JL WIND OY

Sarvinevan tuulivoimahanke Kuortane

Melu- ja varjostusmallinnukset

Karhu, Liisa 2.2.2022

Sisällysluettelo

Sarvinevan tuulivoimahanke Kuortane

1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Kuortaneen kunnassa sijaitsevan Sarvinevan -tuulivoimahankkeessa hankeomistaja JL Wind Oy suunnittelee 8 voimalan rakentamista. Voimaloiden Vestas 162-5.6MW melupäästö on 108,8 dB(A). Voimalavalmistajan lähtömelutasoon on lisätty 2 dB(A) ja käytetty ilman vaimentimia olevaa siipityyppiä ”Blades with serrated trailing edge”.

Voimaloiden melupäästö on 108,8 dB(A), voimalan roottorin halkaisija on 162 m (RD) ja voimalan napakorkeus 199 m (HH). Voimalan kokonaiskorkeus on 280 metriä.

Tuulivoimaloiden aiheuttamia melu on arvioitu melun laskentamallin avulla, joiden mukaan on tehty melumallinnus WindPRO-ohjelmalla tuulivoimapuistosta DECIBEL-modulilla. Tuulivoimaloiden aiheuttamat varjostukset on mallinnettu WindPro-ohjelman SHADOW-moduulilla.

Melu- ja varjostusmallinnukset on laatinut FM Liisa Karhu FCG Finnish Consulting Group Oy:stä.

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 suhteellisena 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 1,0 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 3.4		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:1,0
Maan- ja vedenpinnan absorption 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°		Tuulennopeus: 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.

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 tanskalaisen DSO1284 laskentaohjeen mukaisin ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

Tulokset on esitetty taajuuskohtaisena taulukkona hankealueen ympäröidyille 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 ja hankealueen aikavyöhyke. Mallinnuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, pilvisyys 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 pitkäaikaisiin mitattuihin säätietoihin 1981-2010, (Ilmatieteenlaitos raportti 2012:1). Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

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

2.3 Paikkatietoaineisto

Korkeustiedot perustuvat Maanmittauslaitoksen (MML) maastotietokannan korkeuskäyräaineistoon. Korkeusaseman intrapoloitimenetelmänä kohteille on käytetty WindPro TIN menetelmä.

Rakennusten käyttötarkoitus on arvoitu MML maastotietokannan asuin-, liike- tai julkisen-, loma-, teollisen-, kirkollisen, tai muun rakennuksen mukaisesti. Lisäksi rakennusten käyttötarkoitusta on tiedusteltu Kuortaneen kunnasta. Tietojen mukaan hankealueen läheisyydessä sijaitseva lomarakennukseksi merkitty rakennus ei ole lomarakennuskäytössä.

2.4 Voimalat

Tuulivoimaloiden melumallinnuksen lähtöarvoina on käytetty valmistajan ilmoittamia tuulivoimaloiden melupäästön takuuarvoja.

Taulukko 2. Sarvinevan hankkeen tuulivoimaloiden tyyppitiedot ja äänitehotasot sekä melun erityispiirteet.

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)					
Tuulivoimalan valmistaja: Vestas				Tyyppi: V162 - 5,6 MW	Sarjanumero/t:-
Nimellisteho: 5,6 MW		Napakorkeus: 199 m		Roottorin halkaisija: 162 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:	Mode 0 no STE – mode 06
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso	106,8 – 98.0 dB(A)

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT
Melupäästötiedot perustuvat dokumenttiin: ” Vestas; V162-5.6 MW Third octave noise emission, DMS 0079-5298_01, 2014-11-11, 2019-01-23. Lähtömelutasoon on lisätty 2 dB(A).

Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
31,5	-	20	59,0	200	95,1	2000	94,6
63	87,2	25	64,1	250	96,7	2500	92,6
125	95,9	31,5	69	315	97,9	3150	90,2
250	101,5	40	73,7	400	98,8	4000	87,3
500	103,9	50	77,7	500	99,3	5000	84,3
1000	103,3	63	81,6	630	99,4	6300	80,8
2000	99,5	80	85,1	800	99,2	8000	76,7
4000	92,7	100	88,1	1000	98,6	10000	72,6
8000	82,7	125	90,7	1250	97,7		
108,8 dB(A)		160	93,2	1600	96,3		

Melun erityispiirteiden mittaus ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, Mikä:	
~~kyllä~~	Ei	~~kyllä~~	ei	~~kyllä~~	ei	~~kyllä~~	~~ei~~

2.5 Raja- ja ohjearvot

2.5.1 Melu

Valtioneuvoston asetuksessa (1107/2015) tuulivoimaloille on määritelty ohjearvot päivä- ja yöajan keskiäänitasojen maksimiarvolle. Asetus tuli voimaan 1.9.2015. 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 tyypillisen tuulivoimamelun piirteet, edellä mainitut äänenpiirteiden tulee olla tuulivoimalalle epätyypillisen voimakkaita, jotta mallinnustuloksissa täytyy huomioida viiden desibelin lisä äänenvoimakkuuteen.

Taulukko 3. 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. Asetus tuli voimaan 15.5.2015. Toimenpiderajat koskevat asuinhuoneita ja ne on annettu taajuuspainottamattomina yhden tunnin keskiäänitasoina tersseittäin. Toimenpiderajat koskevat yöaikaa ja päivällä sallitaan 5 dB suuremmat arvot.

Taulukko 4. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.

Terssikaista Hz	20	25	31,5	40	50	63	80	100	125	160	200
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 2012).

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

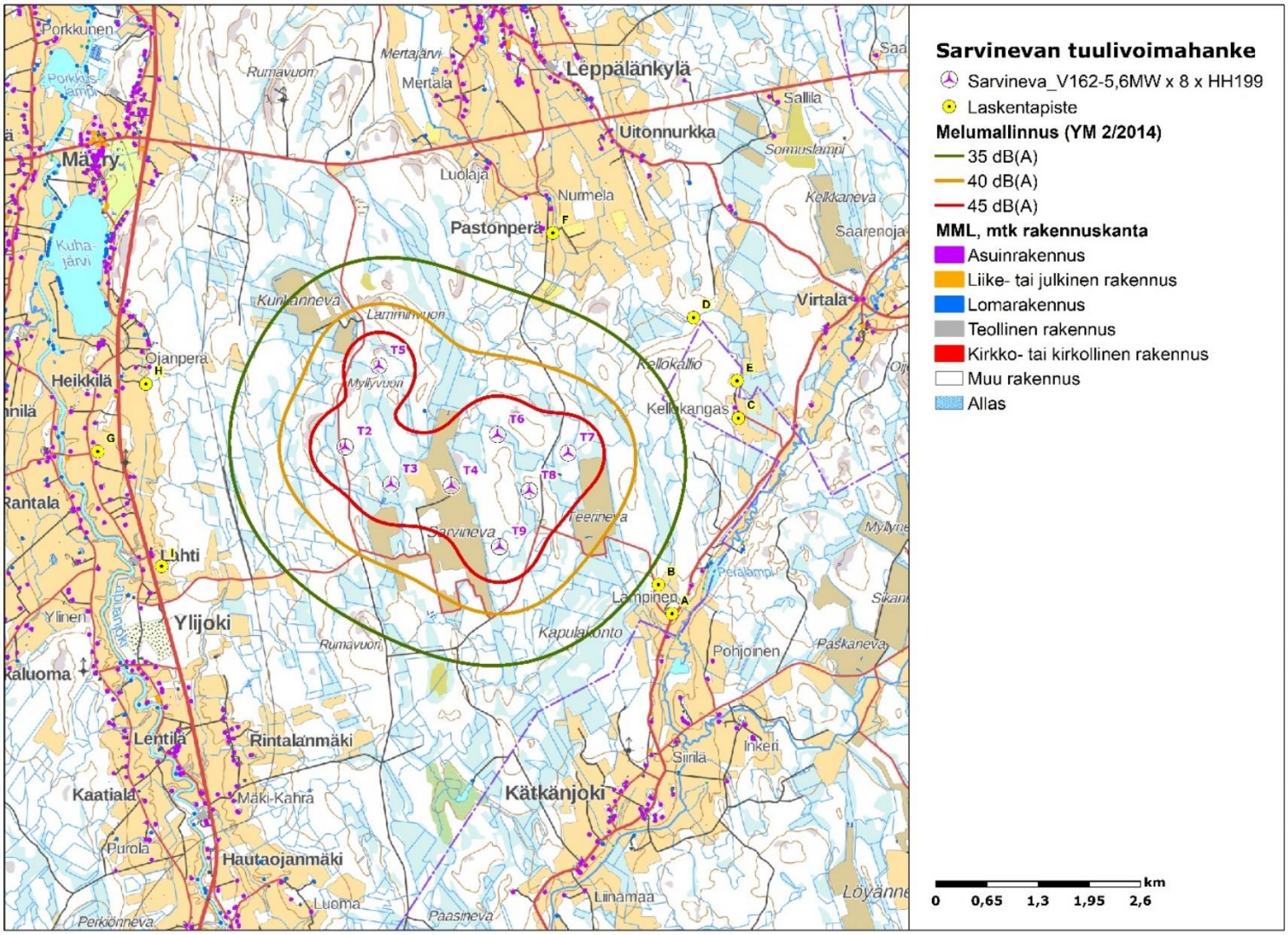
Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa (”real case”) esiintyy vähintään kahdeksan tuntia vuodessa.

3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

3.1 Melun laskentatulokset ISO 9613-2

3.1.1 Hankkeen melu

Tuulivoimapuistoa lähimpien asuin- ja lomarakennusten pihapiirissä melutasot jäävät laskelmien mukaan alle 40 dB(A) (Liite 1).



Kuva 1. Laskennalliset melutasot standardin ISO 9613-2 mukaisesti.

Taulukko 5. Laskennalliset melutasot lähtömelutason olleessa 108,8 dB(A).

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Asuinrakennus A: (Katkanjoentie 530)	329440	6958615	126,1	4,0	32,1
Lomarakennus B: (Katkanjoentie 528)	329267	6958983	127	4,0	33,9
Lomarakennus C: (Kellomaentie 76)	330281	6961097	126,3	4,0	30,9
Lomarakennus D: (Karppakangas)	329713	6962375	111,3	4,0	30,6
Lomarakennus E: (Kellomaentie)	330267	6961574	121,1	4,0	30,3
Asuinrakennus F: (Pastontie 294)	327927	6963451	100	4,0	31
Asuinrakennus G: (Lahdenkankaantie 140)	322143	6960675	88,3	4,0	27,1
Asuinrakennus H: (Kaukorannantie 37)	322755	6961533	91,3	4,0	29,1
Asuinrakennus I: (Alavudentie 560)	322955	6959218	92,3	4,0	28,8

3.2 Matalataajuiset melutasot

3.2.1 Hankkeen matalataajuinenmelu

Matalataajuinen melu ei ylitä asetettuja ohjearvoja lähimpien asuin- ja lomarakennusten sisätiloissa (Liite 2).

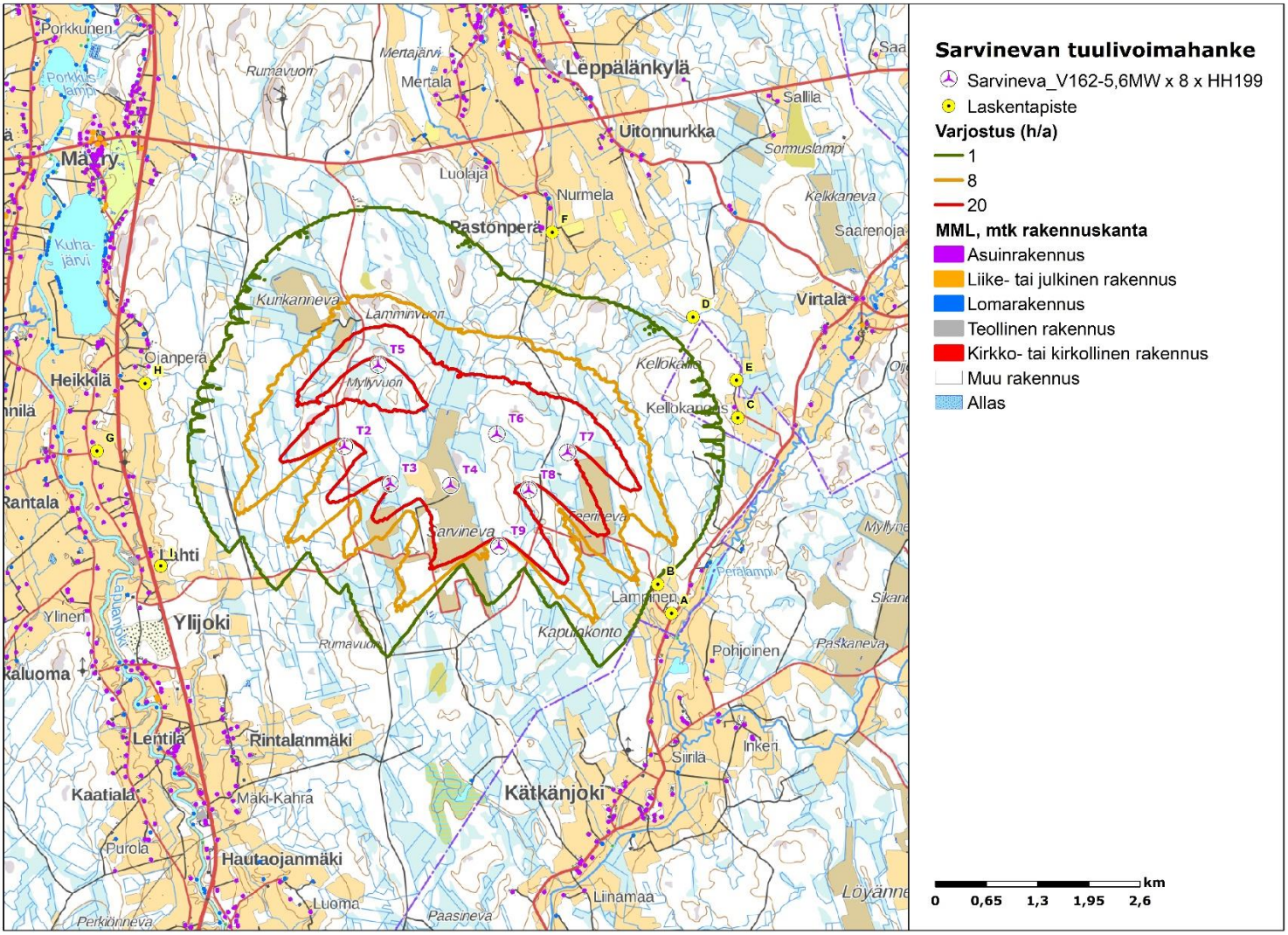
Taulukko 6. Matalataajuisen melun mallinnustulokset herkissä kohteissa verrattuna Sosiaali- ja terveysministeriön asumisterveysohjearvoon.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h - Asumisterveys-ohje sisällä	Hz	L eq,1h - Asumisterveys- ohje sisällä	Hz
Asuinrakennus A: (Katkanjoentie 530)	5,8	100	-9,3	50
Lomarakennus B: (Katkanjoentie 528)	-3,3	100	-17,8	50
Lomarakennus C: (Kellomaentie 76)	-2,0	100	-16,6	50
Lomarakennus D: (Karppakangas)	-4,1	100	-18,6	50
Lomarakennus E: (Kellomaentie)	-4,2	100	-18,7	50
Asuinrakennus F: (Pastontie 294)	-4,5	100	-19,0	50
Asuinrakennus G: (Lahdenkankaantie 140)	-3,8	100	-18,3	50
Asuinrakennus H: (Kaukorannantie 37)	-6,6	100	-21,0	50
Asuinrakennus I: (Alavudentie 560)	-5,3	100	-19,7	50

3.3 Varjostusmallinnuksen tulokset

3.3.1 Hankkeen varjostus

Tuulivoimapuistoa lähimpien asuin- ja lomarakennusten pihapiirissä varjostuksen ohjearvo 8 h/a ei ylity. (Liite 3).



Kuva 2. Laskennalliset varjostusmallinnuksen tulokset "real case, no forest".

Taulukko 7. 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)
Asuinrakennus A: (Katkanjoentie 530)	329440	6958615	126,1	0:00
Lomarakennus B: (Katkanjoentie 528)	329267	6958983	127	0:00
Lomarakennus C: (Kellomaentie 76)	330281	6961097	126,3	0:00
Lomarakennus D: (Karppakangas)	329713	6962375	111,3	0:00
Lomarakennus E: (Kellomaentie)	330267	6961574	121,1	0:00
Asuinrakennus F: (Pastontie 294)	327927	6963451	100	0:00
Asuinrakennus G: (Lahdenkankaantie	322143	6960675	88,3	0:00
Asuinrakennus H: (Kaukorannantie 37)	322755	6961533	91,3	0:00
Asuinrakennus I: (Alavudentie 560)	322955	6959218	92,3	0:00

Laatija

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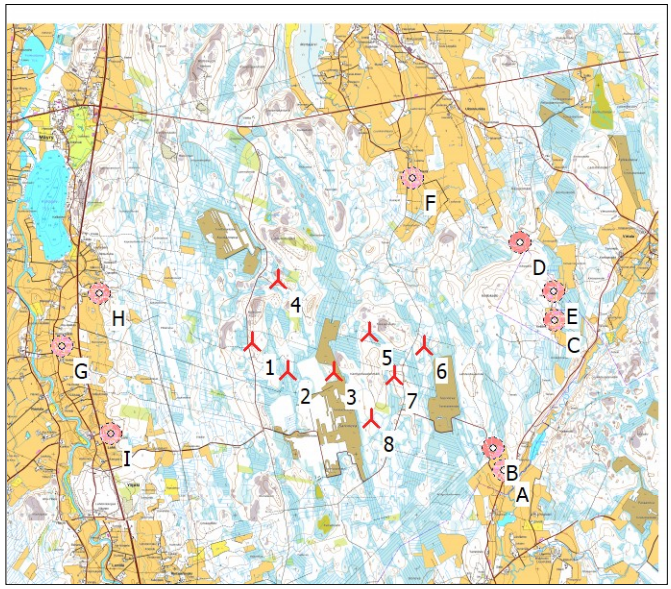
Calculated:
2.2.2022 9.59/3.4.388

DECIBEL - Main Result

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dB

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
Meteorological coefficient, C0:
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:
Pure tones penalty is added to total noise impact at receptors
Model: 5,0 dB(A)
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 NSA 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 1:125 000
New WTG
Noise sensitive area

WTGs

	East	North	Z [m]	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)]	Pure tones
1	325 286	6 960 735	136,8	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
2	325 867	6 960 262	130,8	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
3	326 636	6 960 242	132,7	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
4	325 713	6 961 768	132,5	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
5	327 222	6 960 891	137,3	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
6	328 120	6 960 660	136,8	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
7	327 626	6 960 179	140,0	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No
8	327 250	6 959 467	135,3	VESTAS V162-5.6 5600 162....	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	USER	V162 - 5.6 MW Mode 0 no_STE - 4-2019	8,0	108,8	No

