	05.44 21.04 19.16	07.11 19.16	07.38 16.35	09.13 15.05 10.07	10.07 14.37
26	04.15 22.41	05.47 21.00 19.13	07.14 19.13	07.41 16.32	09.16 15.03 10.07	10.07 14.38
27	04.18 22.38	05.50 20.57 19.09	07.17 19.09	07.44 16.28	09.19 15.01 10.07	10.07 14.39
28	04.21 22.35	05.53 20.53 19.06	07.20 19.06	07.47 16.25	09.22 14.59 10.07	10.07 14.41
29	04.24 22.32	05.56 20.50 19.03	07.23 19.03	07.50 16.22	09.24 14.57 10.06	10.06 14.42
30	04.27 22.29	05.59 20.46 18.59	07.25 18.59	07.53 16.19	09.27 14.55 10.06	10.06 14.43
31	04.30 22.26	06.02 20.43		07.56 16.16		10.06 14.45
Potential sun hours	598	504	392	307	204	147
Sum of minutes with flicker	250	0	192	324	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 -  
 Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
 FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 76 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1200) Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.29
	14.49	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.29	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.23	03.24	04.49	06.19	07.43	08.15	09.42
	14.59	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.46
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.04	23.29	23.24	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.41
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.40
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.52	06.05	04.26	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.38	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.09	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.08	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.08	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.08	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.51	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.21	03.48	03.10	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.41	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.13	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	609	597	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 77 - VESTAS V162-5.6 HH210 5600 180.0 !0! hub: 210,0 m (TOT: 300,0 m) (1201)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48 10.04	09.01 16.13 08.58	07.32 16.26-16.49/23 17.40	06.46 20.10	05.04 21.39	03.32 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.28 17.08-17.21/13 18.56	07.59 16.13	09.30 14.53
2	10.04 14.50 10.03	08.58 16.16 08.55	07.29 16.26-16.50/24 17.43	06.42 20.13	05.00 21.42	03.30 23.13	03.16 23.36	04.37 22.20	06.08 20.36	07.31 17.05-17.23/18 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52 10.02	08.55 16.20 08.52	07.25 16.25-16.50/25 17.46	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 17.04-17.24/20 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54 10.01	08.52 16.23 08.49	07.22 16.25-16.51/26 17.49	06.36 20.19	04.54 21.48	03.26 23.18	03.19 23.34	04.43 22.13	06.13 20.29	07.37 17.02-17.25/23 18.46	08.08 16.04	09.37 14.48
5	10.01 14.56 09.59	08.49 16.26 08.46	07.19 16.24-16.50/26 17.52	06.32 20.22	04.51 21.51	03.24 23.21	03.21 23.32	04.46 22.10	06.16 20.26	07.40 17.01-17.26/25 18.42	08.11 16.01	09.40 14.47
6	09.59 14.58 09.58	08.46 16.29 08.43	07.15 16.24-16.50/26 17.55	06.29 20.25	04.47 21.54	03.22 23.23	03.23 23.30	04.49 22.07	06.19 20.22	07.42 17.01-17.26/25 18.39	08.15 15.58	09.42 14.45
7	09.58 15.00 09.57	08.43 16.32 08.40	07.12 16.24-16.50/26 17.58	06.25 20.28	04.44 21.57	03.20 23.25	03.25 23.28	04.52 22.04	06.22 20.19	07.45 17.00-17.26/26 18.35	08.18 15.55	09.44 14.44
8	09.57 15.03 09.55	08.40 16.36 08.37	07.08 16.24-16.48/24 18.01	06.22 20.30	04.41 22.00	03.18 23.27	03.28 23.27	04.55 22.00	06.25 20.16	07.48 17.00-17.26/26 18.32	08.21 15.52	09.46 14.42
9	09.55 15.05 09.53	08.37 16.39 08.34	07.05 16.25-16.48/23 18.04	06.18 20.33	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.57	06.27 20.12	07.51 16.59-17.26/27 18.29	08.24 15.49	09.49 14.41
10	09.53 15.08 09.52	08.34 16.42 08.31	07.02 16.25-16.46/21 18.07	06.15 20.36	04.35 22.07	03.15 23.31	03.32 23.23	05.01 21.54	06.30 20.09	07.54 16.59-17.25/26 18.25	08.27 15.46	09.51 14.40
11	09.52 15.10 09.50	08.31 16.45 08.28	06.58 16.26-16.45/19 18.10	06.11 20.39	04.31 22.10	03.14 23.32	03.34 23.20	05.04 21.51	06.33 20.05	07.57 17.00-17.24/24 18.22	08.30 15.43	09.52 14.39
12	09.50 15.13 09.48	08.28 16.48 08.24	06.55 16.28-16.43/15 18.13	06.08 20.42	04.28 22.13	03.12 23.34	03.37 23.18	05.07 21.47	06.36 20.02	08.00 17.00-17.23/23 18.18	08.33 15.40	09.54 14.38
13	09.48 15.16 09.46	08.24 16.51 08.21	06.51 16.31-16.41/10 18.16	06.05 20.45	04.25 22.16	03.11 23.36	03.39 23.16	05.10 21.44	06.38 19.58	08.02 17.00-17.22/22 18.15	08.36 15.37	09.56 14.37
14	09.46 15.18 09.44	08.21 16.54 08.18	06.48 18.19	06.01 20.48	04.22 22.19	03.10 23.37	03.42 23.14	05.13 21.41	06.41 19.55	08.05 17.01-17.21/20 18.12	08.39 15.34	09.58 14.37
15	09.44 15.21 09.42	08.18 16.58 08.15	06.45 18.21	06.58 20.51	04.19 22.22	03.09 23.38	03.45 23.11	05.16 21.37	06.44 19.51	08.08 17.02-17.19/17 18.08	08.43 15.32	09.59 14.36
16	09.42 15.24 09.40	08.15 17.01 08.12	06.41 18.24	06.54 20.54	04.16 22.25	03.09 23.39	03.47 23.09	05.19 21.34	06.47 19.48	08.11 17.04-17.16/12 18.05	08.46 15.29	10.00 14.36
17	09.40 15.27 09.37	08.12 17.04 08.08	06.38 18.27	06.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.44	08.14 18.02	08.49 15.26	10.02 14.36
18	09.37 15.30 09.35	08.08 17.07 08.05	06.34 18.30	06.47 21.00	04.10 22.31	03.07 23.41	03.53 23.03	05.25 21.27	06.52 19.41	08.17 17.58	08.52 15.23	10.03 14.35
19	09.35 15.33 09.33	08.05 17.10 08.02	06.31 18.33	06.44 21.03	04.07 22.34	03.07 23.42	03.55 23.01	05.27 21.24	06.55 19.37	08.20 17.55	08.55 15.21	10.04 14.35
20	09.33 15.36 09.30	08.02 17.13 07.59	06.27 18.36	06.41 21.06	04.04 22.37	03.07 23.42	03.58 22.58	05.30 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.36
21	09.30 15.39 09.28	07.59 17.16 07.55	06.24 18.39	06.37 21.09	04.01 22.40	03.07 23.42	04.01 22.55	05.33 21.17	07.01 19.30	08.26 17.48	09.01 15.16	10.05 14.36
22	09.28 15.42 09.25	07.55 17.19 07.52	06.20 18.42	06.34 21.12	03.58 22.43	03.07 23.43	04.04 22.53	05.36 21.14	07.03 19.27	08.29 17.45	09.04 15.13	10.06 14.36
23	09.25 15.45 09.23	07.52 17.22 07.49	06.17 18.44	06.30 21.15	03.55 22.46	03.07 23.43	04.07 22.50	05.39 21.10	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	09.23 15.48 09.20	07.49 17.25 07.45	06.14 18.47	06.27 21.18	03.53 22.49	03.08 23.42	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.08	10.07 14.38
25	09.20 15.51 09.17	07.45 16.35-16.41/6 17.28	06.10 18.50	06.24 21.21	03.50 22.52	03.08 23.42	04.13 22.44	05.45 21.04	07.12 19.17	08.38 17.35	09.13 15.06	10.07 14.38
26	09.17 15.54 09.15	07.42 16.32-16.45/13 17.31	06.07 18.53	06.20 21.24	03.47 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.14 19.13	08.41 17.32	09.16 15.04	10.07 14.39
27	09.15 15.57 09.12	07.39 16.29-16.47/18 17.34	06.03 18.56	06.17 21.27	03.45 22.57	03.10 23.41	04.19 22.38	05.51 20.57	07.17 19.10	08.44 17.29	09.19 15.02	10.07 14.40
28	09.12 16.00 09.09	07.35 16.28-16.48/20 17.37	06.00 18.59	06.14 21.30	03.42 23.00	03.11 23.41	04.22 22.35	05.54 20.53	07.20 19.06	08.47 16.26	09.21 14.59	10.07 14.42
29	09.09 16.04 09.07	07.34 17.37 07.33	06.56 20.02	06.10 21.33	03.40 23.03	03.12 23.40	04.25 22.32	05.56 20.50	07.23 19.03	08.50 16.23	09.24 14.57	10.07 14.43
30	09.07 16.07 09.04	07.33 17.34 07.30	06.53 20.04	06.07 21.36	03.37 23.06	03.13 23.39	04.28 22.29	05.59 20.47	07.26 17.12-17.18/6 18.59	08.53 16.19	09.27 14.55	10.06 14.44
31	09.04 16.10 Potential sun hours	07.29 17.31 179	06.49 20.07 179	06.35 23.08 448	03.35 23.08 562	03.35 23.38 610	04.31 22.26 598	06.02 20.43 504	07.56 16.16 392	08.56 16.16 307	09.02 14.47 204	10.06 14.46 0
	Sum of minutes with flicker	0	57	288	0	0	0	0	6	347	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
2.4.2021 18.49/3.4.388

SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 78 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1202)
Assumptions for shadow calculations
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains sun rise and set times, and a 'Sum of minutes with flicker' row at the bottom.

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project:  
Halsua 20190717 -

Description:  
Halsuan tuulivoimapaisto, OX2

Licensed user:  
FCG Suunnittelu ja tekniikka Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
Calculated:  
2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 79 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1203)  
Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.54	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.04	21.28	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.45	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.41	22.35	20.54	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker



Project: Halsua 20190717 -  
 Description: Halsuan tuulivoimapuisto, OX2

Licensed user:  
 FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 80 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1204)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.39
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.56	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.03	23.29	23.24	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.16	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.30	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.42	09.59
	15.21	16.58	18.22	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.54	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.08	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.01
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.04
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.10	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.18	10.07
	15.58	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.35	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.06
	16.04		20.02	21.33	23.03	23.39	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.38	03.14	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.05	23.38	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.05
	16.10		20.07		23.08		22.26	20.43		17.16		14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 81 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1205)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.30
	14.48	16.13	17.40	20.10	21.39	23.11	23.38	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.00	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.16	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.34	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.21	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.21	23.32	22.10	20.26	18.42	16.01	14.47
6	10.00	08.46	07.15	06.29	04.47	03.22	03.23	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.25	04.52	06.22	07.45	08.18	09.44
	15.00	16.32	17.58	20.28	21.57	23.25	23.29	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.18	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.42
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.49
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.51
	15.08	16.42	18.07	20.36	22.07	23.31	23.23	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.31	03.14	03.35	05.04	06.33	07.57	08.30	09.53
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.11	03.39	05.10	06.39	08.03	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.37	14.37
14	09.46	08.21	06.48	06.01	04.22	03.10	03.42	05.13	06.41	08.05	08.40	09.58
	15.18	16.55	18.19	20.48	22.19	23.37	23.14	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.09	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.38	19.51	18.08	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.47	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.58	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.42	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.30	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.58	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.43	22.53	21.14	19.27	17.45	15.13	14.36
23	09.25	07.52	06.17	05.30	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.07
	15.45	17.22	18.44	21.15	22.46	23.43	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.43	22.47	21.07	19.20	17.39	15.08	14.38
25	09.20	07.46	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.35	15.06	14.38
26	09.18	07.42	06.07	05.20	03.47	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.39
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.57	17.34	18.56	21.27	22.58	23.41	22.38	20.57	19.10	17.29	15.02	14.40
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.41	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.57	14.43
30	09.07		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.19	14.55	14.44
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 82 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1206)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05 14.48	09.01 16.13	07.32 17.41	06.46 20.10	05.04 21.39	03.33 23.11	03.15 23.38	04.34 22.23	06.05 20.40	07.29 18.56	07.59 16.13	09.30 14.54
2	10.40 14.50	08.58 16.17	07.29 17.44	06.43 20.13	05.01 21.42	03.30 23.14	03.16 23.37	04.37 22.20	06.08 20.36	07.31 18.53	08.02 16.10	09.32 14.52
3	10.03 14.52	08.55 16.20	07.26 17.47	06.39 20.16	04.57 21.45	03.28 23.16	03.18 23.35	04.40 22.17	06.11 20.33	07.34 18.49	08.05 16.07	09.35 14.50
4	10.02 14.54	08.52 16.23	07.22 17.49	06.36 20.19	04.54 21.48	03.26 23.18	03.20 23.34	04.43 22.14	06.14 20.30	07.37 18.46	08.09 16.04	09.37 14.48
5	10.01 14.56	08.49 16.26	07.19 17.52	06.32 20.22	04.51 21.51	03.24 23.21	03.22 23.32	04.46 22.10	06.16 20.26	07.40 18.42	08.12 16.01	09.40 14.47
6	10.00 14.58	08.46 16.29	07.15 17.55	06.29 20.25	04.48 21.54	03.22 23.23	03.24 23.30	04.49 22.07	06.19 20.23	07.43 18.39	08.15 15.58	09.42 14.45
7	09.58 15.01	08.43 16.33	07.12 17.58	06.25 20.28	04.44 21.58	03.20 23.25	03.26 23.29	04.52 22.04	06.22 20.19	07.46 18.36	08.18 15.55	09.44 14.44
8	09.57 15.03	08.40 16.36	07.09 18.01	06.22 20.31	04.41 22.01	03.19 23.27	03.28 23.27	04.55 22.01	06.25 20.16	07.48 18.32	08.21 15.52	09.47 14.43
9	09.55 15.05	08.37 16.39	07.05 18.04	06.18 20.34	04.38 22.04	03.17 23.29	03.30 23.25	04.58 21.57	06.28 20.12	07.51 18.29	08.24 15.49	09.49 14.41
10	09.54 15.08	08.34 16.42	07.02 18.07	06.15 20.36	04.35 22.07	03.15 23.31	03.32 23.23	05.01 21.54	06.30 20.09	07.54 18.25	08.27 15.46	09.51 14.40
11	09.52 15.10	08.31 16.45	06.58 18.10	06.12 20.39	04.32 22.10	03.14 23.33	03.35 23.21	05.04 21.51	06.33 20.05	07.57 18.22	08.30 15.43	09.53 14.39
12	09.50 15.13	08.28 16.48	06.55 18.13	06.08 20.42	04.28 22.13	03.13 23.34	03.37 23.18	05.07 21.48	06.36 20.02	08.00 18.19	08.33 15.40	09.54 14.38
13	09.48 15.16	08.25 16.52	06.52 18.16	06.05 20.45	04.25 22.16	03.12 23.36	03.40 23.16	05.10 21.44	06.39 19.58	08.03 18.15	08.37 15.37	09.56 14.38
14	09.46 15.19	08.21 16.55	06.48 18.19	06.01 20.48	04.22 22.19	03.11 23.37	03.42 23.14	05.13 21.41	06.41 19.55	08.06 18.12	08.40 15.35	09.58 14.37
15	09.44 15.21	08.18 16.58	06.45 18.22	05.58 20.51	04.19 22.22	03.10 23.38	03.45 23.11	05.16 21.38	06.44 19.51	08.08 18.09	08.43 15.32	09.59 14.37
16	09.42 15.24	08.15 17.01	06.41 18.25	05.54 20.54	04.16 22.25	03.09 23.39	03.47 23.09	05.19 21.34	06.47 19.48	08.11 18.05	08.46 15.29	10.01 14.36
17	09.40 15.27	08.12 17.04	06.38 18.27	05.51 20.57	04.13 22.28	03.08 23.40	03.50 23.06	05.22 21.31	06.50 19.45	08.14 18.02	08.49 15.26	10.02 14.36
18	09.38 15.30	08.09 17.07	06.34 18.30	05.48 21.00	04.10 22.31	03.08 23.41	03.53 23.04	05.25 21.28	06.53 19.41	08.17 17.59	08.52 15.24	10.03 14.36
19	09.35 15.33	08.05 17.10	06.31 18.33	05.44 21.03	04.07 22.34	03.07 23.42	03.56 23.01	05.28 21.24	06.55 19.38	08.20 17.55	08.55 15.21	10.04 14.36
20	09.33 15.36	08.02 17.13	06.28 18.36	05.41 21.06	04.04 22.37	03.07 23.42	03.59 22.58	05.31 21.21	06.58 19.34	08.23 17.52	08.58 15.18	10.05 14.36
21	09.30 15.39	07.59 17.16	06.24 18.39	05.37 21.09	04.01 22.40	03.07 23.42	04.01 22.55	05.34 21.17	07.01 19.31	08.26 17.49	09.01 15.16	10.06 14.36
22	09.28 15.42	07.56 17.19	06.21 18.42	05.34 21.12	03.59 22.43	03.07 23.43	04.04 22.53	05.36 21.14	07.04 19.27	08.29 17.45	09.04 15.13	10.06 14.37
23	09.25 15.45	07.52 17.22	06.17 18.45	05.31 21.15	03.56 22.46	03.08 23.43	04.07 22.50	05.39 21.11	07.06 19.24	08.32 17.42	09.07 15.11	10.07 14.37
24	09.23 15.48	07.49 17.25	06.14 18.47	05.27 21.18	03.53 22.49	03.08 23.43	04.10 22.47	05.42 21.07	07.09 19.20	08.35 17.39	09.10 15.09	10.07 14.38
25	09.20 15.51	07.46 17.29	06.10 18.50	05.24 21.21	03.50 22.52	03.08 23.42	04.13 22.44	05.45 21.04	07.12 19.17	07.38 17.36	09.13 15.06	10.07 14.39
26	09.18 15.54	07.42 17.32	06.07 18.53	05.21 21.24	03.48 22.55	03.09 23.42	04.16 22.41	05.48 21.00	07.15 19.13	07.41 16.32	09.16 15.04	10.07 14.40
27	09.15 15.58	07.39 17.35	06.03 18.56	05.17 21.27	03.45 22.58	03.10 23.41	04.19 22.38	05.51 20.57	07.17 19.10	07.44 16.29	09.19 15.02	10.07 14.41
28	09.12 16.01	07.36 17.38	06.00 18.59	05.14 21.30	03.42 23.00	03.11 23.41	04.22 22.35	05.54 20.54	07.20 19.07	07.47 16.26	09.22 15.00	10.07 14.42
29	09.09 16.04		05.56 20.02	05.11 21.33	03.40 23.03	03.12 23.40	04.25 22.32	05.57 20.50	07.23 19.03	07.50 16.23	09.24 14.58	10.07 14.43
30	09.07 16.07		05.53 20.05	05.07 21.36	03.37 23.06	03.13 23.39	04.28 22.29	05.59 20.47	07.26 19.00	07.53 16.20	09.27 14.56	10.06 14.45
31	09.04 16.10		05.50 20.08		03.35 23.08		04.31 22.26	06.02 20.43		07.56 16.16		10.06 14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi

