SEMECON OY

Vasaman tuulivoimahanke, Ylivieska

Melu- ja varjostusmallinnusraportti

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Vasaman tuulivoimahanke, Ylivieska

1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Semecon Oy suunnittelee tuulivoimapuistoa Ylivieska kaupungin, Vasaman alueelle. Hankealueelle suunnitellaan 18 tuulivoimalan rakentamista vaihtoehdossa 1 (VE1) ja 12 tuulivoimalan rakentamista vaihtoehdossa 2 (VE2).

Vasaman tuulivoimahankkeen aiheuttamia melu- ja varjostusvaikutuksia on arvioitu laatimalla mallinnukset tuulivoimaloiden aiheuttamista äänenpainetasoista ja varjostuksista. Mallinnusten tavoitteena on osoittaa, kuinka laajalle alueelle kyseiset vaikutukset ulottuvat ja arvioida vaikutukset lähiseudun ympärivuotiselle ja vapaa-ajan asutukselle.

Tuulivoimaloiden aiheuttamia melu- ja varjostusvaikutuksia on mallinnettu WindPro-ohjelmalla voimaloiden ympäristövaikutusten arviointivaiheen suunniteltujen sijoituspaikkojen mukaisesti. Melu- ja varjostusmallinnukset on laatinut insinööri (AMK) Miikka Saranpää ja laaduntarkastuksen on tehnyt Liisa Karhu FCG Finnish Consulting Group Oy:stä.

2 LÄHTÖTIEDOT JA MENETELMÄT

2.1 Melu

2.1.1 Melumallinnus ISO 9613-2

Tuulivoimaloiden aiheuttamat äänenpainetasot on mallinnettu WindPRO-laskentaohjelman Decibel-moduulilla ISO 9613-2 standardin mukaisesti.

Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen 2/2014 mukaan tuulen nopeutena tulee käyttää 10 m korkeudella mitattuna 8 m/s. Ohjeen 2/2014 mukaisesti mallinnuksessa käytettiin ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisena kosteutena 70 % ja maanpinnan kovuutena arvoa 0,4. Laskenta on tehty 4,0 m maan pinnan tasosta (Taulukko 1).

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

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskentakorkeus		Laskentaruudun koko [m·m]	
ISO 9613-2: 4,0 m		25x25 m	
Suhteellinen kosteus		Lämpötila	
70 %	Muu, mikä ja miksi:	ISO 9613-2: 15 C°	
Maastomallin lähde ja tarkkuus			
Maastomallin lähde: MML maastotietokanta		Vaakaresoluutio: 1,0	Pystyresoluutio: 0,5
Maan- ja vedenpinnan absorption ja heijastuksen huomioiminen, käytetyt kertoimet			
ISO 9613-2	maanpinta 0,4	vesialueet 0,0	HUOM
Ilmakehän stabiilius laskennassa/meteorologinen korjaus			
Neutraali, (0): Neutraali		Muu, mikä ja miksi:	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus			
Tuulen suunta: 0-360°		Tuulen nopeus: 10 metrin korkeudella mitattuna 8 m/s	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä		Muu, mikä, miksi:	

Vasaman tuulivoimaloiden äänenpainetasot on mallinnettu käyttäen Vestas V172- 7.2 MW -voimalaitosta molemmissa hankevaihtoehdoissa. Voimalaitoksen lähtömelutaso $L_{W,A}$ on 106,9 dB, mikä on voimalan valmistajan antama takuuarvo, kun voimalassa käytetään ääntä vaimentavaa siipityyppiä (blades with serrated trailing edge). Äänenpainetasojen mallinnuksessa käytetyn voimalaitostyypin V172-7,2MW roottorin halkaisija on 172 metriä ja napakorkeus 200 metriä, voimaloiden kokonaiskorkeus on näin ollen 286 m.

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

Taulukko 2. Vasaman tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: WindPRO version 3.5.576				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: Vestas				Tyyppi: V172-7.2MW (EnVentus)		Sarjanumero/t:-	
Nimellisteho: 7,2 MW		Napakorkeus: 200 m		Roottorin halkaisija: 172 m		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:		Kyllä	
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso		106,9 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Asiakirja nro: 0128-4336_00, 30.6.2022 (Original instruction T05 0128-4336 VER 00)							
Oktaaveittain [Hz], L_{WA} [dB]		1/3-oktaaveittain [Hz], L_{WA} [dB]					
		20	61,7	200	96	1600	92,4
63	90,4	25	66,9	250	96,6	2000	90,4
125	98	31,5	71,8	315	96,8	2500	88,1
250	101,3	40	76,6	400	96,9	3150	85,5
500	101,5	50	81	500	96,7	4000	82,5
1000	99,9	63	84,8	630	96,6	5000	79,1
2000	95,4	80	88,2	800	96,1	6300	75,4
4000	87,9	100	90,9	1000	95,2	8000	71,3
8000	77,2	125	93,2	1250	93,9	10000	66,9
$L_{WA,tot}$ = 106,9 dB		160	94,8				
Melun erityispiirteiden mittaus ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, Mikä:	
~~kyllä~~	ei	~~kyllä~~	ei	~~kyllä~~	ei	~~kyllä~~	ei

Taulukko 3. Urakkanevan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT					
Mallinnusohjelma ja versio: WindPRO version 3.5.576				Mallinnusmenetelmä: ISO 9613-2	
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)					
Tuulivoimalan valmistaja: Nordex				Tyyppi: N163	Sarjanumero/t:-
Nimellisteho:5.7 MW		Napakorkeus:198,5 m		Roottorin halkaisija:163 m	Tornin tyyppi: teräs/hybridi
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun					
Lapakulman säätö		Pyörimisnopeus		Muu, mikä: no STE	
Kyllä	- dB	Kyllä	- dB	Noise mode säätö: Mode 0	Kyllä
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso	109,2 dB (A) + 2 dB (A)

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT
Melupäästötiedot perustuvat dokumenttiin ” F008_276_A17_EN Revision 01, 2019-08-30” NO STE Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitasoa. Takuuarvo saadaan lisäämällä 1,5 dB voimalan äänitehotasoon. Mallinnuksissa voimalan äänitehotasoon on lisätty 2 dB.

Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	64,5	200	92,8	1600	99,0
63	89,5	25	68,5	250	93,9	2000	97,4
125	95,7	31,5	74,0	315	97,4	2500	95,2
250	99,9	40	77,5	400	97,1	3150	91,8
500	103,2	50	82,6	500	97,6	4000	87,2
1000	104,6	63	83,9	630	100	5000	82,1
2000	102,2	80	86,7	800	99,3	6300	81,8
4000	93,4	100	91,4	1000	100,3	8000	79,9
8000	84,6	125	89,9	1250	99,7	10000	75,7
$L_{WA,tot}$ = 109,2 dB(A)		160	91,2				

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

Taulukko 4. Puutionsaari tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT	
Mallinnusohjelma ja versio: WindPRO version 3.5.584	Mallinnusmenetelmä: ISO 9613-2

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: General Electric		Tyyppi: GE158	Sarjanumero/t:-
Nimellisteho: 5,3 MW	Napakorkeus: 200 m	Roottorin halkaisija: 158 m	Tornin tyyppi: teräs
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun			
Lapakulman säätö	Pyörimisnopeus	Muu, mikä	
Kyllä - dB	Kyllä - dB	Noise mode säätö:	Mode 0 STE – Level 06
~~Ei~~	~~Ei~~	Noise mode, lähtömelutaso	106,0 dB(A) + 2 dB(A)

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT

Melupäästötiedot perustuvat dokumenttiin:
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01.pdf

Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitasoa, jolloin voimalan lähtöarvoihin lisätään mallinnuksissa +2 dB vastaamaan ylempää luottamusväliä 95 %.

Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
		20	63,1	200	90,8	2000	94,3
63	87,2	25	67,8	250	92,3	2500	92,3
125	92,6	31,5	72,2	315	93,6	3150	89,7
250	97,2	40	76,1	400	94,1	4000	85,9
500	99,7	50	79,4	500	94,9	5000	81,8
1000	101,3	63	82,2	630	95,5	6300	75,5
2000	99,1	80	84,4	800	96	8000	65,9
4000	91,7	100	86,1	1000	96,5	10000	53,3
8000	76	125	87,7	1250	97		
$L_{WA,tot}$ = 106,0 dB(A)		160	89,2	1600	95,7		

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

Taulukko 5. Tuomiperä tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT	
Mallinnusohjelma ja versio: WindPRO version 3.5.584	Mallinnusmenetelmä: ISO 9613-2

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: General Electric		Tyyppi: GE158	Sarjanumero/t:-
Nimellisteho: 5,3 MW	Napakorkeus: 152,5 m	Roottorin halkaisija: 175 m	Tornin tyyppi: hybridi
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun			
Lapakulman säätö	Pyörimisnopeus	Muu, mikä	
Kyllä - dB	Kyllä - dB	Noise mode säätö:	Mode 0 STE – Level 06
~~Ei~~	~~Ei~~	Noise mode, lähtömelutaso	107,8 dB(A)

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT

Melupäästötiedot perustuvat dokumenttiin:

Technical Documentation Wind Turbine Generator Systems 5.3-158 - 50 Hz, Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01.docx.

Voimalan valmistajan ohjeiden mukaisesti äänitehotasoon on lisätty 1,8 dB, että saadaan äänitehotaso vastaamaan takuuarvoja.

Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
		20	64,9	200	92,6	2000	96,1
63	89	25	69,6	250	94,1	2500	94,1
125	94,4	31,5	74	315	95,4	3150	91,5
250	99	40	77,9	400	95,9	4000	87,7
500	101,5	50	81,2	500	96,7	5000	83,6
1000	103,1	63	84	630	97,3	6300	77,3
2000	100,9	80	86,2	800	97,8	8000	67,7
4000	93,5	100	87,9	1000	98,3	10000	55,1
8000	77,8	125	89,5	1250	98,8		
$L_{WA,tot}$ = 107,8 dB(A)		160	91	1600	97,5		

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

Taulukko 6. Kukonaho tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT					
Mallinnusohjelma ja versio: WindPRO version 3.5.584				Mallinnusmenetelmä: ISO 9613-2	
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)					
Tuulivoimalan valmistaja: General Electric				Tyyppi: GE158	Sarjanumero/t:-
Nimellisteho: 5,5 MW		Napakorkeus: 122,5 m		Roottorin halkaisija: 175 m	Tornin tyyppi: teräs/hybridi
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun					
Lapakulman säätö		Pyörimisnopeus		Muu, mikä	
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:	Kyllä
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso	106 dB + 2 dB
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT					
General Electric GE158 5,3 MW, HH 152,5 m, Technical Documentation Wind Turbine Generator Systems 5.3/5.5-158 - 50 Hz, Noise_Emission-NO_5.3_5.5-158-50Hz_IEC_EN_r01.docx. Melupäästöt (Valmistajan ilmoittamat melupäästön takuuarvot)					

Oktaaveittain [Hz], L_{WA} [dB]		1/3-oktaaveittain [Hz], L_{WA} [dB]					
		20	65,1	200	92,8	1600	97,7
63	89,2	25	68,8	250	94,3	2000	96,3
125	94,6	31,5	74,2	315	95,6	2500	94,3
250	99,2	40	78,1	400	96,1	3150	91,7
500	101,6	50	81,4	500	96,9	4000	87,9
1000	103,3	63	84,2	630	97,5	5000	83,8
2000	101,1	80	86,4	800	98	6300	77,5
4000	93,7	100	88,1	1000	98,5	8000	67,9
8000	78	125	89,7	1250	99	10000	55,4
$L_{WA,tot}$ = 108 dB		160	91,2				

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

Taulukko 7. Rahkola-Hautakangas tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT					
Mallinnusohjelma ja versio: WindPRO version 3.5.576			Mallinnusmenetelmä: ISO 9613-2		
TUULIVOIMALOIDEN TIEDOT					
Tuulivoimalan valmistaja: GE Renewable Energy			Tyyppi: GE 158 – 6,1 MW		Sarjanumero/t:-
Nimellisteho: 6,1 MW		Napakorkeus: 171 m / 221 m	Roottorin halkaisija:158 m		Tornin tyyppi: teräs/hybridi
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	Kyllä
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso	109 dB(A)
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT					
Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01 *Valmistajan ilmoittamaan tuulivoimalan tuottamaan äänitehotasoon on lisätty epävarmuus 2 dB(A) jotta on saatu äänitehotaso vastaamaan takuuarvoa.*					

Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		12,5	54,5	125	90,5	1250	100,2
63	90,2	16	60,9	160	91,9	1600	98,9
125	95,4	20	66,1	200	93,5	2000	97,5
250	99,9	25	70,8	250	95	2500	95,5
500	102,4	31,5	75,2	315	96,3	3150	92,9
1000	104,4	40	79,1	400	96,9	4000	88,9
2000	102,3	50	82,4	500	97,7	5000	84,8
4000	94,8	63	85,2	630	98,3	6300	78,3
8000	78,8	80	87,4	800	99	8000	68,7
$L_{WA,tot}$ = 109,0 dB(A)		100	89	1000	99,6	10000	56,1

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

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 Turun AMK:n (Keränen, Hakala

ja Hongisto, 2018) julkistamien Anojanssi-projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

Taulukko 8. Suomalaisen pientalon julkisivun äänitasoeron alalikiarvo Anojanssi projektin tulosten mukaisesti.

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

Matalataajuinen melu laskettiin ohjeen YM 2/2014 mukaisesti. Laskennan lähtökohta on standardi ISO 9613-2, jossa huomioidaan äänen geometrinen etäisyysvaimennus sekä maanpinnan ja ilmakehän absorption aiheuttamat vakioidut vahvistukset ja vaimennukset. Tulokset esitetään taajuuskohtaisena taulukkona hankealuetta ympäröiville asuin- ja lomarakennuksille.

2.2 Varjostusmallinnus

Tuulivoimaloiden varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Varjostusmallinnuksissa käytetyt voimalatiedot on esitetty taulukossa 4.

Taulukko 9. Vasaman hankkeen mallinnusohjelma ja tuulivoimaloiden koko varjostusmallinnuksissa.

MALLINNUSOHJELMAN TIEDOT			
Mallinnusohjelma ja versio: WindPRO version 3.5.584			
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: Generic		Tyyppi: RD 200 -7,7 MW	Sarjanumero/t:-
Nimellisteho: 7,7 MW	Napakorkeus: 200 m	Roottorin halkaisija: 200 m	Tornin tyyppi: teräs/hybridi

Laskennassa varjot huomioidaan, kun aurinko on vähintään 3 astetta horisontin yläpuolella. Varjoksi lasketaan tilanne, jossa siipi peittää vähintään 20 % auringosta.

Varjostusmallin laskennassa on huomioitu hankealueen korkeustiedot, tuulivoimaloiden sijainnit, tuulivoimalan napakorkeudet ja roottorin halkaisija sekä hankealueen aikavyöhyke. Mallinnuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, 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 laskentaikkunan koko oli 5,0 x 5,0 metriä. Laskentaikkunoiden suunnat asennettiin voimaloita kohti ns. ”greenhouse mode”.

Auringon keskimääräiset paistetunnit perustuvat Uumajan sääaseman pitkäaikaisiin mitattuihin säätietoihin 1969-1993. Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Varjostusvaikutukset on mallinnettu kahdessa eri tilanteessa - huomioimalla puuston suojaava vaikutus ja ilman puuston vaikutusta. Mallinnuksessa käytetty puusto on Luonnonvarakeskuksen (Luke) vuoden 2019 aineistosta.

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

2.3 Raja- ja ohjearvot

2.3.1 Melu

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

Taulukko 10. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason toimenpiderajat (Valtioneuvoston asetus 27.8.2015).

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

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

Taulukko 11. 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 keskiäänitaso 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 $L_{Aeq,1h}$ mitattuna niissä tiloissa, jotka on tarkoitettu nukkumiseen.

2.3.2 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.

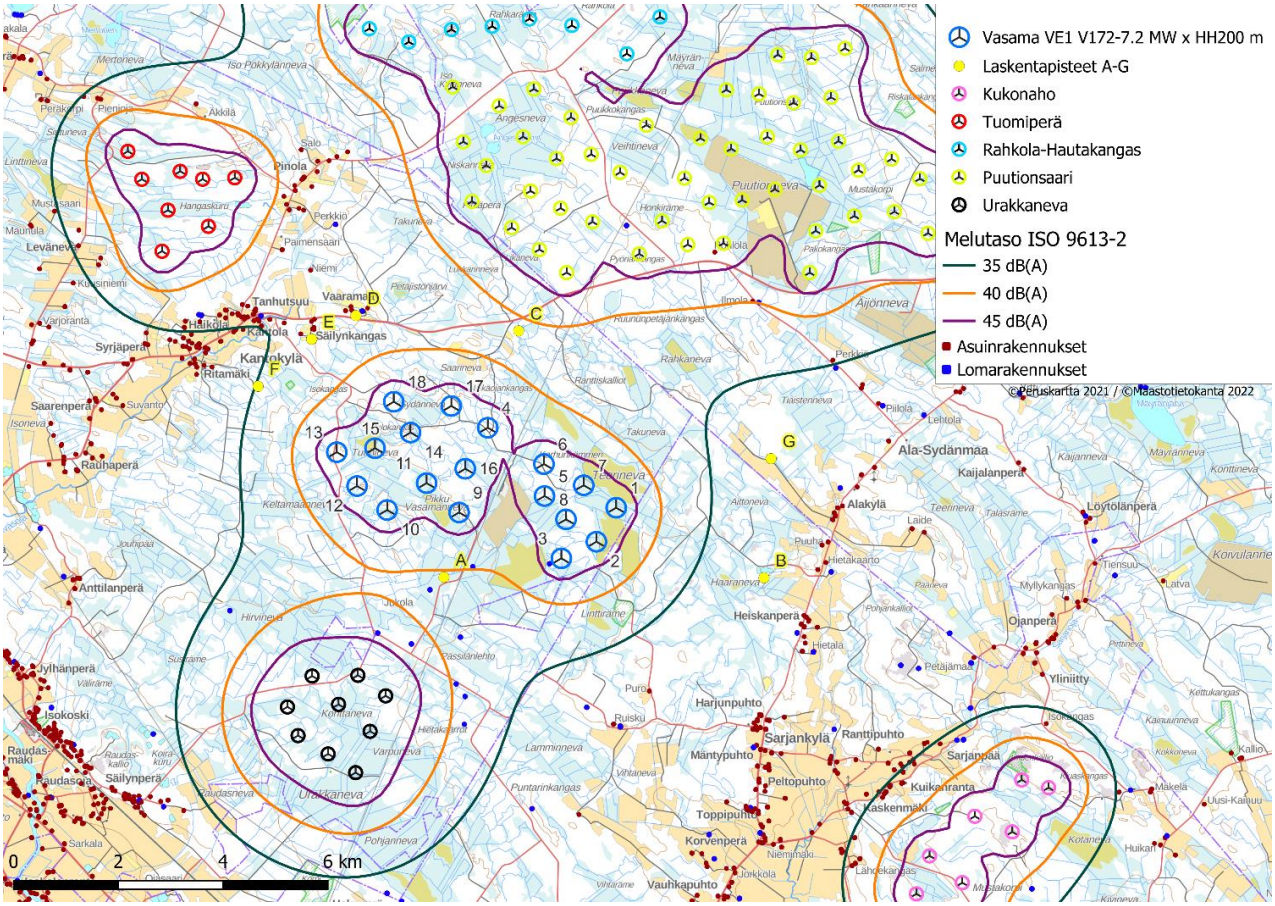
3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

3.1 Melun laskentatulokset ISO 9613-2 voimalaitoksella V172 – 7,2 MW (106,9 dB)

Kuvassa 1 sekä taulukossa 12 on esitetty melumallinnuksen tulokset. Melumallinnuksen mukaan Vasaman tuulivoimapuistoa lähimpien asuin- ja lomarakennusten pihapiirissä melutasot alittavat 40 dB(A). Maanmittauslaitoksen maastotietokannan mukaan hankealueelle sijoittuu kaksi vapaa-ajanrakennusta, mutta nämä eivät ole kiinteistörekisterissä. Niitä ei siksi ole huomioitu häiriintyvinä kohteina. Melumallinnuksen tarkemmat laskentatulokset löytyvät liitteestä 1.