Calculation Results

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	Asuinrakennus A (Katkanjoentie 530)	329 440	6 958 615	126,1	4,0	40,0	32,1
B	Lomarakennus B (Katkanjoentie 528)	329 267	6 958 983	127,0	4,0	40,0	33,9
C	Lomarakennus C (Kellomaentie 76)	330 281	6 961 097	126,3	4,0	40,0	30,9
D	Lomarakennus D (Karppakangas)	329 713	6 962 375	111,3	4,0	40,0	30,6
E	Lomarakennus E (Kellomaentie)	330 267	6 961 574	121,1	4,0	40,0	30,3
F	Asuinrakennus F (Pastontie 294)	327 927	6 963 451	100,0	4,0	40,0	31,0
G	Asuinrakennus G (Lahdenkankaantie 140)	322 143	6 960 675	88,3	4,0	40,0	27,1
H	Asuinrakennus H (Kaukorannantie 37)	322 755	6 961 533	91,3	4,0	40,0	29,1
I	Asuinrakennus I (Alavudentie 560)	322 955	6 959 218	92,3	4,0	40,0	28,8

Distances (m)

	WTG							
NSA	1	2	3	4	5	6	7	8
A	4663	3934	3242	4881	3178	2434	2395	2350
B	4349	3632	2917	4514	2797	2031	2030	2074
C	5007	4492	3744	4616	3065	2204	2809	3441
D	4720	4387	3744	4045	2899	2340	3029	3810
E	5050	4591	3867	4557	3120	2333	2986	3679
F	3787	3796	3459	2781	2655	2797	3285	4040
G	3143	3746	4513	3733	5083	5976	5504	5247
H	2653	3361	4089	2967	4512	5435	5055	4946
I	2781	3093	3820	3756	4583	5362	4768	4301

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Calculated:
2.2.2022 9.59/3.4.388

DECIBEL - Detailed results

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dBNoise calculation model: ISO 9613-2 General 8,0 m/s

Assumptions

Calculated L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(when calculated with ground attenuation, then Dc = Domega)

LWA,ref:	Sound pressure level at WTG
K:	Pure tone
Dc:	Directivity correction
Adiv:	the attenuation due to geometrical divergence
Aatm:	the attenuation due to atmospheric absorption
Agr:	the attenuation due to ground effect
Abar:	the attenuation due to a barrier
Amisc:	the attenuation due to miscellaneous other effects
Cmet:	Meteorological correction

Calculation Results

Noise sensitive area: A Asuinrakennus A (Katkanjoentie 530)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4 663	4 668	16,53	108,8	0,00	84,38	-	-	0,00	0,00	-
2	3 934	3 939	18,99	108,8	0,00	82,91	-	-	0,00	0,00	-
3	3 242	3 248	21,71	108,8	0,00	81,23	-	-	0,00	0,00	-
4	4 881	4 885	15,86	108,8	0,00	84,78	-	-	0,00	0,00	-
5	3 178	3 184	21,98	108,8	0,00	81,06	-	-	0,00	0,00	-
6	2 434	2 442	25,56	108,8	0,00	78,76	-	-	0,00	0,00	-
7	2 395	2 404	25,77	108,8	0,00	78,62	-	-	0,00	0,00	-
8	2 350	2 359	26,02	108,8	0,00	78,45	-	-	0,00	0,00	-
Sum			32,06								

- Data undefined due to calculation with octave data

Noise sensitive area: B Lomarakennus B (Katkanjoentie 528)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4 349	4 354	17,55	108,8	0,00	83,78	-	-	0,00	0,00	-
2	3 632	3 638	20,12	108,8	0,00	82,22	-	-	0,00	0,00	-
3	2 917	2 924	23,15	108,8	0,00	80,32	-	-	0,00	0,00	-
4	4 514	4 519	17,01	108,8	0,00	84,10	-	-	0,00	0,00	-
5	2 797	2 804	23,72	108,8	0,00	79,96	-	-	0,00	0,00	-
6	2 031	2 042	27,88	108,8	0,00	77,20	-	-	0,00	0,00	-
7	2 030	2 041	27,89	108,8	0,00	77,20	-	-	0,00	0,00	-
8	2 074	2 084	27,62	108,8	0,00	77,38	-	-	0,00	0,00	-
Sum			33,91								

- Data undefined due to calculation with octave data

Noise sensitive area: C Lomarakennus C (Kellomaentie 76)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	5 007	5 012	15,49	108,8	0,00	85,00	-	-	0,00	0,00	-
2	4 492	4 496	17,08	108,8	0,00	84,06	-	-	0,00	0,00	-
3	3 744	3 749	19,69	108,8	0,00	82,48	-	-	0,00	0,00	-
4	4 616	4 621	16,68	108,8	0,00	84,29	-	-	0,00	0,00	-
5	3 065	3 072	22,48	108,8	0,00	80,75	-	-	0,00	0,00	-
6	2 204	2 214	26,84	108,8	0,00	77,90	-	-	0,00	0,00	-
7	2 809	2 817	23,66	108,8	0,00	79,99	-	-	0,00	0,00	-
8	3 441	3 447	20,88	108,8	0,00	81,75	-	-	0,00	0,00	-
Sum			30,94								

- Data undefined due to calculation with octave data

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Calculated:
2.2.2022 9.59/3.4.388

DECIBEL - Detailed results

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dBNoise calculation model: ISO 9613-2 General 8,0 m/s

Noise sensitive area: D Lomarakennus D (Karppakangas)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4 720	4 725	16,35	108,8	0,00	84,49	-	-	0,00	0,00	-
2	4 387	4 393	17,42	108,8	0,00	83,85	-	-	0,00	0,00	-
3	3 744	3 750	19,69	108,8	0,00	82,48	-	-	0,00	0,00	-
4	4 045	4 051	18,59	108,8	0,00	83,15	-	-	0,00	0,00	-
5	2 899	2 907	23,23	108,8	0,00	80,27	-	-	0,00	0,00	-
6	2 340	2 350	26,07	108,8	0,00	78,42	-	-	0,00	0,00	-
7	3 029	3 037	22,63	108,8	0,00	80,65	-	-	0,00	0,00	-
8	3 810	3 817	19,44	108,8	0,00	82,63	-	-	0,00	0,00	-
Sum			30,61								

- Data undefined due to calculation with octave data

Noise sensitive area: E Lomarakennus E (Kellomaentie)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	5 050	5 055	15,36	108,8	0,00	85,07	-	-	0,00	0,00	-
2	4 591	4 595	16,76	108,8	0,00	84,25	-	-	0,00	0,00	-
3	3 867	3 873	19,23	108,8	0,00	82,76	-	-	0,00	0,00	-
4	4 557	4 562	16,87	108,8	0,00	84,18	-	-	0,00	0,00	-
5	3 120	3 127	22,23	108,8	0,00	80,90	-	-	0,00	0,00	-
6	2 333	2 342	26,11	108,8	0,00	78,39	-	-	0,00	0,00	-
7	2 986	2 994	22,83	108,8	0,00	80,53	-	-	0,00	0,00	-
8	3 679	3 685	19,94	108,8	0,00	82,33	-	-	0,00	0,00	-
Sum			30,34								

- Data undefined due to calculation with octave data

Noise sensitive area: F Asuinrakennus F (Pastontie 294)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3 787	3 795	19,52	108,8	0,00	82,58	-	-	0,00	0,00	-
2	3 796	3 802	19,49	108,8	0,00	82,60	-	-	0,00	0,00	-
3	3 459	3 466	20,80	108,8	0,00	81,80	-	-	0,00	0,00	-
4	2 781	2 790	23,79	108,8	0,00	79,91	-	-	0,00	0,00	-
5	2 655	2 665	24,41	108,8	0,00	79,51	-	-	0,00	0,00	-
6	2 797	2 807	23,71	108,8	0,00	79,96	-	-	0,00	0,00	-
7	3 285	3 294	21,51	108,8	0,00	81,35	-	-	0,00	0,00	-
8	4 040	4 047	18,60	108,8	0,00	83,14	-	-	0,00	0,00	-
Sum			31,01								

- Data undefined due to calculation with octave data

Noise sensitive area: G Asuinrakennus G (Lahdenkankaantie 140)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3 143	3 152	22,12	108,8	0,00	80,97	-	-	0,00	0,00	-
2	3 746	3 754	19,68	108,8	0,00	82,49	-	-	0,00	0,00	-
3	4 513	4 519	17,01	108,8	0,00	84,10	-	-	0,00	0,00	-
4	3 733	3 741	19,73	108,8	0,00	82,46	-	-	0,00	0,00	-
5	5 083	5 089	15,26	108,8	0,00	85,13	-	-	0,00	0,00	-
6	5 976	5 981	12,86	108,8	0,00	86,54	-	-	0,00	0,00	-
7	5 504	5 510	14,08	108,8	0,00	85,82	-	-	0,00	0,00	-
8	5 247	5 252	14,79	108,8	0,00	85,41	-	-	0,00	0,00	-
Sum			27,06								

- Data undefined due to calculation with octave data

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DECIBEL - Detailed results

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dBNoise calculation model: ISO 9613-2 General 8,0 m/s

Noise sensitive area: H Asuinrakennus H (Kaukorannantie 37)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2 653	2 664	24,41	108,8	0,00	79,51	-	-	0,00	0,00	-
2	3 361	3 369	21,20	108,8	0,00	81,55	-	-	0,00	0,00	-
3	4 089	4 096	18,43	108,8	0,00	83,25	-	-	0,00	0,00	-
4	2 967	2 976	22,91	108,8	0,00	80,47	-	-	0,00	0,00	-
5	4 512	4 519	17,01	108,8	0,00	84,10	-	-	0,00	0,00	-
6	5 435	5 440	14,27	108,8	0,00	85,71	-	-	0,00	0,00	-
7	5 055	5 061	15,34	108,8	0,00	85,08	-	-	0,00	0,00	-
8	4 946	4 952	15,67	108,8	0,00	84,90	-	-	0,00	0,00	-
Sum			29,14								

- Data undefined due to calculation with octave data

Noise sensitive area: I Asuinrakennus I (Alavudentie 560)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2 781	2 791	23,78	108,8	0,00	79,92	-	-	0,00	0,00	-
2	3 093	3 102	22,34	108,8	0,00	80,83	-	-	0,00	0,00	-
3	3 820	3 827	19,40	108,8	0,00	82,66	-	-	0,00	0,00	-
4	3 756	3 763	19,64	108,8	0,00	82,51	-	-	0,00	0,00	-
5	4 583	4 589	16,78	108,8	0,00	84,23	-	-	0,00	0,00	-
6	5 362	5 367	14,47	108,8	0,00	85,60	-	-	0,00	0,00	-
7	4 768	4 774	16,20	108,8	0,00	84,58	-	-	0,00	0,00	-
8	4 301	4 308	17,70	108,8	0,00	83,69	-	-	0,00	0,00	-
Sum			28,84								

- Data undefined due to calculation with octave data

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Calculated:
2.2.2022 9.59/3.4.388

DECIBEL - Assumptions for noise calculation

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dB

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
Meteorological coefficient, C0:
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:
Pure tones penalty is added to total noise impact at receptors
Model: 5,0 dB(A)
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 NSA 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: VESTAS V162-5.6 5600 162.0 !O!
Noise: V162 - 5.6 MW Mode 0 no_STE - 4-2019

Source	Source/Date	Creator	Edited
Vestas	11.4.2019	USER	2.2.2022 9.49

DMS no.: 0079-5298_01

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	199,0	8,0	108,8	No	87,2	95,9	101,5	103,9	103,3	99,5	92,7	82,7

Noise sensitive area: A Asuinrakennus A (Katkanjoentie 530)

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 Lomarakennus B (Katkanjoentie 528)

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 Lomarakennus C (Kellomaentie 76)

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

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DECIBEL - Assumptions for noise calculation

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dB

Noise sensitive area: D Lomarakennus D (Karppakangas)

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 Lomarakennus E (Kellomaentie)

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 (Pastontie 294)

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 (Lahdenkankaantie 140)

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 (Kaukorannantie 37)

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 (Alavudentie 560)

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

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Calculated:
2.2.2022 9.59/3.4.388

DECIBEL - Map 8,0 m/s

Calculation: Sarvineva V162-5,6MW_no_STE + 2dB x 8 x HH199_108,8dB

Map: Maastokartta , Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 326 382 North: 6 960 618

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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Main Result

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

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 hours are calculated from WTGs in calculation and wind distribution:
MERRA_basic_E23.335_N62.500 (1)

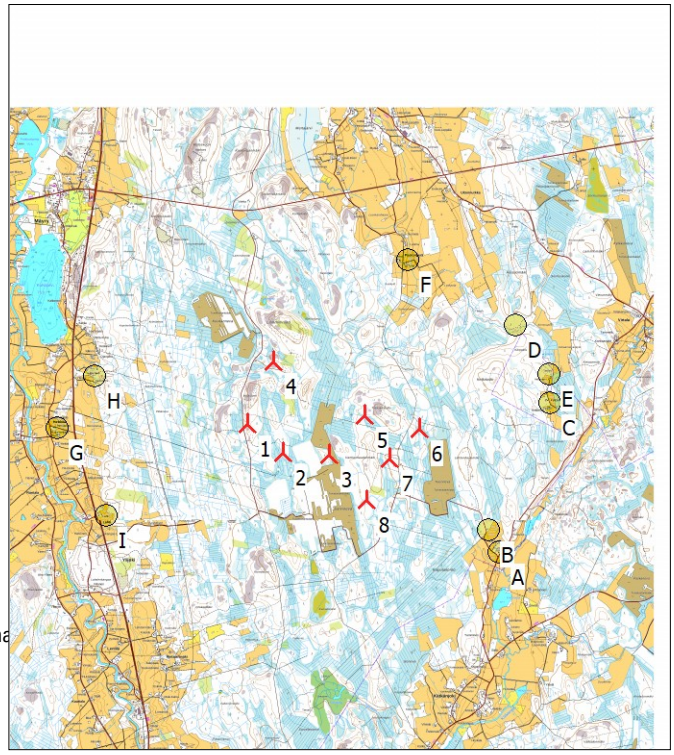
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

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_Sarvinevan tuulivoima
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 1:125 000

New WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	325 286	6 960 735	136,8	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
2	325 867	6 960 262	130,8	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
3	326 636	6 960 242	132,7	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
4	325 713	6 961 768	132,5	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
5	327 222	6 960 891	137,3	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
6	328 120	6 960 660	136,8	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
7	327 626	6 960 179	140,0	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	10,4
8	327 250	6 959 467	135,3	VESTAS V162-5.6 5600 162.0 !O! h...	Yes	VESTAS	V162-5.6-5 600	5 600	162,0	199,0	1 990	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	Asuinrakennus A (Katkanjoentie 530)	329 440	6 958 615	126,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Katkanjoentie 528)	329 267	6 958 983	127,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Lomarakennus C (Kellomaentie 76)	330 281	6 961 097	126,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus D (Karppakangas)	329 713	6 962 375	111,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Lomarakennus E (Kellomaentie)	330 267	6 961 574	121,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pastontie 294)	327 927	6 963 451	100,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Asuinrakennus G (Lahdenkankaantie 140)	322 143	6 960 675	88,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Kaukorannantie 37)	322 755	6 961 533	91,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Alavudentie 560)	322 955	6 959 218	92,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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SHADOW - Main Result

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (Katkanjoentie 530)	0:00
B	Lomarakennus B (Katkanjoentie 528)	0:00
C	Lomarakennus C (Kellomaentie 76)	0:00
D	Lomarakennus D (Karppakangas)	0:00
E	Lomarakennus E (Kellomaentie)	0:00
F	Asuinrakennus F (Pastontie 294)	0:00
G	Asuinrakennus G (Lahdenkankaantie 140)	0:00
H	Asuinrakennus H (Kaukorannantie 37)	0:00
I	Asuinrakennus I (Alavudentie 560)	0:00

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 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (28)	0:00	0:00
2	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (29)	0:00	0:00
3	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (30)	0:00	0:00
4	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (31)	0:00	0:00
5	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (32)	0:00	0:00
6	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (33)	0:00	0:00
7	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (34)	0:00	0:00
8	VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (35)	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.

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SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: A - Asuinrakennus A (Katkanjoentie 530)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.24
	15.00	16.21	17.45	20.12	21.37	23.03	23.28	22.19	20.40	18.59	16.20	15.04
2	09.57	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.33	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.16	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.04	09.29
	15.04	16.27	17.51	20.17	21.43	23.08	23.26	22.13	20.34	18.53	16.14	15.01
4	09.56	08.50	07.23	06.40	05.02	03.40	03.35	04.52	06.18	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.10	23.24	22.10	20.30	18.49	16.11	14.59
5	09.55	08.47	07.20	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.10	09.34
	15.08	16.33	17.56	20.23	21.49	23.12	23.23	22.07	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.44	08.13	09.36
	15.10	16.36	17.59	20.26	21.52	23.14	23.22	22.04	20.23	18.43	16.05	14.57
7	09.52	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.26	07.47	08.16	09.38
	15.12	16.39	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.39	16.02	14.55
8	09.51	08.39	07.10	06.26	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.40
	15.14	16.42	18.05	20.31	21.58	23.18	23.18	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.42
	15.16	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.13	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.55	08.25	09.44
	15.19	16.49	18.11	20.37	22.04	23.21	23.15	21.52	20.10	18.30	15.54	14.52
11	09.46	08.30	07.00	06.16	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.13	20.40	22.06	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.14	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.09	23.24	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.27	03.53	05.17	06.43	08.04	08.34	09.49
	15.26	16.58	18.19	20.45	22.12	23.26	23.09	21.42	20.00	18.20	15.45	14.50
14	09.41	08.21	06.50	06.06	04.31	03.26	03.55	05.20	06.45	08.06	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.43	14.49
15	09.39	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.09	08.40	09.52
	15.31	17.04	18.25	20.51	22.18	23.28	23.04	21.36	19.53	18.13	15.40	14.49
16	09.37	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.27	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.49
17	09.35	08.11	06.40	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.46	18.07	15.35	14.48
18	09.33	08.08	06.37	05.53	04.20	03.24	04.05	05.31	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.30	22.57	21.26	19.43	18.03	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.02	22.29	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.15	03.23	04.10	05.37	07.01	08.23	08.55	09.58
	15.45	17.19	18.39	21.05	22.32	23.32	22.52	21.20	19.36	17.57	15.27	14.49
21	09.27	07.59	06.27	05.43	04.12	03.23	04.13	05.40	07.04	08.26	08.57	09.58
	15.48	17.22	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.24	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.00	09.59
	15.51	17.25	18.44	21.11	22.38	23.32	22.47	21.13	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.23	04.18	05.45	07.09	08.32	09.03	09.59
	15.54	17.27	18.47	21.14	22.41	23.32	22.45	21.10	19.26	17.48	15.20	14.50
24	09.19	07.49	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.43	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.13	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.52	21.20	22.46	23.32	22.39	21.03	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.11	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.56	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.25	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.09	07.36	06.03	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.28	22.54	23.30	22.31	20.54	19.09	16.32	15.10	14.54
29	09.07		07.00	05.17	03.52	03.28	04.34	06.02	07.25	07.49	09.19	10.00
	16.12		20.03	21.31	22.56	23.30	22.28	20.50	19.06	16.29	15.08	14.56
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.52	09.22	09.59
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.01		06.53		03.48		04.40	06.07		07.55		09.59
	16.18		20.09		23.01		22.22	20.44		16.23		14.58
Potential sun hours	187	244	364	445	555	597	588	500	391	309	210	157
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)