Calculated:

2.4.2021 18.49/3.4.388

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 83 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1207

#### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

#### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.29	07.59	09.30
	14.48	16.14	17.41	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.31	03.17	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.44	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.26	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.47	20.16	21.45	23.16	23.35	22.17	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.14	07.37	08.08	09.37
	14.54	16.23	17.50	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.49
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.12	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.43	16.01	14.47
6	09.59	08.46	07.15	06.29	04.48	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.23	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.21	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.33	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.31	22.01	23.27	23.27	22.01	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.19	04.38	03.17	03.30	04.58	06.28	07.51	08.24	09.48
	15.06	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.42
10	09.53	08.34	07.02	06.15	04.35	03.16	03.33	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.26	15.47	14.40
11	09.52	08.31	06.58	06.12	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.11	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.29	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.39
13	09.48	08.25	06.52	06.05	04.25	03.12	03.40	05.10	06.39	08.03	08.36	09.56
	15.16	16.52	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.42	08.06	08.40	09.58
	15.19	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.35	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.22	16.58	18.22	20.51	22.22	23.38	23.11	21.38	19.51	18.09	15.32	14.37
16	09.42	08.15	06.41	05.55	04.16	03.09	03.48	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.25	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.45	18.02	15.26	14.36
18	09.37	08.09	06.34	05.48	04.10	03.08	03.53	05.25	06.53	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.08	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.38	17.55	15.21	14.36
20	09.33	08.02	06.28	05.41	04.04	03.07	03.59	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.19	14.36
21	09.30	07.59	06.24	05.37	04.02	03.07	04.02	05.34	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.56	06.21	05.34	03.59	03.08	04.04	05.37	07.04	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.53	21.14	19.27	17.45	15.14	14.37
23	09.25	07.52	06.17	05.31	03.56	03.08	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.23	18.45	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.26	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.46	06.10	05.24	03.50	03.09	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.29	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.18	07.42	06.07	05.21	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.55	17.32	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.35	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.43	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.38	18.59	21.30	23.00	23.40	22.35	20.54	19.07	17.26	15.00	14.42
29	09.09		06.56	05.11	03.40	03.12	04.25	05.57	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.07		06.53	05.07	03.38	03.14	04.28	06.00	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	19.00	17.20	14.56	14.45
31	09.04		06.50		03.35		04.31	06.02		07.56		10.06
	16.10		20.08		23.08		22.26	20.43		16.17		14.46
Potential sun hours	179	241	363	448	562	609	598	504	392	307	204	148
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

### SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 84 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1208)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

#### Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.46	05.04	03.33	03.15	04.34	06.05	07.28	07.59	09.29
	14.48	16.13	17.40	20.10	21.39	23.11	23.37	22.23	20.40	18.56	16.13	14.54
2	10.40	08.58	07.29	06.43	05.01	03.30	03.16	04.37	06.08	07.31	08.02	09.32
	14.50	16.17	17.43	20.13	21.42	23.13	23.36	22.20	20.36	18.53	16.10	14.52
3	10.03	08.55	07.25	06.39	04.57	03.28	03.18	04.40	06.11	07.34	08.05	09.35
	14.52	16.20	17.46	20.16	21.45	23.16	23.35	22.16	20.33	18.49	16.07	14.50
4	10.02	08.52	07.22	06.36	04.54	03.26	03.20	04.43	06.13	07.37	08.08	09.37
	14.54	16.23	17.49	20.19	21.48	23.18	23.33	22.13	20.29	18.46	16.04	14.48
5	10.01	08.49	07.19	06.32	04.51	03.24	03.22	04.46	06.16	07.40	08.11	09.40
	14.56	16.26	17.52	20.22	21.51	23.20	23.32	22.10	20.26	18.42	16.01	14.47
6	09.59	08.46	07.15	06.29	04.47	03.22	03.24	04.49	06.19	07.43	08.15	09.42
	14.58	16.29	17.55	20.25	21.54	23.23	23.30	22.07	20.22	18.39	15.58	14.45
7	09.58	08.43	07.12	06.25	04.44	03.20	03.26	04.52	06.22	07.45	08.18	09.44
	15.01	16.32	17.58	20.28	21.57	23.25	23.28	22.04	20.19	18.36	15.55	14.44
8	09.57	08.40	07.09	06.22	04.41	03.19	03.28	04.55	06.25	07.48	08.21	09.46
	15.03	16.36	18.01	20.30	22.00	23.27	23.26	22.00	20.16	18.32	15.52	14.43
9	09.55	08.37	07.05	06.18	04.38	03.17	03.30	04.58	06.27	07.51	08.24	09.48
	15.05	16.39	18.04	20.33	22.04	23.29	23.25	21.57	20.12	18.29	15.49	14.41
10	09.53	08.34	07.02	06.15	04.35	03.15	03.32	05.01	06.30	07.54	08.27	09.50
	15.08	16.42	18.07	20.36	22.07	23.31	23.22	21.54	20.09	18.25	15.46	14.40
11	09.52	08.31	06.58	06.11	04.32	03.14	03.35	05.04	06.33	07.57	08.30	09.52
	15.10	16.45	18.10	20.39	22.10	23.32	23.20	21.51	20.05	18.22	15.43	14.39
12	09.50	08.28	06.55	06.08	04.28	03.13	03.37	05.07	06.36	08.00	08.33	09.54
	15.13	16.48	18.13	20.42	22.13	23.34	23.18	21.47	20.02	18.19	15.40	14.38
13	09.48	08.24	06.51	06.05	04.25	03.12	03.40	05.10	06.39	08.02	08.36	09.56
	15.16	16.51	18.16	20.45	22.16	23.35	23.16	21.44	19.58	18.15	15.37	14.38
14	09.46	08.21	06.48	06.01	04.22	03.11	03.42	05.13	06.41	08.05	08.39	09.57
	15.18	16.55	18.19	20.48	22.19	23.37	23.13	21.41	19.55	18.12	15.34	14.37
15	09.44	08.18	06.45	05.58	04.19	03.10	03.45	05.16	06.44	08.08	08.43	09.59
	15.21	16.58	18.21	20.51	22.22	23.38	23.11	21.37	19.51	18.09	15.32	14.36
16	09.42	08.15	06.41	05.54	04.16	03.09	03.47	05.19	06.47	08.11	08.46	10.00
	15.24	17.01	18.24	20.54	22.25	23.39	23.09	21.34	19.48	18.05	15.29	14.36
17	09.40	08.12	06.38	05.51	04.13	03.08	03.50	05.22	06.50	08.14	08.49	10.02
	15.27	17.04	18.27	20.57	22.28	23.40	23.06	21.31	19.44	18.02	15.26	14.36
18	09.37	08.08	06.34	05.48	04.10	03.08	03.53	05.25	06.52	08.17	08.52	10.03
	15.30	17.07	18.30	21.00	22.31	23.41	23.03	21.27	19.41	17.59	15.24	14.36
19	09.35	08.05	06.31	05.44	04.07	03.07	03.56	05.28	06.55	08.20	08.55	10.04
	15.33	17.10	18.33	21.03	22.34	23.41	23.01	21.24	19.37	17.55	15.21	14.36
20	09.33	08.02	06.27	05.41	04.04	03.07	03.58	05.31	06.58	08.23	08.58	10.05
	15.36	17.13	18.36	21.06	22.37	23.42	22.58	21.21	19.34	17.52	15.18	14.36
21	09.30	07.59	06.24	05.37	04.01	03.07	04.01	05.33	07.01	08.26	09.01	10.05
	15.39	17.16	18.39	21.09	22.40	23.42	22.55	21.17	19.31	17.49	15.16	14.36
22	09.28	07.55	06.21	05.34	03.59	03.07	04.04	05.36	07.03	08.29	09.04	10.06
	15.42	17.19	18.42	21.12	22.43	23.42	22.52	21.14	19.27	17.45	15.13	14.37
23	09.25	07.52	06.17	05.31	03.56	03.07	04.07	05.39	07.06	08.32	09.07	10.06
	15.45	17.22	18.44	21.15	22.46	23.42	22.50	21.11	19.24	17.42	15.11	14.37
24	09.23	07.49	06.14	05.27	03.53	03.08	04.10	05.42	07.09	08.35	09.10	10.07
	15.48	17.25	18.47	21.18	22.49	23.42	22.47	21.07	19.20	17.39	15.09	14.38
25	09.20	07.45	06.10	05.24	03.50	03.08	04.13	05.45	07.12	07.38	09.13	10.07
	15.51	17.28	18.50	21.21	22.52	23.42	22.44	21.04	19.17	17.36	15.06	14.39
26	09.17	07.42	06.07	05.20	03.48	03.09	04.16	05.48	07.15	07.41	09.16	10.07
	15.54	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.32	15.04	14.40
27	09.15	07.39	06.03	05.17	03.45	03.10	04.19	05.51	07.17	07.44	09.19	10.07
	15.58	17.34	18.56	21.27	22.57	23.41	22.38	20.57	19.10	17.29	15.02	14.41
28	09.12	07.36	06.00	05.14	03.42	03.11	04.22	05.54	07.20	07.47	09.21	10.07
	16.01	17.37	18.59	21.30	23.00	23.40	22.35	20.53	19.06	17.26	15.00	14.42
29	09.09		06.56	05.10	03.40	03.12	04.25	05.56	07.23	07.50	09.24	10.07
	16.04		20.02	21.33	23.03	23.40	22.32	20.50	19.03	17.23	14.58	14.43
30	09.06		06.53	05.07	03.37	03.13	04.28	05.59	07.26	07.53	09.27	10.06
	16.07		20.05	21.36	23.06	23.39	22.29	20.47	18.59	17.20	14.56	14.45
31	09.04		06.49		03.35		04.31	06.02		07.56		10.06
	16.10		20.07		23.08		22.26	20.43		16.16		14.46
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project: Halsua 20190717 - Description: Halsuan tuulivoimapuisto, OX2