Taulukko 12. Laskennalliset melutasot Vasaman tuulivoimahankkeessa lähtömelutason olleessa 106,9 dB(A).

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Melutaso dB(A) V172 7,2 MW
Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	39,5
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	31,5
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	39,3
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	36,5
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	36
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	35,1
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	32,7



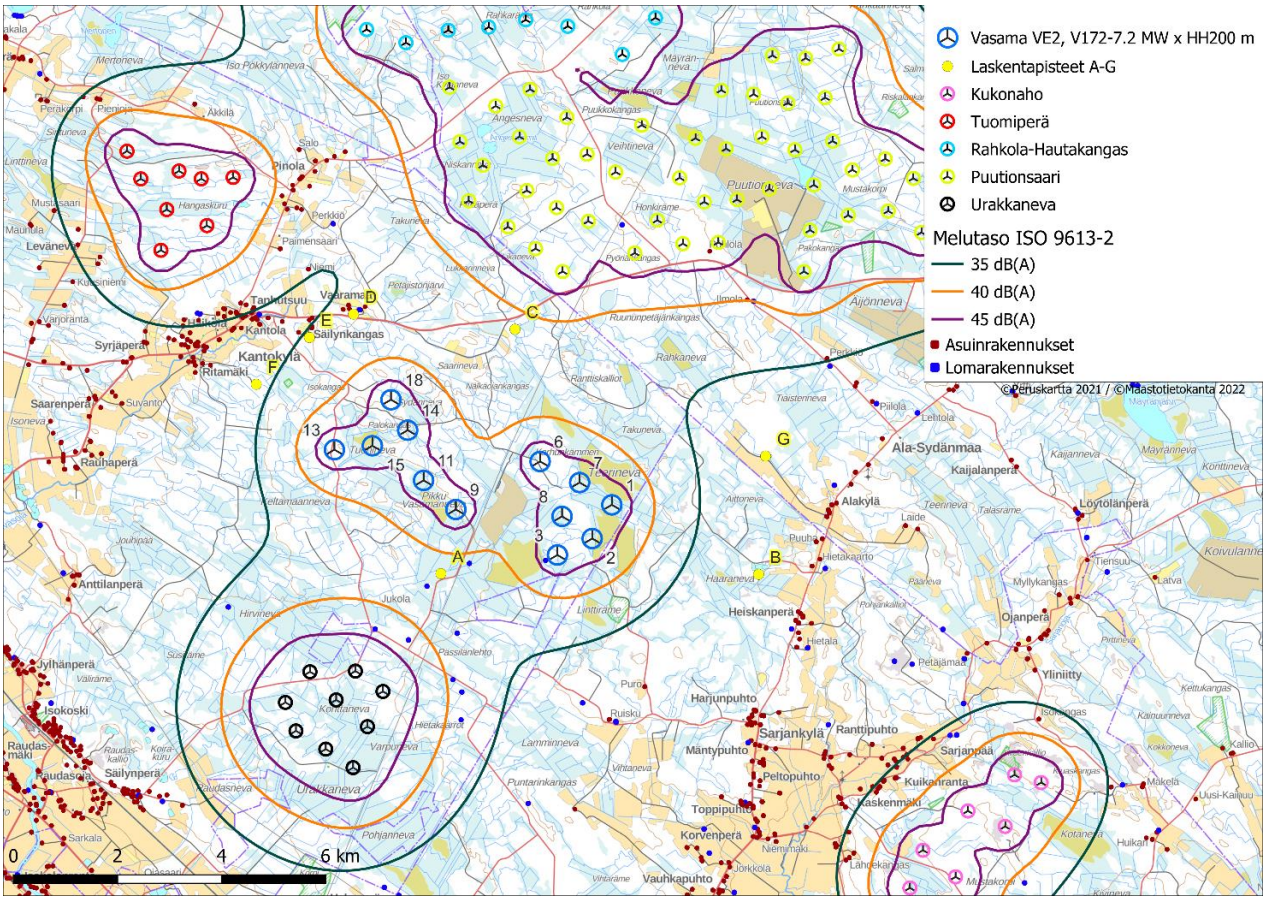
Kuva 1 Melumallinnuksen tulos hankevaihtoehdossa 1

Vaihtoehdon 2 (VE2) melumallinnuksen mukaan melutaso 40 dB(A) ei ylity lähimpien asuin- ja lomarakennusten alueella (Kuva 2 ja Taulukko 13).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 2.

Taulukko 13. Laskennalliset melutasot Vasaman tuulivoimahankkeessa lähtömelutason olleessa 106,9 dB(A).

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Melutaso dB(A) V172 7,2 MW
Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	38,3
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	31
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	38,3
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	35,7
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	35,2
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	34,2
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	32,3



Kuva 2 Melumallinnuksen tulos hankevaihtoehdossa 2

3.2 Matalataajuiset melutasot voimalaitoksella V172 – 7,2 MW (106,9 dB)

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveys-asetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella.

Mallinnettaessa Vasaman tuulivoimahankkeen VE1 matalataajuisia melutasoja voimalaitostyypillä V172 – 7,2 MW, matalataajuinen melu ei ylittä Sosiaali- ja terveysministeriön asumisterveysohjearvoja missään laskentapisteessä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 2,3 dB alle toimenpiderajan taajuudella 50 Hz (Asuinrakennus C).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 3.

Taulukko 14. Matalataajuisen melun laskentatulokset hankevaihtoehdossa 1.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	$L_{eq,1h}$ – Asumisterveys-asetus sisällä	Hz	$L_{eq,1h}$ – Asumisterveys-asetus sisällä	Hz
Lomarakennus A (Pyssynienen metsätie 156)	10,4	100	-2,8	50
Lomarakennus B (Sarjankyläntie 1093)	4,5	80	-7,4	50
Lomarakennnus C (Kurunoja)	9,8	80	-2,3	50
Asuinrakennus D (Haapavesitie 1404)	8,2	80	-4,1	50
Asuinrakennus E (Säilynkankaantie 34)	7,7	80	-4,5	50
Asuinrakennus F (Ritamäentie 156)	7,0	100	-5,3	50
Lomarakennus G (Virtaniementie 175)	5,6	80	-6,2	50

Mallinnettaessa Vasaman tuulivoimahankkeen VE2 matalataajuisia melutasoja voimalaitostyypillä V172 – 7,2 MW, matalataajuinen melu ei ylittä Sosiaali- ja terveysministeriön asumisterveysohjearvoja missään laskentapisteessä. Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 3 dB alle toimenpiderajan taajuudella 50 Hz (Asuinrakennus C).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 4.

Taulukko 15. Matalataajuisen melun laskentatulokset hankevaihtoehdossa 2.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	$L_{eq,1h}$ – Asumisterveys-asetus sisällä	Hz	$L_{eq,1h}$ – Asumisterveys-asetus sisällä	Hz
Lomarakennus A (Pyssynienen metsätie 156)	8,6	80	-4,6	50
Lomarakennus B (Sarjankyläntie 1093)	4,1	80	-8,0	50
Lomarakennnus C (Kurunoja)	9,0	80	-3,0	50
Asuinrakennus D (Haapavesitie 1404)	7,4	80	-4,7	50
Asuinrakennus E (Säilynkankaantie 34)	7,0	80	-5,3	50
Asuinrakennus F (Ritamäentie 156)	6,1	80	-6,2	50
Lomarakennus G (Virtaniementie 175)	5,3	80	-6,6	50

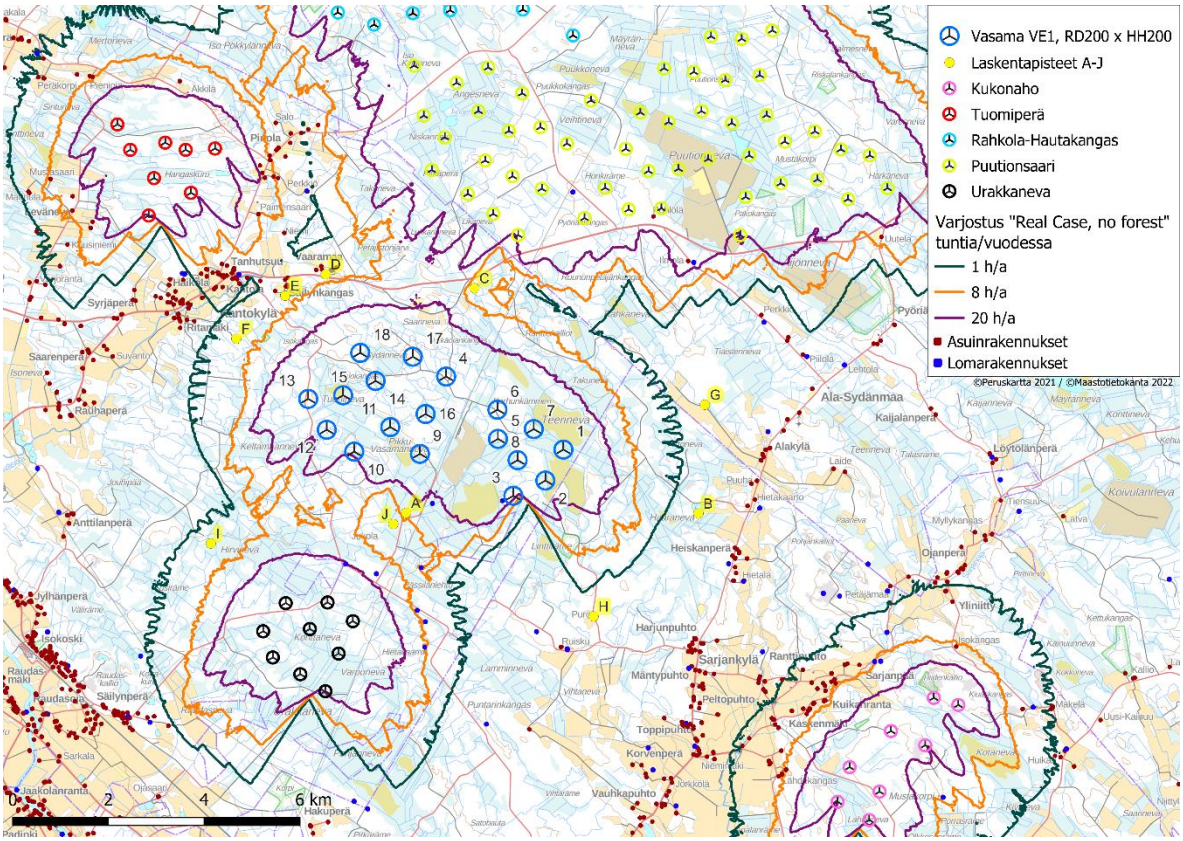
3.3 Varjostus

Puuston suojaavan vaikutuksen jäädessä huomioimatta laskennoissa, tuulivoimahanketta (VE1) lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus ylittää 8 h/a yhdessä laskentapisteessä ollen 14:27 h/a (Lomarakennus A). Muissa laskentapisteissä varjostusvaikutus alittaa 8 h/a, ollen enimmillään 5:39 h/a (Asuinrakennus E). (Taulukko 16).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 5.

Taulukko 16. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, no forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken-taikkuna (m)	Varjostus (h/a)
Lomarakennus A (Pyssynienen metsätie)	398 729	7 102 986	97,5	5,0 x 5,0	14:27
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0 x 5,0	0:00
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0 x 5,0	4:48
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	5,0 x 5,0	3:09
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0 x 5,0	5:39
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0 x 5,0	2:17
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0 x 5,0	0:00
Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0 x 5,0	0:00
Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0 x 5,0	3:17
Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0 x 5,0	4:02



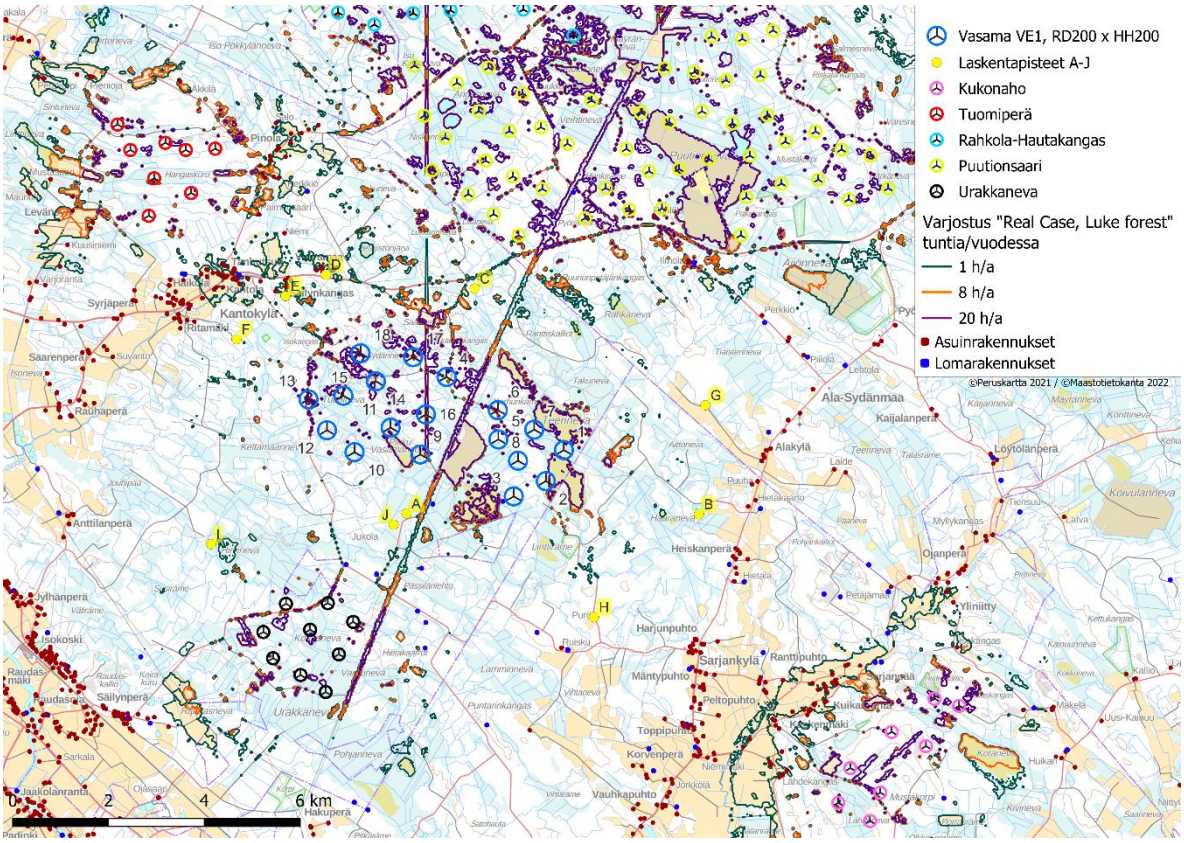
Kuva 3. Varjostusmallinnuksen tulos ilman puuston suojaavaa vaikutusta hankevaihtoehdossa 1

Kun puuston suojaava vaikutus huomioidaan laskennassa, tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus alittaa 8 h/a kaikissa laskentapisteissä (Taulukko 17). Varjostusvaikutus on enimmillään 3 h 9 min vuodessa (asuinrakennus D).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 6.

Taulukko 17. Varjostusmallinnuksen tulos, kun puuston suojaava vaikutus on huomioitu "Real Case, Luke forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken-taikkuna (m)	Varjostus (h/a)
Lomarakennus A (Pyssynienen metsätie)	398 729	7 102 986	97,5	5,0 x 5,0	0:00
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0 x 5,0	0:00
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0 x 5,0	0:00
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	5,0 x 5,0	3:09
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0 x 5,0	0:00
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0 x 5,0	0:00
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0 x 5,0	0:00
Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0 x 5,0	0:00
Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0 x 5,0	0:00
Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0 x 5,0	0:00



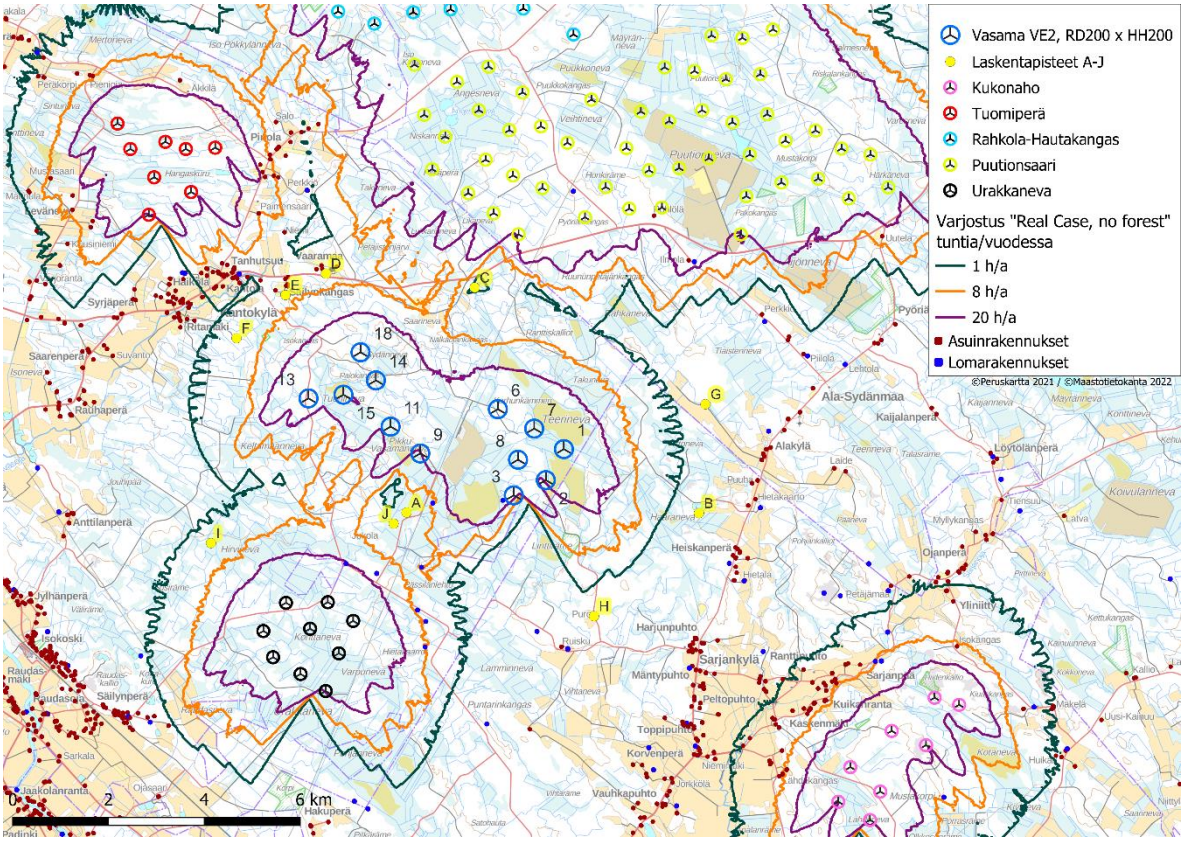
Kuva 4. Varjostusmallinnuksen tulos hankevaihtoehdossa 1, kun puuston suojaava vaikutus on huomioitu

Tuulivoimahankeen (VE2) lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus alittaa 8 h/a kaikissa laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu (Taulukko 18). Varjostusvaikutus on enimmillään 5 h 39 min vuodessa (asuinrakennus B).