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SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: B - Lomarakennus B (Katkanjoentie 528)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.03	23.28	22.19	20.40	18.59	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.16	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.04	09.29
	15.04	16.27	17.51	20.17	21.43	23.08	23.26	22.13	20.34	18.53	16.14	15.01
4	09.56	08.50	07.23	06.40	05.02	03.40	03.34	04.52	06.18	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.10	23.25	22.10	20.30	18.49	16.11	14.59
5	09.55	08.47	07.20	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.10	09.34
	15.08	16.33	17.56	20.23	21.49	23.12	23.23	22.07	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.44	08.13	09.36
	15.10	16.36	17.59	20.26	21.52	23.14	23.22	22.04	20.24	18.43	16.05	14.57
7	09.52	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.26	07.47	08.16	09.38
	15.12	16.39	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.39	16.02	14.55
8	09.51	08.39	07.10	06.26	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.40
	15.14	16.42	18.05	20.31	21.58	23.18	23.18	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.42
	15.16	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.13	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.55	08.25	09.44
	15.19	16.49	18.11	20.37	22.04	23.21	23.15	21.52	20.10	18.30	15.53	14.52
11	09.46	08.30	07.00	06.16	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.13	20.40	22.06	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.14	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.09	23.24	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.27	03.52	05.17	06.43	08.04	08.34	09.49
	15.26	16.58	18.19	20.45	22.12	23.26	23.09	21.42	20.00	18.20	15.45	14.50
14	09.41	08.21	06.50	06.06	04.31	03.26	03.55	05.20	06.45	08.06	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.43	14.49
15	09.39	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.09	08.40	09.52
	15.31	17.04	18.25	20.51	22.18	23.28	23.04	21.36	19.53	18.13	15.40	14.49
16	09.37	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.27	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.49
17	09.35	08.12	06.40	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.46	18.07	15.35	14.48
18	09.33	08.08	06.37	05.53	04.20	03.23	04.05	05.31	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.57	21.26	19.43	18.03	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.02	22.29	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.15	03.23	04.10	05.37	07.01	08.23	08.55	09.58
	15.45	17.19	18.39	21.05	22.32	23.32	22.52	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.23	04.12	05.40	07.04	08.26	08.57	09.58
	15.48	17.22	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.24	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.00	09.59
	15.51	17.25	18.44	21.11	22.38	23.32	22.47	21.13	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.23	04.18	05.45	07.09	08.32	09.03	09.59
	15.54	17.27	18.47	21.14	22.41	23.32	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.49	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.43	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.52	21.20	22.46	23.32	22.39	21.03	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.11	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.56	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.09	07.36	06.03	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.28	22.54	23.31	22.31	20.54	19.09	16.32	15.10	14.54
29	09.07		07.00	05.17	03.52	03.28	04.34	06.02	07.25	07.49	09.19	10.00
	16.12		20.04	21.31	22.56	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.52	09.22	09.59
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.01		06.53		03.48		04.40	06.07		07.55		09.59
	16.18		20.09		23.01		22.22	20.44		16.23		14.58
Potential sun hours	187	244	364	445	555	597	588	500	391	309	210	157
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022 Shadow receptor: C - Lomarakennus C (Kellomaentie 76)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.19	20.40	18.59	16.20	15.04
2	09.58	08.56	07.30	06.46	05.08	03.43	03.31	04.46	06.13	07.33	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.02
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.48	06.16	07.36	08.04	09.30
	15.04	16.27	17.51	20.17	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.50	07.23	06.40	05.01	03.39	03.34	04.51	06.18	07.39	08.07	09.32
	15.05	16.30	17.53	20.20	21.46	23.10	23.25	22.10	20.30	18.49	16.11	14.59
5	09.55	08.48	07.20	06.36	04.58	03.37	03.36	04.54	06.21	07.42	08.10	09.34
	15.07	16.33	17.56	20.23	21.49	23.12	23.23	22.07	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.44	08.13	09.36
	15.09	16.36	17.59	20.26	21.52	23.14	23.22	22.04	20.23	18.43	16.05	14.56
7	09.52	08.42	07.14	06.30	04.52	03.34	03.39	05.00	06.26	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.39	16.02	14.55
8	09.51	08.39	07.10	06.26	04.49	03.32	03.41	05.03	06.29	07.50	08.19	09.41
	15.14	16.42	18.05	20.31	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.43	05.06	06.32	07.53	08.22	09.43
	15.16	16.45	18.08	20.34	22.01	23.20	23.17	21.55	20.13	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.45	05.08	06.34	07.55	08.25	09.44
	15.18	16.48	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.29	15.53	14.52
11	09.47	08.30	07.00	06.16	04.40	03.28	03.48	05.11	06.37	07.58	08.28	09.46
	15.21	16.51	18.13	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.27	03.50	05.14	06.40	08.01	08.31	09.48
	15.23	16.54	18.16	20.43	22.09	23.25	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.26	03.52	05.17	06.42	08.04	08.34	09.50
	15.26	16.57	18.19	20.45	22.12	23.26	23.09	21.43	20.00	18.20	15.45	14.49
14	09.41	08.21	06.50	06.06	04.31	03.25	03.54	05.20	06.45	08.06	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.42	14.49
15	09.39	08.18	06.47	06.03	04.28	03.25	03.57	05.23	06.48	08.09	08.40	09.52
	15.31	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.48
16	09.38	08.15	06.44	06.00	04.25	03.24	03.59	05.26	06.50	08.12	08.43	09.54
	15.34	17.07	18.27	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.48
17	09.35	08.12	06.40	05.56	04.23	03.23	04.02	05.28	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.46	18.07	15.35	14.48
18	09.33	08.08	06.37	05.53	04.20	03.23	04.04	05.31	06.56	08.18	08.49	09.56
	15.39	17.13	18.33	21.00	22.27	23.31	22.58	21.26	19.43	18.03	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.15	18.36	21.02	22.30	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.46	04.14	03.23	04.10	05.37	07.01	08.23	08.55	09.58
	15.45	17.18	18.39	21.05	22.32	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.23	04.12	05.40	07.04	08.26	08.58	09.59
	15.48	17.21	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.48
22	09.24	07.56	06.24	05.40	04.09	03.23	04.15	05.42	07.07	08.29	09.00	09.59
	15.51	17.24	18.44	21.11	22.38	23.32	22.47	21.13	19.30	17.51	15.22	14.49
23	09.22	07.53	06.20	05.37	04.06	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.27	18.47	21.14	22.41	23.32	22.45	21.10	19.26	17.47	15.20	14.49
24	09.20	07.49	06.17	05.33	04.04	03.23	04.20	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.43	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.13	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.52	21.20	22.46	23.32	22.39	21.04	19.19	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.56	03.25	04.29	05.56	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.36	06.03	05.20	03.54	03.26	04.31	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.28	22.54	23.31	22.31	20.54	19.09	16.32	15.10	14.54
29	09.07		07.00	05.17	03.52	03.27	04.34	06.02	07.25	07.49	09.20	10.00
	16.12		20.03	21.31	22.56	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.49	03.28	04.37	06.05	07.28	07.52	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.02		06.53		03.47		04.40	06.07		07.55		09.59
	16.18		20.09		23.01		22.22	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022 Shadow receptor: D - Lomarakennus D (Karppakangas)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.29	22.20	20.40	18.59	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.02
3	09.57	08.53	07.27	06.43	05.05	03.41	03.32	04.48	06.16	07.36	08.04	09.30
	15.03	16.27	17.51	20.17	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.23	06.40	05.01	03.39	03.34	04.51	06.18	07.39	08.07	09.32
	15.05	16.30	17.53	20.20	21.46	23.11	23.25	22.11	20.30	18.49	16.11	14.59
5	09.55	08.48	07.20	06.36	04.58	03.37	03.36	04.54	06.21	07.42	08.10	09.34
	15.07	16.33	17.56	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.37	04.57	06.24	07.44	08.13	09.37
	15.09	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.56
7	09.53	08.42	07.14	06.30	04.52	03.34	03.39	05.00	06.26	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.17	23.21	22.01	20.20	18.39	16.02	14.55
8	09.51	08.39	07.10	06.26	04.49	03.32	03.41	05.03	06.29	07.50	08.19	09.41
	15.14	16.42	18.05	20.31	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.43	05.06	06.32	07.53	08.22	09.43
	15.16	16.45	18.08	20.34	22.01	23.20	23.17	21.55	20.13	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.45	05.08	06.34	07.55	08.25	09.45
	15.18	16.48	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.29	15.53	14.52
11	09.47	08.30	07.00	06.16	04.40	03.28	03.48	05.11	06.37	07.58	08.28	09.46
	15.21	16.51	18.13	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.50	14.51
12	09.45	08.27	06.57	06.13	04.37	03.27	03.50	05.14	06.40	08.01	08.31	09.48
	15.23	16.54	18.16	20.43	22.10	23.25	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.26	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.57	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.49
14	09.42	08.21	06.50	06.06	04.31	03.25	03.54	05.20	06.45	08.07	08.37	09.51
	15.28	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.42	14.49
15	09.40	08.18	06.47	06.03	04.28	03.24	03.57	05.23	06.48	08.09	08.40	09.53
	15.31	17.04	18.25	20.51	22.18	23.29	23.05	21.36	19.53	18.13	15.40	14.48
16	09.38	08.15	06.44	06.00	04.25	03.24	03.59	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.27	20.54	22.21	23.29	23.03	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.40	05.56	04.22	03.23	04.02	05.28	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.46	18.07	15.35	14.48
18	09.34	08.08	06.37	05.53	04.20	03.23	04.04	05.31	06.56	08.18	08.49	09.56
	15.39	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.03	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.03	22.30	23.32	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.46	04.14	03.22	04.09	05.37	07.01	08.23	08.55	09.58
	15.45	17.18	18.39	21.05	22.33	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.11	03.22	04.12	05.40	07.04	08.26	08.58	09.59
	15.48	17.21	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.48
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.42	07.07	08.29	09.01	09.59
	15.51	17.24	18.44	21.11	22.38	23.33	22.48	21.13	19.30	17.51	15.22	14.49
23	09.22	07.53	06.20	05.37	04.06	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.27	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.47	15.20	14.49
24	09.20	07.49	06.17	05.33	04.04	03.23	04.20	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.44	23.33	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.13	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.52	21.20	22.46	23.32	22.40	21.04	19.19	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.24	04.26	05.54	07.17	07.41	09.12	10.01
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.56	03.25	04.29	05.56	07.20	07.44	09.14	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.11	14.53
28	09.10	07.37	06.03	05.20	03.54	03.26	04.31	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.09	16.32	15.09	14.54
29	09.07		07.00	05.17	03.52	03.27	04.34	06.02	07.25	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.49	03.28	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.56
31	09.02		06.53		03.47		04.40	06.07		07.55		09.59
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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)

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Liisa KArhu / liisa.karhu@fcg.fi

Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: E - Lomarakennus E (Kellomaentie)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	18.59	16.19	15.04
2	09.58	08.56	07.30	06.46	05.08	03.43	03.31	04.46	06.13	07.33	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.16	15.02
3	09.57	08.53	07.27	06.43	05.05	03.41	03.32	04.48	06.16	07.36	08.04	09.30
	15.03	16.27	17.51	20.17	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.50	07.23	06.40	05.01	03.39	03.34	04.51	06.18	07.39	08.07	09.32
	15.05	16.30	17.53	20.20	21.46	23.10	23.25	22.11	20.30	18.49	16.11	14.59
5	09.55	08.48	07.20	06.36	04.58	03.37	03.36	04.54	06.21	07.42	08.10	09.34
	15.07	16.33	17.56	20.23	21.49	23.13	23.23	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.37	04.57	06.24	07.44	08.13	09.36
	15.09	16.36	17.59	20.26	21.52	23.15	23.22	22.04	20.23	18.43	16.05	14.56
7	09.53	08.42	07.14	06.30	04.52	03.34	03.39	05.00	06.26	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.39	16.02	14.55
8	09.51	08.39	07.10	06.26	04.49	03.32	03.41	05.03	06.29	07.50	08.19	09.41
	15.14	16.42	18.05	20.31	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.43	05.06	06.32	07.53	08.22	09.43
	15.16	16.45	18.08	20.34	22.01	23.20	23.17	21.55	20.13	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.45	05.08	06.34	07.55	08.25	09.44
	15.18	16.48	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.29	15.53	14.52
11	09.47	08.30	07.00	06.16	04.40	03.28	03.48	05.11	06.37	07.58	08.28	09.46
	15.21	16.51	18.13	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.50	14.51
12	09.45	08.27	06.57	06.13	04.37	03.27	03.50	05.14	06.40	08.01	08.31	09.48
	15.23	16.54	18.16	20.43	22.10	23.25	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.26	03.52	05.17	06.42	08.04	08.34	09.50
	15.26	16.57	18.19	20.45	22.12	23.26	23.09	21.43	20.00	18.20	15.45	14.49
14	09.41	08.21	06.50	06.06	04.31	03.25	03.54	05.20	06.45	08.06	08.37	09.51
	15.29	17.00	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.42	14.49
15	09.40	08.18	06.47	06.03	04.28	03.25	03.57	05.23	06.48	08.09	08.40	09.53
	15.31	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.48
16	09.38	08.15	06.44	06.00	04.25	03.24	03.59	05.26	06.50	08.12	08.43	09.54
	15.34	17.07	18.27	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.40	05.56	04.23	03.23	04.02	05.28	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.46	18.07	15.35	14.48
18	09.33	08.08	06.37	05.53	04.20	03.23	04.04	05.31	06.56	08.18	08.49	09.56
	15.39	17.13	18.33	21.00	22.27	23.31	22.58	21.26	19.43	18.03	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.15	18.36	21.03	22.30	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.46	04.14	03.23	04.10	05.37	07.01	08.23	08.55	09.58
	15.45	17.18	18.39	21.05	22.32	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.11	03.23	04.12	05.40	07.04	08.26	08.58	09.59
	15.48	17.21	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.48
22	09.24	07.56	06.24	05.40	04.09	03.23	04.15	05.42	07.07	08.29	09.00	09.59
	15.51	17.24	18.44	21.11	22.38	23.32	22.48	21.13	19.30	17.51	15.22	14.49
23	09.22	07.53	06.20	05.37	04.06	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.27	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.47	15.20	14.49
24	09.20	07.49	06.17	05.33	04.04	03.23	04.20	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.43	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.13	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.52	21.20	22.46	23.32	22.39	21.04	19.19	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.56	03.25	04.29	05.56	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.11	14.53
28	09.10	07.36	06.03	05.20	03.54	03.26	04.31	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.09	16.32	15.09	14.54
29	09.07		07.00	05.17	03.52	03.27	04.34	06.02	07.25	07.50	09.20	10.00
	16.12		20.03	21.31	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.49	03.28	04.37	06.05	07.28	07.52	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.56
31	09.02		06.53		03.47		04.40	06.07		07.55		09.59
	16.18		20.09		23.01		22.22	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: F - Asuinrakennus F (Pastontie 294)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.38	23.04	23.29	22.20	20.40	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.02	09.28
	15.02	16.24	17.48	20.15	21.40	23.06	23.28	22.17	20.37	18.56	16.17	15.02
3	09.57	08.54	07.27	06.43	05.05	03.41	03.32	04.48	06.16	07.36	08.05	09.30
	15.03	16.27	17.51	20.18	21.43	23.09	23.27	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.01	03.39	03.34	04.51	06.18	07.39	08.08	09.32
	15.05	16.30	17.54	20.20	21.46	23.11	23.25	22.11	20.30	18.49	16.11	14.59
5	09.55	08.48	07.20	06.37	04.58	03.37	03.36	04.54	06.21	07.42	08.11	09.35
	15.07	16.33	17.56	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.37	04.57	06.24	07.45	08.14	09.37
	15.09	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.56
7	09.53	08.42	07.14	06.30	04.52	03.34	03.39	05.00	06.26	07.47	08.17	09.39
	15.12	16.39	18.02	20.29	21.55	23.17	23.21	22.02	20.20	18.40	16.02	14.55
8	09.52	08.39	07.10	06.26	04.49	03.32	03.41	05.03	06.29	07.50	08.20	09.41
	15.14	16.42	18.05	20.32	21.58	23.19	23.19	21.59	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.43	05.06	06.32	07.53	08.23	09.43
	15.16	16.45	18.08	20.34	22.01	23.21	23.17	21.55	20.14	18.33	15.56	14.53
10	09.49	08.33	07.04	06.20	04.43	03.30	03.45	05.09	06.35	07.56	08.25	09.45
	15.18	16.48	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.53	14.52
11	09.47	08.30	07.01	06.16	04.40	03.28	03.48	05.11	06.37	07.58	08.28	09.47
	15.21	16.52	18.14	20.40	22.07	23.24	23.14	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.27	03.50	05.14	06.40	08.01	08.31	09.48
	15.23	16.55	18.16	20.43	22.10	23.25	23.12	21.46	20.04	18.23	15.48	14.50
13	09.44	08.24	06.54	06.10	04.34	03.26	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.49
14	09.42	08.21	06.51	06.06	04.31	03.25	03.54	05.20	06.45	08.07	08.37	09.52
	15.29	17.01	18.22	20.49	22.16	23.28	23.07	21.40	19.57	18.16	15.42	14.49
15	09.40	08.18	06.47	06.03	04.28	03.24	03.57	05.23	06.48	08.10	08.40	09.53
	15.31	17.04	18.25	20.51	22.19	23.29	23.05	21.36	19.53	18.13	15.40	14.48
16	09.38	08.15	06.44	06.00	04.25	03.24	03.59	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.30	23.03	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.40	05.56	04.23	03.23	04.02	05.28	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.31	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.23	04.04	05.31	06.56	08.18	08.49	09.56
	15.39	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.03	15.32	14.48
19	09.32	08.06	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.03	22.30	23.32	22.56	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.14	03.22	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.22	04.12	05.40	07.04	08.27	08.58	09.59
	15.48	17.22	18.41	21.09	22.36	23.33	22.50	21.17	19.33	17.54	15.25	14.48
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	10.00
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.22	14.49
23	09.22	07.53	06.20	05.37	04.06	03.23	04.18	05.45	07.09	08.32	09.04	10.00
	15.54	17.27	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.47	15.20	14.49
24	09.20	07.50	06.17	05.33	04.04	03.23	04.20	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.44	23.33	22.43	21.07	19.23	17.44	15.18	14.50
25	09.18	07.46	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.01
	16.00	17.33	18.53	21.20	22.47	23.33	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.24	04.26	05.54	07.17	07.41	09.12	10.01
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.56	03.25	04.29	05.56	07.20	07.44	09.15	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.11	14.53
28	09.10	07.37	06.03	05.21	03.54	03.26	04.31	05.59	07.23	07.47	09.17	10.01
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.17	03.52	03.27	04.34	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.31	22.29	20.51	19.06	16.29	15.08	14.55
30	09.05		06.57	05.14	03.49	03.28	04.37	06.05	07.28	07.53	09.23	10.00
	16.15		20.06	21.35	22.59	23.30	22.26	20.47	19.03	16.26	15.06	14.56
31	09.02		06.53		03.47		04.40	06.07		07.56		10.00
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	589	500	391	309	209	156
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: G - Asuinrakennus G (Lahdenkankaantie 140)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.51	05.12	03.46	03.30	04.43	06.11	07.31	07.59	09.25
	15.01	16.22	17.45	20.12	21.38	23.04	23.29	22.20	20.41	19.00	16.20	15.05
2	09.58	08.57	07.31	06.47	05.08	03.44	03.32	04.46	06.13	07.34	08.02	09.28
	15.02	16.25	17.48	20.15	21.41	23.07	23.28	22.17	20.38	18.57	16.17	15.03
3	09.57	08.54	07.27	06.44	05.05	03.42	03.33	04.49	06.16	07.37	08.05	09.30
	15.04	16.28	17.51	20.18	21.44	23.09	23.27	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.40	08.08	09.32
	15.06	16.31	17.54	20.21	21.47	23.11	23.25	22.11	20.31	18.50	16.11	15.00
5	09.55	08.48	07.21	06.37	04.59	03.38	03.37	04.55	06.22	07.42	08.11	09.35
	15.08	16.34	17.57	20.24	21.50	23.13	23.24	22.08	20.27	18.47	16.08	14.58
6	09.54	08.45	07.17	06.34	04.56	03.36	03.38	04.58	06.24	07.45	08.14	09.37
	15.10	16.37	18.00	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.53	03.35	03.40	05.01	06.27	07.48	08.17	09.39
	15.12	16.40	18.03	20.29	21.55	23.17	23.21	22.02	20.21	18.40	16.02	14.56
8	09.52	08.39	07.11	06.27	04.50	03.33	03.42	05.03	06.30	07.50	08.20	09.41
	15.15	16.43	18.06	20.32	21.58	23.19	23.19	21.59	20.17	18.37	16.00	14.55
9	09.50	08.36	07.08	06.24	04.47	03.32	03.44	05.06	06.32	07.53	08.23	09.43
	15.17	16.46	18.08	20.35	22.01	23.21	23.17	21.56	20.14	18.33	15.57	14.53
10	09.49	08.33	07.04	06.20	04.44	03.30	03.46	05.09	06.35	07.56	08.26	09.45
	15.19	16.49	18.11	20.38	22.04	23.22	23.16	21.53	20.11	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.41	03.29	03.48	05.12	06.38	07.59	08.29	09.47
	15.22	16.52	18.14	20.40	22.07	23.24	23.14	21.49	20.07	18.27	15.51	14.52
12	09.46	08.27	06.58	06.14	04.38	03.28	03.51	05.15	06.40	08.02	08.32	09.48
	15.24	16.55	18.17	20.43	22.10	23.25	23.12	21.46	20.04	18.24	15.48	14.51
13	09.44	08.24	06.54	06.10	04.35	03.27	03.53	05.18	06.43	08.04	08.35	09.50
	15.27	16.58	18.20	20.46	22.13	23.26	23.09	21.43	20.01	18.20	15.46	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.21	06.46	08.07	08.38	09.52
	15.29	17.01	18.22	20.49	22.16	23.28	23.07	21.40	19.57	18.17	15.43	14.50
15	09.40	08.18	06.48	06.04	04.29	03.25	03.58	05.23	06.48	08.10	08.41	09.53
	15.32	17.04	18.25	20.52	22.19	23.29	23.05	21.37	19.54	18.14	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.25	04.00	05.26	06.51	08.13	08.44	09.54
	15.35	17.07	18.28	20.55	22.22	23.30	23.03	21.33	19.50	18.10	15.38	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.03	05.29	06.54	08.16	08.47	09.55
	15.37	17.10	18.31	20.57	22.24	23.31	23.01	21.30	19.47	18.07	15.35	14.49
18	09.34	08.09	06.38	05.54	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.57
	15.40	17.13	18.34	21.00	22.27	23.31	22.58	21.27	19.44	18.04	15.33	14.49
19	09.32	08.06	06.34	05.50	04.18	03.24	04.08	05.35	06.59	08.21	08.52	09.58
	15.43	17.16	18.36	21.03	22.30	23.32	22.56	21.24	19.40	18.01	15.30	14.49
20	09.30	08.03	06.31	05.47	04.15	03.23	04.10	05.38	07.02	08.24	08.55	09.58
	15.46	17.19	18.39	21.06	22.33	23.32	22.53	21.21	19.37	17.58	15.28	14.49
21	09.27	08.00	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.49	17.22	18.42	21.09	22.36	23.33	22.51	21.17	19.34	17.54	15.25	14.49
22	09.25	07.56	06.24	05.41	04.10	03.24	04.16	05.43	07.07	08.30	09.01	10.00
	15.52	17.25	18.45	21.12	22.39	23.33	22.48	21.14	19.30	17.51	15.23	14.50
23	09.23	07.53	06.21	05.37	04.07	03.24	04.18	05.46	07.10	08.33	09.04	10.00
	15.54	17.28	18.47	21.15	22.41	23.33	22.45	21.11	19.27	17.48	15.21	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.49	07.13	08.36	09.07	10.01
	15.57	17.31	18.50	21.17	22.44	23.33	22.43	21.07	19.23	17.45	15.19	14.51
25	09.18	07.47	06.14	05.31	04.02	03.25	04.24	05.51	07.15	07.38	09.09	10.01
	16.00	17.34	18.53	21.20	22.47	23.33	22.40	21.04	19.20	16.42	15.16	14.52
26	09.15	07.44	06.11	05.28	03.59	03.25	04.27	05.54	07.18	07.41	09.12	10.01
	16.03	17.37	18.56	21.23	22.49	23.32	22.37	21.01	19.17	16.39	15.14	14.52
27	09.13	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.21	07.44	09.15	10.01
	16.06	17.40	18.59	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.54
28	09.10	07.37	06.04	05.21	03.55	03.27	04.32	06.00	07.23	07.47	09.18	10.01
	16.09	17.43	19.01	21.29	22.54	23.31	22.32	20.54	19.10	16.32	15.10	14.55
29	09.07		07.01	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.31	22.29	20.51	19.07	16.29	15.08	14.56
30	09.05		06.57	05.15	03.50	03.29	04.38	06.05	07.29	07.53	09.23	10.00
	16.15		20.07	21.35	22.59	23.30	22.26	20.48	19.03	16.26	15.06	14.57
31	09.02		06.54		03.48		04.41	06.08		07.56		10.00
	16.18		20.10		23.02		22.23	20.44		16.23		14.59
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022Shadow receptor: H - Asuinrakennus H (Kaukorannantie 37)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.50	05.11	03.46	03.30	04.43	06.11	07.31	07.59	09.25
	15.01	16.21	17.45	20.12	21.38	23.04	23.29	22.20	20.41	19.00	16.20	15.05
2	09.58	08.57	07.31	06.47	05.08	03.44	03.32	04.46	06.13	07.34	08.02	09.28
	15.02	16.24	17.48	20.15	21.41	23.07	23.28	22.17	20.37	18.57	16.17	15.03
3	09.57	08.54	07.27	06.44	05.05	03.42	03.33	04.49	06.16	07.37	08.05	09.30
	15.04	16.28	17.51	20.18	21.44	23.09	23.27	22.14	20.34	18.53	16.14	15.01
4	09.57	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.08	09.32
	15.06	16.31	17.54	20.21	21.47	23.11	23.25	22.11	20.31	18.50	16.11	15.00
5	09.55	08.48	07.21	06.37	04.59	03.38	03.36	04.55	06.22	07.42	08.11	09.35
	15.08	16.34	17.57	20.24	21.50	23.13	23.24	22.08	20.27	18.47	16.08	14.58
6	09.54	08.45	07.17	06.34	04.56	03.36	03.38	04.58	06.24	07.45	08.14	09.37
	15.10	16.37	18.00	20.26	21.53	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.53	03.35	03.40	05.00	06.27	07.48	08.17	09.39
	15.12	16.40	18.03	20.29	21.55	23.17	23.21	22.02	20.21	18.40	16.02	14.56
8	09.52	08.39	07.11	06.27	04.50	03.33	03.42	05.03	06.30	07.50	08.20	09.41
	15.14	16.43	18.05	20.32	21.58	23.19	23.19	21.59	20.17	18.37	16.00	14.54
9	09.50	08.36	07.08	06.24	04.47	03.32	03.44	05.06	06.32	07.53	08.23	09.43
	15.17	16.46	18.08	20.35	22.01	23.21	23.17	21.56	20.14	18.33	15.57	14.53
10	09.49	08.33	07.04	06.20	04.44	03.30	03.46	05.09	06.35	07.56	08.26	09.45
	15.19	16.49	18.11	20.38	22.04	23.22	23.16	21.53	20.11	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.41	03.29	03.48	05.12	06.38	07.59	08.29	09.47
	15.21	16.52	18.14	20.40	22.07	23.24	23.14	21.49	20.07	18.27	15.51	14.51
12	09.46	08.27	06.58	06.14	04.38	03.28	03.50	05.15	06.40	08.01	08.32	09.49
	15.24	16.55	18.17	20.43	22.10	23.25	23.12	21.46	20.04	18.23	15.48	14.51
13	09.44	08.24	06.54	06.10	04.35	03.27	03.53	05.18	06.43	08.04	08.35	09.50
	15.27	16.58	18.20	20.46	22.13	23.27	23.10	21.43	20.00	18.20	15.46	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.20	06.46	08.07	08.38	09.52
	15.29	17.01	18.22	20.49	22.16	23.28	23.07	21.40	19.57	18.17	15.43	14.50
15	09.40	08.18	06.48	06.04	04.29	03.25	03.57	05.23	06.48	08.10	08.41	09.53
	15.32	17.04	18.25	20.52	22.19	23.29	23.05	21.37	19.54	18.14	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.25	04.00	05.26	06.51	08.13	08.44	09.54
	15.34	17.07	18.28	20.55	22.22	23.30	23.03	21.33	19.50	18.10	15.38	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.54	08.15	08.47	09.56
	15.37	17.10	18.31	20.57	22.25	23.31	23.01	21.30	19.47	18.07	15.35	14.49
18	09.34	08.09	06.38	05.54	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.57
	15.40	17.13	18.34	21.00	22.27	23.31	22.58	21.27	19.44	18.04	15.33	14.49
19	09.32	08.06	06.34	05.50	04.18	03.23	04.08	05.35	06.59	08.21	08.52	09.58
	15.43	17.16	18.36	21.03	22.30	23.32	22.56	21.24	19.40	18.01	15.30	14.49
20	09.30	08.03	06.31	05.47	04.15	03.23	04.10	05.37	07.02	08.24	08.55	09.58
	15.46	17.19	18.39	21.06	22.33	23.32	22.53	21.21	19.37	17.58	15.28	14.49
21	09.27	08.00	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.49	17.22	18.42	21.09	22.36	23.33	22.51	21.17	19.34	17.54	15.25	14.49
22	09.25	07.56	06.24	05.41	04.09	03.23	04.15	05.43	07.07	08.30	09.01	10.00
	15.51	17.25	18.45	21.12	22.39	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.23	07.53	06.21	05.37	04.07	03.24	04.18	05.46	07.10	08.33	09.04	10.00
	15.54	17.28	18.47	21.15	22.41	23.33	22.45	21.11	19.27	17.48	15.21	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.49	07.12	08.35	09.07	10.01
	15.57	17.31	18.50	21.17	22.44	23.33	22.43	21.07	19.23	17.45	15.18	14.51
25	09.18	07.47	06.14	05.31	04.02	03.25	04.24	05.51	07.15	07.38	09.09	10.01
	16.00	17.34	18.53	21.20	22.47	23.33	22.40	21.04	19.20	16.42	15.16	14.51
26	09.15	07.44	06.11	05.27	03.59	03.25	04.26	05.54	07.18	07.41	09.12	10.01
	16.03	17.37	18.56	21.23	22.49	23.32	22.37	21.01	19.17	16.39	15.14	14.52
27	09.13	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.21	07.44	09.15	10.01
	16.06	17.40	18.59	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	06.00	07.23	07.47	09.18	10.01
	16.09	17.43	19.01	21.29	22.55	23.31	22.32	20.54	19.10	16.32	15.10	14.54
29	09.07		07.01	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.01
	16.12		20.04	21.32	22.57	23.31	22.29	20.51	19.07	16.29	15.08	14.56
30	09.05		06.57	05.15	03.50	03.29	04.38	06.05	07.29	07.53	09.23	10.00
	16.15		20.07	21.35	23.00	23.30	22.26	20.48	19.03	16.26	15.06	14.57
31	09.02		06.54		03.48		04.40	06.08		07.56		10.00
	16.18		20.10		23.02		22.23	20.44		16.23		14.59
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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)

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022 Shadow receptor: I - Asuinrakennus I (Alavudentie 560)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.50	05.12	03.46	03.31	04.43	06.11	07.31	07.59	09.25
	15.01	16.22	17.45	20.12	21.38	23.04	23.29	22.20	20.41	19.00	16.20	15.05
2	09.58	08.56	07.30	06.47	05.08	03.44	03.32	04.46	06.13	07.34	08.02	09.27
	15.03	16.25	17.48	20.15	21.41	23.06	23.27	22.17	20.37	18.57	16.17	15.03
3	09.57	08.54	07.27	06.44	05.05	03.42	03.33	04.49	06.16	07.37	08.05	09.30
	15.04	16.28	17.51	20.18	21.44	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.08	09.32
	15.06	16.31	17.54	20.21	21.46	23.11	23.25	22.11	20.31	18.50	16.11	15.00
5	09.55	08.48	07.21	06.37	04.59	03.38	03.37	04.55	06.22	07.42	08.11	09.35
	15.08	16.34	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.47	16.08	14.58
6	09.54	08.45	07.17	06.34	04.56	03.36	03.38	04.58	06.24	07.45	08.14	09.37
	15.10	16.37	18.00	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.53	03.35	03.40	05.01	06.27	07.48	08.17	09.39
	15.12	16.40	18.03	20.29	21.55	23.17	23.21	22.02	20.21	18.40	16.03	14.56
8	09.51	08.39	07.11	06.27	04.50	03.33	03.42	05.03	06.30	07.50	08.20	09.41
	15.15	16.43	18.05	20.32	21.58	23.19	23.19	21.59	20.17	18.37	16.00	14.55
9	09.50	08.36	07.07	06.24	04.47	03.32	03.44	05.06	06.32	07.53	08.23	09.43
	15.17	16.46	18.08	20.35	22.01	23.20	23.17	21.56	20.14	18.33	15.57	14.54
10	09.49	08.33	07.04	06.20	04.44	03.31	03.46	05.09	06.35	07.56	08.26	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.11	18.30	15.54	14.53
11	09.47	08.30	07.01	06.17	04.41	03.29	03.48	05.12	06.38	07.59	08.29	09.47
	15.22	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.27	15.51	14.52
12	09.45	08.27	06.58	06.14	04.38	03.28	03.51	05.15	06.40	08.01	08.32	09.48
	15.24	16.55	18.17	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.51
13	09.44	08.24	06.54	06.10	04.35	03.27	03.53	05.18	06.43	08.04	08.35	09.50
	15.27	16.58	18.20	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.46	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.21	06.46	08.07	08.37	09.51
	15.29	17.01	18.22	20.49	22.16	23.27	23.07	21.40	19.57	18.17	15.43	14.50
15	09.40	08.18	06.48	06.04	04.29	03.26	03.58	05.23	06.48	08.10	08.40	09.53
	15.32	17.04	18.25	20.52	22.19	23.28	23.05	21.37	19.54	18.14	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.25	04.00	05.26	06.51	08.13	08.43	09.54
	15.35	17.07	18.28	20.54	22.21	23.29	23.03	21.33	19.50	18.10	15.38	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.03	05.29	06.54	08.15	08.46	09.55
	15.37	17.10	18.31	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.49
18	09.34	08.09	06.37	05.54	04.21	03.24	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.34	21.00	22.27	23.31	22.58	21.27	19.44	18.04	15.33	14.49
19	09.32	08.06	06.34	05.50	04.18	03.24	04.08	05.35	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.32	22.55	21.24	19.40	18.01	15.30	14.49
20	09.29	08.03	06.31	05.47	04.15	03.24	04.10	05.37	07.02	08.24	08.55	09.58
	15.46	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.58	15.28	14.49
21	09.27	07.59	06.27	05.44	04.12	03.24	04.13	05.40	07.04	08.27	08.58	09.59
	15.49	17.22	18.42	21.09	22.36	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.41	04.10	03.24	04.16	05.43	07.07	08.30	09.01	09.59
	15.52	17.25	18.45	21.12	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.50
23	09.22	07.53	06.21	05.37	04.07	03.24	04.18	05.46	07.10	08.33	09.04	10.00
	15.55	17.28	18.47	21.14	22.41	23.33	22.45	21.11	19.27	17.48	15.21	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.49	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.33	22.43	21.07	19.23	17.45	15.19	14.51
25	09.18	07.47	06.14	05.31	04.02	03.25	04.24	05.51	07.15	07.38	09.09	10.01
	16.00	17.34	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.42	15.16	14.52
26	09.15	07.43	06.11	05.28	04.00	03.26	04.27	05.54	07.18	07.41	09.12	10.01
	16.03	17.37	18.56	21.23	22.49	23.32	22.37	21.01	19.17	16.39	15.14	14.53
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.21	07.44	09.15	10.01
	16.06	17.40	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.54
28	09.10	07.37	06.04	05.21	03.55	03.27	04.32	06.00	07.23	07.47	09.17	10.01
	16.09	17.43	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.55
29	09.07		07.01	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.29	20.51	19.07	16.29	15.08	14.56
30	09.05		06.57	05.15	03.50	03.29	04.38	06.05	07.29	07.53	09.22	10.00
	16.15		20.07	21.35	22.59	23.29	22.26	20.47	19.03	16.26	15.07	14.57
31	09.02		06.54		03.48		04.41	06.08		07.56		09.59
	16.19		20.10		23.02		22.23	20.44		16.23		14.59
Potential sun hours	187	244	364	445	555	597	588	500	391	309	210	157
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)

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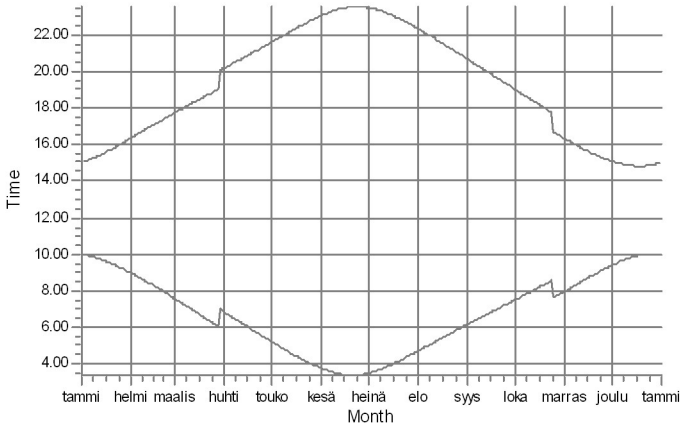
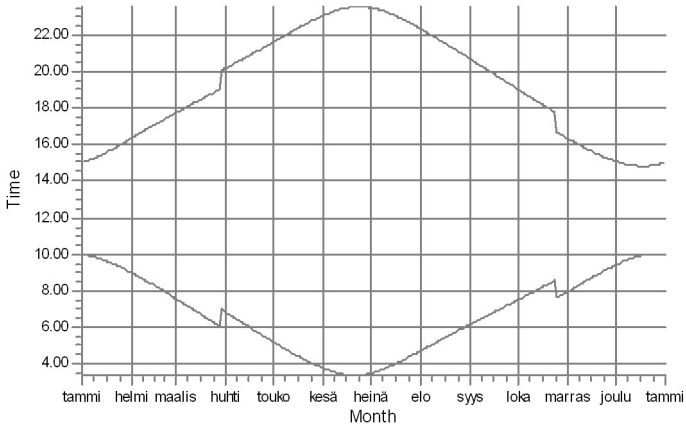
SHADOW - Calendar, graphical

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

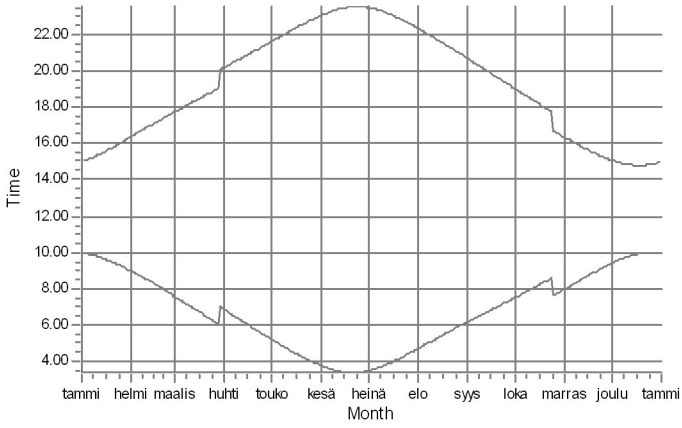
A: Asuinrakennus A (Katkanjoentie 530)