Licensed user: FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated: 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 85 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1209)  
 Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 537 395 365 414 594 798 1 009 1 106 957 759 614 627 8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.01	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.30
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.23	20.39	18.55	16.12	14.52
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.14	23.37	22.20	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.16	04.39	06.10	07.34	08.05	09.35
	14.51	16.19	17.46	20.16	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.19	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.40
	14.55	16.25	17.52	20.21	21.51	23.21	23.32	22.10	20.26	18.42	16.00	14.45
6	10.00	08.46	07.15	06.28	04.46	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.31	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.18	09.44
	14.59	16.32	17.58	20.27	21.57	23.25	23.29	22.04	20.19	18.35	15.54	14.43
8	09.57	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.21	09.47
	15.02	16.35	18.01	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.15	03.28	04.57	06.27	07.51	08.24	09.49
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.54	08.34	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.51
	15.07	16.41	18.06	20.36	22.07	23.31	23.23	21.54	20.08	18.25	15.45	14.39
11	09.52	08.30	06.58	06.11	04.30	03.12	03.33	05.03	06.32	07.56	08.30	09.53
	15.09	16.44	18.09	20.39	22.10	23.33	23.21	21.51	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.15	15.36	14.36
14	09.46	08.21	06.48	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.58
	15.17	16.54	18.18	20.48	22.19	23.37	23.14	21.41	19.54	18.11	15.33	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.43	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.51	22.22	23.39	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.15	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.46	10.01
	15.23	17.00	18.24	20.54	22.25	23.40	23.09	21.34	19.47	18.04	15.28	14.35
17	09.40	08.11	06.37	05.50	04.12	03.06	03.49	05.21	06.49	08.14	08.49	10.02
	15.26	17.03	18.27	20.57	22.28	23.41	23.06	21.31	19.44	18.01	15.25	14.34
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.30	20.59	22.31	23.41	23.04	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.55	08.20	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.33	08.02	06.27	05.40	04.03	03.05	03.57	05.30	06.57	08.23	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.43	22.58	21.20	19.33	17.51	15.17	14.34
21	09.30	07.58	06.23	05.36	04.00	03.05	04.00	05.33	07.00	08.26	09.01	10.06
	15.38	17.15	18.38	21.08	22.40	23.43	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.05	04.03	05.35	07.03	08.29	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.53	21.14	19.27	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.54	03.06	04.06	05.38	07.06	08.31	09.07	10.07
	15.44	17.22	18.44	21.14	22.46	23.43	22.50	21.10	19.23	17.41	15.10	14.36
24	09.23	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.07	14.36
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.38	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.43	22.44	21.03	19.16	17.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.07	04.15	05.47	07.14	07.41	09.16	10.07
	15.53	17.31	18.53	21.24	22.55	23.42	22.41	21.00	19.13	17.31	15.03	14.38
27	09.15	07.38	06.03	05.16	03.44	03.08	04.18	05.50	07.17	07.44	09.19	10.07
	15.56	17.34	18.55	21.27	22.58	23.42	22.38	20.57	19.09	17.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.09	04.21	05.53	07.20	07.47	09.21	10.07
	16.00	17.37	18.58	21.30	23.00	23.41	22.35	20.53	19.06	17.25	14.58	14.40
29	09.09		06.56	05.10	03.38	03.10	04.24	05.56	07.22	07.50	09.24	10.07
	16.03		20.01	21.33	23.03	23.40	22.32	20.50	19.02	17.22	14.56	14.42
30	09.06		06.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	17.19	14.54	14.43
31	09.04		06.49		03.34		04.30	06.01		07.56		10.06
	16.09		20.07		23.09		22.26	20.43		17.16		14.45
Potential sun hours	179	241	363	448	562	611	599	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month Sun rise (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker  
 Sun set (hh:mm) First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:

Halsua 20190717 -

Description:

Halsuan tuulivoimapuisto, OX2

Licensed user:

FCG Suunnittelu ja tekniikka Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 2.4.2021 18.49/3.4.388

## SHADOW - Calendar per WTG

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset WTG: 86 - VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m) (1210)

### Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
537	395	365	414	594	798	1 009	1 106	957	759	614	627	8 175

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.05	09.00	07.32	06.45	05.03	03.31	03.13	04.33	06.04	07.28	07.59	09.29
	14.47	16.12	17.40	20.10	21.39	23.11	23.38	22.22	20.39	18.55	16.12	14.53
2	10.04	08.58	07.28	06.42	05.00	03.29	03.15	04.36	06.07	07.31	08.02	09.32
	14.49	16.16	17.43	20.13	21.42	23.13	23.36	22.19	20.36	18.52	16.09	14.51
3	10.03	08.55	07.25	06.38	04.56	03.27	03.17	04.39	06.10	07.33	08.05	09.35
	14.51	16.19	17.46	20.15	21.45	23.16	23.35	22.16	20.32	18.49	16.06	14.49
4	10.02	08.52	07.22	06.35	04.53	03.25	03.18	04.42	06.13	07.36	08.08	09.37
	14.53	16.22	17.49	20.18	21.48	23.18	23.34	22.13	20.29	18.45	16.03	14.47
5	10.01	08.49	07.18	06.31	04.50	03.23	03.20	04.45	06.16	07.39	08.11	09.39
	14.55	16.25	17.52	20.21	21.51	23.20	23.32	22.10	20.25	18.42	16.00	14.46
6	09.59	08.46	07.15	06.28	04.47	03.21	03.22	04.48	06.18	07.42	08.14	09.42
	14.57	16.28	17.55	20.24	21.54	23.23	23.30	22.07	20.22	18.38	15.57	14.44
7	09.58	08.43	07.11	06.25	04.43	03.19	03.24	04.51	06.21	07.45	08.17	09.44
	14.59	16.32	17.57	20.27	21.57	23.25	23.28	22.03	20.18	18.35	15.54	14.43
8	09.56	08.40	07.08	06.21	04.40	03.17	03.26	04.54	06.24	07.48	08.20	09.46
	15.02	16.35	18.00	20.30	22.00	23.27	23.27	22.00	20.15	18.31	15.51	14.41
9	09.55	08.37	07.05	06.18	04.37	03.16	03.29	04.57	06.27	07.50	08.24	09.48
	15.04	16.38	18.03	20.33	22.03	23.29	23.25	21.57	20.12	18.28	15.48	14.40
10	09.53	08.33	07.01	06.14	04.34	03.14	03.31	05.00	06.30	07.53	08.27	09.50
	15.07	16.41	18.06	20.36	22.06	23.31	23.22	21.54	20.08	18.25	15.45	14.39
11	09.51	08.30	06.58	06.11	04.31	03.13	03.33	05.03	06.32	07.56	08.30	09.52
	15.09	16.44	18.09	20.39	22.09	23.32	23.20	21.50	20.05	18.21	15.42	14.38
12	09.50	08.27	06.54	06.07	04.27	03.11	03.36	05.06	06.35	07.59	08.33	09.54
	15.12	16.47	18.12	20.42	22.13	23.34	23.18	21.47	20.01	18.18	15.39	14.37
13	09.48	08.24	06.51	06.04	04.24	03.10	03.38	05.09	06.38	08.02	08.36	09.56
	15.15	16.51	18.15	20.45	22.16	23.36	23.16	21.44	19.58	18.14	15.36	14.36
14	09.46	08.21	06.47	06.00	04.21	03.09	03.41	05.12	06.41	08.05	08.39	09.57
	15.17	16.54	18.18	20.47	22.19	23.37	23.13	21.40	19.54	18.11	15.34	14.36
15	09.44	08.18	06.44	05.57	04.18	03.08	03.44	05.15	06.43	08.08	08.42	09.59
	15.20	16.57	18.21	20.50	22.22	23.38	23.11	21.37	19.51	18.08	15.31	14.35
16	09.42	08.14	06.41	05.54	04.15	03.07	03.46	05.18	06.46	08.11	08.45	10.00
	15.23	17.00	18.24	20.53	22.25	23.39	23.08	21.34	19.47	18.04	15.28	14.35
17	09.39	08.11	06.37	05.50	04.12	03.07	03.49	05.21	06.49	08.14	08.48	10.02
	15.26	17.03	18.27	20.56	22.28	23.40	23.06	21.30	19.44	18.01	15.25	14.35
18	09.37	08.08	06.34	05.47	04.09	03.06	03.52	05.24	06.52	08.17	08.52	10.03
	15.29	17.06	18.29	20.59	22.31	23.41	23.03	21.27	19.40	17.58	15.23	14.34
19	09.35	08.05	06.30	05.43	04.06	03.06	03.54	05.27	06.54	08.19	08.55	10.04
	15.32	17.09	18.32	21.02	22.34	23.42	23.01	21.24	19.37	17.54	15.20	14.34
20	09.32	08.01	06.27	05.40	04.03	03.06	03.57	05.30	06.57	08.22	08.58	10.05
	15.35	17.12	18.35	21.05	22.37	23.42	22.58	21.20	19.33	17.51	15.17	14.35
21	09.30	07.58	06.23	05.36	04.00	03.06	04.00	05.33	07.00	08.25	09.01	10.05
	15.38	17.15	18.38	21.08	22.40	23.42	22.55	21.17	19.30	17.48	15.15	14.35
22	09.28	07.55	06.20	05.33	03.57	03.06	04.03	05.35	07.03	08.28	09.04	10.06
	15.41	17.19	18.41	21.11	22.43	23.43	22.52	21.13	19.26	17.45	15.12	14.35
23	09.25	07.52	06.16	05.30	03.55	03.06	04.06	05.38	07.06	08.31	09.07	10.06
	15.44	17.22	18.44	21.14	22.46	23.43	22.49	21.10	19.23	17.41	15.10	14.36
24	09.22	07.48	06.13	05.26	03.52	03.06	04.09	05.41	07.08	08.34	09.10	10.07
	15.47	17.25	18.47	21.17	22.49	23.43	22.47	21.07	19.20	17.38	15.08	14.37
25	09.20	07.45	06.10	05.23	03.49	03.07	04.12	05.44	07.11	07.37	09.13	10.07
	15.50	17.28	18.50	21.20	22.52	23.42	22.44	21.03	19.16	16.35	15.05	14.37
26	09.17	07.42	06.06	05.20	03.46	03.08	04.15	05.47	07.14	07.40	09.15	10.07
	15.53	17.31	18.52	21.23	22.55	23.42	22.41	21.00	19.13	16.31	15.03	14.38
27	09.14	07.38	06.03	05.16	03.44	03.09	04.18	05.50	07.17	07.43	09.18	10.07
	15.57	17.34	18.55	21.26	22.57	23.41	22.38	20.56	19.09	16.28	15.01	14.39
28	09.12	07.35	05.59	05.13	03.41	03.10	04.21	05.53	07.19	07.46	09.21	10.07
	16.00	17.37	18.58	21.29	23.00	23.41	22.35	20.53	19.06	16.25	14.59	14.41
29	09.09		05.56	05.10	03.39	03.11	04.24	05.56	07.22	07.49	09.24	10.06
	16.03		20.01	21.32	23.03	23.40	22.32	20.50	19.02	16.22	14.56	14.42
30	09.06		05.52	05.06	03.36	03.12	04.27	05.59	07.25	07.53	09.27	10.06
	16.06		20.04	21.36	23.06	23.39	22.29	20.46	18.59	16.19	14.54	14.43
31	09.03		05.49		03.34		04.30	06.01		07.56		10.05
	16.09		20.07		23.08		22.26	20.43		16.16		14.45
Potential sun hours	179	241	363	448	562	610	598	504	392	307	204	147
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

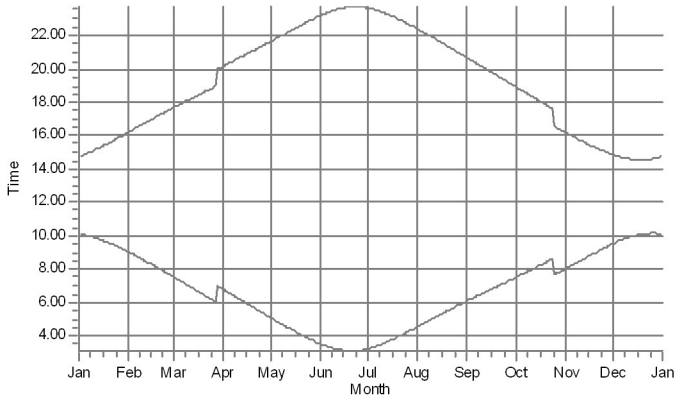
Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

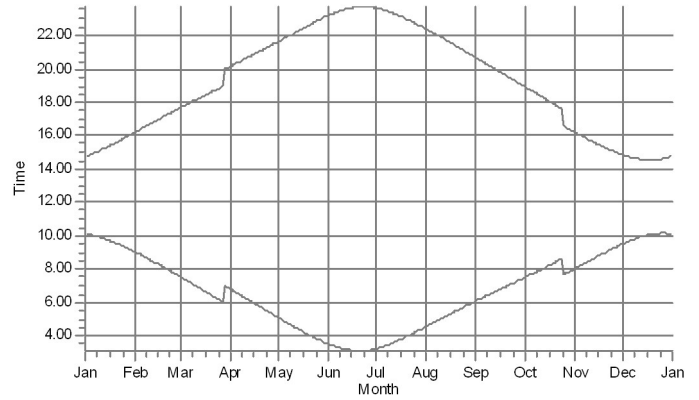
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

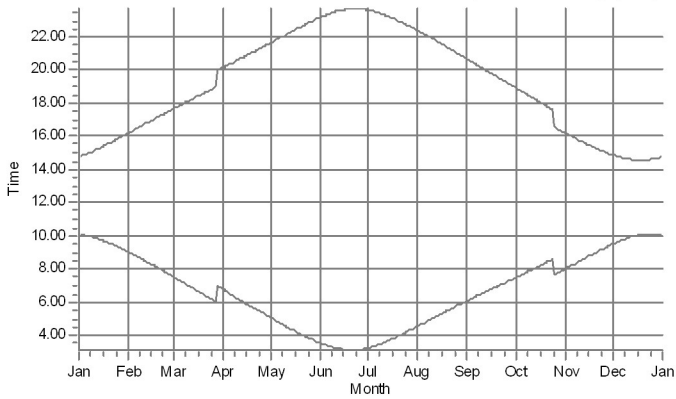
1: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (579)



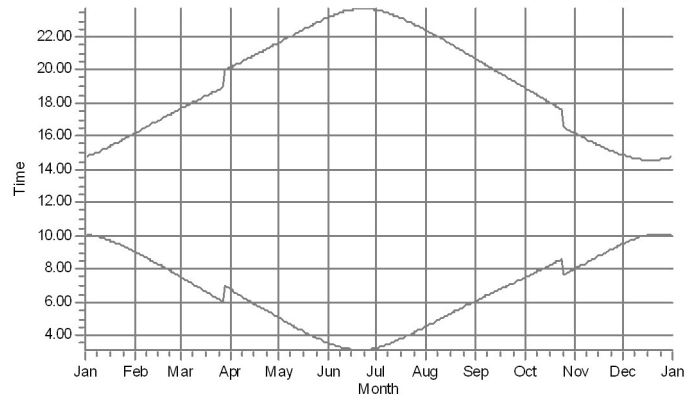
2: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (580)



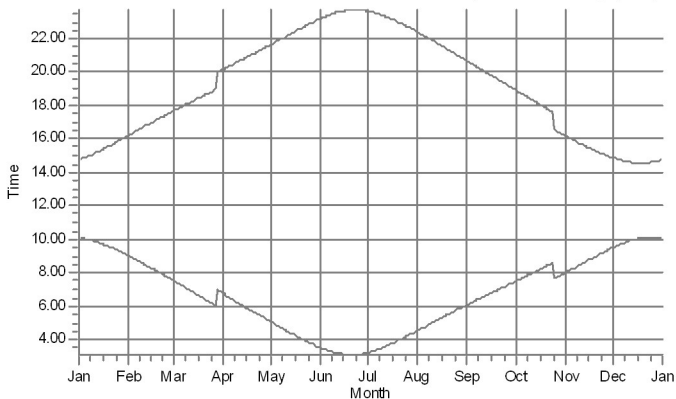
3: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (581)



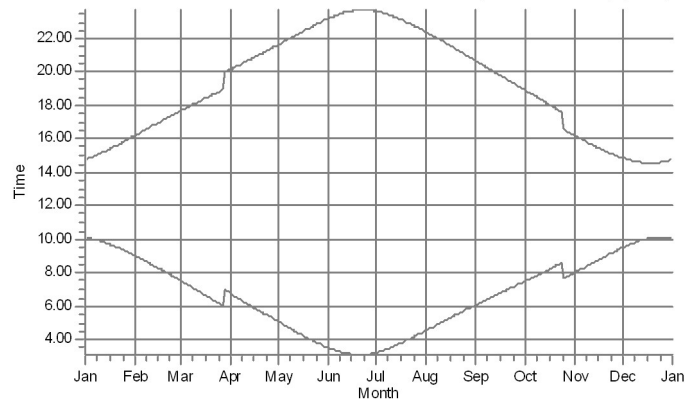
4: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (582)