Tarkemmat laskentatulokset ja käytetyt lähtötiedot on esitetty tarkemmin liitteessä 7.

Taulukko 18. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, no forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken-taikkuna (m)	Varjostus (h/a)
Lomarakennus A (Pyssynienen metsätie)	398 729	7 102 986	97,5	5,0 x 5,0	2:37
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0 x 5,0	0:00
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0 x 5,0	0:00
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	5,0 x 5,0	3:09
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0 x 5,0	5:39
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0 x 5,0	2:17
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0 x 5,0	0:00
Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0 x 5,0	0:00
Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0 x 5,0	3:17
Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0 x 5,0	2:54

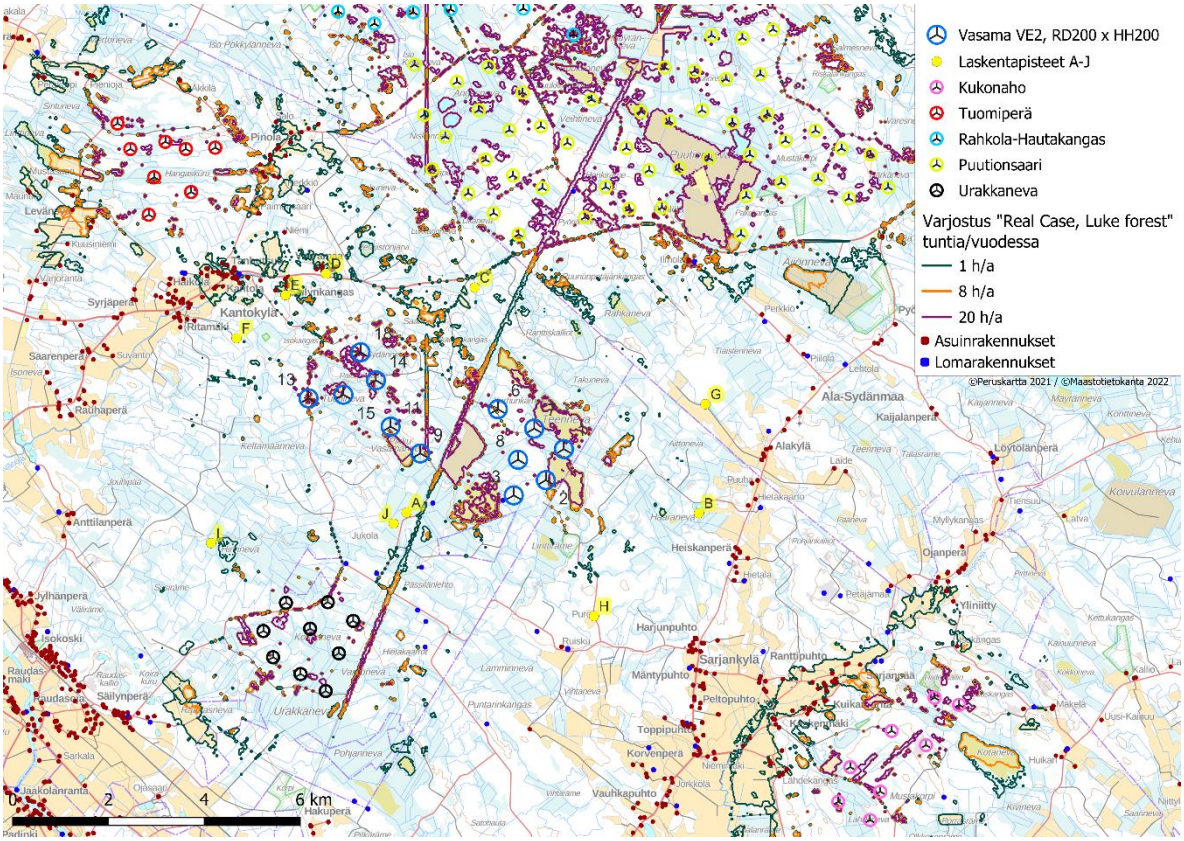


Kuva 5. Varjostusmallinnuksen tulos ilman puuston suojaavaa vaikutusta hankevaihtoehdossa 2

Tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus alittaa 8 h/a kaikissa laskentapisteissä, kun puuston suojaava vaikutus on huomioitu. Varjostusvaikutus on enimmillään 3 h 9 min vuodessa (asuinrakennus D) (Taulukko 19).

Taulukko 19. Varjostusmallinnuksen tulos, kun puuston suojaava vaikutus on huomioitu "Real Case, Luke forest"

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken-taikkuna (m)	Varjostus (h/a)
Lomarakennus A (Pyssynienen metsätie)	398 729	7 102 986	97,5	5,0 x 5,0	0:00
Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0 x 5,0	0:00
Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0 x 5,0	0:00
Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88	5,0 x 5,0	3:09
Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0 x 5,0	0:00
Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0 x 5,0	0:00
Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0 x 5,0	0:00
Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0 x 5,0	0:00
Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0 x 5,0	0:00
Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0 x 5,0	0:00



Kuva 6. Varjostusmallinnuksen tulo hankevaihtoehdossa 2, kun puuston suojaava vaikutus on huomioitu

FCG Finnish Consulting Group Oy

Miikka Saranpää, ins. AMK
Laatija

Liisa Karhu,
Tarkastaja

Liite 1. Vasaman tuulivoimahanke VE1 – melun leviämismallinnuksen tulokset (ISO 9613-2, YM2/2014)

Project:

Vasama_22_11_2022

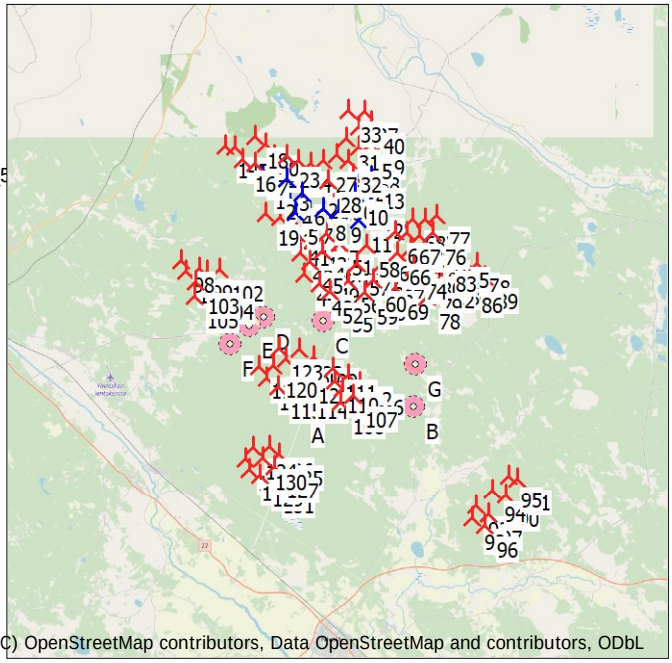
Licensed user:
FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Vasama_5
Area type with hard ground: vesistöt
Ground factor for hard ground: 0,0
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:
Fixed penalty added to source noise of WTGs with pure tones
WTG catalogue
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



Scale 1:400 000
New WTG
Noise sensitive area

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

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)]
1	397 208	7 115 412	88,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
2	397 754	7 114 856	87,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
3	398 503	7 115 243	95,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
4	398 570	7 114 265	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
5	398 871	7 113 427	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
6	399 272	7 114 459	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
7	399 647	7 113 488	95,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
8	400 360	7 113 628	100,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
9	401 168	7 113 504	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
10	402 041	7 114 329	106,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
11	402 216	7 112 963	108,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
12	402 852	7 113 666	105,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
13	402 975	7 115 189	106,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
14	395 254	7 117 093	87,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
15	395 819	7 117 022	83,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
16	396 195	7 116 379	82,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
17	396 858	7 116 145	85,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
18	396 894	7 117 531	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
19	397 303	7 113 442	87,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
20	397 417	7 117 093	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
21	397 854	7 116 507	90,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
22	398 058	7 113 189	92,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
23	398 529	7 116 484	94,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
24	399 116	7 116 184	97,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
25	399 762	7 116 032	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
26	399 974	7 114 812	98,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
27	400 456	7 116 139	99,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
28	400 698	7 115 062	102,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
29	401 155	7 116 430	100,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
30	401 348	7 114 680	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
31	401 706	7 117 283	100,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
32	401 754	7 116 113	103,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
33	401 837	7 118 791	95,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
34	402 023	7 115 337	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
35	402 362	7 116 825	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
36	402 365	7 117 878	100,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
37	402 692	7 118 655	95,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
38	402 733	7 116 070	109,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
39	402 975	7 117 005	104,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
40	403 021	7 118 167	96,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
41	398 896	7 112 332	92,5	PUU01	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
42	399 097	7 111 286	95,0	PUU02	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
43	399 784	7 111 972	97,5	PUU03	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
44	399 264	7 110 151	97,2	PUU04	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
45	399 536	7 110 832	95,4	PUU05	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
46	400 239	7 111 382	97,5	PUU06	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
47	400 444	7 112 292	97,3	PUU07	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
48	400 019	7 109 649	100,0	PUU08	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
49	400 380	7 110 348	100,0	PUU09	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
50	400 876	7 110 966	99,4	PUU10	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
51	401 152	7 111 752	100,0	PUU11	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
52	400 549	7 109 232	102,5	PUU12	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

	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)]
53	400 953	7 110 020	102,5	PUU13	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
54	401 537	7 111 046	104,5	PUU14	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
55	401 068	7 108 792	105,0	PUU15	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
56	401 564	7 109 758	104,1	PUU16	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
57	402 089	7 110 702	107,5	PUU17	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
58	402 589	7 111 603	106,9	PUU18	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
59	402 455	7 109 148	112,5	PUU19	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
60	402 889	7 109 778	110,0	PUU20	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
61	403 318	7 110 593	107,5	PUU21	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
62	403 622	7 111 352	106,3	PUU22	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
63	404 117	7 112 276	103,7	PUU23	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
64	403 379	7 109 327	115,0	PUU24	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
65	403 790	7 110 129	108,2	PUU25	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
66	404 210	7 111 152	105,6	PUU26	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
67	404 739	7 112 199	105,0	PUU27	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
68	405 100	7 112 943	100,6	PUU28	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
69	404 061	7 109 351	110,0	PUU29	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
70	404 420	7 110 174	106,8	PUU30	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
71	404 900	7 111 381	105,0	PUU31	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
72	405 395	7 112 030	102,5	PUU32	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
73	405 740	7 112 891	100,2	PUU33	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
74	405 042	7 110 380	105,9	PUU34	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
75	405 532	7 111 130	103,8	PUU35	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
76	406 114	7 112 133	103,1	PUU36	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
77	406 380	7 113 067	107,2	PUU37	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
78	405 707	7 108 791	111,2	PUU38	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
79	405 822	7 109 587	108,6	PUU39	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
80	405 893	7 110 455	104,7	PUU40	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
81	406 257	7 111 298	104,1	PUU41	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
82	406 558	7 109 872	106,5	PUU42	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
83	406 638	7 110 744	106,0	PUU43	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
84	407 324	7 109 954	108,3	PUU44	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
85	407 269	7 110 957	112,5	PUU45	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
86	407 963	7 109 542	113,5	PUU46	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
87	407 809	7 110 582	116,0	PUU47	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
88	408 414	7 110 457	120,0	PUU48	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
89	408 786	7 109 772	117,5	PUU49	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
90	409 573	7 098 129	122,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
91	410 264	7 098 972	122,5	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
92	407 742	7 096 948	109,1	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
93	407 993	7 097 672	109,3	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
94	408 857	7 098 427	115,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
95	409 752	7 099 120	115,4	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
96	408 404	7 096 567	110,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
97	408 619	7 097 160	117,5	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
98	392 697	7 111 104	82,5	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
99	393 696	7 110 723	85,1	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
100	394 124	7 110 573	88,4	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
101	392 964	7 110 572	83,1	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
102	394 736	7 110 600	89,8	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
103	393 462	7 109 982	84,9	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
104	394 233	7 109 674	87,5	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
105	393 349	7 109 200	84,2	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
106	402 014	7 104 309	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
107	401 637	7 103 661	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
108	400 968	7 103 344	104,9	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
109	399 564	7 105 835	105,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
110	400 647	7 104 532	102,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
111	400 636	7 105 142	105,1	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
112	401 395	7 104 737	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
113	401 057	7 104 087	103,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
114	399 017	7 104 219	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
115	397 644	7 104 266	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
116	398 397	7 104 778	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
117	397 070	7 104 723	99,3	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
118	396 683	7 105 368	98,3	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
119	398 090	7 105 743	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
120	397 412	7 105 444	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
121	399 135	7 105 052	102,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
122	398 868	7 106 249	100,2	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
123	397 770	7 106 329	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
124	396 213	7 101 101	92,7	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
125	397 616	7 100 723	97,6	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
126	397 086	7 101 114	95,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
127	397 318	7 100 046	97,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
128	395 741	7 100 512	93,4	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
129	396 517	7 099 615	95,1	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
130	396 717	7 100 560	95,3	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
131	397 043	7 099 258	95,9	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
132	395 944	7 099 965	95,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2

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)]	Distance to noise demand [m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	4,0	40,0	39,5	135
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	4,0	40,0	31,5	2 205
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	4,0	40,0	39,3	262
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	4,0	40,0	36,5	877

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23.11.2022 8.50/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]	Distance to noise demand [m]
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	4,0	40,0	36,0	996
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	4,0	40,0	35,1	1 091
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	4,0	40,0	32,7	2 236

Distances (m)

WTG	A	B	C	D	E	F	G
1	12519	14591	8272	7441	7952	9018	12790
2	11910	13833	7565	6919	7494	8624	12017
3	12259	13807	7739	7414	8054	9236	11906
4	11280	12913	6771	6473	7144	8358	11059
5	10442	12036	5886	5750	6478	7739	10204
6	11486	12762	6834	6856	7583	8838	10832
7	10542	11725	5828	6096	6887	8188	9811
8	10766	11557	5950	6553	7385	8710	9566
9	10797	11151	5910	6896	7772	9119	9091
10	11817	11695	6910	8082	8966	10316	9543
11	10569	10328	5670	7183	8108	9469	8194
12	11448	10876	6565	8129	9051	10412	8682
13	12921	12357	8020	9337	10228	11580	10141
14	14529	17064	10610	9295	9616	10469	15321
15	14334	16693	10297	9132	9506	10417	14913
16	13631	15949	9555	8449	8855	9807	14175
17	13291	15399	9082	8174	8646	9667	13586
18	14660	16583	10374	9559	10031	11040	14701
19	10553	12897	6427	5475	6019	7140	11223
20	14168	15950	9801	9128	9645	10705	14050
21	13549	15228	9120	8572	9133	10238	13321
22	10225	12259	5892	5313	5961	7167	10529
23	13500	14910	8951	8639	9257	10412	12953
24	13204	14396	8565	8467	9137	10338	12406
25	13087	14010	8359	8503	9222	10463	11977
26	11891	12798	7132	7438	8205	9487	10792
27	13266	13875	8462	8848	9607	10879	11791
28	12236	12777	7400	7973	8776	10081	10705
29	13661	13951	8805	9401	10190	11482	11817
30	11984	12215	7099	7967	8813	10145	10105
31	14604	14648	9726	10410	11203	12497	12472
32	13471	13497	8582	9402	10226	11543	11333
33	16108	16100	11236	11830	12597	13868	13903
34	12783	12680	7880	8886	9742	11078	10512
35	14308	14071	9406	10324	11155	12474	11869
36	15330	15109	10433	11241	12049	13351	12898
37	16163	15828	11263	12081	12884	14182	13601
38	13683	13265	8776	9893	10755	12093	11053
39	14648	14155	9741	10803	11651	12980	11927
40	15776	15302	10870	11815	12639	13953	13067
41	9348	11084	4817	4734	5510	6810	9333
42	8308	10101	3756	3895	4746	6088	8424
43	9048	10320	4306	4845	5710	7055	8493
44	7185	9086	2624	3106	4033	5395	7524
45	7888	9478	3210	3789	4696	6055	7793
46	8531	9583	3701	4669	5583	6943	7748
47	9463	10302	4619	5494	6381	7734	8374
48	6787	8232	1972	3410	4367	5705	6625
49	7545	8616	2676	4091	5042	6394	6862
50	8264	8920	3363	4858	5803	7161	7034
51	9095	9520	4191	5578	6509	7870	7543
52	6506	7586	1600	3719	4669	5967	5952
53	7377	8046	2471	4408	5365	6696	6239
54	8535	8721	3638	5439	6391	7742	6740
55	6260	6932	1439	4101	5027	6273	5272
56	7342	7532	2510	4855	5807	7110	5653
57	8416	8202	3587	5731	6689	8021	6170

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23.11.2022 8.50/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