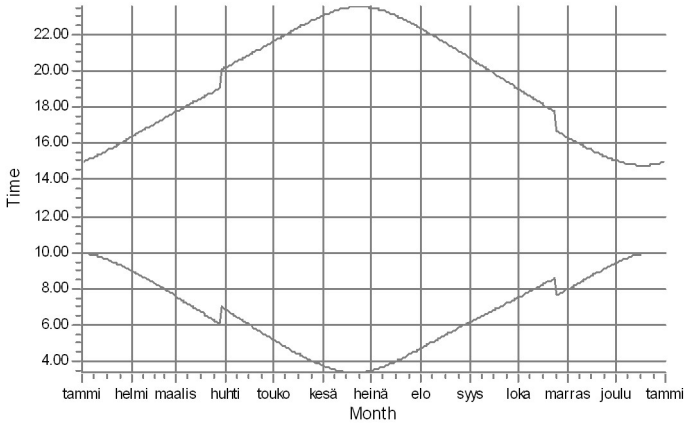
B: Lomarakennus B (Katkanjoentie 528)



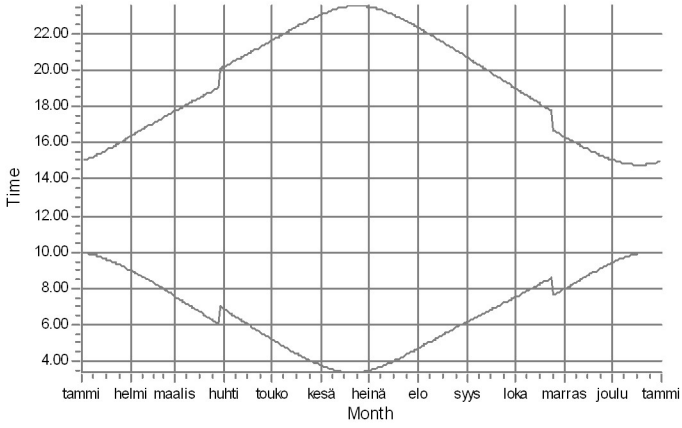
C: Lomarakennus C (Kellomaentie 76)



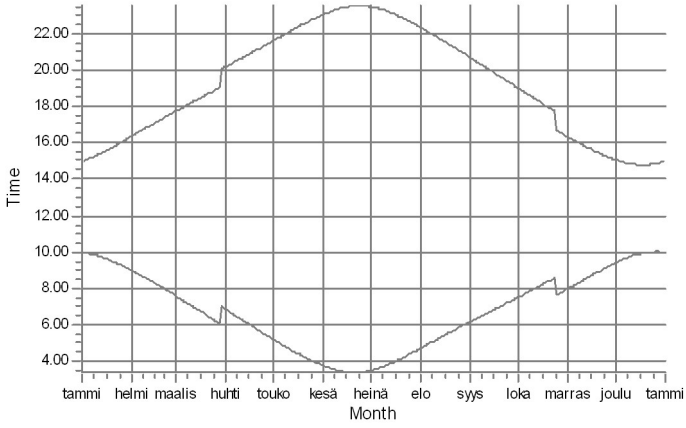
D: Lomarakennus D (Karppakangas)



E: Lomarakennus E (Kellomaentie)



F: Asuinrakennus F (Pastontie 294)



WTGs

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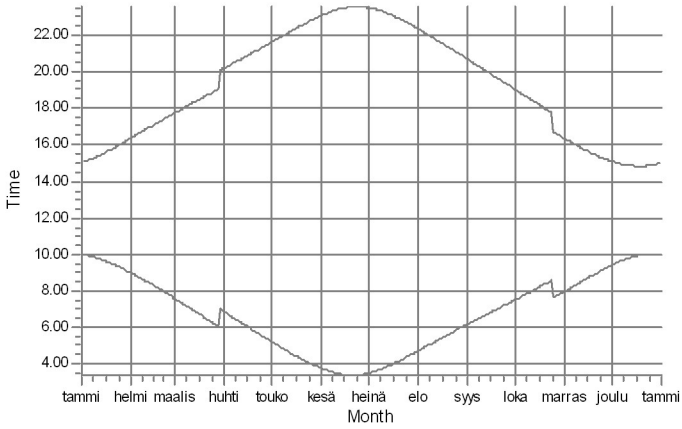
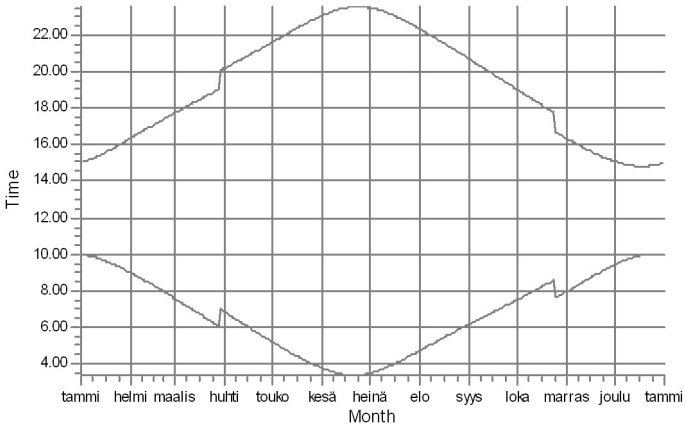
SHADOW - Calendar, graphical

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

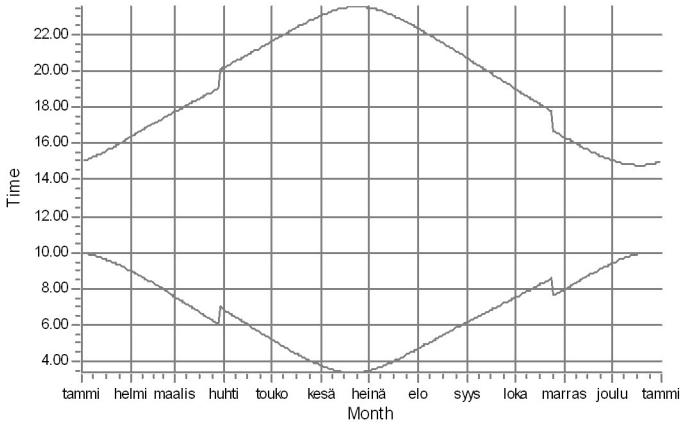
G: Asuinrakennus G (Lahdenkankaantie 140)



H: Asuinrakennus H (Kaukorannantie 37)



I: Asuinrakennus I (Alavudentie 560)



WTGs

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 1 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (28)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.50	05.11	03.46	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.38	23.04	23.29	22.20	20.41	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.32	04.46	06.13	07.34	08.02	09.27
	15.02	16.24	17.48	20.15	21.41	23.06	23.28	22.17	20.37	18.56	16.17	15.03
3	09.57	08.54	07.27	06.44	05.05	03.42	03.33	04.49	06.16	07.37	08.05	09.30
	15.04	16.27	17.51	20.18	21.43	23.09	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.08	09.32
	15.06	16.30	17.54	20.21	21.46	23.11	23.25	22.11	20.31	18.50	16.11	15.00
5	09.55	08.48	07.21	06.37	04.59	03.38	03.36	04.55	06.21	07.42	08.11	09.34
	15.08	16.34	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.56	03.36	03.38	04.57	06.24	07.45	08.14	09.37
	15.10	16.37	18.00	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.53	03.34	03.40	05.00	06.27	07.47	08.17	09.39
	15.12	16.40	18.02	20.29	21.55	23.17	23.21	22.02	20.20	18.40	16.02	14.55
8	09.51	08.39	07.11	06.27	04.50	03.33	03.42	05.03	06.29	07.50	08.20	09.41
	15.14	16.43	18.05	20.32	21.58	23.19	23.19	21.59	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.23	09.43
	15.17	16.46	18.08	20.35	22.01	23.20	23.17	21.55	20.14	18.33	15.57	14.53
10	09.49	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.26	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.38	07.58	08.29	09.47
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.27	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.15	06.40	08.01	08.31	09.48
	15.24	16.55	18.17	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.51
13	09.44	08.24	06.54	06.10	04.35	03.27	03.53	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.20	06.46	08.07	08.37	09.51
	15.29	17.01	18.22	20.49	22.16	23.27	23.07	21.40	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.10	08.40	09.53
	15.32	17.04	18.25	20.51	22.19	23.29	23.05	21.36	19.54	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.30	23.03	21.33	19.50	18.10	15.38	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.54	08.15	08.46	09.55
	15.37	17.10	18.31	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.32	08.06	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.32	22.55	21.24	19.40	18.01	15.30	14.48
20	09.29	08.02	06.31	05.47	04.15	03.23	04.10	05.37	07.02	08.24	08.55	09.58
	15.46	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.57	15.28	14.49
21	09.27	07.59	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.48	17.22	18.42	21.09	22.36	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.30	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.21	05.37	04.07	03.24	04.18	05.46	07.10	08.32	09.04	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.27	17.48	15.21	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.33	22.42	21.07	19.23	17.45	15.18	14.51
25	09.17	07.47	06.14	05.31	04.02	03.24	04.24	05.51	07.15	07.38	09.09	10.01
	16.00	17.34	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.18	07.41	09.12	10.01
	16.03	17.37	18.56	21.23	22.49	23.32	22.37	21.01	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.15	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.01
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.29	20.51	19.06	16.29	15.08	14.56
30	09.05		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.07	21.35	22.59	23.30	22.26	20.47	19.03	16.26	15.06	14.57
31	09.02		06.54		03.48		04.40	06.08		07.56		09.59
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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

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Liisa KArhu / liisa.karhu@fcg.fi

Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 2 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (29)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.50	05.11	03.46	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.38	23.04	23.28	22.20	20.41	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.32	04.46	06.13	07.34	08.02	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.42	03.33	04.49	06.16	07.36	08.05	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.08	09.32
	15.06	16.30	17.54	20.20	21.46	23.11	23.25	22.11	20.31	18.50	16.11	15.00
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.55	06.21	07.42	08.11	09.34
	15.08	16.33	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.56	03.36	03.38	04.57	06.24	07.45	08.14	09.37
	15.10	16.37	18.00	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.53	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.40	18.02	20.29	21.55	23.17	23.20	22.02	20.20	18.40	16.02	14.55
8	09.51	08.39	07.11	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.43	18.05	20.32	21.58	23.18	23.19	21.59	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.32	03.44	05.06	06.32	07.53	08.22	09.43
	15.17	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.57	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.25	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.27	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.15	06.40	08.01	08.31	09.48
	15.24	16.55	18.17	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.51
13	09.43	08.24	06.54	06.10	04.35	03.27	03.53	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.20	06.46	08.07	08.37	09.51
	15.29	17.01	18.22	20.49	22.16	23.27	23.07	21.40	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.10	08.40	09.53
	15.32	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.03	21.33	19.50	18.10	15.38	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.54	08.15	08.46	09.55
	15.37	17.10	18.31	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.06	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.32	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.31	05.47	04.15	03.23	04.10	05.37	07.02	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.57	15.28	14.49
21	09.27	07.59	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.48	17.22	18.42	21.09	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.24	04.18	05.46	07.10	08.32	09.04	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.27	17.48	15.21	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.33	22.42	21.07	19.23	17.45	15.18	14.51
25	09.17	07.46	06.14	05.31	04.02	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.34	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.18	07.41	09.12	10.01
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.01	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.15	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.51	19.06	16.29	15.08	14.56
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.07	21.35	22.59	23.29	22.26	20.47	19.03	16.26	15.06	14.57
31	09.02		06.54		03.48		04.40	06.08		07.56		09.59
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	187	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 3 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (30)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.02	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.05	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.11	23.25	22.11	20.30	18.50	16.11	14.59
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.55	06.21	07.42	08.10	09.34
	15.08	16.33	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.56	03.36	03.38	04.57	06.24	07.45	08.13	09.37
	15.10	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.40	18.02	20.29	21.55	23.17	23.20	22.02	20.20	18.40	16.02	14.55
8	09.51	08.39	07.11	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.43	18.05	20.32	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.43
	15.17	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.25	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.15	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.51
13	09.43	08.24	06.54	06.10	04.34	03.27	03.53	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.42	08.21	06.51	06.07	04.32	03.26	03.55	05.20	06.45	08.07	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.40	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.10	08.40	09.53
	15.32	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.06	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.32	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.31	05.47	04.15	03.23	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.57	15.27	14.49
21	09.27	07.59	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.48	17.22	18.42	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.23	04.18	05.46	07.09	08.32	09.03	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.32	22.42	21.07	19.23	17.45	15.18	14.50
25	09.17	07.46	06.14	05.30	04.02	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.34	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.18	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.56
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.07	21.35	22.59	23.29	22.26	20.47	19.03	16.26	15.06	14.57
31	09.02		06.54		03.48		04.40	06.08		07.56		09.59
	16.18		20.09		23.01		22.23	20.44		16.23		14.58
Potential sun hours	187	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 4 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (31)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.34	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.38	23.04	23.29	22.20	20.41	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.02	09.28
	15.02	16.24	17.48	20.15	21.41	23.06	23.28	22.17	20.37	18.56	16.17	15.03
3	09.57	08.54	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.37	08.05	09.30
	15.04	16.27	17.51	20.18	21.43	23.09	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.39	03.34	04.52	06.19	07.39	08.08	09.32
	15.06	16.30	17.54	20.21	21.46	23.11	23.25	22.11	20.31	18.50	16.11	14.59
5	09.55	08.48	07.21	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.11	09.35
	15.08	16.33	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.56	03.36	03.38	04.57	06.24	07.45	08.14	09.37
	15.10	16.36	18.00	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.17	09.39
	15.12	16.40	18.02	20.29	21.55	23.17	23.21	22.02	20.20	18.40	16.02	14.55
8	09.52	08.39	07.11	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.20	09.41
	15.14	16.43	18.05	20.32	21.58	23.19	23.19	21.59	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.23	09.43
	15.16	16.46	18.08	20.35	22.01	23.20	23.17	21.56	20.14	18.33	15.56	14.53
10	09.49	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.26	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.29	09.47
	15.21	16.52	18.14	20.40	22.07	23.24	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.15	06.40	08.01	08.32	09.48
	15.24	16.55	18.17	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.50
13	09.44	08.24	06.54	06.10	04.34	03.27	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.42	08.21	06.51	06.07	04.31	03.26	03.55	05.20	06.46	08.07	08.37	09.51
	15.29	17.01	18.22	20.49	22.16	23.28	23.07	21.40	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.10	08.40	09.53
	15.32	17.04	18.25	20.51	22.19	23.29	23.05	21.36	19.54	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.30	23.03	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.54	08.15	08.46	09.55
	15.37	17.10	18.31	20.57	22.24	23.31	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.23	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.32	08.06	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.32	22.56	21.24	19.40	18.00	15.30	14.48
20	09.29	08.02	06.31	05.47	04.15	03.23	04.10	05.37	07.02	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.57	15.27	14.48
21	09.27	07.59	06.27	05.44	04.12	03.23	04.13	05.40	07.04	08.27	08.58	09.59
	15.48	17.22	18.42	21.09	22.36	23.33	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.30	09.01	10.00
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.21	05.37	04.07	03.23	04.18	05.46	07.10	08.32	09.04	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.27	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.33	22.43	21.07	19.23	17.45	15.18	14.50
25	09.18	07.47	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.01
	16.00	17.34	18.53	21.20	22.47	23.33	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.18	07.41	09.12	10.01
	16.03	17.36	18.56	21.23	22.49	23.32	22.37	21.01	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.15	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.01
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.31	22.29	20.51	19.06	16.29	15.08	14.55
30	09.05		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.23	10.00
	16.15		20.07	21.35	22.59	23.30	22.26	20.47	19.03	16.26	15.06	14.57
31	09.02		06.54		03.47		04.40	06.08		07.56		10.00
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 5 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (32)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.02	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.05	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.39	03.34	04.52	06.18	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.11	23.25	22.11	20.30	18.50	16.11	14.59
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.10	09.34
	15.08	16.33	17.57	20.23	21.49	23.13	23.24	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.45	08.13	09.37
	15.10	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.17	23.20	22.02	20.20	18.40	16.02	14.55
8	09.51	08.39	07.10	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.43	18.05	20.32	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.43
	15.16	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.25	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.14	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.10	23.25	23.11	21.46	20.04	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.27	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.42	08.21	06.51	06.07	04.31	03.26	03.55	05.20	06.45	08.07	08.37	09.51
	15.29	17.01	18.22	20.48	22.16	23.27	23.07	21.40	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.09	08.40	09.53
	15.31	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.03	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.34	08.09	06.37	05.53	04.20	03.23	04.05	05.31	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.03	22.30	23.32	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.15	03.23	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.37	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.23	04.12	05.40	07.04	08.26	08.58	09.59
	15.48	17.22	18.42	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.33	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.33	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.01
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.14	10.01
	16.06	17.39	18.58	21.26	22.52	23.32	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.34	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.06	21.35	22.59	23.29	22.26	20.47	19.03	16.26	15.06	14.57
31	09.02		06.53		03.47		04.40	06.08		07.56		09.59
	16.18		20.09		23.02		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 6 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (33)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.59	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	18.59	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.02
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.04	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.39	03.34	04.52	06.18	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.10	23.25	22.11	20.30	18.49	16.11	14.59
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.10	09.34
	15.08	16.33	17.57	20.23	21.49	23.13	23.23	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.45	08.13	09.36
	15.10	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.17	23.20	22.01	20.20	18.40	16.02	14.55
8	09.51	08.39	07.10	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.42	18.05	20.31	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.43
	15.16	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.55	08.25	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.53	14.52
11	09.47	08.30	07.00	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.14	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.10	23.25	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.27	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.41	08.21	06.50	06.07	04.31	03.26	03.55	05.20	06.45	08.07	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.16	15.43	14.49
15	09.40	08.18	06.47	06.03	04.28	03.25	03.57	05.23	06.48	08.09	08.40	09.53
	15.31	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.48
17	09.36	08.12	06.40	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.33	08.09	06.37	05.53	04.20	03.23	04.05	05.31	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.42	17.16	18.36	21.03	22.30	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.14	03.23	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.05	22.33	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.23	04.12	05.40	07.04	08.26	08.58	09.59
	15.48	17.22	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.32	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.06	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.28	18.47	21.14	22.41	23.33	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.30	18.50	21.17	22.44	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.03	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.17	03.52	03.28	04.34	06.02	07.25	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.02		06.53		03.47		04.40	06.08		07.56		09.59
	16.18		20.09		23.01		22.23	20.44		16.23		14.58
Potential sun hours	186	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 7 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (34)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.45	03.30	04.43	06.10	07.31	07.59	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.31	04.46	06.13	07.34	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.41	03.33	04.49	06.16	07.36	08.04	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.39	03.34	04.52	06.18	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.10	23.25	22.11	20.30	18.50	16.11	14.59
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.54	06.21	07.42	08.10	09.34
	15.08	16.33	17.57	20.23	21.49	23.13	23.23	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.55	03.36	03.38	04.57	06.24	07.45	08.13	09.36
	15.10	16.36	17.59	20.26	21.52	23.15	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.39	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.40	16.02	14.55
8	09.51	08.39	07.10	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.43	18.05	20.32	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.43
	15.16	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.25	09.45
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.00	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.14	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.10	23.25	23.11	21.46	20.03	18.23	15.48	14.50
13	09.43	08.24	06.54	06.10	04.34	03.27	03.52	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.13	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.41	08.21	06.51	06.07	04.31	03.26	03.55	05.20	06.45	08.07	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.09	08.40	09.53
	15.31	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.49
17	09.36	08.12	06.40	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.33	08.09	06.37	05.53	04.20	03.23	04.05	05.31	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.15	03.23	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.33	23.32	22.53	21.20	19.36	17.57	15.27	14.48
21	09.27	07.59	06.27	05.43	04.12	03.23	04.13	05.40	07.04	08.26	08.58	09.59
	15.48	17.22	18.41	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.32	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.23	04.18	05.45	07.09	08.32	09.03	10.00
	15.54	17.28	18.47	21.14	22.41	23.32	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.44	23.32	22.42	21.07	19.23	17.44	15.18	14.50
25	09.17	07.46	06.14	05.30	04.01	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.57	23.30	22.28	20.50	19.06	16.29	15.08	14.55
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.02		06.53		03.48		04.40	06.08		07.56		09.59
	16.18		20.09		23.01		22.23	20.44		16.23		14.58
Potential sun hours	187	244	364	446	555	598	588	500	391	309	209	157
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