5: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (583)



6: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (584)



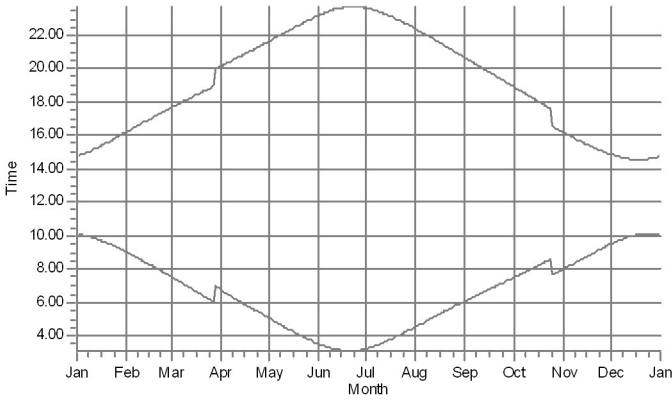
Shadow receptors



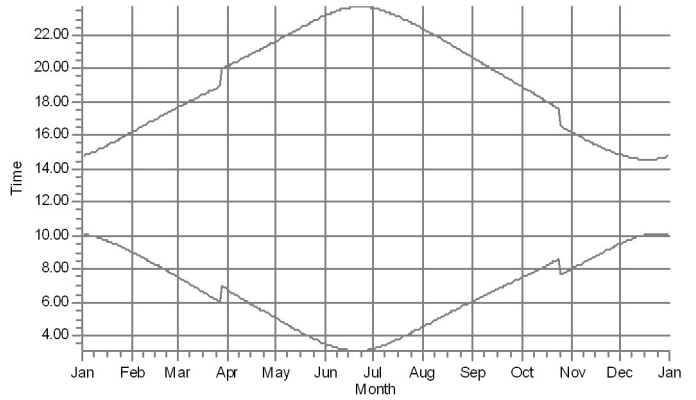
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

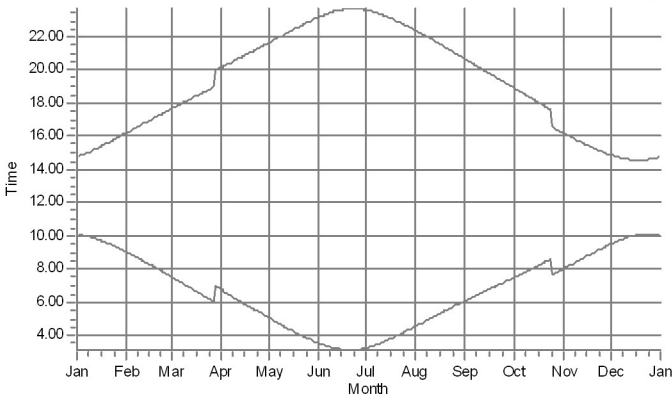
7: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (585)



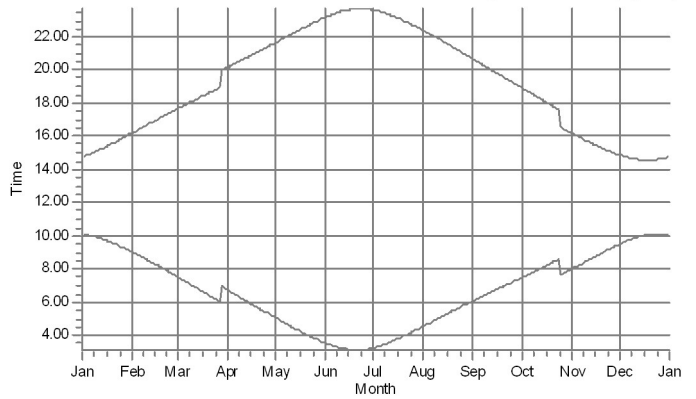
8: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (586)



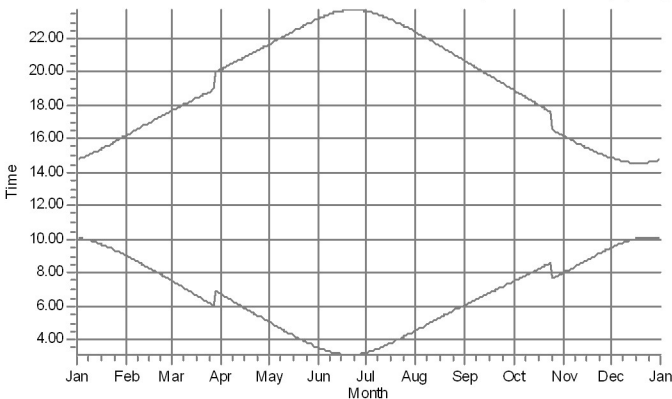
9: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (587)



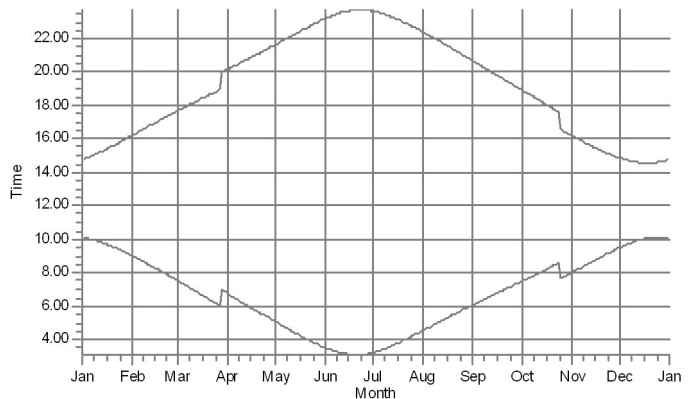
10: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (588)



11: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (589)



12: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (590)

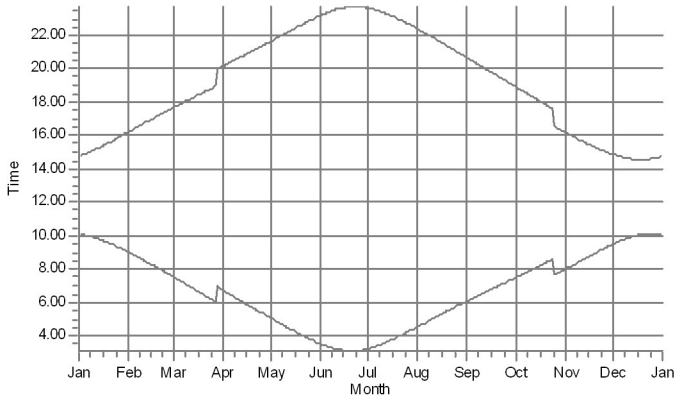


Shadow receptors

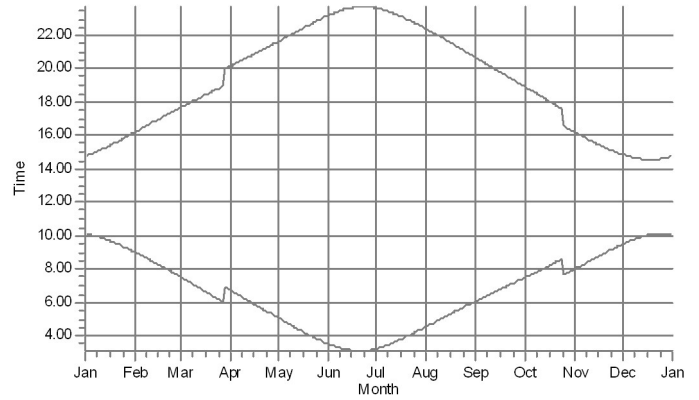
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

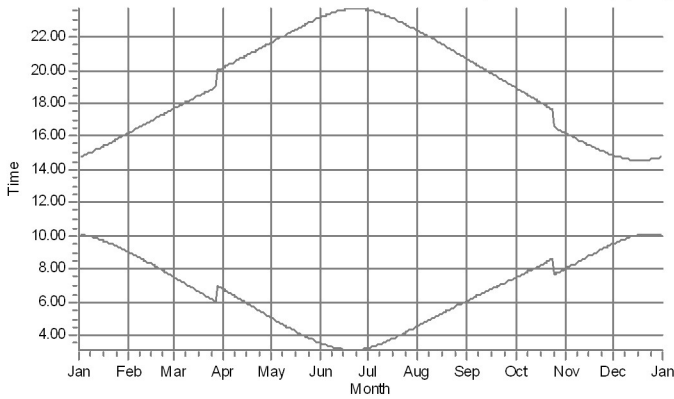
13: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (591)



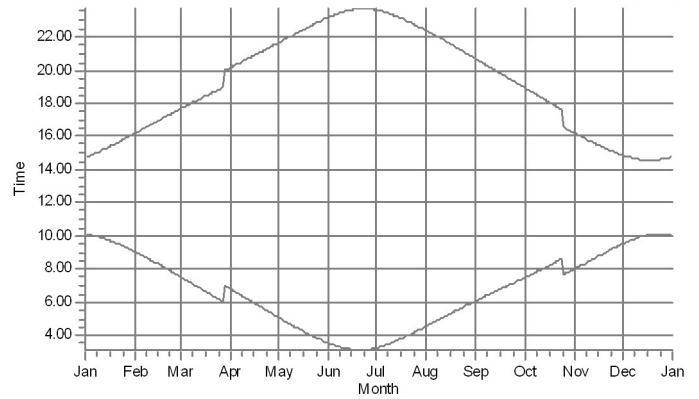
14: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (592)



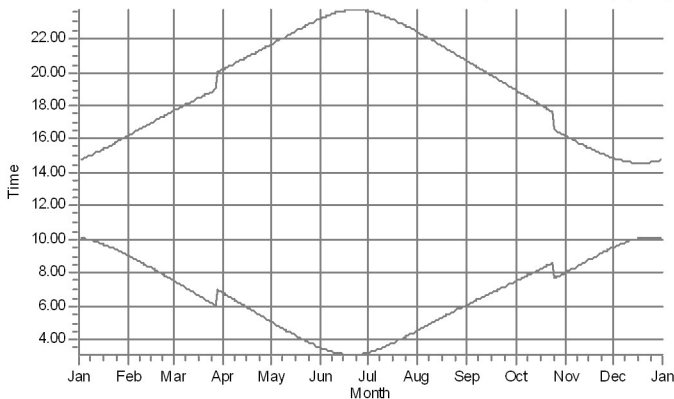
15: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (593)



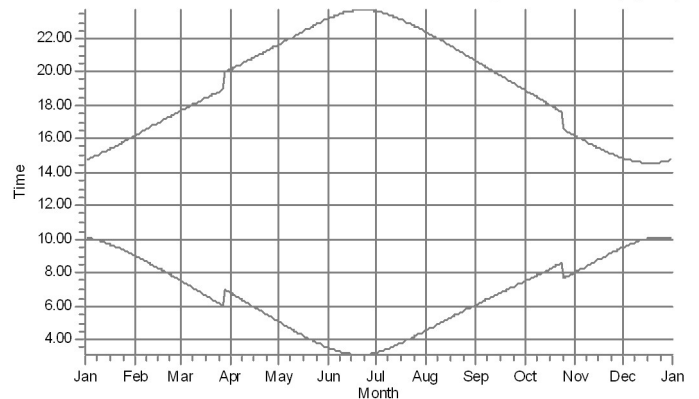
16: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (594)



17: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (595)



18: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (596)

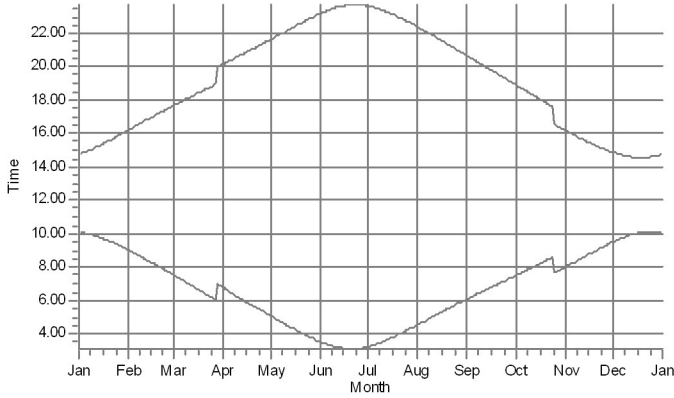


Shadow receptors

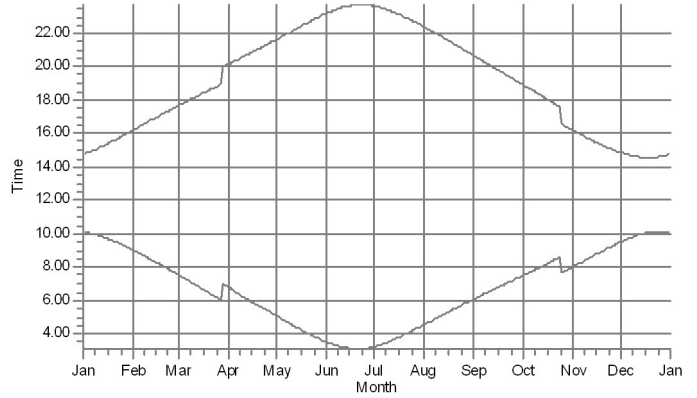
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

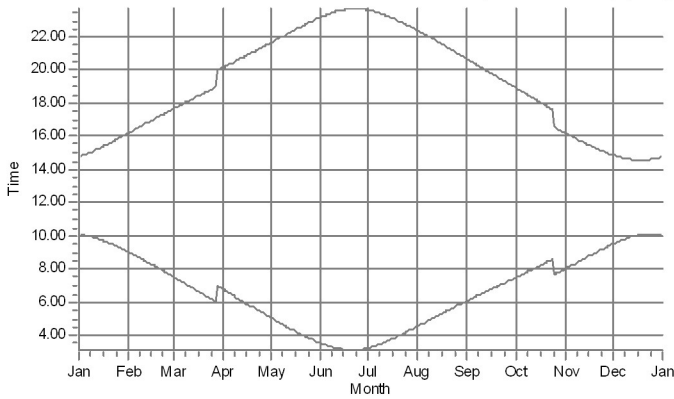
19: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (597)



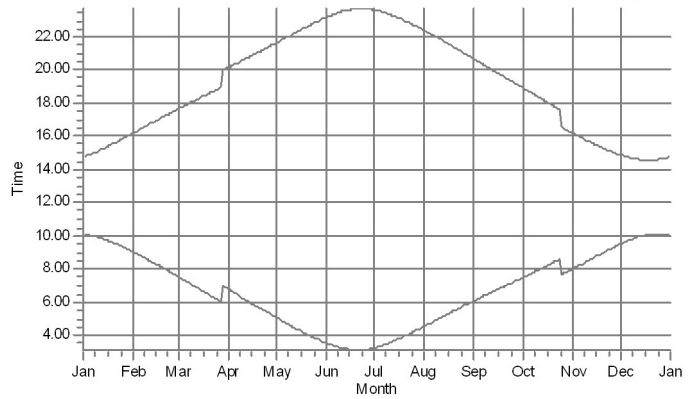
20: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (598)