WTG	A	B	C	D	E	F	G
58	9442	8918	4616	6623	7577	8925	6788
59	7201	6618	2729	5532	6459	7699	4642
60	7965	7078	3447	6112	7055	8327	4987
61	8884	7770	4300	6794	7748	9052	5596
62	9692	8467	5050	7390	8348	9674	6253
63	10740	9331	6068	8275	9231	10573	7082
64	7864	6519	3621	6473	7399	8631	4380
65	8754	7232	4384	7077	8021	9294	5024
66	9835	8203	5339	7835	8790	10100	5955
67	11000	9227	6437	8775	9732	11064	6957
68	11821	9974	7222	9461	10417	11760	7698
69	8304	6425	4250	7146	8067	9288	4204
70	9168	7213	4941	7692	8633	9897	4959
71	10419	8409	6018	8559	9513	10820	6136
72	11235	9075	6811	9280	10237	11555	6798
73	12135	9960	7639	9986	10943	12278	7684
74	9723	7410	5584	8347	9288	10551	5135
75	10612	8187	6389	9051	10001	11288	5911
76	11756	9249	7439	9974	10930	12242	6982
77	12656	10212	8233	10631	11588	12919	7947
78	9077	5884	5664	8696	9588	10746	3621
79	9690	6688	5981	8920	9837	11045	4424
80	10350	7557	6375	9185	10123	11376	5290
81	11215	8446	7095	9790	10739	12021	6188
82	10427	7112	6769	9697	10617	11831	4891
83	11079	7978	7172	9981	10920	12174	5746
84	11065	7412	7522	10464	11383	12590	5264
85	11682	8348	7833	10646	11586	12840	6157
86	11325	7277	8028	11026	11931	13110	5236
87	11839	8170	8187	11072	12002	13233	6045
88	12232	8297	8715	11633	12558	13776	6247
89	12133	7865	8882	11874	12782	13964	5921
90	11882	6776	13416	15929	16341	16711	8476
91	12214	6744	13345	15989	16457	16912	8209
92	10849	6690	13146	15358	15652	15855	8749
93	10680	6170	12715	15029	15364	15629	8155
94	11107	6070	12705	15184	15584	15944	7849
95	11682	6247	12863	15483	15943	16389	7772
96	11611	7333	13843	16094	16399	16612	9334
97	11479	6936	13505	15836	16173	16436	8871
98	10114	14609	8204	5362	5011	5123	13599
99	9230	13569	7137	4337	4065	4360	12533
100	8875	13133	6686	3914	3691	4088	12083
101	9528	14094	7748	4842	4448	4528	13134
102	8597	12655	6153	3501	3408	4001	11549
103	8757	13359	7075	4112	3682	3773	12444
104	8059	12542	6246	3290	2916	3194	11614
105	8219	13065	6971	3899	3310	3161	12275
106	3542	3121	3852	6170	6641	7214	3100
107	2986	3270	4286	6296	6667	7103	3690
108	2268	3884	4414	6065	6338	6651	4430
109	2969	5997	1938	3301	3761	4453	5437
110	2464	4468	3188	4978	5357	5852	4381
111	2879	4726	2585	4569	5032	5652	4334
112	3190	3865	3196	5418	5892	6493	3610
113	2576	3938	3707	5582	5947	6400	4080
114	1266	5949	3644	4238	4340	4527	6040
115	1678	7305	4238	3754	3562	3409	7390
116	1823	6685	3393	3467	3515	3708	6589
117	2402	7959	4273	3250	2932	2680	7916
118	3140	8496	4171	2630	2209	1957	8287
119	2830	7291	2831	2461	2595	3039	6897
120	2789	7823	3538	2555	2406	2523	7560
121	2106	6067	2820	3589	3835	4254	5837
122	3266	6807	1925	2506	2954	3705	6183
123	3478	7821	2740	1795	1970	2605	7280

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DECIBEL - Main Result

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

WTG	A	B	C	D	E	F	G
124	3144	8822	7670	6923	6423	5619	9688
125	2522	7560	7407	7272	6946	6384	8632
126	2490	7968	7249	6859	6471	5830	8900
127	3260	8065	8145	7931	7560	6916	9250
128	3879	9420	8418	7575	7027	6138	10371
129	4032	8969	8849	8375	7916	7136	10156
130	3151	8468	7907	7420	6983	6255	9490
131	4091	8631	8979	8714	8308	7597	9934
132	4109	9385	8790	8084	7564	6703	10457

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DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise 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 Lomarakennus A (Pyssynienen metsätie 156)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	12 519	12 520	3,32	109,0		0,00	92,95	-	-	0,00	0,00	-
10	11 817	11 819	4,00	109,0		0,00	92,45	-	-	0,00	0,00	-
100	8 875	8 876	6,89	107,8		0,00	89,96	-	-	0,00	0,00	-
101	9 528	9 529	6,01	107,8		0,00	90,58	-	-	0,00	0,00	-
102	8 597	8 599	7,28	107,8		0,00	89,69	-	-	0,00	0,00	-
103	8 757	8 758	7,05	107,8		0,00	89,85	-	-	0,00	0,00	-
104	8 059	8 060	8,09	107,8		0,00	89,13	-	-	0,00	0,00	-
105	8 219	8 220	7,84	107,8		0,00	89,30	-	-	0,00	0,00	-
106	3 542	3 548	20,36	106,9		0,00	82,00	-	-	0,00	0,00	-
107	2 986	2 993	22,49	106,9		0,00	80,52	-	-	0,00	0,00	-
108	2 268	2 277	25,80	106,9		0,00	78,15	-	-	0,00	0,00	-
109	2 969	2 976	22,56	106,9		0,00	80,47	-	-	0,00	0,00	-
11	10 569	10 571	5,33	109,0		0,00	91,48	-	-	0,00	0,00	-
110	2 464	2 472	24,82	106,9		0,00	78,86	-	-	0,00	0,00	-
111	2 879	2 886	22,93	106,9		0,00	80,21	-	-	0,00	0,00	-
112	3 190	3 197	21,67	106,9		0,00	81,09	-	-	0,00	0,00	-
113	2 576	2 584	24,28	106,9		0,00	79,24	-	-	0,00	0,00	-
114	1 266	1 282	32,36	106,9		0,00	73,16	-	-	0,00	0,00	-
115	1 678	1 690	29,27	106,9		0,00	75,56	-	-	0,00	0,00	-
116	1 823	1 833	28,34	106,9		0,00	76,26	-	-	0,00	0,00	-
117	2 402	2 410	25,12	106,9		0,00	78,64	-	-	0,00	0,00	-
118	3 140	3 146	21,87	106,9		0,00	80,96	-	-	0,00	0,00	-
119	2 830	2 837	23,14	106,9		0,00	80,06	-	-	0,00	0,00	-
12	11 448	11 451	4,38	109,0		0,00	92,18	-	-	0,00	0,00	-
120	2 789	2 796	23,32	106,9		0,00	79,93	-	-	0,00	0,00	-
121	2 106	2 115	26,67	106,9		0,00	77,51	-	-	0,00	0,00	-
122	3 266	3 272	21,38	106,9		0,00	81,30	-	-	0,00	0,00	-
123	3 478	3 483	20,59	106,9		0,00	81,84	-	-	0,00	0,00	-
124	3 144	3 149	23,60	109,2	2	0,00	80,96	-	-	0,00	0,00	-
125	2 522	2 529	26,63	109,2	2	0,00	79,06	-	-	0,00	0,00	-
126	2 490	2 498	26,80	109,2	2	0,00	78,95	-	-	0,00	0,00	-
127	3 260	3 266	23,09	109,2	2	0,00	81,28	-	-	0,00	0,00	-
128	3 879	3 883	20,64	109,2	2	0,00	82,78	-	-	0,00	0,00	-
129	4 032	4 036	20,09	109,2	2	0,00	83,12	-	-	0,00	0,00	-
13	12 921	12 923	2,94	109,0		0,00	93,23	-	-	0,00	0,00	-
130	3 151	3 157	23,57	109,2	2	0,00	80,99	-	-	0,00	0,00	-
131	4 091	4 096	19,88	109,2	2	0,00	83,25	-	-	0,00	0,00	-
132	4 109	4 113	19,82	109,2	2	0,00	83,28	-	-	0,00	0,00	-
14	14 529	14 529	1,81	109,0		0,00	94,25	-	-	0,00	0,00	-
15	14 334	14 335	1,97	109,0		0,00	94,13	-	-	0,00	0,00	-
16	13 631	13 631	2,58	109,0		0,00	93,69	-	-	0,00	0,00	-
17	13 291	13 292	2,88	109,0		0,00	93,47	-	-	0,00	0,00	-
18	14 660	14 661	1,70	109,0		0,00	94,32	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
19	10 553	10 554	5,68	109,0		0,00	91,47	-	-	0,00	0,00	-
2	11 910	11 912	3,91	109,0		0,00	92,52	-	-	0,00	0,00	-
20	14 168	14 169	2,11	109,0		0,00	94,03	-	-	0,00	0,00	-
21	13 549	13 550	2,65	109,0		0,00	93,64	-	-	0,00	0,00	-
22	10 225	10 226	6,06	109,0		0,00	91,19	-	-	0,00	0,00	-
23	13 500	13 501	2,70	109,0		0,00	93,61	-	-	0,00	0,00	-
24	13 204	13 205	2,96	109,0		0,00	93,41	-	-	0,00	0,00	-
25	13 087	13 088	3,08	109,0		0,00	93,34	-	-	0,00	0,00	-
26	11 891	11 893	4,24	109,0		0,00	92,51	-	-	0,00	0,00	-
27	13 266	13 267	2,91	109,0		0,00	93,46	-	-	0,00	0,00	-
28	12 236	12 237	3,89	109,0		0,00	92,75	-	-	0,00	0,00	-
29	13 661	13 662	2,55	109,0		0,00	93,71	-	-	0,00	0,00	-
3	12 259	12 261	3,57	109,0		0,00	92,77	-	-	0,00	0,00	-
30	11 984	11 985	4,14	109,0		0,00	92,57	-	-	0,00	0,00	-
31	14 604	14 605	1,75	109,0		0,00	94,29	-	-	0,00	0,00	-
32	13 471	13 472	2,72	109,0		0,00	93,59	-	-	0,00	0,00	-
33	16 108	16 109	0,56	109,0		0,00	95,14	-	-	0,00	0,00	-
34	12 783	12 784	3,36	109,0		0,00	93,13	-	-	0,00	0,00	-
35	14 308	14 309	1,99	109,0		0,00	94,11	-	-	0,00	0,00	-
36	15 330	15 331	1,16	109,0		0,00	94,71	-	-	0,00	0,00	-
37	16 163	16 163	0,52	109,0		0,00	95,17	-	-	0,00	0,00	-
38	13 683	13 684	2,53	109,0		0,00	93,72	-	-	0,00	0,00	-
39	14 648	14 649	1,71	109,0		0,00	94,32	-	-	0,00	0,00	-
4	11 280	11 282	4,56	109,0		0,00	92,05	-	-	0,00	0,00	-
40	15 776	15 777	0,81	109,0		0,00	94,96	-	-	0,00	0,00	-
41	9 348	9 350	6,10	108,0		0,00	90,42	-	-	0,00	0,00	-
42	8 308	8 310	7,53	108,0		0,00	89,39	-	-	0,00	0,00	-
43	9 048	9 050	6,51	108,0		0,00	90,13	-	-	0,00	0,00	-
44	7 185	7 188	9,29	108,0		0,00	88,13	-	-	0,00	0,00	-
45	7 888	7 890	8,16	108,0		0,00	88,94	-	-	0,00	0,00	-
46	8 531	8 533	7,21	108,0		0,00	89,62	-	-	0,00	0,00	-
47	9 463	9 465	5,95	108,0		0,00	90,52	-	-	0,00	0,00	-
48	6 787	6 790	9,97	108,0		0,00	87,64	-	-	0,00	0,00	-
49	7 545	7 548	8,69	108,0		0,00	88,56	-	-	0,00	0,00	-
5	10 442	10 444	5,47	109,0		0,00	91,38	-	-	0,00	0,00	-
50	8 264	8 266	7,59	108,0		0,00	89,35	-	-	0,00	0,00	-
51	9 095	9 097	6,43	108,0		0,00	90,18	-	-	0,00	0,00	-
52	6 506	6 509	10,48	108,0		0,00	87,27	-	-	0,00	0,00	-
53	7 377	7 380	8,97	108,0		0,00	88,36	-	-	0,00	0,00	-
54	8 535	8 538	7,20	108,0		0,00	89,63	-	-	0,00	0,00	-
55	6 260	6 263	10,95	108,0		0,00	86,94	-	-	0,00	0,00	-
56	7 342	7 344	9,02	108,0		0,00	88,32	-	-	0,00	0,00	-
57	8 416	8 419	7,37	108,0		0,00	89,50	-	-	0,00	0,00	-
58	9 442	9 444	5,98	108,0		0,00	90,50	-	-	0,00	0,00	-
59	7 201	7 204	9,26	108,0		0,00	88,15	-	-	0,00	0,00	-
6	11 486	11 488	4,34	109,0		0,00	92,20	-	-	0,00	0,00	-
60	7 965	7 968	8,04	108,0		0,00	89,03	-	-	0,00	0,00	-
61	8 884	8 887	6,71	108,0		0,00	89,97	-	-	0,00	0,00	-
62	9 692	9 694	5,66	108,0		0,00	90,73	-	-	0,00	0,00	-
63	10 740	10 742	4,42	108,0		0,00	91,62	-	-	0,00	0,00	-
64	7 864	7 866	8,19	108,0		0,00	88,92	-	-	0,00	0,00	-
65	8 754	8 757	6,89	108,0		0,00	89,85	-	-	0,00	0,00	-
66	9 835	9 837	5,48	108,0		0,00	90,86	-	-	0,00	0,00	-
67	11 000	11 002	4,13	108,0		0,00	91,83	-	-	0,00	0,00	-
68	11 821	11 823	3,26	108,0		0,00	92,45	-	-	0,00	0,00	-
69	8 304	8 306	7,53	108,0		0,00	89,39	-	-	0,00	0,00	-
7	10 542	10 544	5,37	109,0		0,00	91,46	-	-	0,00	0,00	-
70	9 168	9 171	6,33	108,0		0,00	90,25	-	-	0,00	0,00	-
71	10 419	10 421	4,78	108,0		0,00	91,36	-	-	0,00	0,00	-
72	11 235	11 237	3,87	108,0		0,00	92,01	-	-	0,00	0,00	-
73	12 135	12 137	2,94	108,0		0,00	92,68	-	-	0,00	0,00	-
74	9 723	9 725	5,62	108,0		0,00	90,76	-	-	0,00	0,00	-
75	10 612	10 614	4,56	108,0		0,00	91,52	-	-	0,00	0,00	-
76	11 756	11 758	3,32	108,0		0,00	92,41	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
77	12 656	12 658	2,43	108,0		0,00	93,05	-	-	0,00	0,00	-
78	9 077	9 080	6,45	108,0		0,00	90,16	-	-	0,00	0,00	-
79	9 690	9 692	5,66	108,0		0,00	90,73	-	-	0,00	0,00	-
8	10 766	10 769	5,11	109,0		0,00	91,64	-	-	0,00	0,00	-
80	10 350	10 352	4,86	108,0		0,00	91,30	-	-	0,00	0,00	-
81	11 215	11 216	3,89	108,0		0,00	92,00	-	-	0,00	0,00	-
82	10 427	10 429	4,77	108,0		0,00	91,36	-	-	0,00	0,00	-
83	11 079	11 081	4,04	108,0		0,00	91,89	-	-	0,00	0,00	-
84	11 065	11 067	4,05	108,0		0,00	91,88	-	-	0,00	0,00	-
85	11 682	11 684	3,40	108,0		0,00	92,35	-	-	0,00	0,00	-
86	11 325	11 327	3,77	108,0		0,00	92,08	-	-	0,00	0,00	-
87	11 839	11 841	3,24	108,0		0,00	92,47	-	-	0,00	0,00	-
88	12 232	12 234	2,84	108,0		0,00	92,75	-	-	0,00	0,00	-
89	12 133	12 135	2,94	108,0		0,00	92,68	-	-	0,00	0,00	-
9	10 797	10 800	5,08	109,0		0,00	91,67	-	-	0,00	0,00	-
90	11 882	11 883	3,66	108,0		0,00	92,50	-	-	0,00	0,00	-
91	12 214	12 215	3,32	108,0		0,00	92,74	-	-	0,00	0,00	-
92	10 849	10 850	4,79	108,0		0,00	91,71	-	-	0,00	0,00	-
93	10 680	10 681	4,99	108,0		0,00	91,57	-	-	0,00	0,00	-
94	11 107	11 108	4,50	108,0		0,00	91,91	-	-	0,00	0,00	-
95	11 682	11 682	3,87	108,0		0,00	92,35	-	-	0,00	0,00	-
96	11 611	11 612	3,95	108,0		0,00	92,30	-	-	0,00	0,00	-
97	11 479	11 480	4,09	108,0		0,00	92,20	-	-	0,00	0,00	-
98	10 114	10 114	5,27	107,8		0,00	91,10	-	-	0,00	0,00	-
99	9 230	9 231	6,40	107,8		0,00	90,30	-	-	0,00	0,00	-
Sum			39,55									