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Calculated:
2.2.2022 10.08/3.4.388

SHADOW - Calendar per WTG

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022WTG: 8 - VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (35)

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
654	458	399	433	553	827	981	1 180	977	838	655	682	8 638

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.58	08.59	07.33	06.50	05.11	03.46	03.30	04.43	06.10	07.31	07.58	09.25
	15.00	16.21	17.45	20.12	21.37	23.04	23.28	22.20	20.40	19.00	16.20	15.04
2	09.58	08.56	07.30	06.47	05.08	03.43	03.32	04.46	06.13	07.34	08.01	09.27
	15.02	16.24	17.48	20.15	21.40	23.06	23.27	22.17	20.37	18.56	16.17	15.03
3	09.57	08.53	07.27	06.43	05.05	03.42	03.33	04.49	06.16	07.36	08.04	09.30
	15.04	16.27	17.51	20.18	21.43	23.08	23.26	22.14	20.34	18.53	16.14	15.01
4	09.56	08.51	07.24	06.40	05.02	03.40	03.35	04.52	06.19	07.39	08.07	09.32
	15.06	16.30	17.54	20.20	21.46	23.10	23.25	22.11	20.30	18.50	16.11	15.00
5	09.55	08.48	07.20	06.37	04.59	03.38	03.36	04.55	06.21	07.42	08.10	09.34
	15.08	16.33	17.57	20.23	21.49	23.12	23.23	22.08	20.27	18.46	16.08	14.58
6	09.54	08.45	07.17	06.33	04.56	03.36	03.38	04.57	06.24	07.45	08.13	09.36
	15.10	16.36	17.59	20.26	21.52	23.14	23.22	22.05	20.24	18.43	16.05	14.57
7	09.53	08.42	07.14	06.30	04.52	03.34	03.40	05.00	06.27	07.47	08.16	09.39
	15.12	16.40	18.02	20.29	21.55	23.16	23.20	22.01	20.20	18.40	16.02	14.55
8	09.51	08.39	07.10	06.27	04.49	03.33	03.42	05.03	06.29	07.50	08.19	09.41
	15.14	16.43	18.05	20.32	21.58	23.18	23.19	21.58	20.17	18.36	15.59	14.54
9	09.50	08.36	07.07	06.23	04.46	03.31	03.44	05.06	06.32	07.53	08.22	09.43
	15.17	16.46	18.08	20.34	22.01	23.20	23.17	21.55	20.14	18.33	15.56	14.53
10	09.48	08.33	07.04	06.20	04.43	03.30	03.46	05.09	06.35	07.56	08.25	09.44
	15.19	16.49	18.11	20.37	22.04	23.22	23.15	21.52	20.10	18.30	15.54	14.52
11	09.47	08.30	07.01	06.17	04.40	03.29	03.48	05.12	06.37	07.58	08.28	09.46
	15.21	16.52	18.14	20.40	22.07	23.23	23.13	21.49	20.07	18.26	15.51	14.51
12	09.45	08.27	06.57	06.13	04.37	03.28	03.50	05.15	06.40	08.01	08.31	09.48
	15.24	16.55	18.16	20.43	22.10	23.25	23.11	21.46	20.03	18.23	15.48	14.51
13	09.43	08.24	06.54	06.10	04.34	03.27	03.53	05.17	06.43	08.04	08.34	09.50
	15.26	16.58	18.19	20.46	22.12	23.26	23.09	21.43	20.00	18.20	15.45	14.50
14	09.41	08.21	06.51	06.07	04.32	03.26	03.55	05.20	06.45	08.07	08.37	09.51
	15.29	17.01	18.22	20.48	22.15	23.27	23.07	21.39	19.57	18.17	15.43	14.49
15	09.40	08.18	06.47	06.03	04.29	03.25	03.57	05.23	06.48	08.09	08.40	09.52
	15.32	17.04	18.25	20.51	22.18	23.28	23.05	21.36	19.53	18.13	15.40	14.49
16	09.38	08.15	06.44	06.00	04.26	03.24	04.00	05.26	06.51	08.12	08.43	09.54
	15.34	17.07	18.28	20.54	22.21	23.29	23.02	21.33	19.50	18.10	15.37	14.49
17	09.36	08.12	06.41	05.57	04.23	03.24	04.02	05.29	06.53	08.15	08.46	09.55
	15.37	17.10	18.30	20.57	22.24	23.30	23.00	21.30	19.47	18.07	15.35	14.48
18	09.33	08.09	06.37	05.53	04.20	03.24	04.05	05.32	06.56	08.18	08.49	09.56
	15.40	17.13	18.33	21.00	22.27	23.31	22.58	21.27	19.43	18.04	15.32	14.48
19	09.31	08.05	06.34	05.50	04.17	03.23	04.07	05.34	06.59	08.21	08.52	09.57
	15.43	17.16	18.36	21.03	22.30	23.31	22.55	21.23	19.40	18.00	15.30	14.48
20	09.29	08.02	06.30	05.47	04.15	03.23	04.10	05.37	07.01	08.24	08.55	09.58
	15.45	17.19	18.39	21.06	22.32	23.32	22.53	21.20	19.37	17.57	15.27	14.49
21	09.27	07.59	06.27	05.43	04.12	03.23	04.13	05.40	07.04	08.26	08.58	09.59
	15.48	17.22	18.42	21.08	22.35	23.32	22.50	21.17	19.33	17.54	15.25	14.49
22	09.25	07.56	06.24	05.40	04.09	03.23	04.15	05.43	07.07	08.29	09.01	09.59
	15.51	17.25	18.44	21.11	22.38	23.32	22.48	21.14	19.30	17.51	15.23	14.49
23	09.22	07.53	06.20	05.37	04.07	03.24	04.18	05.46	07.09	08.32	09.03	10.00
	15.54	17.28	18.47	21.14	22.41	23.32	22.45	21.10	19.26	17.48	15.20	14.50
24	09.20	07.50	06.17	05.34	04.04	03.24	04.21	05.48	07.12	08.35	09.06	10.00
	15.57	17.31	18.50	21.17	22.43	23.32	22.42	21.07	19.23	17.45	15.18	14.51
25	09.17	07.46	06.14	05.30	04.02	03.24	04.23	05.51	07.15	07.38	09.09	10.00
	16.00	17.33	18.53	21.20	22.46	23.32	22.40	21.04	19.20	16.41	15.16	14.51
26	09.15	07.43	06.10	05.27	03.59	03.25	04.26	05.54	07.17	07.41	09.12	10.00
	16.03	17.36	18.55	21.23	22.49	23.32	22.37	21.00	19.16	16.38	15.14	14.52
27	09.12	07.40	06.07	05.24	03.57	03.26	04.29	05.57	07.20	07.44	09.14	10.00
	16.06	17.39	18.58	21.26	22.51	23.31	22.34	20.57	19.13	16.35	15.12	14.53
28	09.10	07.37	06.04	05.21	03.54	03.27	04.32	05.59	07.23	07.47	09.17	10.00
	16.09	17.42	19.01	21.29	22.54	23.31	22.31	20.54	19.10	16.32	15.10	14.54
29	09.07		07.00	05.18	03.52	03.28	04.35	06.02	07.26	07.50	09.20	10.00
	16.12		20.04	21.32	22.56	23.30	22.28	20.50	19.06	16.29	15.08	14.56
30	09.04		06.57	05.14	03.50	03.29	04.37	06.05	07.28	07.53	09.22	10.00
	16.15		20.06	21.34	22.59	23.29	22.25	20.47	19.03	16.26	15.06	14.57
31	09.02		06.53		03.48		04.40	06.08		07.56		09.59
	16.18		20.09		23.01		22.22	20.44		16.23		14.58
Potential sun hours	187	244	364	446	555	597	588	500	391	309	210	157
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

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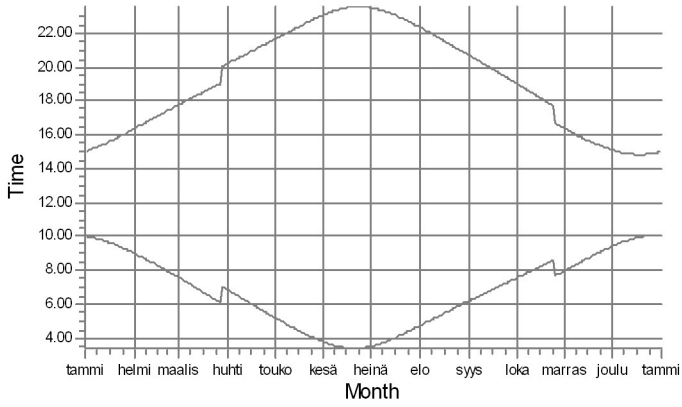
Liisa KArhu / liisa.karhu@fcg.fi

Calculated:
2.2.2022 10.08/3.4.388

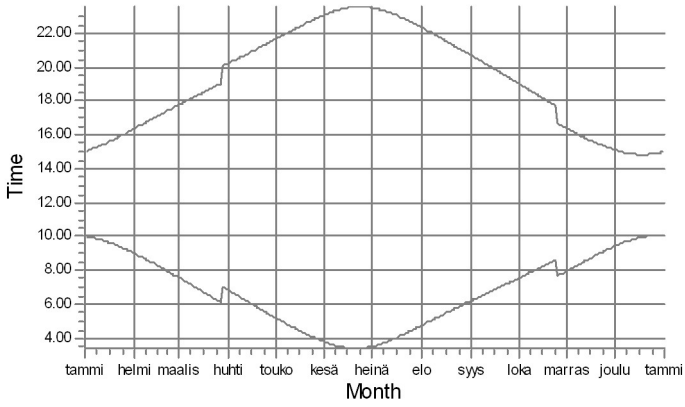
SHADOW - Calendar per WTG, graphical

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

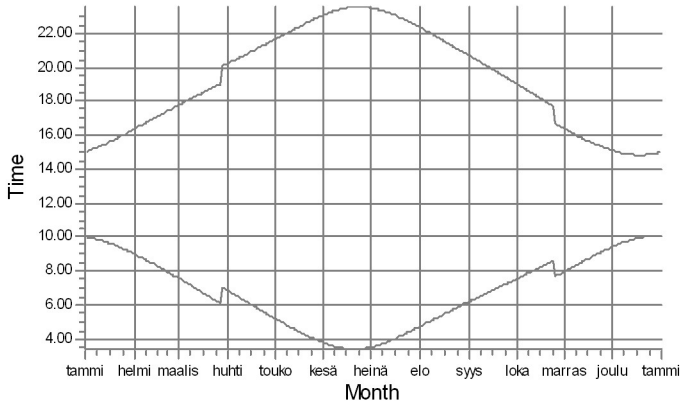
1: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (28)



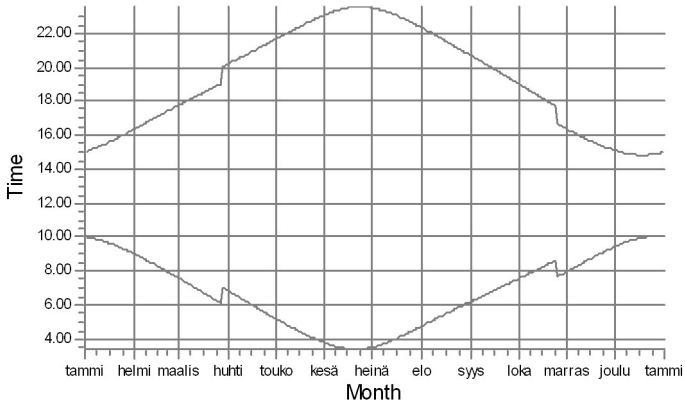
2: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (29)



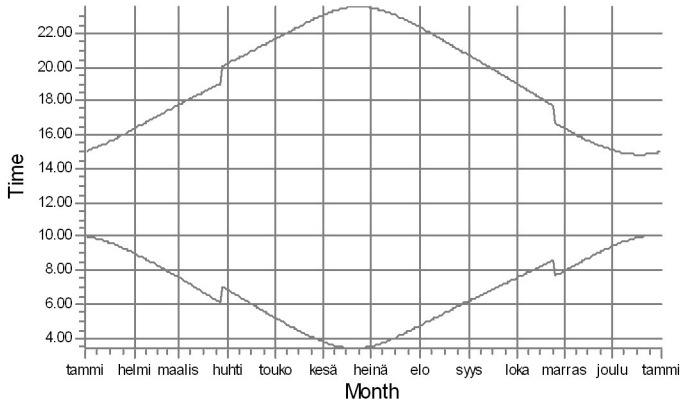
3: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (30)



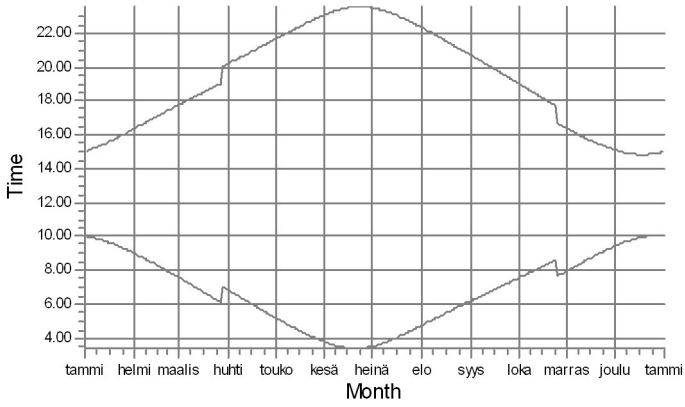
4: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (31)



5: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (32)



6: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (33)



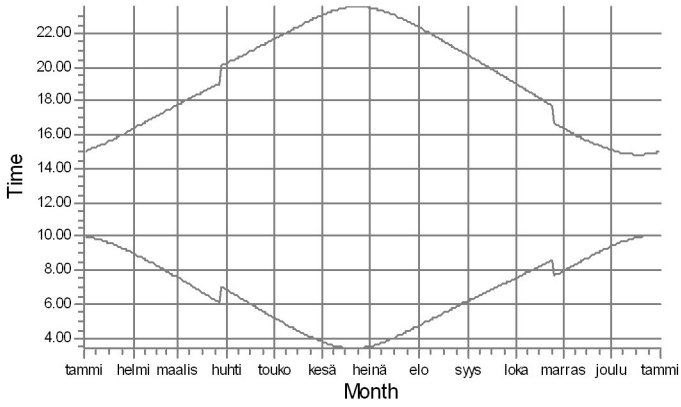
Shadow receptors

Licensed user:
FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Liisa KArhu / liisa.karhu@fcg.fi

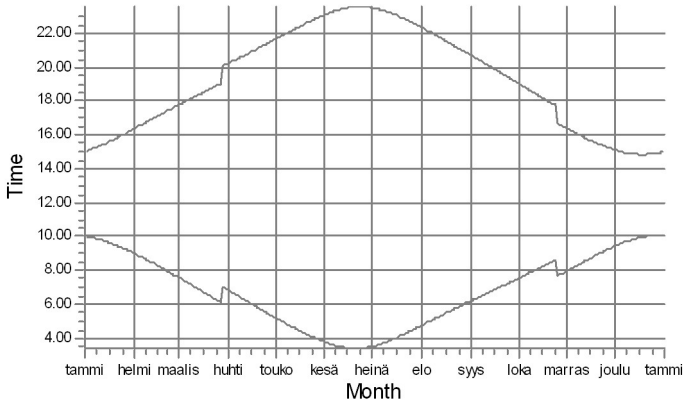
SHADOW - Calendar per WTG, graphical

Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

7: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (34)



8: VESTAS V162-5.6 5600 162.0 !O! hub: 199,0 m (TOT: 280,0 m) (35)



Shadow receptors

Licensed user:
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Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Liisa KArhu / liisa.karhu@fcg.fi