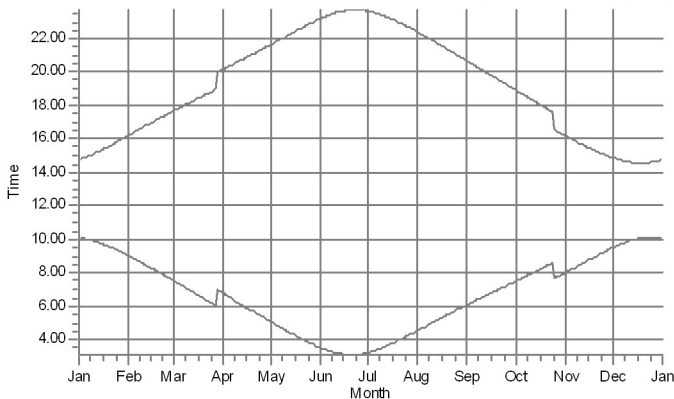
21: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (599)



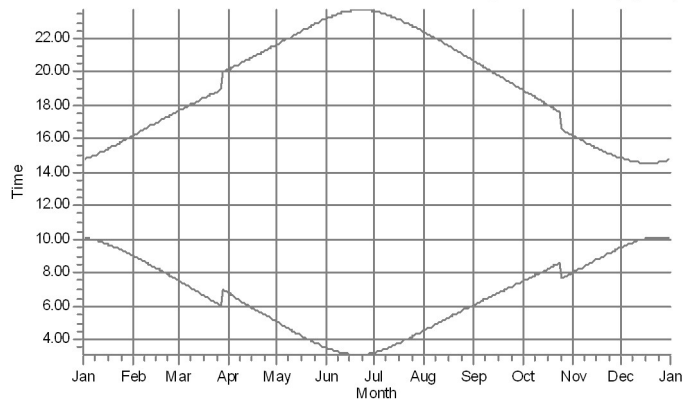
22: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (600)



23: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (601)



24: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (602)

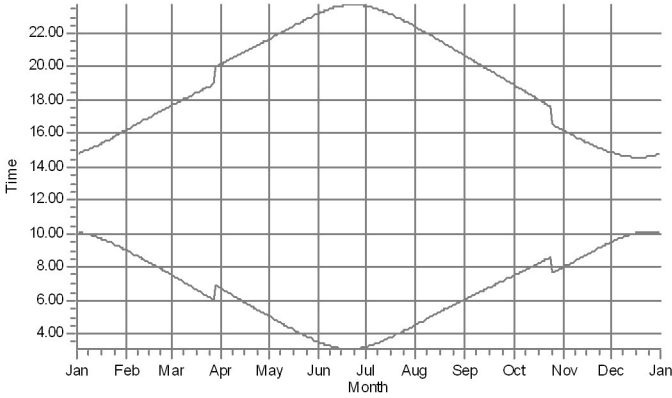


Shadow receptors

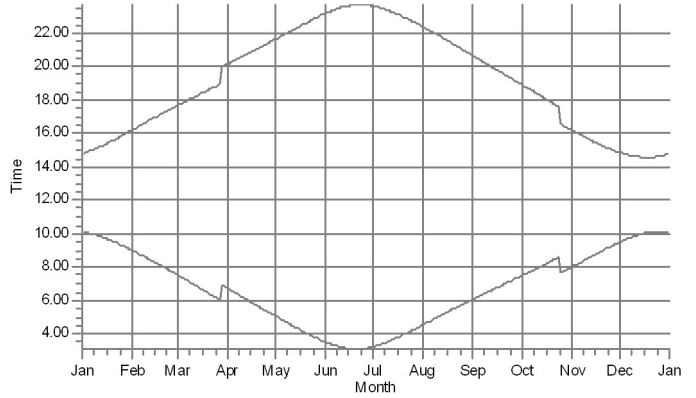
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

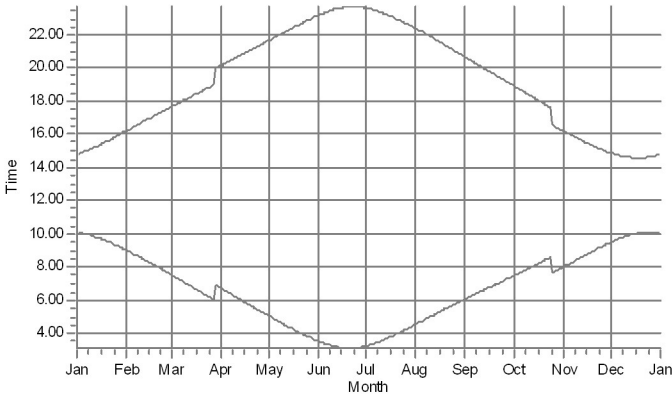
25: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (624)



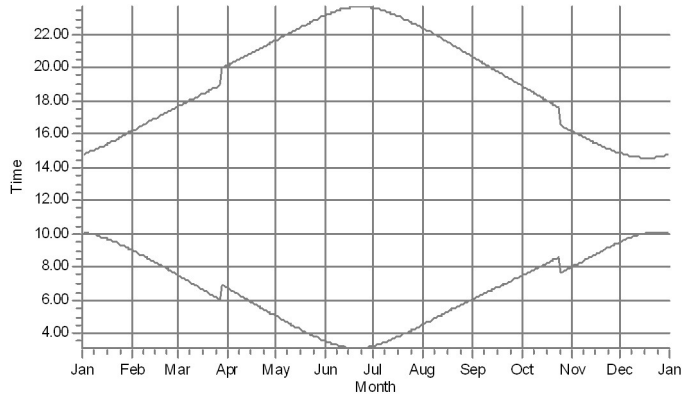
26: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (625)



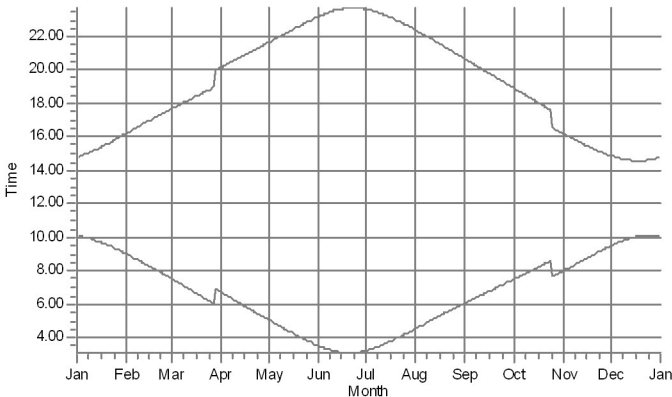
27: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (626)



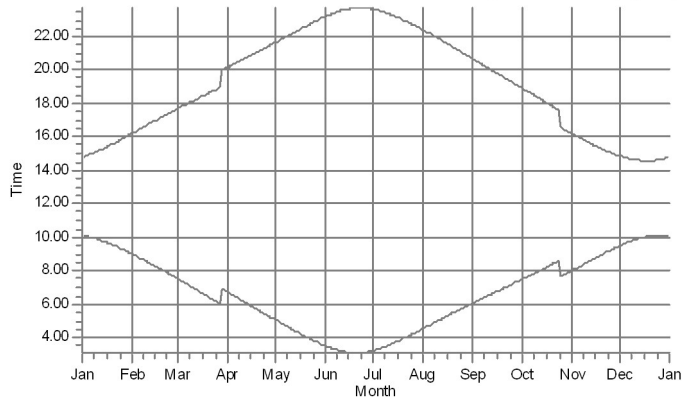
28: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (627)



29: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (628)



30: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (629)

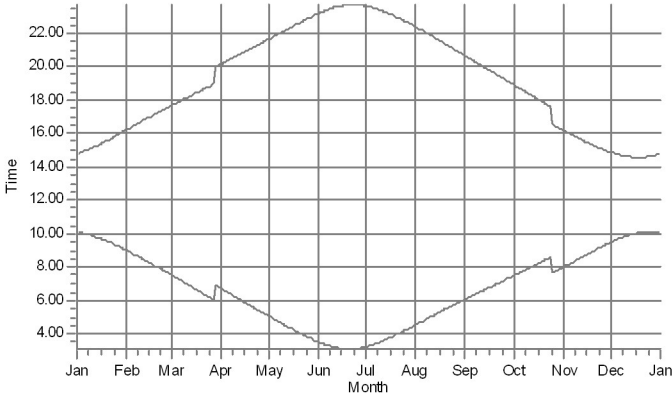


Shadow receptors

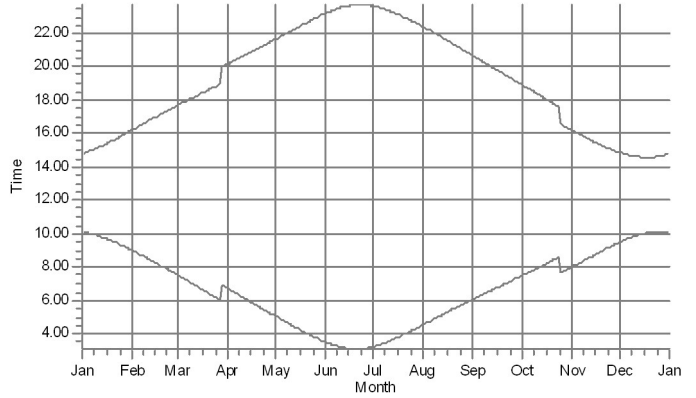
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

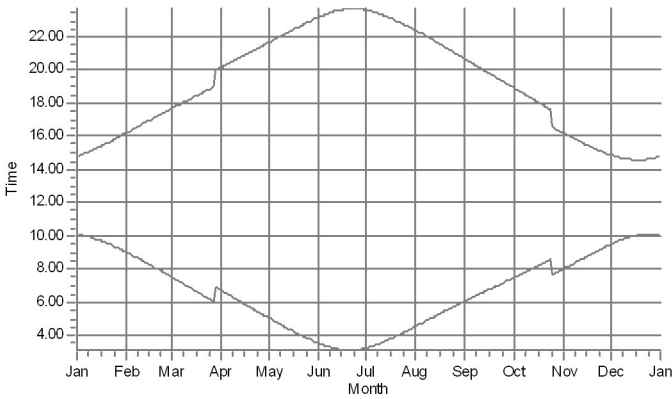
31: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (630)



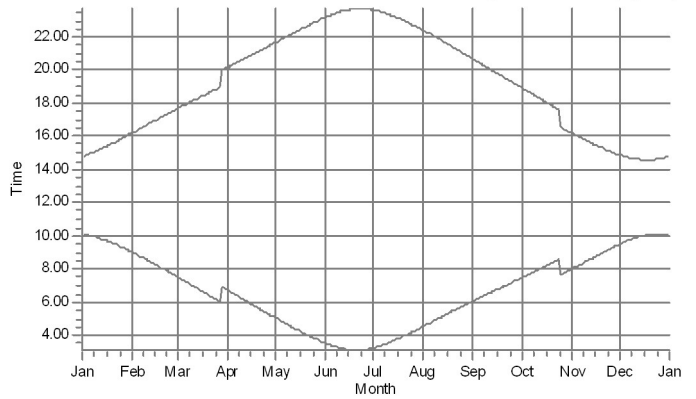
32: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (631)



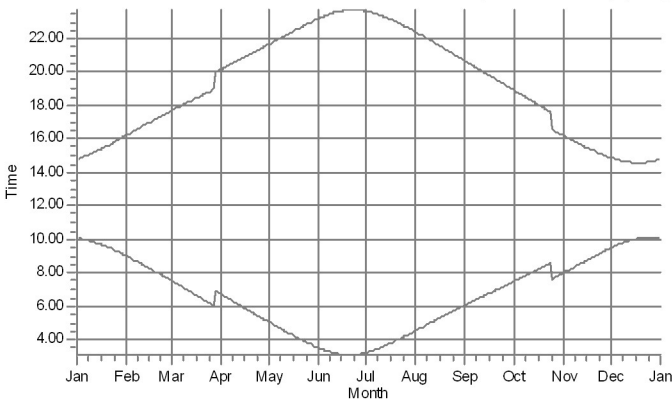
33: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (632)



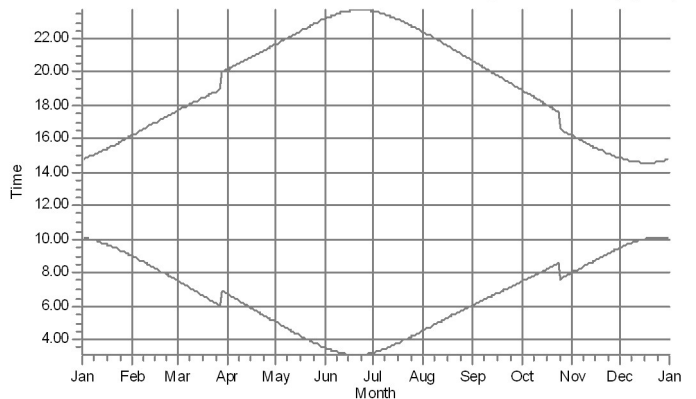
34: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (633)



35: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (634)



36: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (635)

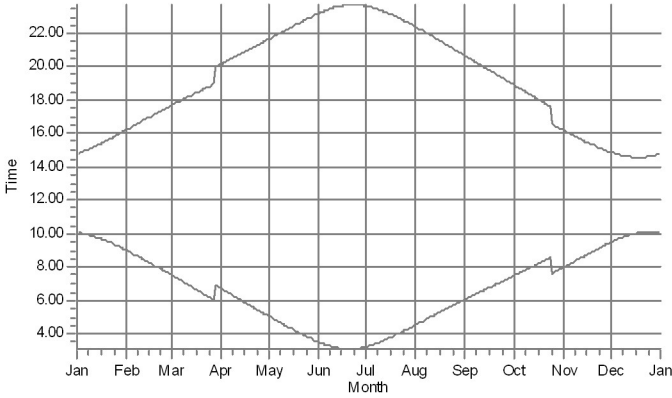


Shadow receptors

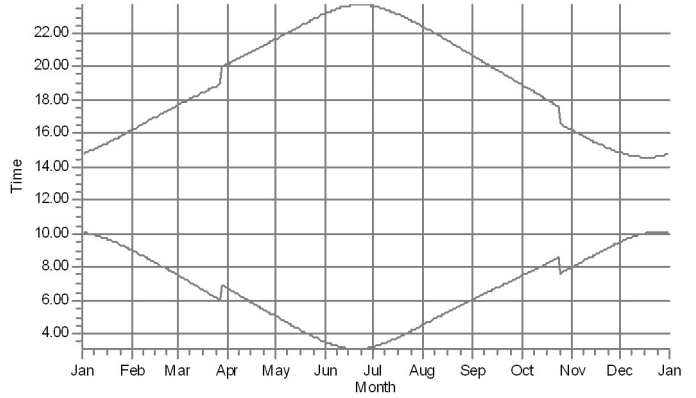
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

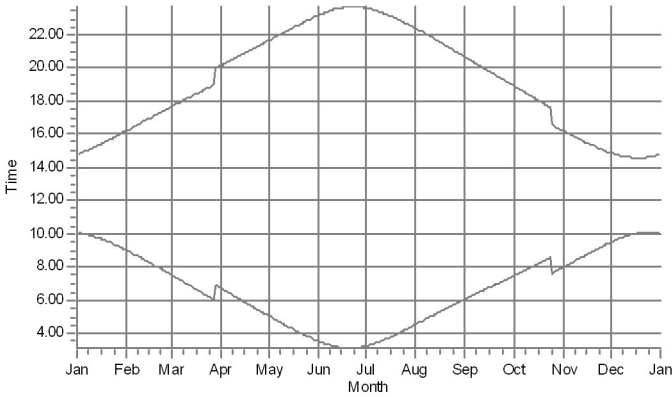
37: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (636)