- Data undefined due to calculation with octave data

Noise sensitive area: B Lomarakennus B (Sarjankyläntie 1093)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	14 591	14 592	1,50	109,0		0,00	94,28	-	-	0,00	0,00	-
10	11 695	11 697	4,13	109,0		0,00	92,36	-	-	0,00	0,00	-
100	13 133	13 134	2,05	107,8		0,00	93,37	-	-	0,00	0,00	-
101	14 094	14 095	1,18	107,8		0,00	93,98	-	-	0,00	0,00	-
102	12 655	12 656	2,50	107,8		0,00	93,05	-	-	0,00	0,00	-
103	13 359	13 359	1,84	107,8		0,00	93,52	-	-	0,00	0,00	-
104	12 542	12 542	2,61	107,8		0,00	92,97	-	-	0,00	0,00	-
105	13 065	13 065	2,11	107,8		0,00	93,32	-	-	0,00	0,00	-
106	3 121	3 127	21,94	106,9		0,00	80,90	-	-	0,00	0,00	-
107	3 270	3 276	21,36	106,9		0,00	81,31	-	-	0,00	0,00	-
108	3 884	3 888	19,20	106,9		0,00	82,80	-	-	0,00	0,00	-
109	5 997	6 000	13,55	106,9		0,00	86,56	-	-	0,00	0,00	-
11	10 328	10 330	5,60	109,0		0,00	91,28	-	-	0,00	0,00	-
110	4 468	4 472	17,40	106,9		0,00	84,01	-	-	0,00	0,00	-
111	4 726	4 729	16,68	106,9		0,00	84,50	-	-	0,00	0,00	-
112	3 865	3 870	19,26	106,9		0,00	82,75	-	-	0,00	0,00	-
113	3 938	3 943	19,02	106,9		0,00	82,92	-	-	0,00	0,00	-
114	5 949	5 952	13,65	106,9		0,00	86,49	-	-	0,00	0,00	-
115	7 305	7 308	11,25	106,9		0,00	88,28	-	-	0,00	0,00	-
116	6 685	6 688	12,28	106,9		0,00	87,51	-	-	0,00	0,00	-
117	7 959	7 961	10,25	106,9		0,00	89,02	-	-	0,00	0,00	-
118	8 496	8 498	9,48	106,9		0,00	89,59	-	-	0,00	0,00	-
119	7 291	7 293	11,28	106,9		0,00	88,26	-	-	0,00	0,00	-
12	10 876	10 878	4,99	109,0		0,00	91,73	-	-	0,00	0,00	-
120	7 823	7 825	10,45	106,9		0,00	88,87	-	-	0,00	0,00	-
121	6 067	6 069	13,40	106,9		0,00	86,66	-	-	0,00	0,00	-
122	6 807	6 809	12,07	106,9		0,00	87,66	-	-	0,00	0,00	-
123	7 821	7 823	10,45	106,9		0,00	88,87	-	-	0,00	0,00	-
124	8 822	8 824	9,55	109,2	2	0,00	89,91	-	-	0,00	0,00	-
125	7 560	7 562	11,48	109,2	2	0,00	88,57	-	-	0,00	0,00	-
126	7 968	7 970	10,82	109,2	2	0,00	89,03	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
127	8 065	8 067	10,67	109,2	2	0,00	89,13	-	-	0,00	0,00	-
128	9 420	9 421	8,74	109,2	2	0,00	90,48	-	-	0,00	0,00	-
129	8 969	8 971	9,35	109,2	2	0,00	90,06	-	-	0,00	0,00	-
13	12 357	12 359	3,47	109,0		0,00	92,84	-	-	0,00	0,00	-
130	8 468	8 470	10,06	109,2	2	0,00	89,56	-	-	0,00	0,00	-
131	8 631	8 633	9,83	109,2	2	0,00	89,72	-	-	0,00	0,00	-
132	9 385	9 387	8,79	109,2	2	0,00	90,45	-	-	0,00	0,00	-
14	17 064	17 064	-0,14	109,0		0,00	95,64	-	-	0,00	0,00	-
15	16 693	16 694	0,14	109,0		0,00	95,45	-	-	0,00	0,00	-
16	15 949	15 949	0,69	109,0		0,00	95,05	-	-	0,00	0,00	-
17	15 399	15 400	1,10	109,0		0,00	94,75	-	-	0,00	0,00	-
18	16 583	16 584	0,21	109,0		0,00	95,39	-	-	0,00	0,00	-
19	12 897	12 898	3,25	109,0		0,00	93,21	-	-	0,00	0,00	-
2	13 833	13 834	2,13	109,0		0,00	93,82	-	-	0,00	0,00	-
20	15 950	15 951	0,68	109,0		0,00	95,06	-	-	0,00	0,00	-
21	15 228	15 229	1,24	109,0		0,00	94,65	-	-	0,00	0,00	-
22	12 259	12 260	3,86	109,0		0,00	92,77	-	-	0,00	0,00	-
23	14 910	14 911	1,49	109,0		0,00	94,47	-	-	0,00	0,00	-
24	14 396	14 397	1,92	109,0		0,00	94,17	-	-	0,00	0,00	-
25	14 010	14 011	2,25	109,0		0,00	93,93	-	-	0,00	0,00	-
26	12 798	12 799	3,34	109,0		0,00	93,14	-	-	0,00	0,00	-
27	13 875	13 876	2,36	109,0		0,00	93,85	-	-	0,00	0,00	-
28	12 777	12 778	3,36	109,0		0,00	93,13	-	-	0,00	0,00	-
29	13 951	13 952	2,30	109,0		0,00	93,89	-	-	0,00	0,00	-
3	13 807	13 809	2,16	109,0		0,00	93,80	-	-	0,00	0,00	-
30	12 215	12 216	3,91	109,0		0,00	92,74	-	-	0,00	0,00	-
31	14 648	14 649	1,71	109,0		0,00	94,32	-	-	0,00	0,00	-
32	13 497	13 498	2,70	109,0		0,00	93,61	-	-	0,00	0,00	-
33	16 100	16 101	0,57	109,0		0,00	95,14	-	-	0,00	0,00	-
34	12 680	12 681	3,45	109,0		0,00	93,06	-	-	0,00	0,00	-
35	14 071	14 072	2,19	109,0		0,00	93,97	-	-	0,00	0,00	-
36	15 109	15 109	1,33	109,0		0,00	94,58	-	-	0,00	0,00	-
37	15 828	15 829	0,77	109,0		0,00	94,99	-	-	0,00	0,00	-
38	13 265	13 266	2,91	109,0		0,00	93,45	-	-	0,00	0,00	-
39	14 155	14 156	2,12	109,0		0,00	94,02	-	-	0,00	0,00	-
4	12 913	12 915	2,95	109,0		0,00	93,22	-	-	0,00	0,00	-
40	15 302	15 303	1,18	109,0		0,00	94,70	-	-	0,00	0,00	-
41	11 084	11 086	4,06	108,0		0,00	91,90	-	-	0,00	0,00	-
42	10 101	10 103	5,16	108,0		0,00	91,09	-	-	0,00	0,00	-
43	10 320	10 321	4,90	108,0		0,00	91,27	-	-	0,00	0,00	-
44	9 086	9 088	6,44	108,0		0,00	90,17	-	-	0,00	0,00	-
45	9 478	9 480	5,93	108,0		0,00	90,54	-	-	0,00	0,00	-
46	9 583	9 585	5,80	108,0		0,00	90,63	-	-	0,00	0,00	-
47	10 302	10 303	4,92	108,0		0,00	91,26	-	-	0,00	0,00	-
48	8 232	8 234	7,64	108,0		0,00	89,31	-	-	0,00	0,00	-
49	8 616	8 618	7,09	108,0		0,00	89,71	-	-	0,00	0,00	-
5	12 036	12 037	3,79	109,0		0,00	92,61	-	-	0,00	0,00	-
50	8 920	8 922	6,67	108,0		0,00	90,01	-	-	0,00	0,00	-
51	9 520	9 522	5,88	108,0		0,00	90,57	-	-	0,00	0,00	-
52	7 586	7 588	8,63	108,0		0,00	88,60	-	-	0,00	0,00	-
53	8 046	8 048	7,92	108,0		0,00	89,11	-	-	0,00	0,00	-
54	8 721	8 723	6,94	108,0		0,00	89,81	-	-	0,00	0,00	-
55	6 932	6 934	9,72	108,0		0,00	87,82	-	-	0,00	0,00	-
56	7 532	7 535	8,72	108,0		0,00	88,54	-	-	0,00	0,00	-
57	8 202	8 205	7,68	108,0		0,00	89,28	-	-	0,00	0,00	-
58	8 918	8 920	6,67	108,0		0,00	90,01	-	-	0,00	0,00	-
59	6 618	6 621	10,28	108,0		0,00	87,42	-	-	0,00	0,00	-
6	12 762	12 764	3,09	109,0		0,00	93,12	-	-	0,00	0,00	-
60	7 078	7 081	9,47	108,0		0,00	88,00	-	-	0,00	0,00	-
61	7 770	7 772	8,34	108,0		0,00	88,81	-	-	0,00	0,00	-
62	8 467	8 469	7,30	108,0		0,00	89,56	-	-	0,00	0,00	-
63	9 331	9 333	6,12	108,0		0,00	90,40	-	-	0,00	0,00	-
64	6 519	6 522	10,46	108,0		0,00	87,29	-	-	0,00	0,00	-
65	7 232	7 235	9,21	108,0		0,00	88,19	-	-	0,00	0,00	-

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23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
66	8 203	8 205	7,68	108,0		0,00	89,28	-	-	0,00	0,00	-
67	9 227	9 229	6,26	108,0		0,00	90,30	-	-	0,00	0,00	-
68	9 974	9 976	5,31	108,0		0,00	90,98	-	-	0,00	0,00	-
69	6 425	6 428	10,63	108,0		0,00	87,16	-	-	0,00	0,00	-
7	11 725	11 727	4,10	109,0		0,00	92,38	-	-	0,00	0,00	-
70	7 213	7 216	9,24	108,0		0,00	88,17	-	-	0,00	0,00	-
71	8 409	8 411	7,38	108,0		0,00	89,50	-	-	0,00	0,00	-
72	9 075	9 077	6,46	108,0		0,00	90,16	-	-	0,00	0,00	-
73	9 960	9 961	5,33	108,0		0,00	90,97	-	-	0,00	0,00	-
74	7 410	7 413	8,91	108,0		0,00	88,40	-	-	0,00	0,00	-
75	8 187	8 189	7,70	108,0		0,00	89,27	-	-	0,00	0,00	-
76	9 249	9 251	6,23	108,0		0,00	90,32	-	-	0,00	0,00	-
77	10 212	10 214	5,03	108,0		0,00	91,18	-	-	0,00	0,00	-
78	5 884	5 887	11,77	108,0		0,00	86,40	-	-	0,00	0,00	-
79	6 688	6 691	10,15	108,0		0,00	87,51	-	-	0,00	0,00	-
8	11 557	11 558	4,27	109,0		0,00	92,26	-	-	0,00	0,00	-
80	7 557	7 559	8,68	108,0		0,00	88,57	-	-	0,00	0,00	-
81	8 446	8 448	7,33	108,0		0,00	89,54	-	-	0,00	0,00	-
82	7 112	7 114	9,41	108,0		0,00	88,04	-	-	0,00	0,00	-
83	7 978	7 980	8,02	108,0		0,00	89,04	-	-	0,00	0,00	-
84	7 412	7 415	8,91	108,0		0,00	88,40	-	-	0,00	0,00	-
85	8 348	8 350	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
86	7 277	7 279	9,13	108,0		0,00	88,24	-	-	0,00	0,00	-
87	8 170	8 173	7,73	108,0		0,00	89,25	-	-	0,00	0,00	-
88	8 297	8 299	7,54	108,0		0,00	89,38	-	-	0,00	0,00	-
89	7 865	7 867	8,19	108,0		0,00	88,92	-	-	0,00	0,00	-
9	11 151	11 153	4,69	109,0		0,00	91,95	-	-	0,00	0,00	-
90	6 776	6 777	10,73	108,0		0,00	87,62	-	-	0,00	0,00	-
91	6 744	6 746	10,79	108,0		0,00	87,58	-	-	0,00	0,00	-
92	6 690	6 691	10,89	108,0		0,00	87,51	-	-	0,00	0,00	-
93	6 170	6 172	11,91	108,0		0,00	86,81	-	-	0,00	0,00	-
94	6 070	6 071	12,12	108,0		0,00	86,67	-	-	0,00	0,00	-
95	6 247	6 248	11,76	108,0		0,00	86,92	-	-	0,00	0,00	-
96	7 333	7 334	9,73	108,0		0,00	88,31	-	-	0,00	0,00	-
97	6 936	6 937	10,43	108,0		0,00	87,82	-	-	0,00	0,00	-
98	14 609	14 610	0,74	107,8		0,00	94,29	-	-	0,00	0,00	-
99	13 569	13 570	1,65	107,8		0,00	93,65	-	-	0,00	0,00	-
Sum			31,45									

- Data undefined due to calculation with octave data

Noise sensitive area: C Lomarakennnus C (Kurunoja)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	8 272	8 275	8,25	109,0		0,00	89,35	-	-	0,00	0,00	-
10	6 910	6 914	10,38	109,0		0,00	87,79	-	-	0,00	0,00	-
100	6 686	6 688	10,41	107,8		0,00	87,51	-	-	0,00	0,00	-
101	7 748	7 749	8,58	107,8		0,00	88,79	-	-	0,00	0,00	-
102	6 153	6 154	11,44	107,8		0,00	86,78	-	-	0,00	0,00	-
103	7 075	7 077	9,71	107,8		0,00	88,00	-	-	0,00	0,00	-
104	6 246	6 248	11,25	107,8		0,00	86,91	-	-	0,00	0,00	-
105	6 971	6 973	9,89	107,8		0,00	87,87	-	-	0,00	0,00	-
106	3 852	3 857	19,30	106,9		0,00	82,73	-	-	0,00	0,00	-
107	4 286	4 291	17,94	106,9		0,00	83,65	-	-	0,00	0,00	-
108	4 414	4 418	17,56	106,9		0,00	83,90	-	-	0,00	0,00	-
109	1 938	1 949	27,63	106,9		0,00	76,79	-	-	0,00	0,00	-
11	5 670	5 674	13,10	109,0		0,00	86,08	-	-	0,00	0,00	-
110	3 188	3 194	21,68	106,9		0,00	81,09	-	-	0,00	0,00	-
111	2 585	2 593	24,24	106,9		0,00	79,28	-	-	0,00	0,00	-
112	3 196	3 202	21,65	106,9		0,00	81,11	-	-	0,00	0,00	-
113	3 707	3 712	19,79	106,9		0,00	82,39	-	-	0,00	0,00	-
114	3 644	3 650	20,00	106,9		0,00	82,24	-	-	0,00	0,00	-
115	4 238	4 243	18,08	106,9		0,00	83,55	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
116	3 393	3 399	20,90	106,9		0,00	81,63	-	-	0,00	0,00	-
117	4 273	4 277	17,98	106,9		0,00	83,62	-	-	0,00	0,00	-
118	4 171	4 175	18,29	106,9		0,00	83,41	-	-	0,00	0,00	-
119	2 831	2 838	23,14	106,9		0,00	80,06	-	-	0,00	0,00	-
12	6 565	6 568	11,05	109,0		0,00	87,35	-	-	0,00	0,00	-
120	3 538	3 544	20,38	106,9		0,00	81,99	-	-	0,00	0,00	-
121	2 820	2 827	23,19	106,9		0,00	80,03	-	-	0,00	0,00	-
122	1 925	1 934	27,72	106,9		0,00	76,73	-	-	0,00	0,00	-
123	2 740	2 747	23,54	106,9		0,00	79,78	-	-	0,00	0,00	-
124	7 670	7 673	11,29	109,2	2	0,00	88,70	-	-	0,00	0,00	-
125	7 407	7 409	11,73	109,2	2	0,00	88,40	-	-	0,00	0,00	-
126	7 249	7 251	12,00	109,2	2	0,00	88,21	-	-	0,00	0,00	-
127	8 145	8 147	10,55	109,2	2	0,00	89,22	-	-	0,00	0,00	-
128	8 418	8 420	10,14	109,2	2	0,00	89,51	-	-	0,00	0,00	-
129	8 849	8 851	9,52	109,2	2	0,00	89,94	-	-	0,00	0,00	-
13	8 020	8 023	8,61	109,0		0,00	89,09	-	-	0,00	0,00	-
130	7 907	7 909	10,92	109,2	2	0,00	88,96	-	-	0,00	0,00	-
131	8 979	8 981	9,33	109,2	2	0,00	90,07	-	-	0,00	0,00	-
132	8 790	8 792	9,60	109,2	2	0,00	89,88	-	-	0,00	0,00	-
14	10 610	10 611	5,62	109,0		0,00	91,52	-	-	0,00	0,00	-
15	10 297	10 298	5,98	109,0		0,00	91,25	-	-	0,00	0,00	-
16	9 555	9 556	6,89	109,0		0,00	90,61	-	-	0,00	0,00	-
17	9 082	9 083	7,51	109,0		0,00	90,16	-	-	0,00	0,00	-
18	10 374	10 375	5,89	109,0		0,00	91,32	-	-	0,00	0,00	-
19	6 427	6 428	11,73	109,0		0,00	87,16	-	-	0,00	0,00	-
2	7 565	7 567	9,31	109,0		0,00	88,58	-	-	0,00	0,00	-
20	9 801	9 802	6,58	109,0		0,00	90,83	-	-	0,00	0,00	-
21	9 120	9 121	7,46	109,0		0,00	90,20	-	-	0,00	0,00	-
22	5 892	5 894	12,79	109,0		0,00	86,41	-	-	0,00	0,00	-
23	8 951	8 952	7,71	109,0		0,00	90,04	-	-	0,00	0,00	-
24	8 565	8 567	8,22	109,0		0,00	89,66	-	-	0,00	0,00	-
25	8 359	8 361	8,52	109,0		0,00	89,44	-	-	0,00	0,00	-
26	7 132	7 134	10,46	109,0		0,00	88,07	-	-	0,00	0,00	-
27	8 462	8 464	8,37	109,0		0,00	89,55	-	-	0,00	0,00	-
28	7 400	7 402	10,01	109,0		0,00	88,39	-	-	0,00	0,00	-
29	8 805	8 807	7,89	109,0		0,00	89,90	-	-	0,00	0,00	-
3	7 739	7 742	9,05	109,0		0,00	88,78	-	-	0,00	0,00	-
30	7 099	7 101	10,52	109,0		0,00	88,03	-	-	0,00	0,00	-
31	9 726	9 727	6,67	109,0		0,00	90,76	-	-	0,00	0,00	-
32	8 582	8 583	8,20	109,0		0,00	89,67	-	-	0,00	0,00	-
33	11 236	11 237	4,92	109,0		0,00	92,01	-	-	0,00	0,00	-
34	7 880	7 882	9,24	109,0		0,00	88,93	-	-	0,00	0,00	-
35	9 406	9 408	7,08	109,0		0,00	90,47	-	-	0,00	0,00	-
36	10 433	10 435	5,82	109,0		0,00	91,37	-	-	0,00	0,00	-
37	11 263	11 264	4,89	109,0		0,00	92,03	-	-	0,00	0,00	-
38	8 776	8 778	7,93	109,0		0,00	89,87	-	-	0,00	0,00	-
39	9 741	9 742	6,65	109,0		0,00	90,77	-	-	0,00	0,00	-
4	6 771	6 774	10,62	109,0		0,00	87,62	-	-	0,00	0,00	-
40	10 870	10 871	5,32	109,0		0,00	91,73	-	-	0,00	0,00	-
41	4 817	4 821	14,59	108,0		0,00	84,66	-	-	0,00	0,00	-
42	3 756	3 760	18,08	108,0		0,00	82,50	-	-	0,00	0,00	-
43	4 306	4 310	16,17	108,0		0,00	83,69	-	-	0,00	0,00	-
44	2 624	2 631	22,98	108,0		0,00	79,40	-	-	0,00	0,00	-
45	3 210	3 216	20,25	108,0		0,00	81,15	-	-	0,00	0,00	-
46	3 701	3 706	18,28	108,0		0,00	82,38	-	-	0,00	0,00	-
47	4 619	4 623	15,18	108,0		0,00	84,30	-	-	0,00	0,00	-
48	1 972	1 981	26,72	108,0		0,00	76,94	-	-	0,00	0,00	-
49	2 676	2 683	22,72	108,0		0,00	79,57	-	-	0,00	0,00	-
5	5 886	5 890	12,58	109,0		0,00	86,40	-	-	0,00	0,00	-
50	3 363	3 368	19,61	108,0		0,00	81,55	-	-	0,00	0,00	-
51	4 191	4 195	16,55	108,0		0,00	83,46	-	-	0,00	0,00	-
52	1 600	1 612	29,34	108,0		0,00	75,15	-	-	0,00	0,00	-
53	2 471	2 479	23,78	108,0		0,00	78,89	-	-	0,00	0,00	-
54	3 638	3 643	18,52	108,0		0,00	82,23	-	-	0,00	0,00	-