Calculated:
2.2.2022 10.08/3.4.388

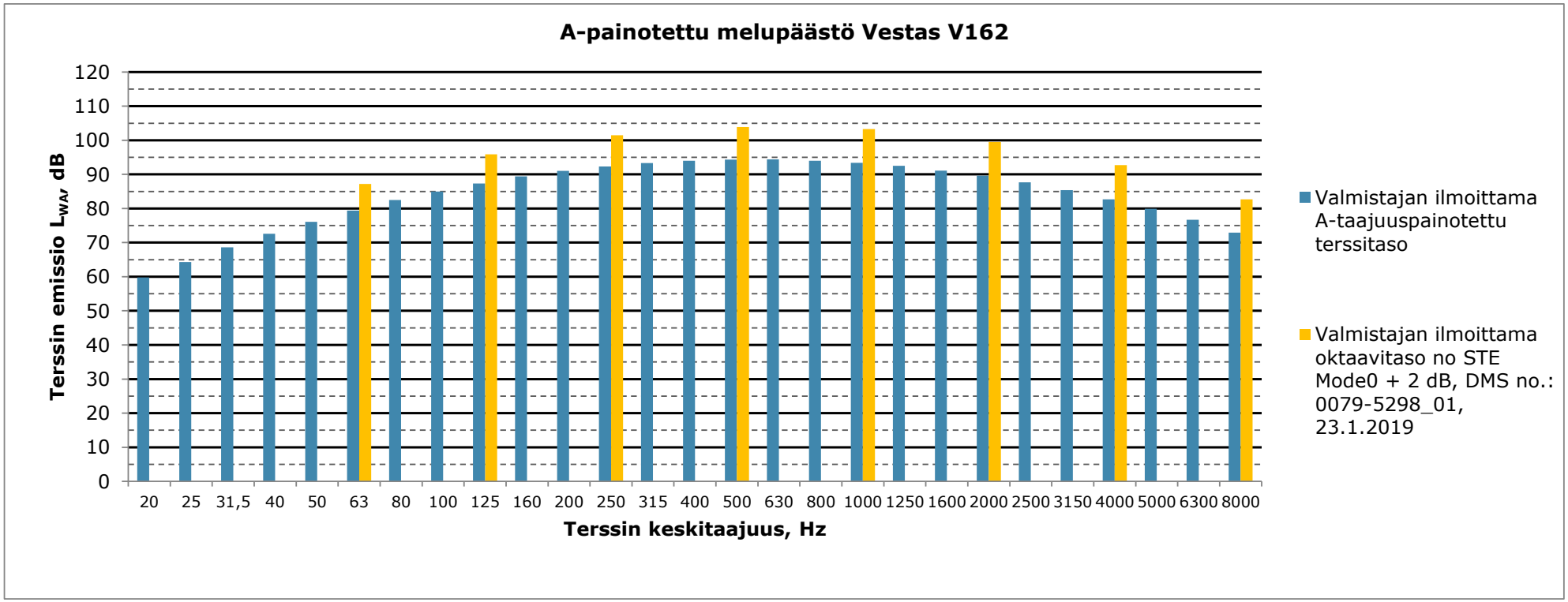
SHADOW - Map

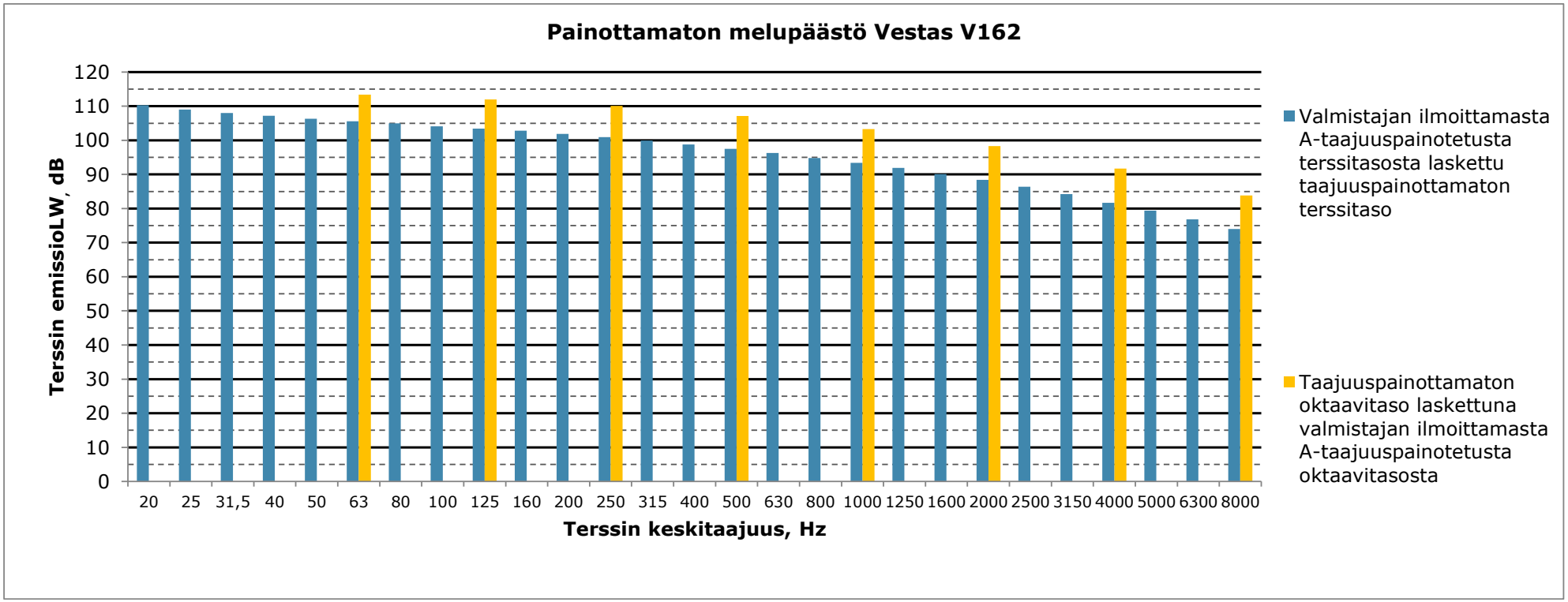
Calculation: SHADOW_Sarvineva V162-5.6MW x 8 x HH199_no forest_02022022

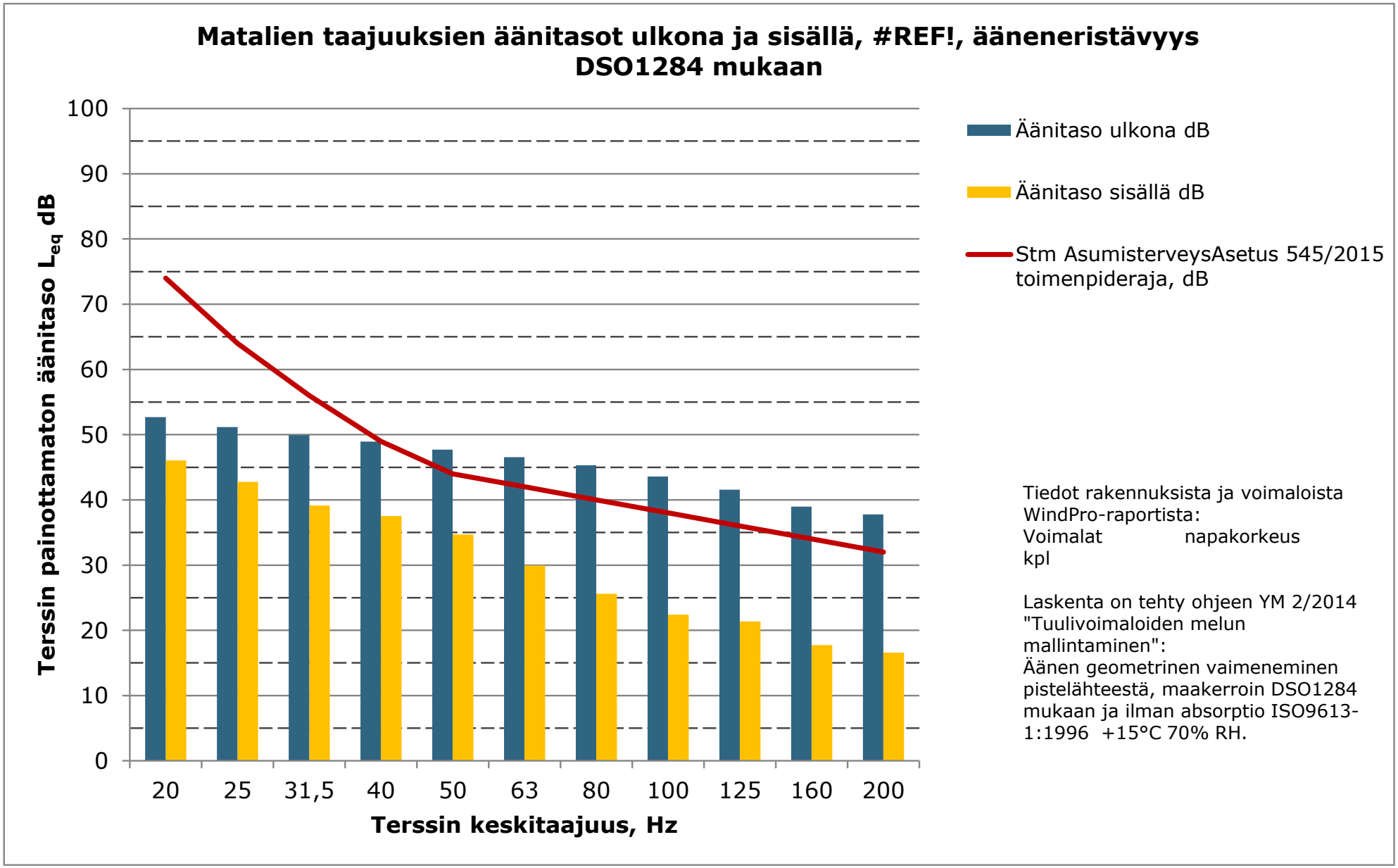
Map: Maastokartta , Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 326 610 North: 6 960 720

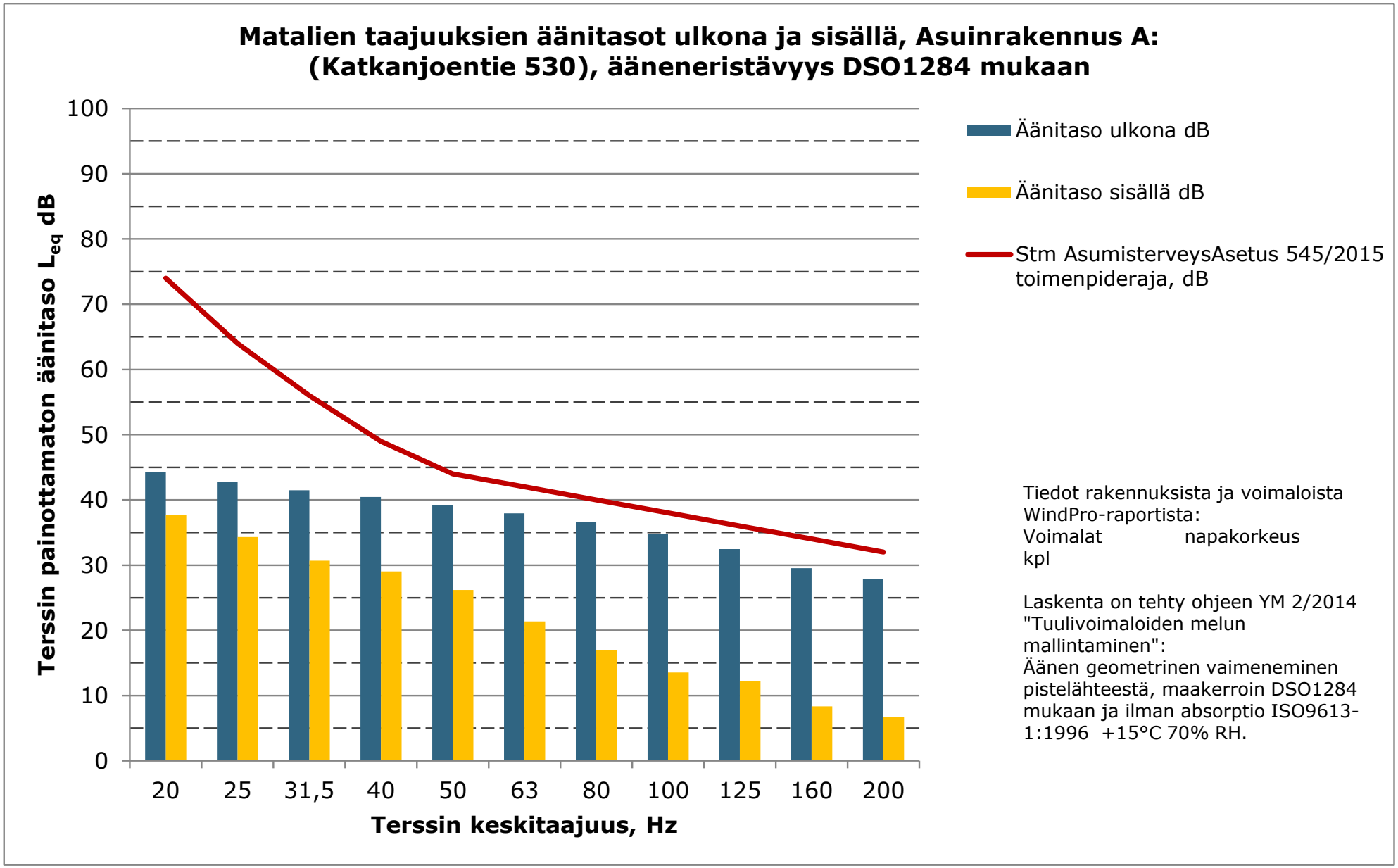
New WTG Shadow receptor

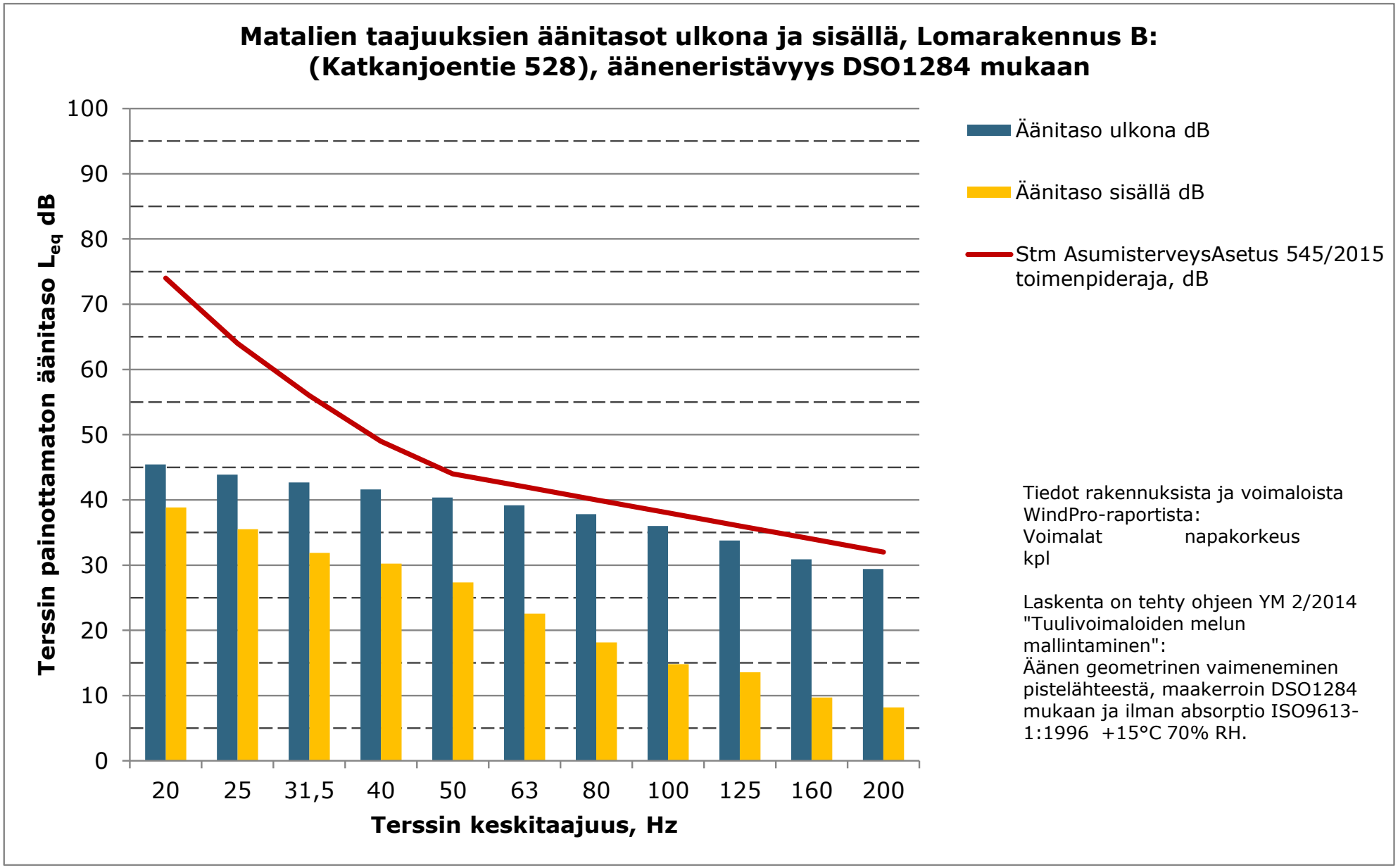
Flicker map level: Height Contours: CONTOURLINE_Sarvinevan tuulivoimapuisto_0.wpo (2)

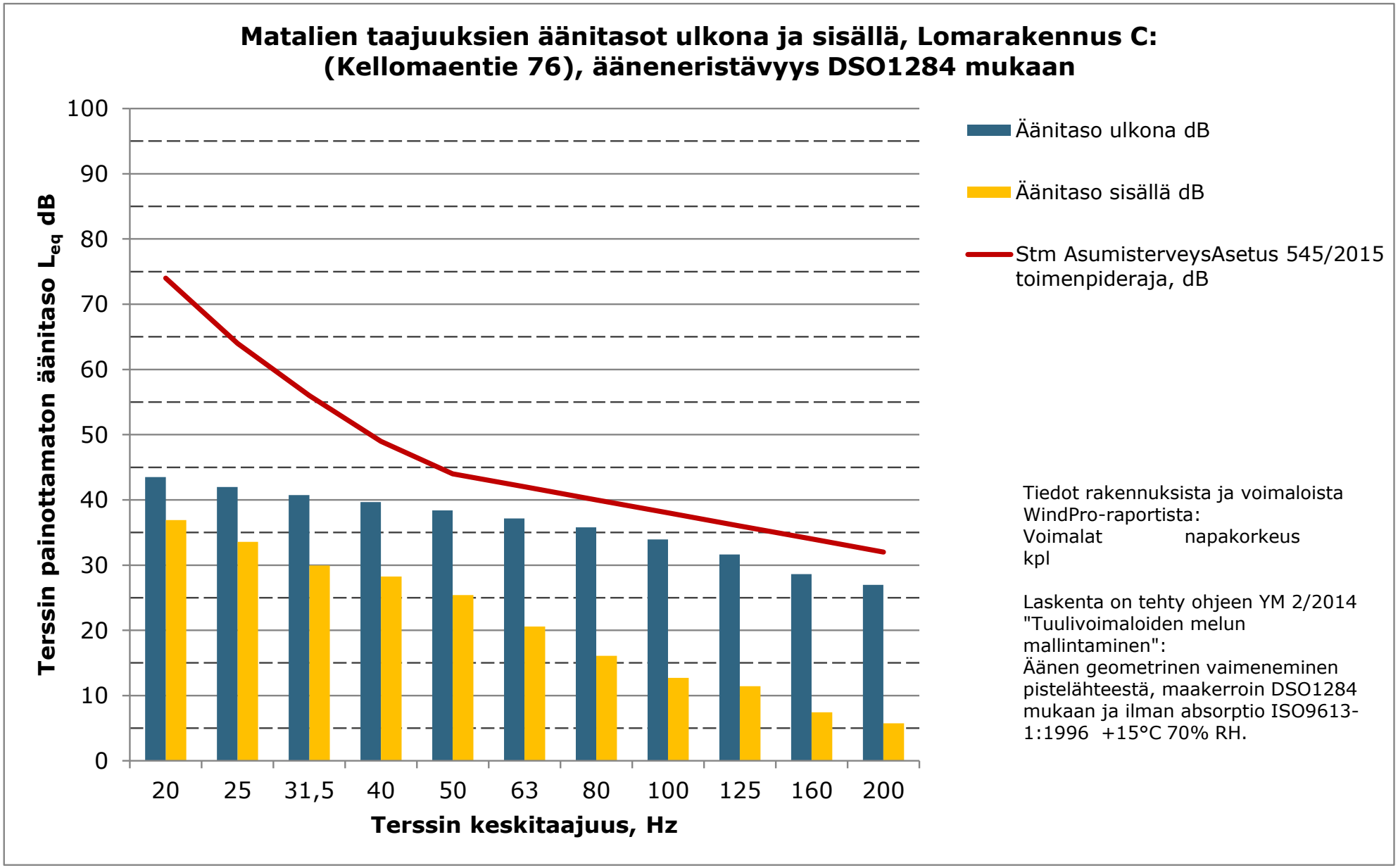

A-painotettu melupäästö Vestas V162
Terssin emissio L_{WA} dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso no STE Mode0 + 2 dB, DMS no.: 0079-5298_01, 23.1.2019