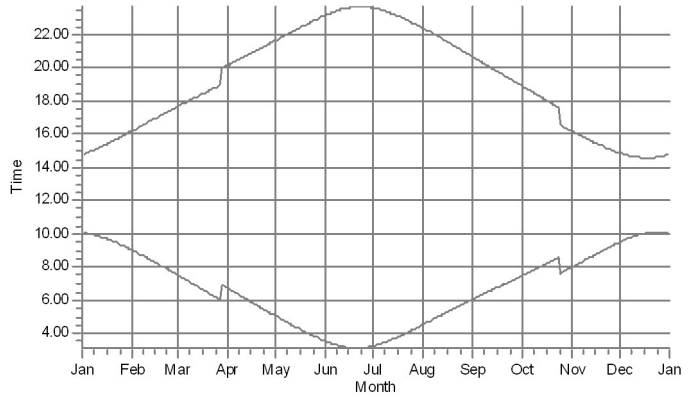
38: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (637)



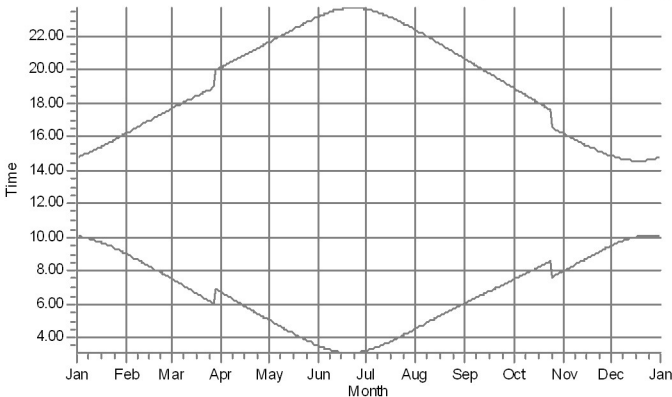
39: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (638)



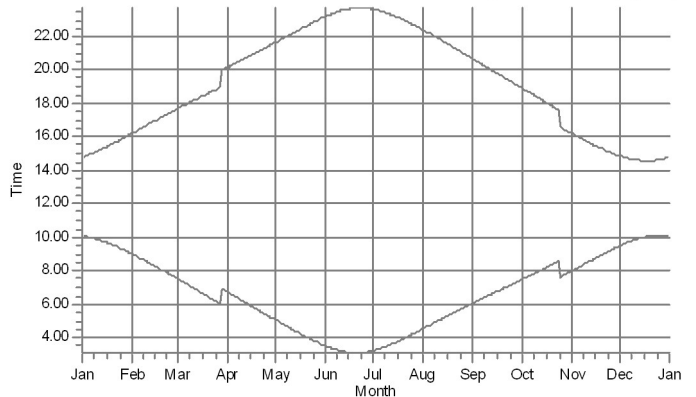
40: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (639)



41: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (640)



42: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (641)

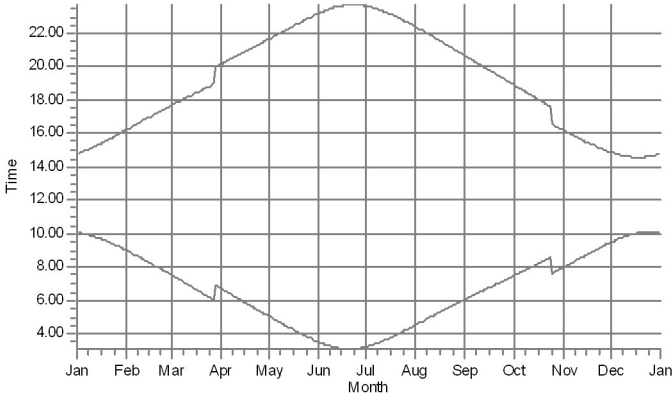


Shadow receptors

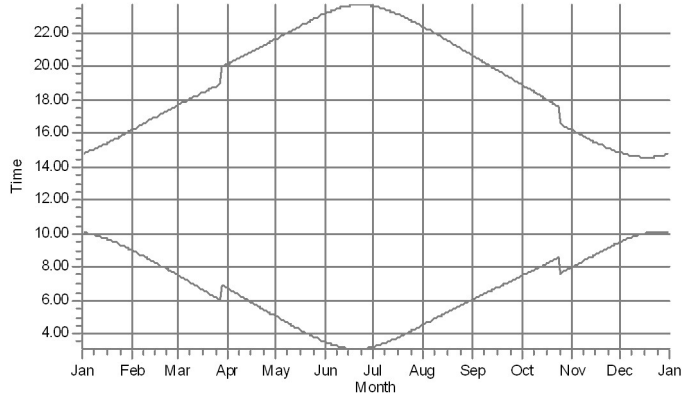
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

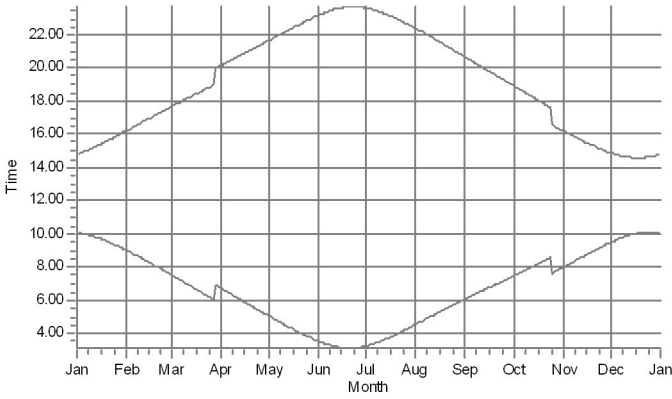
43: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (642)



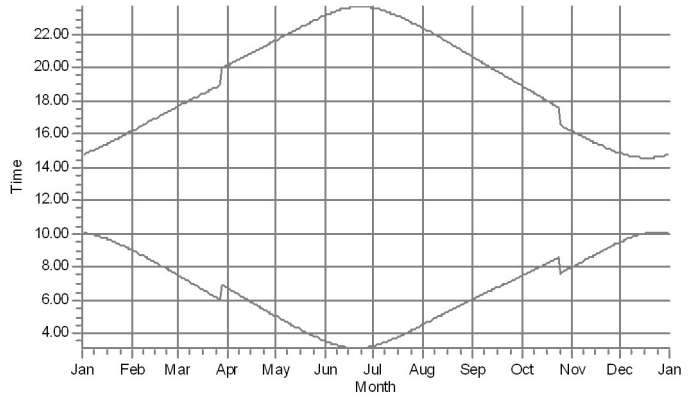
44: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (643)



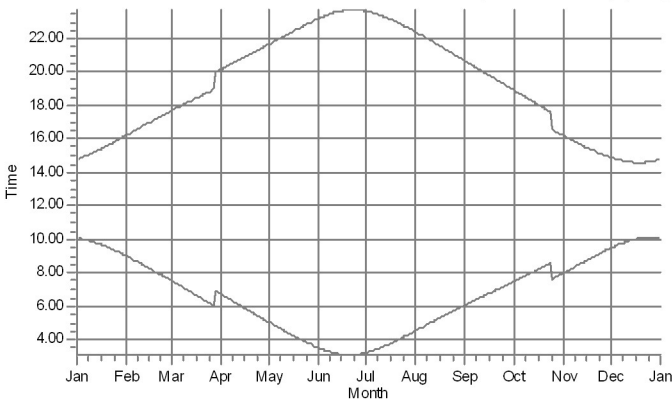
45: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (644)



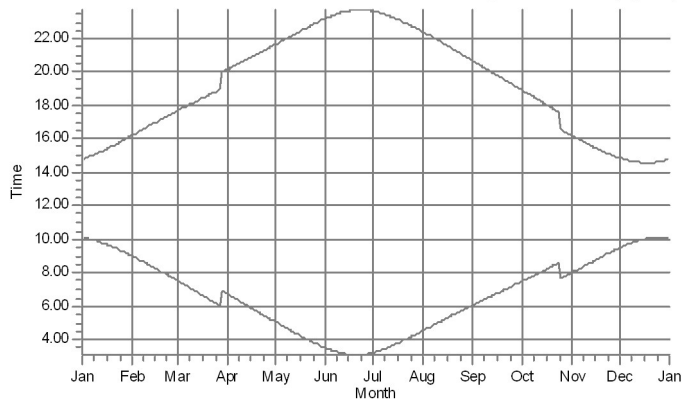
46: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (645)



47: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (646)



48: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (647)

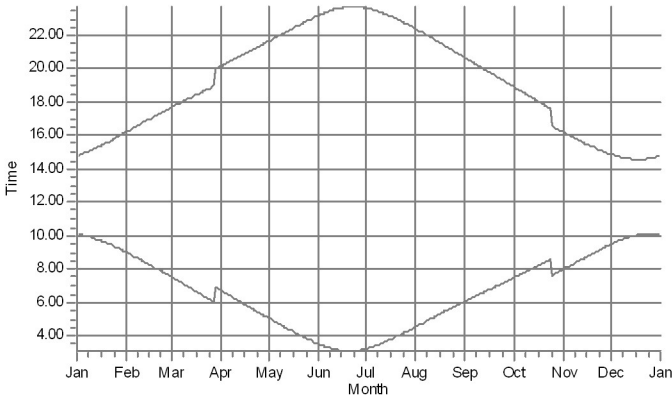


Shadow receptors

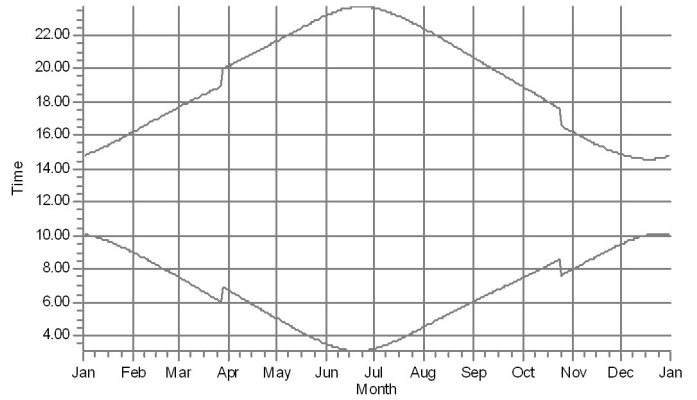
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

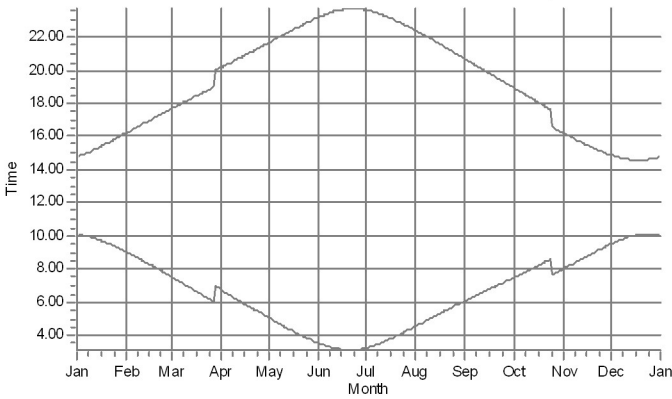
49: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (648)



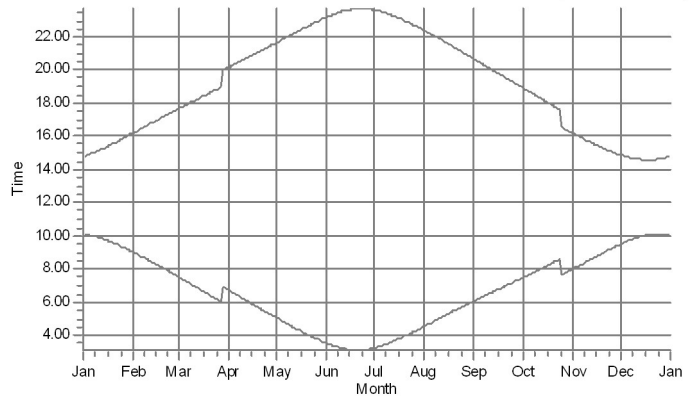
50: VESTAS V150-4.2 4200 150.0 !O! hub: 165,0 m (TOT: 240,0 m) (649)



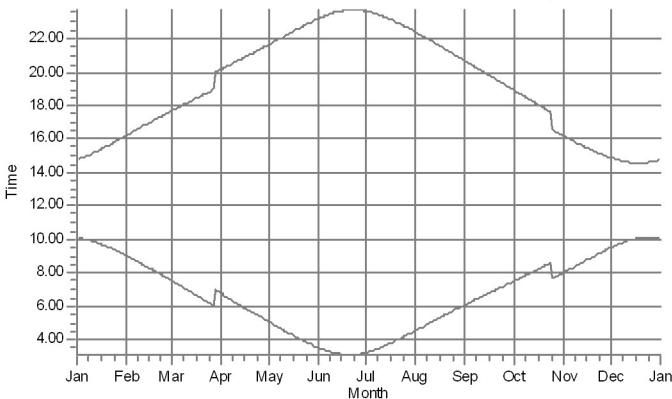
51: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



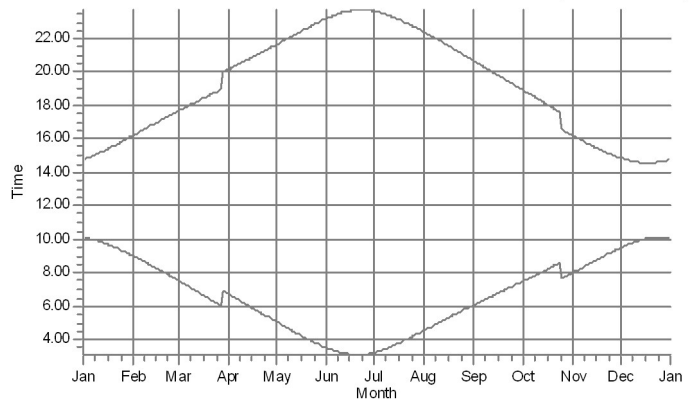
52: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



53: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



54: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



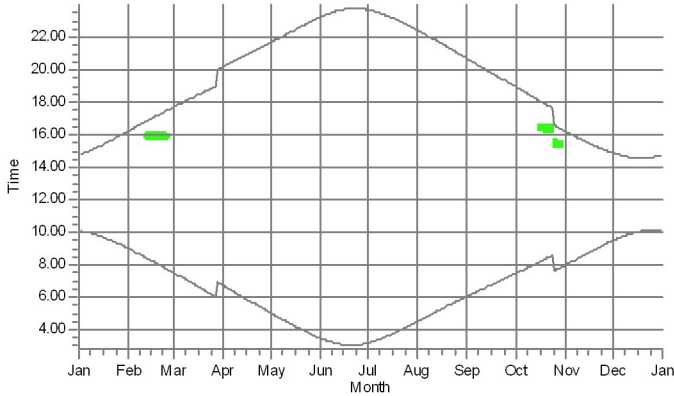
Shadow receptors



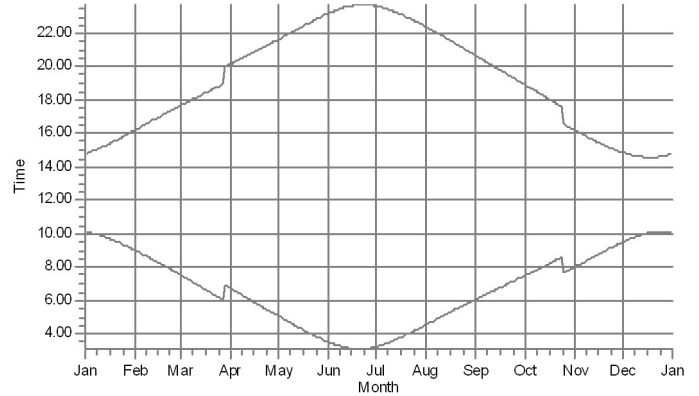
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