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
55	1 439	1 452	30,63	108,0		0,00	74,24	-	-	0,00	0,00	-
56	2 510	2 518	23,57	108,0		0,00	79,02	-	-	0,00	0,00	-
57	3 587	3 593	18,72	108,0		0,00	82,11	-	-	0,00	0,00	-
58	4 616	4 621	15,19	108,0		0,00	84,29	-	-	0,00	0,00	-
59	2 729	2 737	22,45	108,0		0,00	79,75	-	-	0,00	0,00	-
6	6 834	6 837	10,51	109,0		0,00	87,70	-	-	0,00	0,00	-
60	3 447	3 453	19,27	108,0		0,00	81,76	-	-	0,00	0,00	-
61	4 300	4 305	16,18	108,0		0,00	83,68	-	-	0,00	0,00	-
62	5 050	5 054	13,92	108,0		0,00	85,07	-	-	0,00	0,00	-
63	6 068	6 071	11,34	108,0		0,00	86,67	-	-	0,00	0,00	-
64	3 621	3 627	18,58	108,0		0,00	82,19	-	-	0,00	0,00	-
65	4 384	4 388	15,91	108,0		0,00	83,85	-	-	0,00	0,00	-
66	5 339	5 342	13,14	108,0		0,00	85,55	-	-	0,00	0,00	-
67	6 437	6 440	10,61	108,0		0,00	87,18	-	-	0,00	0,00	-
68	7 222	7 224	9,22	108,0		0,00	88,18	-	-	0,00	0,00	-
69	4 250	4 254	16,35	108,0		0,00	83,58	-	-	0,00	0,00	-
7	5 828	5 832	12,71	109,0		0,00	86,32	-	-	0,00	0,00	-
70	4 941	4 946	14,23	108,0		0,00	84,88	-	-	0,00	0,00	-
71	6 018	6 021	11,45	108,0		0,00	86,59	-	-	0,00	0,00	-
72	6 811	6 813	9,93	108,0		0,00	87,67	-	-	0,00	0,00	-
73	7 639	7 641	8,55	108,0		0,00	88,66	-	-	0,00	0,00	-
74	5 584	5 588	12,51	108,0		0,00	85,94	-	-	0,00	0,00	-
75	6 389	6 392	10,70	108,0		0,00	87,11	-	-	0,00	0,00	-
76	7 439	7 442	8,86	108,0		0,00	88,43	-	-	0,00	0,00	-
77	8 233	8 235	7,64	108,0		0,00	89,31	-	-	0,00	0,00	-
78	5 664	5 667	12,31	108,0		0,00	86,07	-	-	0,00	0,00	-
79	5 981	5 984	11,54	108,0		0,00	86,54	-	-	0,00	0,00	-
8	5 950	5 954	12,42	109,0		0,00	86,50	-	-	0,00	0,00	-
80	6 375	6 378	10,73	108,0		0,00	87,09	-	-	0,00	0,00	-
81	7 095	7 097	9,44	108,0		0,00	88,02	-	-	0,00	0,00	-
82	6 769	6 772	10,01	108,0		0,00	87,61	-	-	0,00	0,00	-
83	7 172	7 174	9,31	108,0		0,00	88,12	-	-	0,00	0,00	-
84	7 522	7 525	8,73	108,0		0,00	88,53	-	-	0,00	0,00	-
85	7 833	7 836	8,24	108,0		0,00	88,88	-	-	0,00	0,00	-
86	8 028	8 031	7,94	108,0		0,00	89,10	-	-	0,00	0,00	-
87	8 187	8 190	7,70	108,0		0,00	89,27	-	-	0,00	0,00	-
88	8 715	8 717	6,95	108,0		0,00	89,81	-	-	0,00	0,00	-
89	8 882	8 885	6,72	108,0		0,00	89,97	-	-	0,00	0,00	-
9	5 910	5 914	12,52	109,0		0,00	86,44	-	-	0,00	0,00	-
90	13 416	13 417	2,15	108,0		0,00	93,55	-	-	0,00	0,00	-
91	13 345	13 346	2,21	108,0		0,00	93,51	-	-	0,00	0,00	-
92	13 146	13 146	2,40	108,0		0,00	93,38	-	-	0,00	0,00	-
93	12 715	12 715	2,82	108,0		0,00	93,09	-	-	0,00	0,00	-
94	12 705	12 706	2,83	108,0		0,00	93,08	-	-	0,00	0,00	-
95	12 863	12 863	2,67	108,0		0,00	93,19	-	-	0,00	0,00	-
96	13 843	13 843	1,76	108,0		0,00	93,82	-	-	0,00	0,00	-
97	13 505	13 506	2,07	108,0		0,00	93,61	-	-	0,00	0,00	-
98	8 204	8 205	7,86	107,8		0,00	89,28	-	-	0,00	0,00	-
99	7 137	7 139	9,60	107,8		0,00	88,07	-	-	0,00	0,00	-
Sum			39,28									

- Data undefined due to calculation with octave data

Noise sensitive area: D Asuinrakennus D (Haapavesitie 1404)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	7 441	7 444	9,50	109,0		0,00	88,44	-	-	0,00	0,00	-
10	8 082	8 085	8,53	109,0		0,00	89,15	-	-	0,00	0,00	-
100	3 914	3 917	17,31	107,8		0,00	82,86	-	-	0,00	0,00	-
101	4 842	4 844	14,38	107,8		0,00	84,70	-	-	0,00	0,00	-
102	3 501	3 504	18,86	107,8		0,00	81,89	-	-	0,00	0,00	-
103	4 112	4 114	16,62	107,8		0,00	83,29	-	-	0,00	0,00	-
104	3 290	3 294	19,72	107,8		0,00	81,35	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
105	3 899	3 901	17,37	107,8		0,00	82,82	-	-	0,00	0,00	-
106	6 170	6 174	13,18	106,9		0,00	86,81	-	-	0,00	0,00	-
107	6 296	6 300	12,96	106,9		0,00	86,99	-	-	0,00	0,00	-
108	6 065	6 069	13,40	106,9		0,00	86,66	-	-	0,00	0,00	-
109	3 301	3 307	21,24	106,9		0,00	81,39	-	-	0,00	0,00	-
11	7 183	7 187	9,92	109,0		0,00	88,13	-	-	0,00	0,00	-
110	4 978	4 983	15,99	106,9		0,00	84,95	-	-	0,00	0,00	-
111	4 569	4 574	17,11	106,9		0,00	84,21	-	-	0,00	0,00	-
112	5 418	5 422	14,89	106,9		0,00	85,68	-	-	0,00	0,00	-
113	5 582	5 586	14,49	106,9		0,00	85,94	-	-	0,00	0,00	-
114	4 238	4 243	18,08	106,9		0,00	83,55	-	-	0,00	0,00	-
115	3 754	3 760	19,63	106,9		0,00	82,50	-	-	0,00	0,00	-
116	3 467	3 474	20,63	106,9		0,00	81,82	-	-	0,00	0,00	-
117	3 250	3 256	21,44	106,9		0,00	81,25	-	-	0,00	0,00	-
118	2 630	2 638	24,03	106,9		0,00	79,43	-	-	0,00	0,00	-
119	2 461	2 469	24,83	106,9		0,00	78,85	-	-	0,00	0,00	-
12	8 129	8 133	8,45	109,0		0,00	89,20	-	-	0,00	0,00	-
120	2 555	2 563	24,38	106,9		0,00	79,18	-	-	0,00	0,00	-
121	3 589	3 595	20,19	106,9		0,00	82,11	-	-	0,00	0,00	-
122	2 506	2 514	24,61	106,9		0,00	79,01	-	-	0,00	0,00	-
123	1 795	1 807	28,51	106,9		0,00	76,14	-	-	0,00	0,00	-
124	6 923	6 926	12,57	109,2	2	0,00	87,81	-	-	0,00	0,00	-
125	7 272	7 275	11,96	109,2	2	0,00	88,24	-	-	0,00	0,00	-
126	6 859	6 862	12,68	109,2	2	0,00	87,73	-	-	0,00	0,00	-
127	7 931	7 934	10,88	109,2	2	0,00	88,99	-	-	0,00	0,00	-
128	7 575	7 577	11,45	109,2	2	0,00	88,59	-	-	0,00	0,00	-
129	8 375	8 378	10,20	109,2	2	0,00	89,46	-	-	0,00	0,00	-
13	9 337	9 340	6,80	109,0		0,00	90,41	-	-	0,00	0,00	-
130	7 420	7 423	11,71	109,2	2	0,00	88,41	-	-	0,00	0,00	-
131	8 714	8 717	9,71	109,2	2	0,00	89,81	-	-	0,00	0,00	-
132	8 084	8 086	10,64	109,2	2	0,00	89,16	-	-	0,00	0,00	-
14	9 295	9 297	7,22	109,0		0,00	90,37	-	-	0,00	0,00	-
15	9 132	9 134	7,44	109,0		0,00	90,21	-	-	0,00	0,00	-
16	8 449	8 451	8,39	109,0		0,00	89,54	-	-	0,00	0,00	-
17	8 174	8 176	8,79	109,0		0,00	89,25	-	-	0,00	0,00	-
18	9 559	9 561	6,88	109,0		0,00	90,61	-	-	0,00	0,00	-
19	5 475	5 478	13,68	109,0		0,00	85,77	-	-	0,00	0,00	-
2	6 919	6 923	10,37	109,0		0,00	87,81	-	-	0,00	0,00	-
20	9 128	9 129	7,45	109,0		0,00	90,21	-	-	0,00	0,00	-
21	8 572	8 574	8,21	109,0		0,00	89,66	-	-	0,00	0,00	-
22	5 313	5 316	14,04	109,0		0,00	85,51	-	-	0,00	0,00	-
23	8 639	8 641	8,12	109,0		0,00	89,73	-	-	0,00	0,00	-
24	8 467	8 469	8,36	109,0		0,00	89,56	-	-	0,00	0,00	-
25	8 503	8 505	8,31	109,0		0,00	89,59	-	-	0,00	0,00	-
26	7 438	7 440	9,95	109,0		0,00	88,43	-	-	0,00	0,00	-
27	8 848	8 850	7,83	109,0		0,00	89,94	-	-	0,00	0,00	-
28	7 973	7 975	9,10	109,0		0,00	89,03	-	-	0,00	0,00	-
29	9 401	9 403	7,09	109,0		0,00	90,47	-	-	0,00	0,00	-
3	7 414	7 417	9,55	109,0		0,00	88,41	-	-	0,00	0,00	-
30	7 967	7 969	9,12	109,0		0,00	89,03	-	-	0,00	0,00	-
31	10 410	10 411	5,85	109,0		0,00	91,35	-	-	0,00	0,00	-
32	9 402	9 404	7,09	109,0		0,00	90,47	-	-	0,00	0,00	-
33	11 830	11 832	4,29	109,0		0,00	92,46	-	-	0,00	0,00	-
34	8 886	8 888	7,79	109,0		0,00	89,98	-	-	0,00	0,00	-
35	10 324	10 326	5,95	109,0		0,00	91,28	-	-	0,00	0,00	-
36	11 241	11 243	4,91	109,0		0,00	92,02	-	-	0,00	0,00	-
37	12 081	12 082	4,04	109,0		0,00	92,64	-	-	0,00	0,00	-
38	9 893	9 895	6,47	109,0		0,00	90,91	-	-	0,00	0,00	-
39	10 803	10 804	5,41	109,0		0,00	91,67	-	-	0,00	0,00	-
4	6 473	6 477	11,24	109,0		0,00	87,23	-	-	0,00	0,00	-
40	11 815	11 816	4,31	109,0		0,00	92,45	-	-	0,00	0,00	-
41	4 734	4 738	14,83	108,0		0,00	84,51	-	-	0,00	0,00	-
42	3 895	3 900	17,57	108,0		0,00	82,82	-	-	0,00	0,00	-
43	4 845	4 849	14,53	108,0		0,00	84,71	-	-	0,00	0,00	-

To be continued on next page...

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23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
44	3 106	3 113	20,70	108,0		0,00	80,86	-	-	0,00	0,00	-
45	3 789	3 795	17,95	108,0		0,00	82,58	-	-	0,00	0,00	-
46	4 669	4 673	15,03	108,0		0,00	84,39	-	-	0,00	0,00	-
47	5 494	5 497	12,75	108,0		0,00	85,80	-	-	0,00	0,00	-
48	3 410	3 416	19,41	108,0		0,00	81,67	-	-	0,00	0,00	-
49	4 091	4 096	16,88	108,0		0,00	83,25	-	-	0,00	0,00	-
5	5 750	5 755	12,90	109,0		0,00	86,20	-	-	0,00	0,00	-
50	4 858	4 863	14,47	108,0		0,00	84,74	-	-	0,00	0,00	-
51	5 578	5 582	12,52	108,0		0,00	85,94	-	-	0,00	0,00	-
52	3 719	3 725	18,21	108,0		0,00	82,42	-	-	0,00	0,00	-
53	4 408	4 413	15,84	108,0		0,00	83,89	-	-	0,00	0,00	-
54	5 439	5 443	12,88	108,0		0,00	85,72	-	-	0,00	0,00	-
55	4 101	4 107	16,85	108,0		0,00	83,27	-	-	0,00	0,00	-
56	4 855	4 859	14,48	108,0		0,00	84,73	-	-	0,00	0,00	-
57	5 731	5 735	12,14	108,0		0,00	86,17	-	-	0,00	0,00	-
58	6 623	6 627	10,27	108,0		0,00	87,43	-	-	0,00	0,00	-
59	5 532	5 536	12,64	108,0		0,00	85,86	-	-	0,00	0,00	-
6	6 856	6 860	10,47	109,0		0,00	87,73	-	-	0,00	0,00	-
60	6 112	6 116	11,23	108,0		0,00	86,73	-	-	0,00	0,00	-
61	6 794	6 798	9,96	108,0		0,00	87,65	-	-	0,00	0,00	-
62	7 390	7 394	8,94	108,0		0,00	88,38	-	-	0,00	0,00	-
63	8 275	8 277	7,58	108,0		0,00	89,36	-	-	0,00	0,00	-
64	6 473	6 477	10,54	108,0		0,00	87,23	-	-	0,00	0,00	-
65	7 077	7 080	9,47	108,0		0,00	88,00	-	-	0,00	0,00	-
66	7 835	7 838	8,24	108,0		0,00	88,88	-	-	0,00	0,00	-
67	8 775	8 777	6,86	108,0		0,00	89,87	-	-	0,00	0,00	-
68	9 461	9 464	5,95	108,0		0,00	90,52	-	-	0,00	0,00	-
69	7 146	7 149	9,35	108,0		0,00	88,09	-	-	0,00	0,00	-
7	6 096	6 101	12,08	109,0		0,00	86,71	-	-	0,00	0,00	-
70	7 692	7 695	8,46	108,0		0,00	88,72	-	-	0,00	0,00	-
71	8 559	8 561	7,17	108,0		0,00	89,65	-	-	0,00	0,00	-
72	9 280	9 282	6,19	108,0		0,00	90,35	-	-	0,00	0,00	-
73	9 986	9 988	5,30	108,0		0,00	90,99	-	-	0,00	0,00	-
74	8 347	8 350	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
75	9 051	9 054	6,49	108,0		0,00	90,14	-	-	0,00	0,00	-
76	9 974	9 976	5,31	108,0		0,00	90,98	-	-	0,00	0,00	-
77	10 631	10 633	4,54	108,0		0,00	91,53	-	-	0,00	0,00	-
78	8 696	8 699	6,97	108,0		0,00	89,79	-	-	0,00	0,00	-
79	8 920	8 923	6,66	108,0		0,00	90,01	-	-	0,00	0,00	-
8	6 553	6 557	11,07	109,0		0,00	87,33	-	-	0,00	0,00	-
80	9 185	9 188	6,31	108,0		0,00	90,26	-	-	0,00	0,00	-
81	9 790	9 792	5,54	108,0		0,00	90,82	-	-	0,00	0,00	-
82	9 697	9 699	5,65	108,0		0,00	90,73	-	-	0,00	0,00	-
83	9 981	9 983	5,30	108,0		0,00	90,99	-	-	0,00	0,00	-
84	10 464	10 466	4,73	108,0		0,00	91,40	-	-	0,00	0,00	-
85	10 646	10 649	4,52	108,0		0,00	91,55	-	-	0,00	0,00	-
86	11 026	11 028	4,10	108,0		0,00	91,85	-	-	0,00	0,00	-
87	11 072	11 074	4,05	108,0		0,00	91,89	-	-	0,00	0,00	-
88	11 633	11 635	3,45	108,0		0,00	92,32	-	-	0,00	0,00	-
89	11 874	11 876	3,20	108,0		0,00	92,49	-	-	0,00	0,00	-
9	6 896	6 900	10,41	109,0		0,00	87,78	-	-	0,00	0,00	-
90	15 929	15 930	0,02	108,0		0,00	95,04	-	-	0,00	0,00	-
91	15 989	15 990	-0,03	108,0		0,00	95,08	-	-	0,00	0,00	-
92	15 358	15 359	0,47	108,0		0,00	94,73	-	-	0,00	0,00	-
93	15 029	15 030	0,74	108,0		0,00	94,54	-	-	0,00	0,00	-
94	15 184	15 184	0,61	108,0		0,00	94,63	-	-	0,00	0,00	-
95	15 483	15 484	0,37	108,0		0,00	94,80	-	-	0,00	0,00	-
96	16 094	16 095	-0,11	108,0		0,00	95,13	-	-	0,00	0,00	-
97	15 836	15 837	0,09	108,0		0,00	94,99	-	-	0,00	0,00	-
98	5 362	5 364	13,14	107,8		0,00	85,59	-	-	0,00	0,00	-
99	4 337	4 339	15,87	107,8		0,00	83,75	-	-	0,00	0,00	-
Sum			36,53									

- Data undefined due to calculation with octave data

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DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