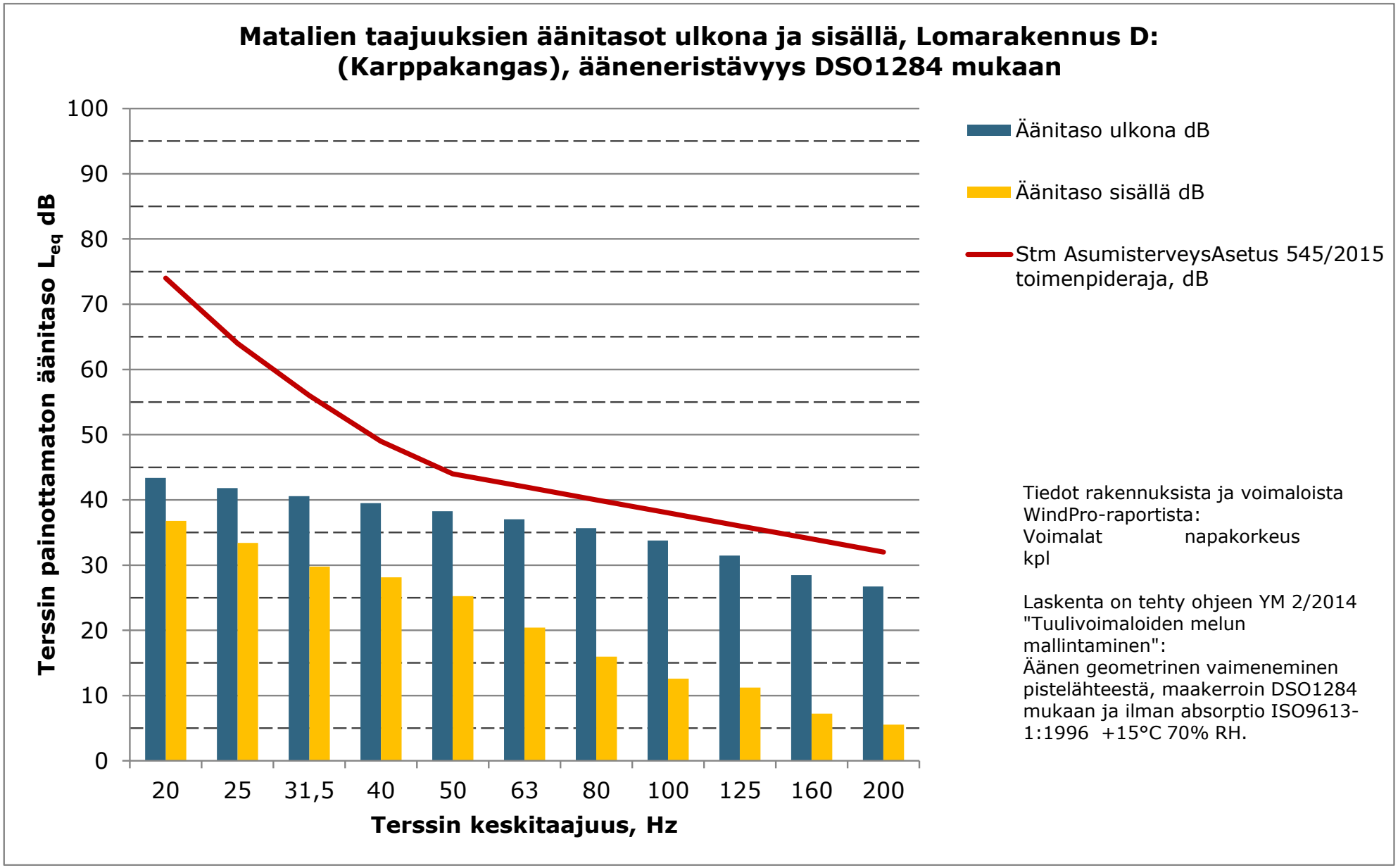

Painottamaton melupäästö Vestas V162
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

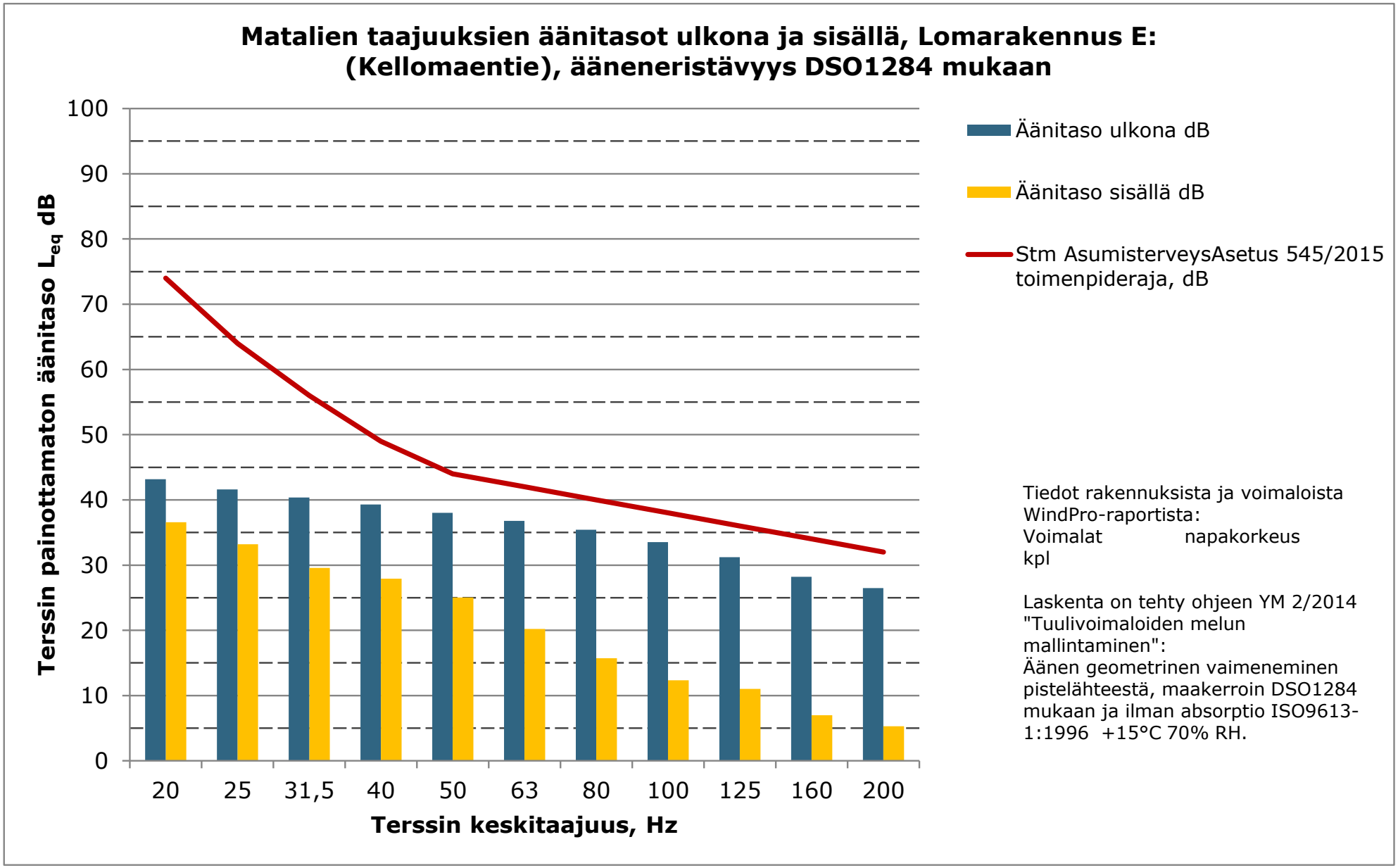

Matalien taajuuksien äänitasot ulkona ja sisällä, #REF!, ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
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.

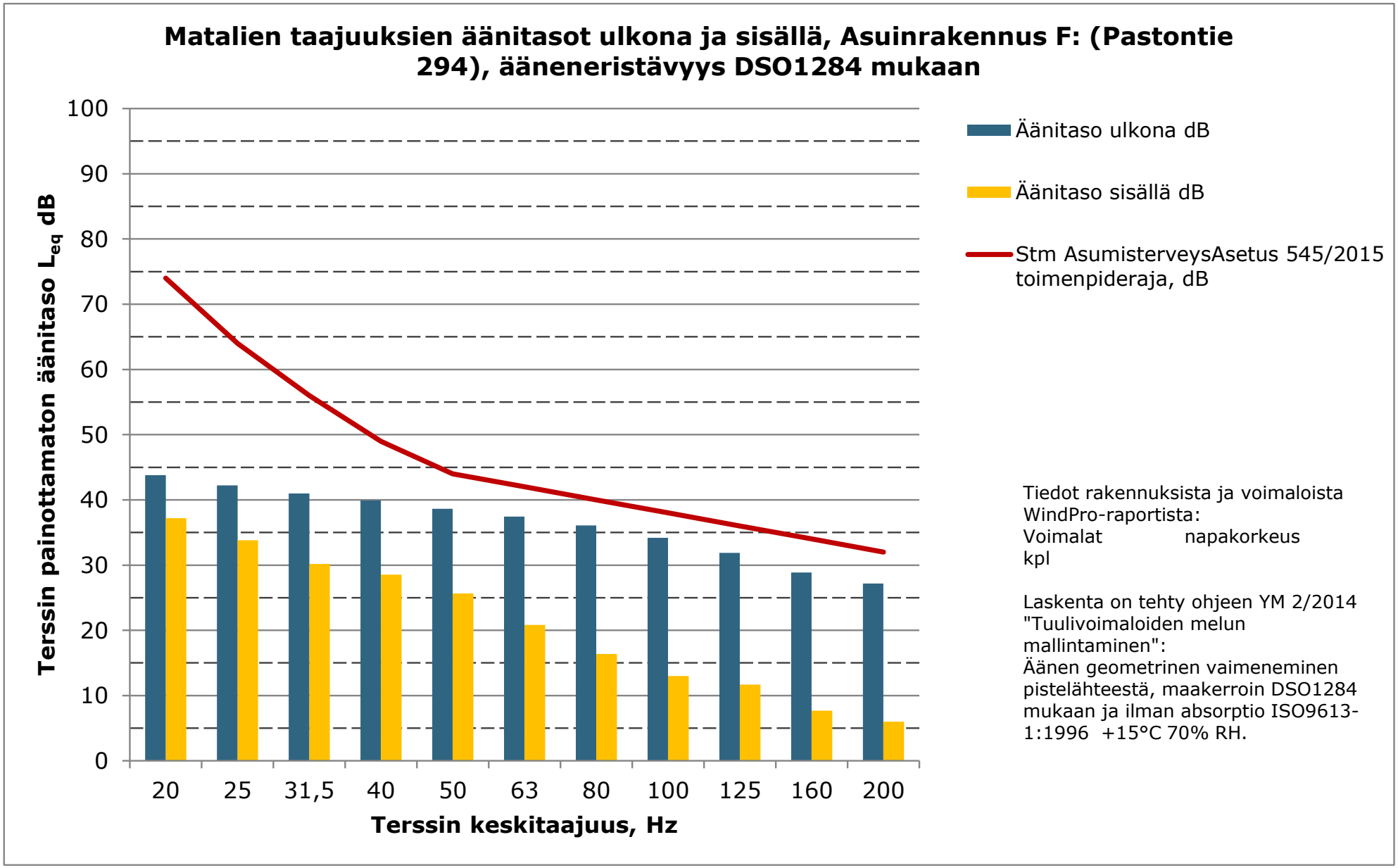

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus A:
(Katkanjoentie 530), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
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.

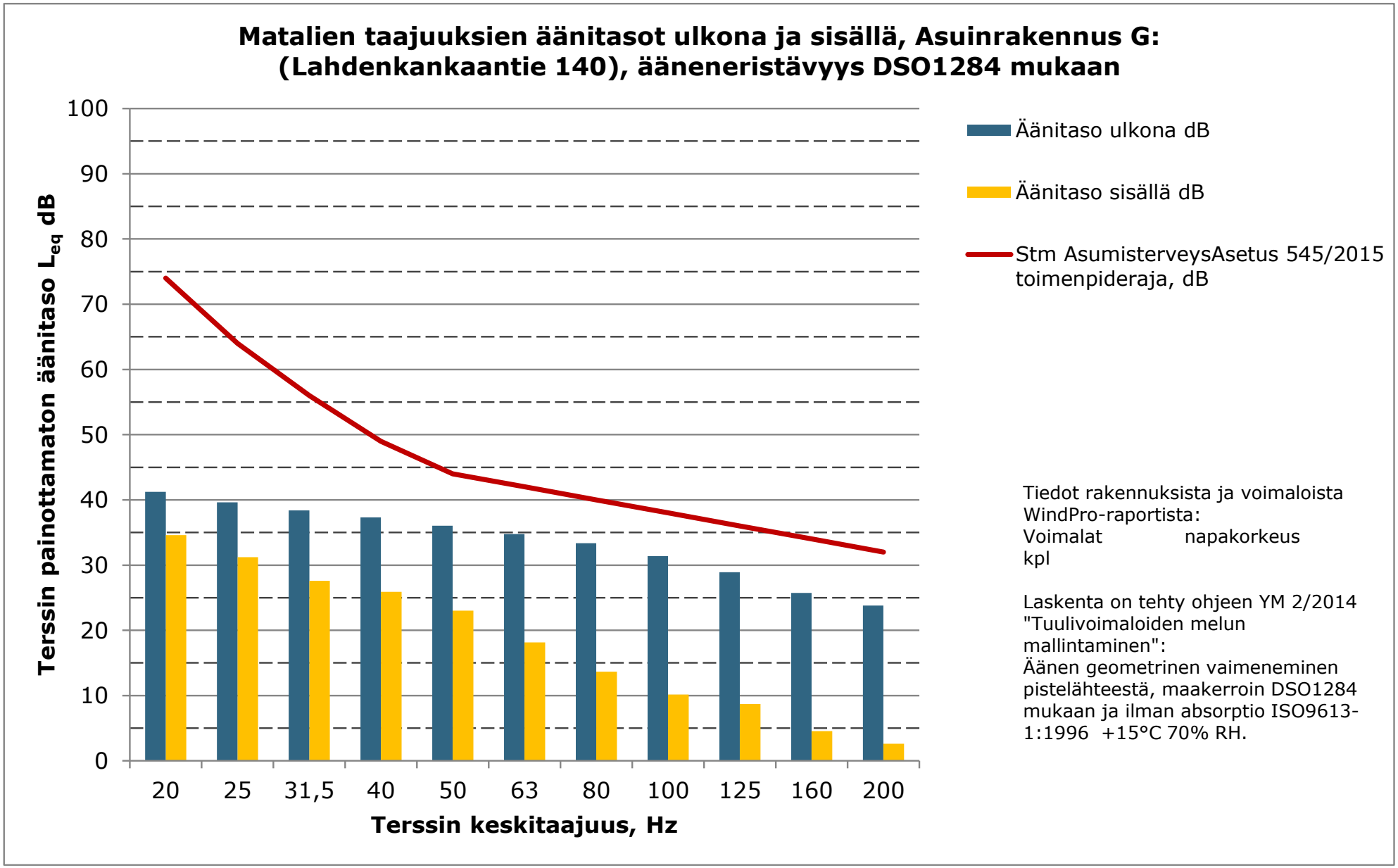

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus B:
(Katkanjoentie 528), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso Leq dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
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 C: (Kellomaentie 76), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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.

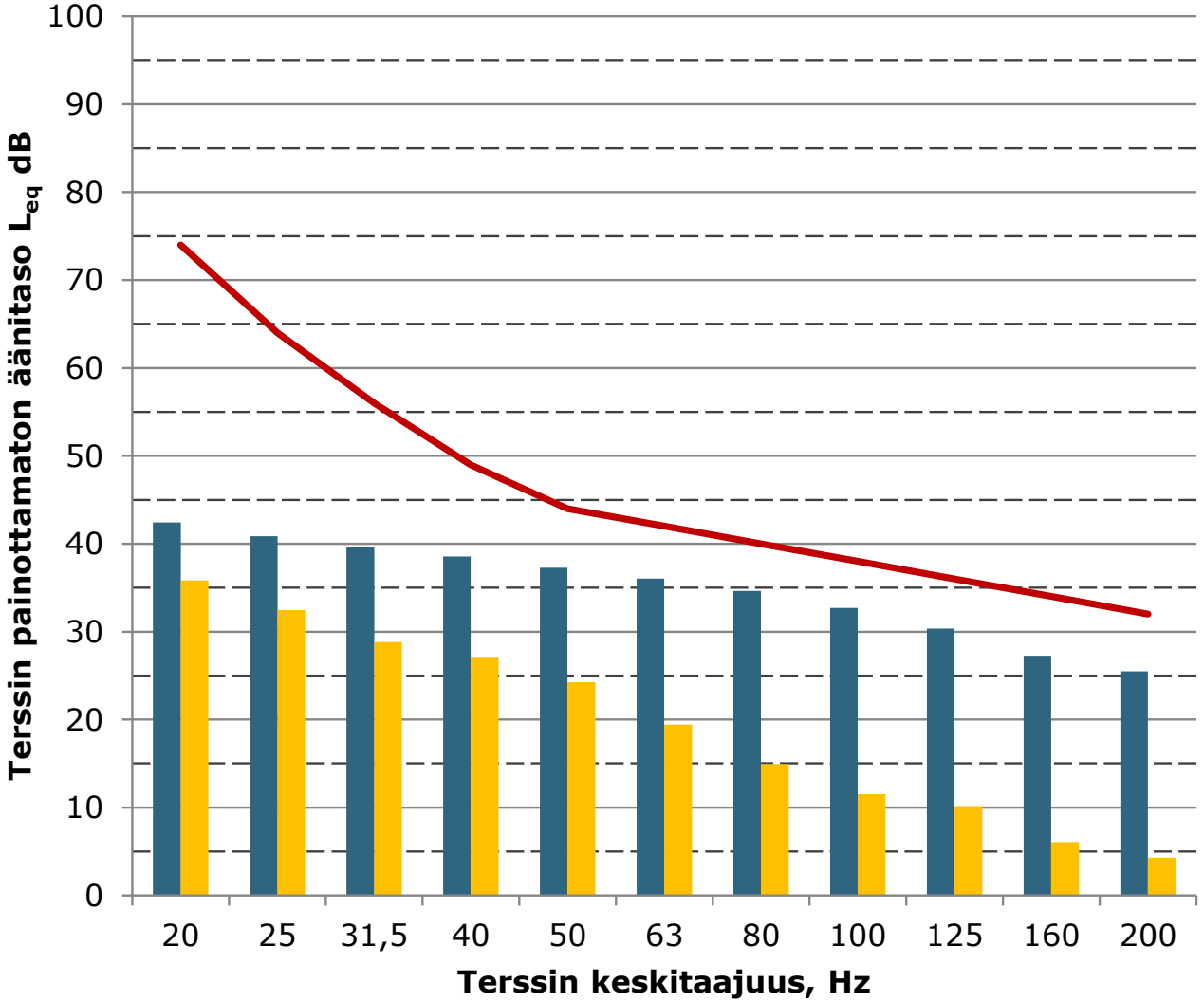

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus D: (Karppakangas), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso Leq dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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.

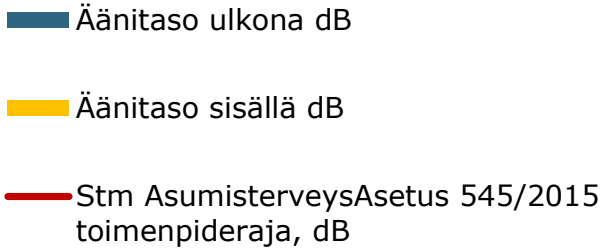

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus E: (Kellomaentie), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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, Asuinrakennus F: (Pastontie 294), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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, Asuinrakennus G: (Lahdenkankaantie 140), ääneneristävyys DSO1284 mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
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, Asuinrakennus H: (Kaukorannantie 37), ääneneristävyys DSO1284 mukaan





Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl

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.