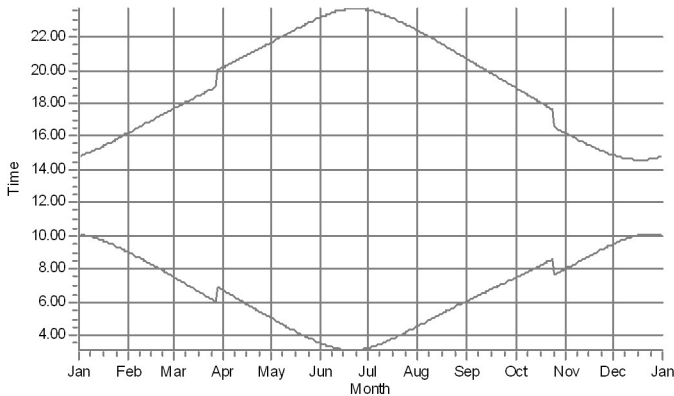
55: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



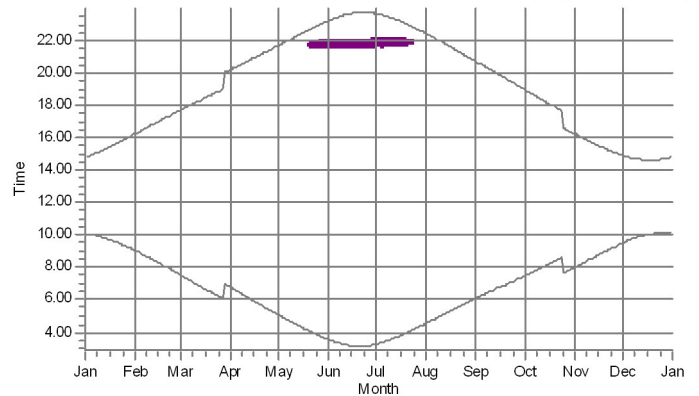
56: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



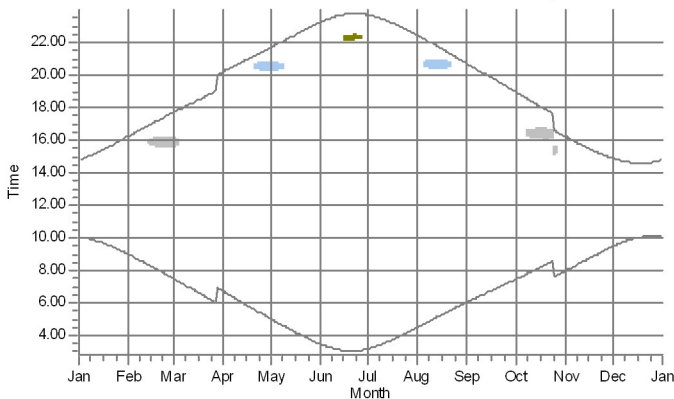
57: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



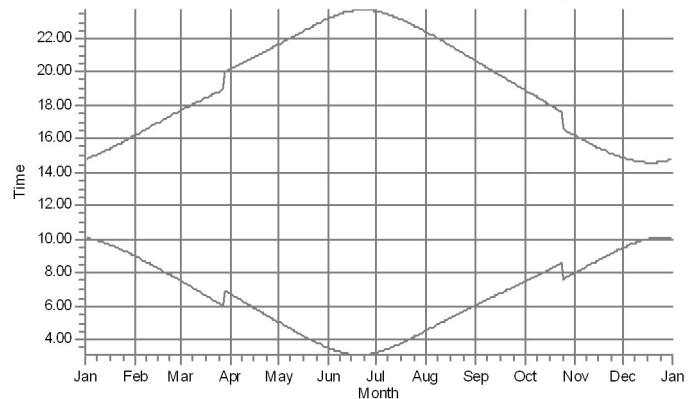
58: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



59: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



60: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

J: Lomarakenus J (Katajajarventie 49)  
K: Lomarakenus K (Silostenlampi)

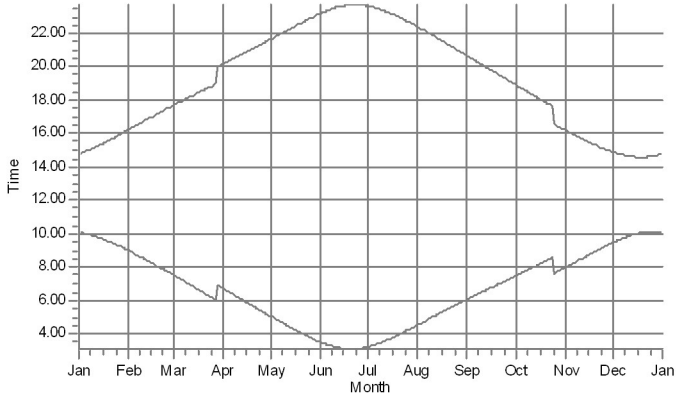
L: Lomarakenus L (Harjunpaantie 215)  
O: Lomarakenus O (Harjunpaantie 398)

R: Lomarakenus R (Peuraneva,Valvatintie)

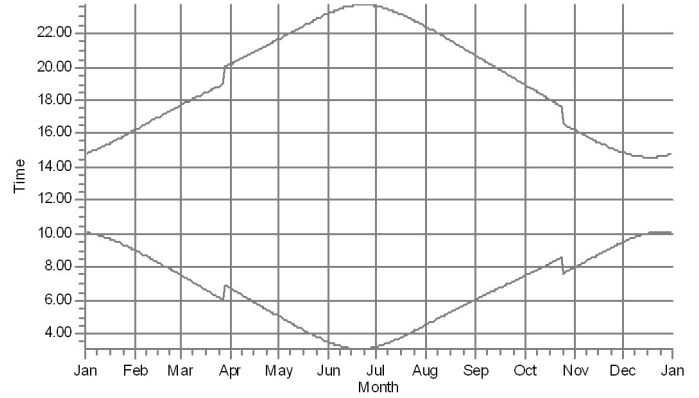
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

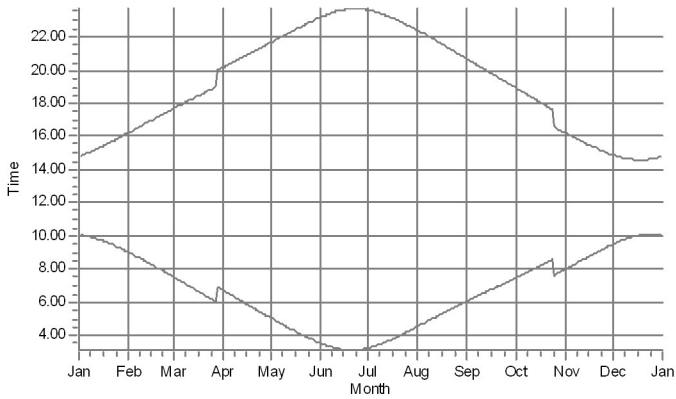
61: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



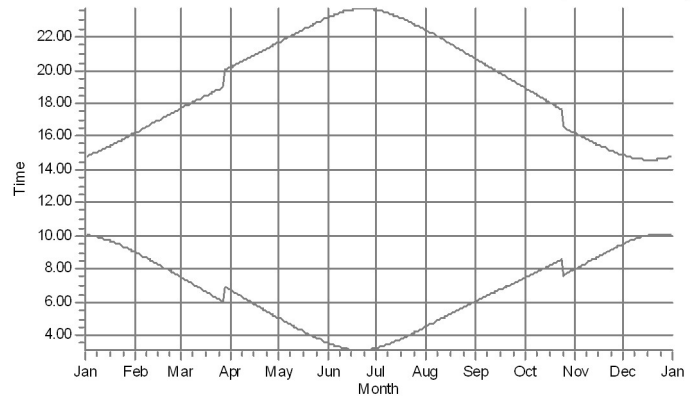
62: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



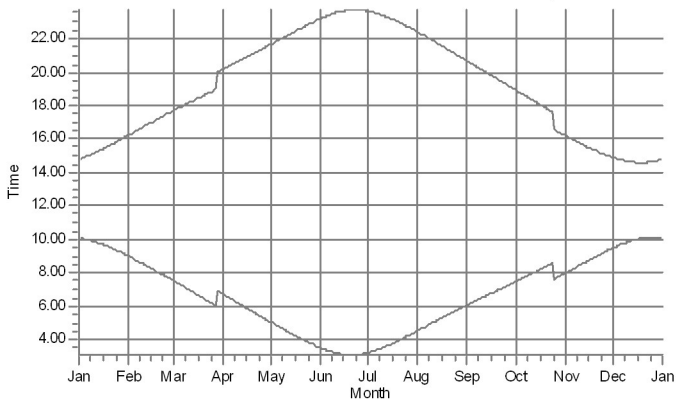
63: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



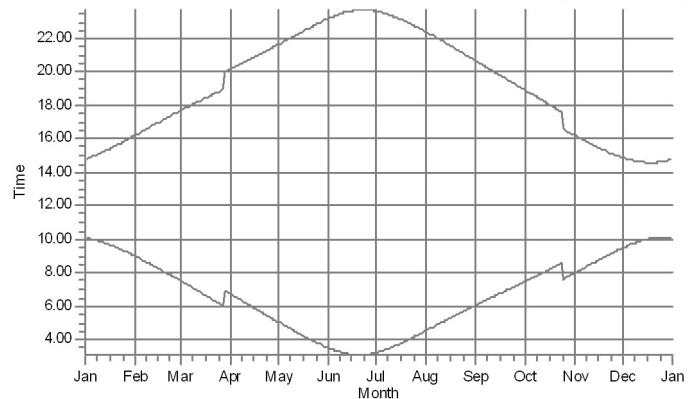
64: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



65: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



66: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)

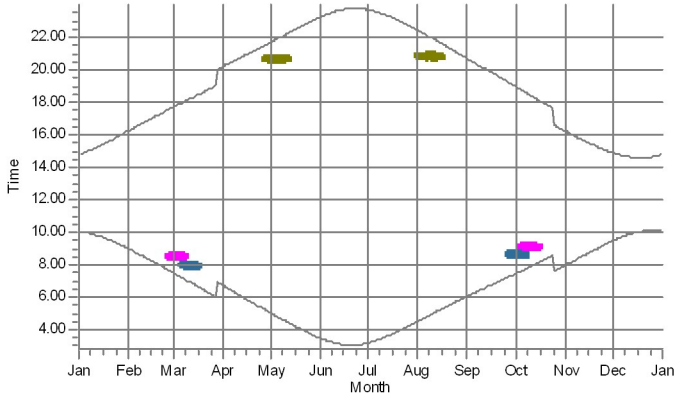


Shadow receptors

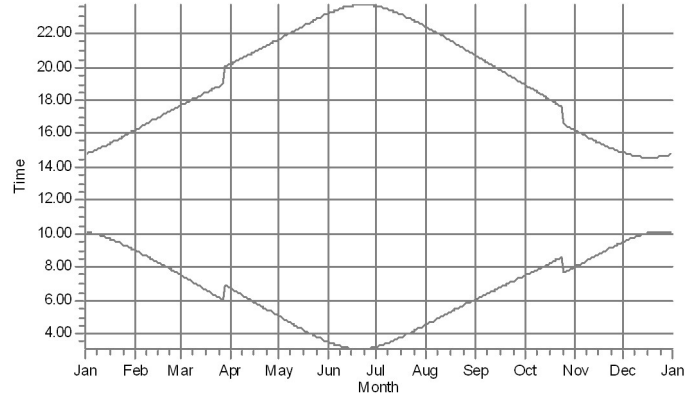
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

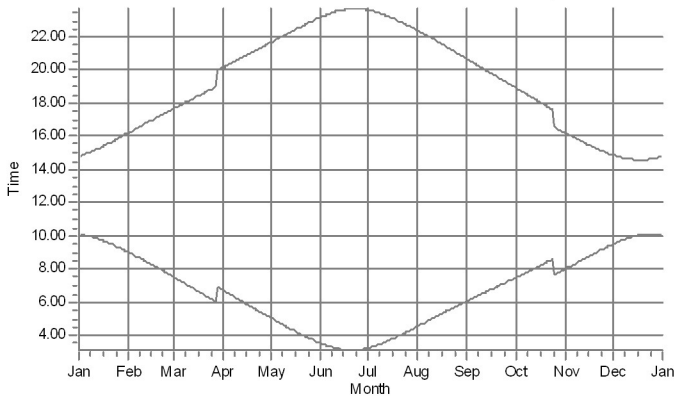
67: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



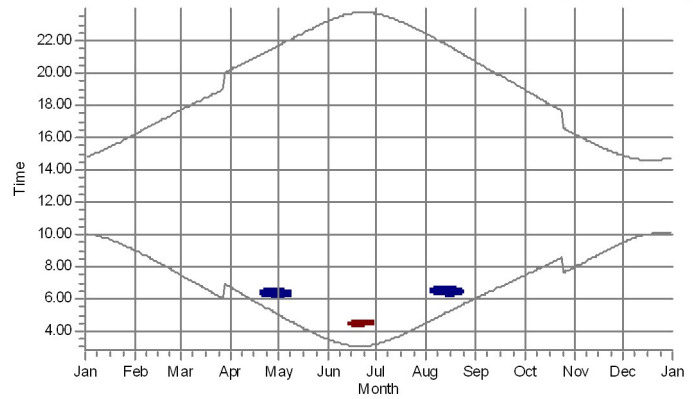
68: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



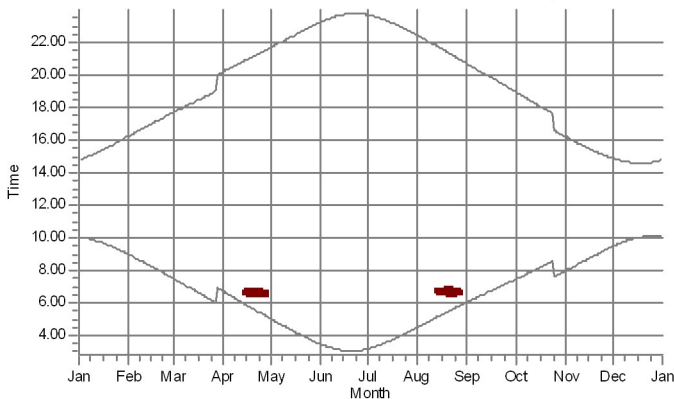
69: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