Noise sensitive area: E Asuinrakennus E (Säilynkankaantie 34)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	7 952	7 955	8,71	109,0		0,00	89,01	-	-	0,00	0,00	-
10	8 966	8 969	7,29	109,0		0,00	90,05	-	-	0,00	0,00	-
100	3 691	3 694	18,13	107,8		0,00	82,35	-	-	0,00	0,00	-
101	4 448	4 450	15,52	107,8		0,00	83,97	-	-	0,00	0,00	-
102	3 408	3 411	19,24	107,8		0,00	81,66	-	-	0,00	0,00	-
103	3 682	3 685	18,16	107,8		0,00	82,33	-	-	0,00	0,00	-
104	2 916	2 920	21,37	107,8		0,00	80,31	-	-	0,00	0,00	-
105	3 310	3 313	19,64	107,8		0,00	81,41	-	-	0,00	0,00	-
106	6 641	6 644	12,35	106,9		0,00	87,45	-	-	0,00	0,00	-
107	6 667	6 670	12,31	106,9		0,00	87,48	-	-	0,00	0,00	-
108	6 338	6 342	12,88	106,9		0,00	87,04	-	-	0,00	0,00	-
109	3 761	3 767	19,60	106,9		0,00	82,52	-	-	0,00	0,00	-
11	8 108	8 111	8,48	109,0		0,00	89,18	-	-	0,00	0,00	-
110	5 357	5 361	15,03	106,9		0,00	85,59	-	-	0,00	0,00	-
111	5 032	5 037	15,85	106,9		0,00	85,04	-	-	0,00	0,00	-
112	5 892	5 896	13,78	106,9		0,00	86,41	-	-	0,00	0,00	-
113	5 947	5 951	13,66	106,9		0,00	86,49	-	-	0,00	0,00	-
114	4 340	4 345	17,77	106,9		0,00	83,76	-	-	0,00	0,00	-
115	3 562	3 568	20,29	106,9		0,00	82,05	-	-	0,00	0,00	-
116	3 515	3 521	20,46	106,9		0,00	81,93	-	-	0,00	0,00	-
117	2 932	2 939	22,71	106,9		0,00	80,37	-	-	0,00	0,00	-
118	2 209	2 218	26,11	106,9		0,00	77,92	-	-	0,00	0,00	-
119	2 595	2 603	24,19	106,9		0,00	79,31	-	-	0,00	0,00	-
12	9 051	9 054	7,17	109,0		0,00	90,14	-	-	0,00	0,00	-
120	2 406	2 415	25,10	106,9		0,00	78,66	-	-	0,00	0,00	-
121	3 835	3 841	19,36	106,9		0,00	82,69	-	-	0,00	0,00	-
122	2 954	2 961	22,62	106,9		0,00	80,43	-	-	0,00	0,00	-
123	1 970	1 981	27,44	106,9		0,00	76,94	-	-	0,00	0,00	-
124	6 423	6 427	13,50	109,2	2	0,00	87,16	-	-	0,00	0,00	-
125	6 946	6 949	12,53	109,2	2	0,00	87,84	-	-	0,00	0,00	-
126	6 471	6 474	13,41	109,2	2	0,00	87,22	-	-	0,00	0,00	-
127	7 560	7 563	11,47	109,2	2	0,00	88,57	-	-	0,00	0,00	-
128	7 027	7 030	12,38	109,2	2	0,00	87,94	-	-	0,00	0,00	-
129	7 916	7 918	10,90	109,2	2	0,00	88,97	-	-	0,00	0,00	-
13	10 228	10 230	5,73	109,0		0,00	91,20	-	-	0,00	0,00	-
130	6 983	6 986	12,46	109,2	2	0,00	87,88	-	-	0,00	0,00	-
131	8 308	8 311	10,30	109,2	2	0,00	89,39	-	-	0,00	0,00	-
132	7 564	7 567	11,47	109,2	2	0,00	88,58	-	-	0,00	0,00	-
14	9 616	9 617	6,81	109,0		0,00	90,66	-	-	0,00	0,00	-
15	9 506	9 507	6,95	109,0		0,00	90,56	-	-	0,00	0,00	-
16	8 855	8 856	7,82	109,0		0,00	89,95	-	-	0,00	0,00	-
17	8 646	8 647	8,11	109,0		0,00	89,74	-	-	0,00	0,00	-
18	10 031	10 032	6,30	109,0		0,00	91,03	-	-	0,00	0,00	-
19	6 019	6 021	12,53	109,0		0,00	86,59	-	-	0,00	0,00	-
2	7 494	7 497	9,42	109,0		0,00	88,50	-	-	0,00	0,00	-
20	9 645	9 647	6,77	109,0		0,00	90,69	-	-	0,00	0,00	-
21	9 133	9 135	7,44	109,0		0,00	90,21	-	-	0,00	0,00	-
22	5 961	5 963	12,65	109,0		0,00	86,51	-	-	0,00	0,00	-
23	9 257	9 258	7,28	109,0		0,00	90,33	-	-	0,00	0,00	-
24	9 137	9 138	7,43	109,0		0,00	90,22	-	-	0,00	0,00	-
25	9 222	9 224	7,32	109,0		0,00	90,30	-	-	0,00	0,00	-
26	8 205	8 207	8,75	109,0		0,00	89,28	-	-	0,00	0,00	-
27	9 607	9 609	6,82	109,0		0,00	90,65	-	-	0,00	0,00	-
28	8 776	8 778	7,93	109,0		0,00	89,87	-	-	0,00	0,00	-
29	10 190	10 191	6,11	109,0		0,00	91,16	-	-	0,00	0,00	-
3	8 054	8 057	8,56	109,0		0,00	89,12	-	-	0,00	0,00	-
30	8 813	8 815	7,87	109,0		0,00	89,90	-	-	0,00	0,00	-
31	11 203	11 205	4,95	109,0		0,00	91,99	-	-	0,00	0,00	-
32	10 226	10 228	6,06	109,0		0,00	91,20	-	-	0,00	0,00	-
33	12 597	12 598	3,53	109,0		0,00	93,01	-	-	0,00	0,00	-
34	9 742	9 744	6,65	109,0		0,00	90,77	-	-	0,00	0,00	-
35	11 155	11 157	5,01	109,0		0,00	91,95	-	-	0,00	0,00	-
36	12 049	12 050	4,07	109,0		0,00	92,62	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
37	12 884	12 885	3,26	109,0		0,00	93,20	-	-	0,00	0,00	-
38	10 755	10 757	5,46	109,0		0,00	91,63	-	-	0,00	0,00	-
39	11 651	11 652	4,48	109,0		0,00	92,33	-	-	0,00	0,00	-
4	7 144	7 148	9,99	109,0		0,00	88,08	-	-	0,00	0,00	-
40	12 639	12 640	3,49	109,0		0,00	93,04	-	-	0,00	0,00	-
41	5 510	5 514	12,69	108,0		0,00	85,83	-	-	0,00	0,00	-
42	4 746	4 750	14,80	108,0		0,00	84,53	-	-	0,00	0,00	-
43	5 710	5 714	12,20	108,0		0,00	86,14	-	-	0,00	0,00	-
44	4 033	4 039	17,08	108,0		0,00	83,12	-	-	0,00	0,00	-
45	4 696	4 700	14,95	108,0		0,00	84,44	-	-	0,00	0,00	-
46	5 583	5 587	12,51	108,0		0,00	85,94	-	-	0,00	0,00	-
47	6 381	6 384	10,72	108,0		0,00	87,10	-	-	0,00	0,00	-
48	4 367	4 372	15,97	108,0		0,00	83,81	-	-	0,00	0,00	-
49	5 042	5 046	13,95	108,0		0,00	85,06	-	-	0,00	0,00	-
5	6 478	6 481	11,23	109,0		0,00	87,23	-	-	0,00	0,00	-
50	5 803	5 807	11,96	108,0		0,00	86,28	-	-	0,00	0,00	-
51	6 509	6 512	10,48	108,0		0,00	87,27	-	-	0,00	0,00	-
52	4 669	4 674	15,03	108,0		0,00	84,39	-	-	0,00	0,00	-
53	5 365	5 370	13,07	108,0		0,00	85,60	-	-	0,00	0,00	-
54	6 391	6 395	10,70	108,0		0,00	87,12	-	-	0,00	0,00	-
55	5 027	5 032	13,99	108,0		0,00	85,03	-	-	0,00	0,00	-
56	5 807	5 811	11,95	108,0		0,00	86,29	-	-	0,00	0,00	-
57	6 689	6 692	10,15	108,0		0,00	87,51	-	-	0,00	0,00	-
58	7 577	7 580	8,64	108,0		0,00	88,59	-	-	0,00	0,00	-
59	6 459	6 463	10,57	108,0		0,00	87,21	-	-	0,00	0,00	-
6	7 583	7 587	9,28	109,0		0,00	88,60	-	-	0,00	0,00	-
60	7 055	7 059	9,50	108,0		0,00	87,97	-	-	0,00	0,00	-
61	7 748	7 751	8,37	108,0		0,00	88,79	-	-	0,00	0,00	-
62	8 348	8 351	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
63	9 231	9 233	6,25	108,0		0,00	90,31	-	-	0,00	0,00	-
64	7 399	7 402	8,93	108,0		0,00	88,39	-	-	0,00	0,00	-
65	8 021	8 024	7,95	108,0		0,00	89,09	-	-	0,00	0,00	-
66	8 790	8 793	6,84	108,0		0,00	89,88	-	-	0,00	0,00	-
67	9 732	9 734	5,61	108,0		0,00	90,77	-	-	0,00	0,00	-
68	10 417	10 419	4,79	108,0		0,00	91,36	-	-	0,00	0,00	-
69	8 067	8 070	7,88	108,0		0,00	89,14	-	-	0,00	0,00	-
7	6 887	6 890	10,42	109,0		0,00	87,76	-	-	0,00	0,00	-
70	8 633	8 636	7,06	108,0		0,00	89,73	-	-	0,00	0,00	-
71	9 513	9 516	5,88	108,0		0,00	90,57	-	-	0,00	0,00	-
72	10 237	10 239	5,00	108,0		0,00	91,20	-	-	0,00	0,00	-
73	10 943	10 945	4,19	108,0		0,00	91,78	-	-	0,00	0,00	-
74	9 288	9 291	6,17	108,0		0,00	90,36	-	-	0,00	0,00	-
75	10 001	10 003	5,28	108,0		0,00	91,00	-	-	0,00	0,00	-
76	10 930	10 932	4,20	108,0		0,00	91,77	-	-	0,00	0,00	-
77	11 588	11 590	3,50	108,0		0,00	92,28	-	-	0,00	0,00	-
78	9 588	9 590	5,79	108,0		0,00	90,64	-	-	0,00	0,00	-
79	9 837	9 840	5,48	108,0		0,00	90,86	-	-	0,00	0,00	-
8	7 385	7 388	9,59	109,0		0,00	88,37	-	-	0,00	0,00	-
80	10 123	10 125	5,13	108,0		0,00	91,11	-	-	0,00	0,00	-
81	10 739	10 741	4,42	108,0		0,00	91,62	-	-	0,00	0,00	-
82	10 617	10 620	4,55	108,0		0,00	91,52	-	-	0,00	0,00	-
83	10 920	10 922	4,21	108,0		0,00	91,77	-	-	0,00	0,00	-
84	11 383	11 385	3,71	108,0		0,00	92,13	-	-	0,00	0,00	-
85	11 586	11 588	3,50	108,0		0,00	92,28	-	-	0,00	0,00	-
86	11 931	11 933	3,14	108,0		0,00	92,54	-	-	0,00	0,00	-
87	12 002	12 004	3,07	108,0		0,00	92,59	-	-	0,00	0,00	-
88	12 558	12 560	2,52	108,0		0,00	92,98	-	-	0,00	0,00	-
89	12 782	12 784	2,31	108,0		0,00	93,13	-	-	0,00	0,00	-
9	7 772	7 776	9,00	109,0		0,00	88,81	-	-	0,00	0,00	-
90	16 341	16 341	-0,30	108,0		0,00	95,27	-	-	0,00	0,00	-
91	16 457	16 458	-0,39	108,0		0,00	95,33	-	-	0,00	0,00	-
92	15 652	15 653	0,24	108,0		0,00	94,89	-	-	0,00	0,00	-
93	15 364	15 365	0,47	108,0		0,00	94,73	-	-	0,00	0,00	-
94	15 584	15 585	0,29	108,0		0,00	94,85	-	-	0,00	0,00	-

To be continued on next page...

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23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
95	15 943	15 944	0,01	108,0		0,00	95,05	-	-	0,00	0,00	-
96	16 399	16 399	-0,34	108,0		0,00	95,30	-	-	0,00	0,00	-
97	16 173	16 174	-0,17	108,0		0,00	95,18	-	-	0,00	0,00	-
98	5 011	5 013	13,97	107,8		0,00	85,00	-	-	0,00	0,00	-
99	4 065	4 067	16,78	107,8		0,00	83,19	-	-	0,00	0,00	-
Sum			36,05									

- Data undefined due to calculation with octave data

Noise sensitive area: F Asuinrakennus F (Ritamäentie 156)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	9 018	9 021	7,22	109,0		0,00	90,11	-	-	0,00	0,00	-
10	10 316	10 318	5,62	109,0		0,00	91,27	-	-	0,00	0,00	-
100	4 088	4 091	16,70	107,8		0,00	83,24	-	-	0,00	0,00	-
101	4 528	4 530	15,27	107,8		0,00	84,12	-	-	0,00	0,00	-
102	4 001	4 004	17,00	107,8		0,00	83,05	-	-	0,00	0,00	-
103	3 773	3 776	17,82	107,8		0,00	82,54	-	-	0,00	0,00	-
104	3 194	3 198	20,13	107,8		0,00	81,10	-	-	0,00	0,00	-
105	3 161	3 165	20,27	107,8		0,00	81,01	-	-	0,00	0,00	-
106	7 214	7 217	11,40	106,9		0,00	88,17	-	-	0,00	0,00	-
107	7 103	7 106	11,58	106,9		0,00	88,03	-	-	0,00	0,00	-
108	6 651	6 655	12,33	106,9		0,00	87,46	-	-	0,00	0,00	-
109	4 453	4 458	17,44	106,9		0,00	83,98	-	-	0,00	0,00	-
11	9 469	9 472	6,64	109,0		0,00	90,53	-	-	0,00	0,00	-
110	5 852	5 856	13,87	106,9		0,00	86,35	-	-	0,00	0,00	-
111	5 652	5 656	14,33	106,9		0,00	86,05	-	-	0,00	0,00	-
112	6 493	6 497	12,61	106,9		0,00	87,25	-	-	0,00	0,00	-
113	6 400	6 403	12,77	106,9		0,00	87,13	-	-	0,00	0,00	-
114	4 527	4 532	17,23	106,9		0,00	84,13	-	-	0,00	0,00	-
115	3 409	3 416	20,84	106,9		0,00	81,67	-	-	0,00	0,00	-
116	3 708	3 713	19,78	106,9		0,00	82,40	-	-	0,00	0,00	-
117	2 680	2 688	23,80	106,9		0,00	79,59	-	-	0,00	0,00	-
118	1 957	1 969	27,51	106,9		0,00	76,88	-	-	0,00	0,00	-
119	3 039	3 046	22,27	106,9		0,00	80,67	-	-	0,00	0,00	-
12	10 412	10 415	5,51	109,0		0,00	91,35	-	-	0,00	0,00	-
120	2 523	2 532	24,53	106,9		0,00	79,07	-	-	0,00	0,00	-
121	4 254	4 260	18,03	106,9		0,00	83,59	-	-	0,00	0,00	-
122	3 705	3 711	19,79	106,9		0,00	82,39	-	-	0,00	0,00	-
123	2 605	2 613	24,15	106,9		0,00	79,34	-	-	0,00	0,00	-
124	5 619	5 623	15,31	109,2	2	0,00	86,00	-	-	0,00	0,00	-
125	6 384	6 387	13,57	109,2	2	0,00	87,11	-	-	0,00	0,00	-
126	5 830	5 834	14,78	109,2	2	0,00	86,32	-	-	0,00	0,00	-
127	6 916	6 919	12,58	109,2	2	0,00	87,80	-	-	0,00	0,00	-
128	6 138	6 141	14,06	109,2	2	0,00	86,77	-	-	0,00	0,00	-
129	7 136	7 139	12,19	109,2	2	0,00	88,07	-	-	0,00	0,00	-
13	11 580	11 582	4,25	109,0		0,00	92,28	-	-	0,00	0,00	-
130	6 255	6 259	13,83	109,2	2	0,00	86,93	-	-	0,00	0,00	-
131	7 597	7 600	11,41	109,2	2	0,00	88,62	-	-	0,00	0,00	-
132	6 703	6 706	12,97	109,2	2	0,00	87,53	-	-	0,00	0,00	-
14	10 469	10 470	5,78	109,0		0,00	91,40	-	-	0,00	0,00	-
15	10 417	10 419	5,84	109,0		0,00	91,36	-	-	0,00	0,00	-
16	9 807	9 809	6,57	109,0		0,00	90,83	-	-	0,00	0,00	-
17	9 667	9 669	6,75	109,0		0,00	90,71	-	-	0,00	0,00	-
18	11 040	11 042	5,13	109,0		0,00	91,86	-	-	0,00	0,00	-
19	7 140	7 142	10,45	109,0		0,00	88,08	-	-	0,00	0,00	-
2	8 624	8 627	7,75	109,0		0,00	89,72	-	-	0,00	0,00	-
20	10 705	10 706	5,51	109,0		0,00	91,59	-	-	0,00	0,00	-
21	10 238	10 239	6,05	109,0		0,00	91,21	-	-	0,00	0,00	-
22	7 167	7 169	10,40	109,0		0,00	88,11	-	-	0,00	0,00	-
23	10 412	10 414	5,84	109,0		0,00	91,35	-	-	0,00	0,00	-
24	10 338	10 339	5,93	109,0		0,00	91,29	-	-	0,00	0,00	-
25	10 463	10 465	5,78	109,0		0,00	91,39	-	-	0,00	0,00	-