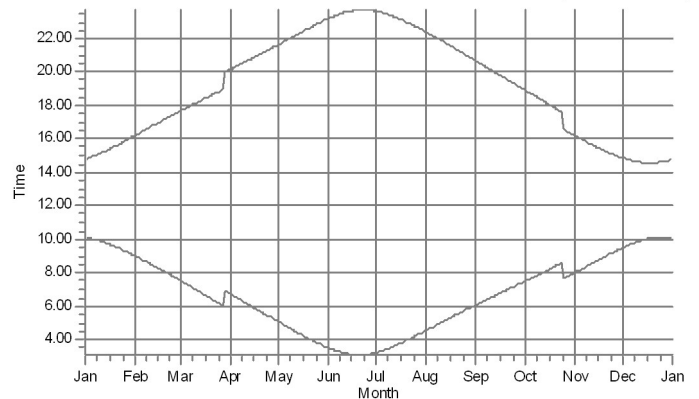
70: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



71: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



72: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



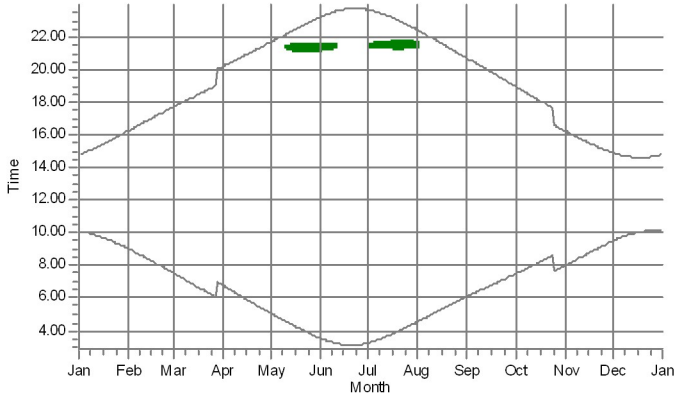
### Shadow receptors

<span style="display: inline-block; width: 15px; height: 15px; background-color: #FF00FF; border: 1px solid black;"></span> E: Asuinrakennus E (Kannistontie 557)	<span style="display: inline-block; width: 15px; height: 15px; background-color: #800000; border: 1px solid black;"></span> H: Asuinrakennus H (Hautakoskentie 544)	<span style="display: inline-block; width: 15px; height: 15px; background-color: #000080; border: 1px solid black;"></span> V: Asuinrakennus V (Kannistontie 586)
<span style="display: inline-block; width: 15px; height: 15px; background-color: #000080; border: 1px solid black;"></span> G: Asuinrakennus G (Hautakoskentie 455)	<span style="display: inline-block; width: 15px; height: 15px; background-color: #808000; border: 1px solid black;"></span> J: Lomarakennus J (Katajarventie 49)	

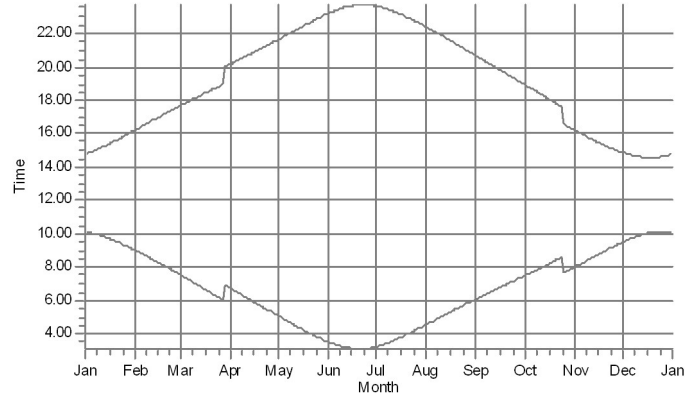
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

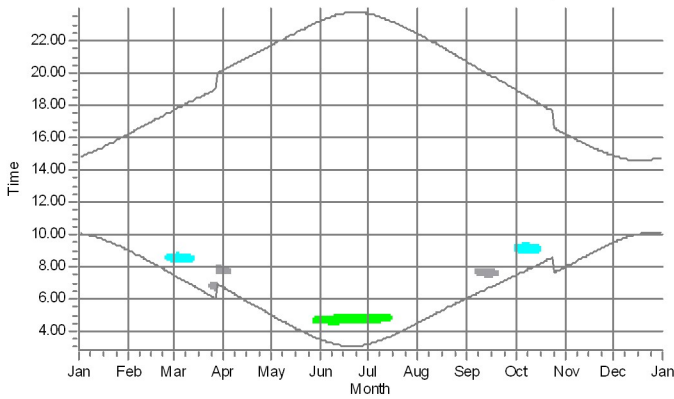
73: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



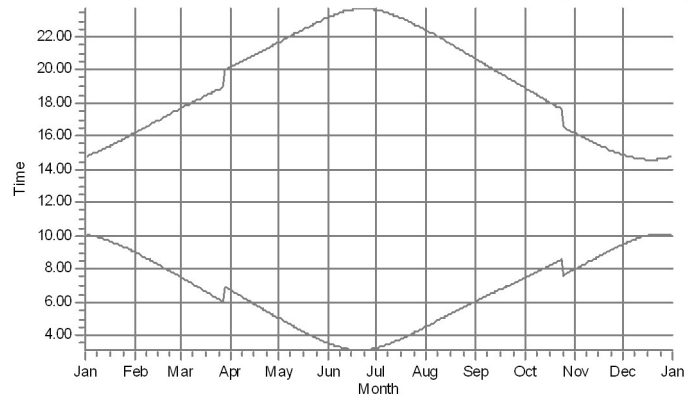
74: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



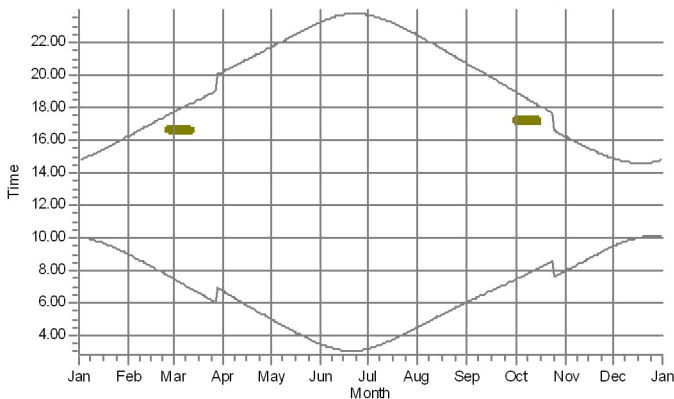
75: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



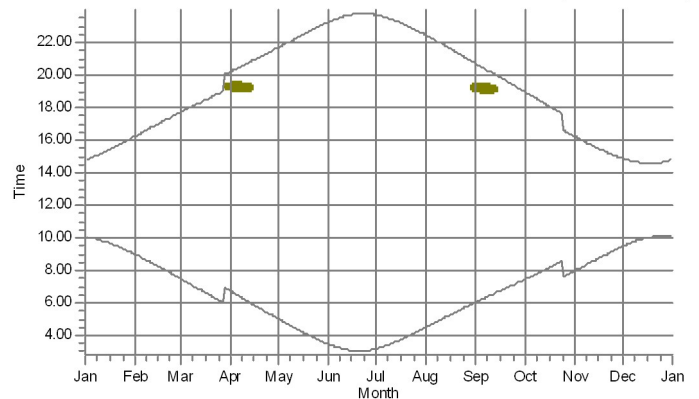
76: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



77: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



78: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



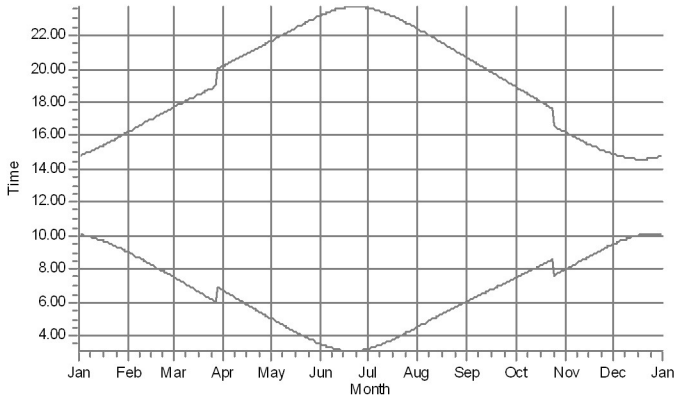
### Shadow receptors

- A: Lomarakenus A (Kuuslammentie)
- I: Asuinrakennus I (Hautakoskentie 289)
- J: Lomarakenus J (Katajajarventie 49)
- M: Lomarakenus M (Hakala, Iso-Mottonen)
- P: Asuinrakennus P (Hautakoskentie 135)

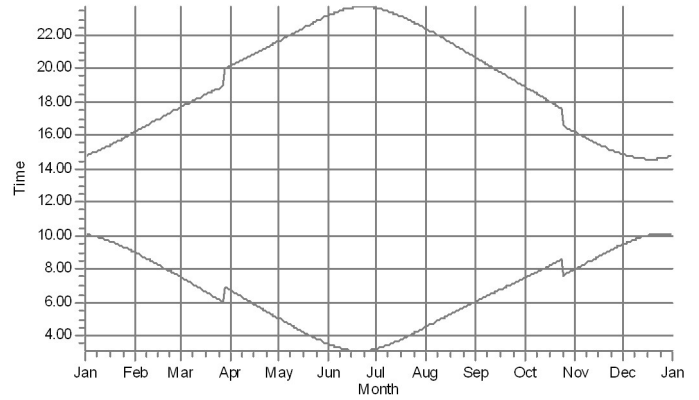
### SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

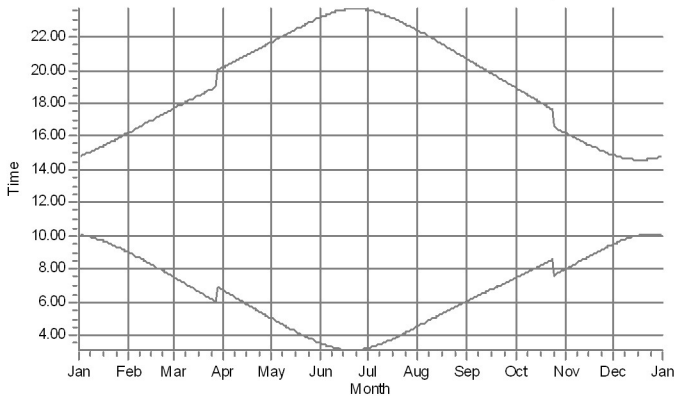
79: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



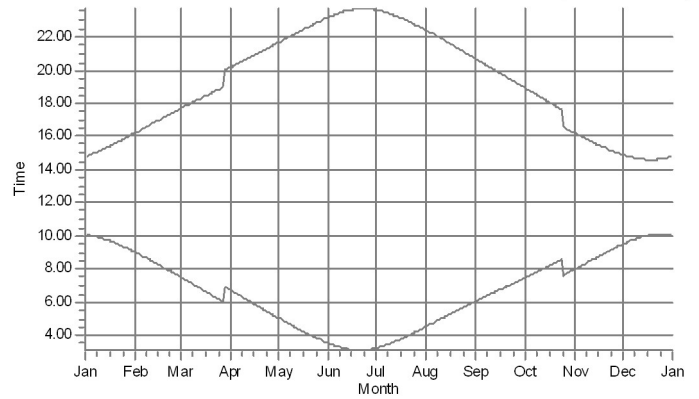
80: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



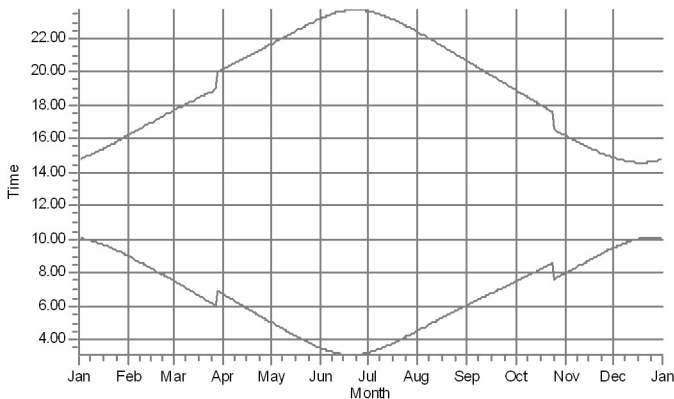
81: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



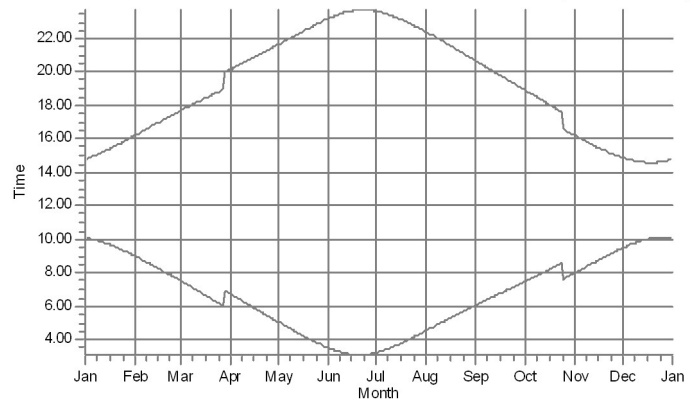
82: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



83: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



84: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)

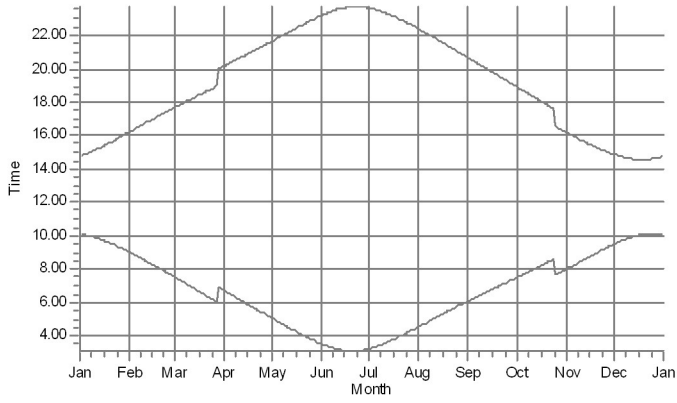


Shadow receptors

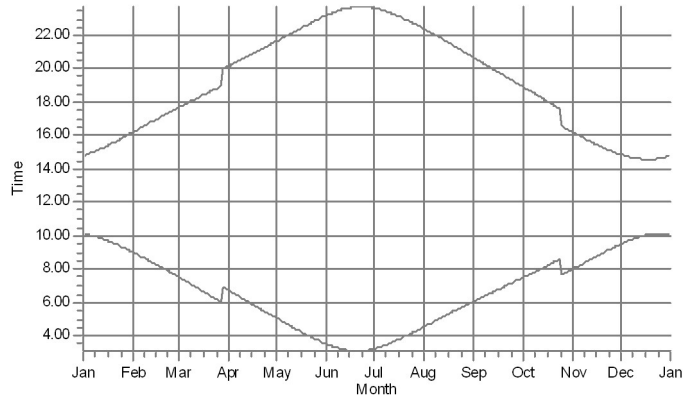
## SHADOW - Calendar per WTG, graphical

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

85: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



86: VESTAS V162-5.6 HH210 5600 180.0 !O! hub: 210,0 m (TOT: 300,0 m)



Shadow receptors

## SHADOW - Map

Calculation: Halsua\_Generic RD200x36xHH210\_Luke forest\_20210402 + yhteisvaikutukset