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23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
26	9 487	9 489	6,98	109,0		0,00	90,54	-	-	0,00	0,00	-
27	10 879	10 880	5,31	109,0		0,00	91,73	-	-	0,00	0,00	-
28	10 081	10 083	6,24	109,0		0,00	91,07	-	-	0,00	0,00	-
29	11 482	11 483	4,66	109,0		0,00	92,20	-	-	0,00	0,00	-
3	9 236	9 239	6,93	109,0		0,00	90,31	-	-	0,00	0,00	-
30	10 145	10 146	6,16	109,0		0,00	91,13	-	-	0,00	0,00	-
31	12 497	12 498	3,63	109,0		0,00	92,94	-	-	0,00	0,00	-
32	11 542	11 544	4,59	109,0		0,00	92,25	-	-	0,00	0,00	-
33	13 868	13 869	2,37	109,0		0,00	93,84	-	-	0,00	0,00	-
34	11 078	11 079	5,09	109,0		0,00	91,89	-	-	0,00	0,00	-
35	12 474	12 476	3,65	109,0		0,00	92,92	-	-	0,00	0,00	-
36	13 351	13 352	2,83	109,0		0,00	93,51	-	-	0,00	0,00	-
37	14 182	14 184	2,10	109,0		0,00	94,04	-	-	0,00	0,00	-
38	12 093	12 095	4,03	109,0		0,00	92,65	-	-	0,00	0,00	-
39	12 980	12 982	3,17	109,0		0,00	93,27	-	-	0,00	0,00	-
4	8 358	8 361	8,12	109,0		0,00	89,45	-	-	0,00	0,00	-
40	13 953	13 954	2,30	109,0		0,00	93,89	-	-	0,00	0,00	-
41	6 810	6 813	9,93	108,0		0,00	87,67	-	-	0,00	0,00	-
42	6 088	6 091	11,29	108,0		0,00	86,69	-	-	0,00	0,00	-
43	7 055	7 058	9,51	108,0		0,00	87,97	-	-	0,00	0,00	-
44	5 395	5 399	12,99	108,0		0,00	85,65	-	-	0,00	0,00	-
45	6 055	6 059	11,37	108,0		0,00	86,65	-	-	0,00	0,00	-
46	6 943	6 946	9,70	108,0		0,00	87,84	-	-	0,00	0,00	-
47	7 734	7 737	8,39	108,0		0,00	88,77	-	-	0,00	0,00	-
48	5 705	5 709	12,20	108,0		0,00	86,13	-	-	0,00	0,00	-
49	6 394	6 398	10,69	108,0		0,00	87,12	-	-	0,00	0,00	-
5	7 739	7 742	9,04	109,0		0,00	88,78	-	-	0,00	0,00	-
50	7 161	7 164	9,33	108,0		0,00	88,10	-	-	0,00	0,00	-
51	7 870	7 873	8,18	108,0		0,00	88,92	-	-	0,00	0,00	-
52	5 967	5 971	11,57	108,0		0,00	86,52	-	-	0,00	0,00	-
53	6 696	6 699	10,14	108,0		0,00	87,52	-	-	0,00	0,00	-
54	7 742	7 745	8,38	108,0		0,00	88,78	-	-	0,00	0,00	-
55	6 273	6 276	10,92	108,0		0,00	86,95	-	-	0,00	0,00	-
56	7 110	7 113	9,41	108,0		0,00	88,04	-	-	0,00	0,00	-
57	8 021	8 024	7,95	108,0		0,00	89,09	-	-	0,00	0,00	-
58	8 925	8 927	6,66	108,0		0,00	90,01	-	-	0,00	0,00	-
59	7 699	7 702	8,45	108,0		0,00	88,73	-	-	0,00	0,00	-
6	8 838	8 841	7,46	109,0		0,00	89,93	-	-	0,00	0,00	-
60	8 327	8 330	7,50	108,0		0,00	89,41	-	-	0,00	0,00	-
61	9 052	9 055	6,49	108,0		0,00	90,14	-	-	0,00	0,00	-
62	9 674	9 676	5,68	108,0		0,00	90,71	-	-	0,00	0,00	-
63	10 573	10 575	4,61	108,0		0,00	91,49	-	-	0,00	0,00	-
64	8 631	8 634	7,06	108,0		0,00	89,72	-	-	0,00	0,00	-
65	9 294	9 297	6,17	108,0		0,00	90,37	-	-	0,00	0,00	-
66	10 100	10 102	5,16	108,0		0,00	91,09	-	-	0,00	0,00	-
67	11 064	11 066	4,06	108,0		0,00	91,88	-	-	0,00	0,00	-
68	11 760	11 762	3,32	108,0		0,00	92,41	-	-	0,00	0,00	-
69	9 288	9 291	6,17	108,0		0,00	90,36	-	-	0,00	0,00	-
7	8 188	8 191	8,37	109,0		0,00	89,27	-	-	0,00	0,00	-
70	9 897	9 899	5,41	108,0		0,00	90,91	-	-	0,00	0,00	-
71	10 820	10 822	4,33	108,0		0,00	91,69	-	-	0,00	0,00	-
72	11 555	11 557	3,53	108,0		0,00	92,26	-	-	0,00	0,00	-
73	12 278	12 280	2,80	108,0		0,00	92,78	-	-	0,00	0,00	-
74	10 551	10 553	4,63	108,0		0,00	91,47	-	-	0,00	0,00	-
75	11 288	11 290	3,81	108,0		0,00	92,05	-	-	0,00	0,00	-
76	12 242	12 243	2,83	108,0		0,00	92,76	-	-	0,00	0,00	-
77	12 919	12 921	2,18	108,0		0,00	93,23	-	-	0,00	0,00	-
78	10 746	10 748	4,41	108,0		0,00	91,63	-	-	0,00	0,00	-
79	11 045	11 047	4,08	108,0		0,00	91,86	-	-	0,00	0,00	-
8	8 710	8 713	7,63	109,0		0,00	89,80	-	-	0,00	0,00	-
80	11 376	11 378	3,72	108,0		0,00	92,12	-	-	0,00	0,00	-
81	12 021	12 023	3,05	108,0		0,00	92,60	-	-	0,00	0,00	-
82	11 831	11 833	3,25	108,0		0,00	92,46	-	-	0,00	0,00	-
83	12 174	12 176	2,90	108,0		0,00	92,71	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
84	12 590	12 592	2,50	108,0		0,00	93,00	-	-	0,00	0,00	-
85	12 840	12 842	2,26	108,0		0,00	93,17	-	-	0,00	0,00	-
86	13 110	13 112	2,00	108,0		0,00	93,35	-	-	0,00	0,00	-
87	13 233	13 235	1,89	108,0		0,00	93,43	-	-	0,00	0,00	-
88	13 776	13 778	1,41	108,0		0,00	93,78	-	-	0,00	0,00	-
89	13 964	13 965	1,24	108,0		0,00	93,90	-	-	0,00	0,00	-
9	9 119	9 123	7,10	109,0		0,00	90,20	-	-	0,00	0,00	-
90	16 711	16 712	-0,58	108,0		0,00	95,46	-	-	0,00	0,00	-
91	16 912	16 913	-0,72	108,0		0,00	95,56	-	-	0,00	0,00	-
92	15 855	15 856	0,08	108,0		0,00	95,00	-	-	0,00	0,00	-
93	15 629	15 630	0,25	108,0		0,00	94,88	-	-	0,00	0,00	-
94	15 944	15 944	0,01	108,0		0,00	95,05	-	-	0,00	0,00	-
95	16 389	16 390	-0,33	108,0		0,00	95,29	-	-	0,00	0,00	-
96	16 612	16 613	-0,50	108,0		0,00	95,41	-	-	0,00	0,00	-
97	16 436	16 436	-0,37	108,0		0,00	95,32	-	-	0,00	0,00	-
98	5 123	5 125	13,70	107,8		0,00	85,19	-	-	0,00	0,00	-
99	4 360	4 362	15,80	107,8		0,00	83,79	-	-	0,00	0,00	-
Sum			35,13									

- Data undefined due to calculation with octave data

Noise sensitive area: G Lomarakennus G (Virtaniementie 175)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	12 790	12 792	3,07	109,0		0,00	93,14	-	-	0,00	0,00	-
10	9 543	9 546	6,54	109,0		0,00	90,60	-	-	0,00	0,00	-
100	12 083	12 084	3,07	107,8		0,00	92,64	-	-	0,00	0,00	-
101	13 134	13 134	2,05	107,8		0,00	93,37	-	-	0,00	0,00	-
102	11 549	11 550	3,63	107,8		0,00	92,25	-	-	0,00	0,00	-
103	12 444	12 444	2,71	107,8		0,00	92,90	-	-	0,00	0,00	-
104	11 614	11 614	3,56	107,8		0,00	92,30	-	-	0,00	0,00	-
105	12 275	12 275	2,88	107,8		0,00	92,78	-	-	0,00	0,00	-
106	3 100	3 106	22,03	106,9		0,00	80,84	-	-	0,00	0,00	-
107	3 690	3 695	19,85	106,9		0,00	82,35	-	-	0,00	0,00	-
108	4 430	4 434	17,51	106,9		0,00	83,94	-	-	0,00	0,00	-
109	5 437	5 440	14,84	106,9		0,00	85,71	-	-	0,00	0,00	-
11	8 194	8 196	8,36	109,0		0,00	89,27	-	-	0,00	0,00	-
110	4 381	4 385	17,66	106,9		0,00	83,84	-	-	0,00	0,00	-
111	4 334	4 338	17,79	106,9		0,00	83,75	-	-	0,00	0,00	-
112	3 610	3 615	20,12	106,9		0,00	82,16	-	-	0,00	0,00	-
113	4 080	4 084	18,57	106,9		0,00	83,22	-	-	0,00	0,00	-
114	6 040	6 043	13,45	106,9		0,00	86,62	-	-	0,00	0,00	-
115	7 390	7 393	11,12	106,9		0,00	88,38	-	-	0,00	0,00	-
116	6 589	6 591	12,44	106,9		0,00	87,38	-	-	0,00	0,00	-
117	7 916	7 919	10,31	106,9		0,00	88,97	-	-	0,00	0,00	-
118	8 287	8 289	9,77	106,9		0,00	89,37	-	-	0,00	0,00	-
119	6 897	6 900	11,92	106,9		0,00	87,78	-	-	0,00	0,00	-
12	8 682	8 685	7,67	109,0		0,00	89,78	-	-	0,00	0,00	-
120	7 560	7 562	10,85	106,9		0,00	88,57	-	-	0,00	0,00	-
121	5 837	5 840	13,91	106,9		0,00	86,33	-	-	0,00	0,00	-
122	6 183	6 186	13,16	106,9		0,00	86,83	-	-	0,00	0,00	-
123	7 280	7 283	11,29	106,9		0,00	88,25	-	-	0,00	0,00	-
124	9 688	9 689	8,39	109,2	2	0,00	90,73	-	-	0,00	0,00	-
125	8 632	8 634	9,82	109,2	2	0,00	89,72	-	-	0,00	0,00	-
126	8 900	8 902	9,45	109,2	2	0,00	89,99	-	-	0,00	0,00	-
127	9 250	9 252	8,97	109,2	2	0,00	90,32	-	-	0,00	0,00	-
128	10 371	10 373	7,55	109,2	2	0,00	91,32	-	-	0,00	0,00	-
129	10 156	10 158	7,81	109,2	2	0,00	91,14	-	-	0,00	0,00	-
13	10 141	10 143	5,82	109,0		0,00	91,12	-	-	0,00	0,00	-
130	9 490	9 491	8,65	109,2	2	0,00	90,55	-	-	0,00	0,00	-
131	9 934	9 935	8,08	109,2	2	0,00	90,94	-	-	0,00	0,00	-
132	10 457	10 458	7,45	109,2	2	0,00	91,39	-	-	0,00	0,00	-
14	15 321	15 322	1,17	109,0		0,00	94,71	-	-	0,00	0,00	-

To be continued on next page...

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...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
15	14 913	14 914	1,49	109,0		0,00	94,47	-	-	0,00	0,00	-
16	14 175	14 176	2,11	109,0		0,00	94,03	-	-	0,00	0,00	-
17	13 586	13 587	2,62	109,0		0,00	93,66	-	-	0,00	0,00	-
18	14 701	14 702	1,67	109,0		0,00	94,35	-	-	0,00	0,00	-
19	11 223	11 224	4,94	109,0		0,00	92,00	-	-	0,00	0,00	-
2	12 017	12 019	3,81	109,0		0,00	92,60	-	-	0,00	0,00	-
20	14 050	14 050	2,21	109,0		0,00	93,95	-	-	0,00	0,00	-
21	13 321	13 321	2,86	109,0		0,00	93,49	-	-	0,00	0,00	-
22	10 529	10 530	5,72	109,0		0,00	91,45	-	-	0,00	0,00	-
23	12 953	12 954	3,20	109,0		0,00	93,25	-	-	0,00	0,00	-
24	12 406	12 407	3,72	109,0		0,00	92,87	-	-	0,00	0,00	-
25	11 977	11 978	4,14	109,0		0,00	92,57	-	-	0,00	0,00	-
26	10 792	10 793	5,41	109,0		0,00	91,66	-	-	0,00	0,00	-
27	11 791	11 792	4,33	109,0		0,00	92,43	-	-	0,00	0,00	-
28	10 705	10 706	5,51	109,0		0,00	91,59	-	-	0,00	0,00	-
29	11 817	11 818	4,31	109,0		0,00	92,45	-	-	0,00	0,00	-
3	11 906	11 908	3,92	109,0		0,00	92,52	-	-	0,00	0,00	-
30	10 105	10 107	6,21	109,0		0,00	91,09	-	-	0,00	0,00	-
31	12 472	12 473	3,65	109,0		0,00	92,92	-	-	0,00	0,00	-
32	11 333	11 334	4,82	109,0		0,00	92,09	-	-	0,00	0,00	-
33	13 903	13 903	2,34	109,0		0,00	93,86	-	-	0,00	0,00	-
34	10 512	10 514	5,73	109,0		0,00	91,44	-	-	0,00	0,00	-
35	11 869	11 870	4,25	109,0		0,00	92,49	-	-	0,00	0,00	-
36	12 898	12 899	3,25	109,0		0,00	93,21	-	-	0,00	0,00	-
37	13 601	13 602	2,61	109,0		0,00	93,67	-	-	0,00	0,00	-
38	11 053	11 054	5,12	109,0		0,00	91,87	-	-	0,00	0,00	-
39	11 927	11 928	4,20	109,0		0,00	92,53	-	-	0,00	0,00	-
4	11 059	11 060	4,79	109,0		0,00	91,88	-	-	0,00	0,00	-
40	13 067	13 068	3,09	109,0		0,00	93,32	-	-	0,00	0,00	-
41	9 333	9 334	6,13	108,0		0,00	90,40	-	-	0,00	0,00	-
42	8 424	8 426	7,36	108,0		0,00	89,51	-	-	0,00	0,00	-
43	8 493	8 495	7,26	108,0		0,00	89,58	-	-	0,00	0,00	-
44	7 524	7 526	8,73	108,0		0,00	88,53	-	-	0,00	0,00	-
45	7 793	7 795	8,30	108,0		0,00	88,84	-	-	0,00	0,00	-
46	7 748	7 750	8,37	108,0		0,00	88,79	-	-	0,00	0,00	-
47	8 374	8 376	7,43	108,0		0,00	89,46	-	-	0,00	0,00	-
48	6 625	6 628	10,27	108,0		0,00	87,43	-	-	0,00	0,00	-
49	6 862	6 865	9,84	108,0		0,00	87,73	-	-	0,00	0,00	-
5	10 204	10 206	5,75	109,0		0,00	91,18	-	-	0,00	0,00	-
50	7 034	7 036	9,54	108,0		0,00	87,95	-	-	0,00	0,00	-
51	7 543	7 546	8,70	108,0		0,00	88,55	-	-	0,00	0,00	-
52	5 952	5 955	11,61	108,0		0,00	86,50	-	-	0,00	0,00	-
53	6 239	6 242	10,99	108,0		0,00	86,91	-	-	0,00	0,00	-
54	6 740	6 742	10,06	108,0		0,00	87,58	-	-	0,00	0,00	-
55	5 272	5 275	13,32	108,0		0,00	85,45	-	-	0,00	0,00	-
56	5 653	5 656	12,34	108,0		0,00	86,05	-	-	0,00	0,00	-
57	6 170	6 173	11,12	108,0		0,00	86,81	-	-	0,00	0,00	-
58	6 788	6 791	9,97	108,0		0,00	87,64	-	-	0,00	0,00	-
59	4 642	4 646	15,11	108,0		0,00	84,34	-	-	0,00	0,00	-
6	10 832	10 834	5,04	109,0		0,00	91,70	-	-	0,00	0,00	-
60	4 987	4 991	14,10	108,0		0,00	84,96	-	-	0,00	0,00	-
61	5 596	5 600	12,48	108,0		0,00	85,96	-	-	0,00	0,00	-
62	6 253	6 256	10,96	108,0		0,00	86,93	-	-	0,00	0,00	-
63	7 082	7 084	9,46	108,0		0,00	88,01	-	-	0,00	0,00	-
64	4 380	4 385	15,93	108,0		0,00	83,84	-	-	0,00	0,00	-
65	5 024	5 027	14,00	108,0		0,00	85,03	-	-	0,00	0,00	-
66	5 955	5 958	11,60	108,0		0,00	86,50	-	-	0,00	0,00	-
67	6 957	6 960	9,68	108,0		0,00	87,85	-	-	0,00	0,00	-
68	7 698	7 701	8,45	108,0		0,00	88,73	-	-	0,00	0,00	-
69	4 204	4 209	16,50	108,0		0,00	83,48	-	-	0,00	0,00	-
7	9 811	9 813	6,22	109,0		0,00	90,84	-	-	0,00	0,00	-
70	4 959	4 962	14,18	108,0		0,00	84,91	-	-	0,00	0,00	-
71	6 136	6 139	11,19	108,0		0,00	86,76	-	-	0,00	0,00	-
72	6 798	6 800	9,96	108,0		0,00	87,65	-	-	0,00	0,00	-

To be continued on next page...

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Calculated:
23.11.2022 8.50/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
73	7 684	7 686	8,47	108,0		0,00	88,71	-	-	0,00	0,00	-
74	5 135	5 138	13,69	108,0		0,00	85,22	-	-	0,00	0,00	-
75	5 911	5 914	11,71	108,0		0,00	86,44	-	-	0,00	0,00	-
76	6 982	6 984	9,63	108,0		0,00	87,88	-	-	0,00	0,00	-
77	7 947	7 950	8,07	108,0		0,00	89,01	-	-	0,00	0,00	-
78	3 621	3 626	18,59	108,0		0,00	82,19	-	-	0,00	0,00	-
79	4 424	4 428	15,79	108,0		0,00	83,92	-	-	0,00	0,00	-
8	9 566	9 568	6,52	109,0		0,00	90,62	-	-	0,00	0,00	-
80	5 290	5 294	13,27	108,0		0,00	85,48	-	-	0,00	0,00	-
81	6 188	6 191	11,09	108,0		0,00	86,83	-	-	0,00	0,00	-
82	4 891	4 895	14,37	108,0		0,00	84,80	-	-	0,00	0,00	-
83	5 746	5 749	12,11	108,0		0,00	86,19	-	-	0,00	0,00	-
84	5 264	5 268	13,34	108,0		0,00	85,43	-	-	0,00	0,00	-
85	6 157	6 160	11,15	108,0		0,00	86,79	-	-	0,00	0,00	-
86	5 236	5 240	13,41	108,0		0,00	85,39	-	-	0,00	0,00	-
87	6 045	6 048	11,39	108,0		0,00	86,63	-	-	0,00	0,00	-
88	6 247	6 250	10,97	108,0		0,00	86,92	-	-	0,00	0,00	-
89	5 921	5 924	11,68	108,0		0,00	86,45	-	-	0,00	0,00	-
9	9 091	9 093	7,12	109,0		0,00	90,17	-	-	0,00	0,00	-
90	8 476	8 477	7,90	108,0		0,00	89,56	-	-	0,00	0,00	-
91	8 209	8 210	8,30	108,0		0,00	89,29	-	-	0,00	0,00	-
92	8 749	8 750	7,50	108,0		0,00	89,84	-	-	0,00	0,00	-
93	8 155	8 156	8,38	108,0		0,00	89,23	-	-	0,00	0,00	-
94	7 849	7 850	8,87	108,0		0,00	88,90	-	-	0,00	0,00	-
95	7 772	7 773	8,99	108,0		0,00	88,81	-	-	0,00	0,00	-
96	9 334	9 334	6,68	108,0		0,00	90,40	-	-	0,00	0,00	-
97	8 871	8 872	7,32	108,0		0,00	89,96	-	-	0,00	0,00	-
98	13 599	13 599	1,62	107,8		0,00	93,67	-	-	0,00	0,00	-
99	12 533	12 534	2,62	107,8		0,00	92,96	-	-	0,00	0,00	-
Sum			32,68									

- Data undefined due to calculation with octave data

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23.11.2022 8.50/3.5.584

DECIBEL - Assumptions for noise calculation

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Vasama_5_5_2022_5.w2r (5)
Area type with hard ground: vesistöt
Ground factor for hard ground: 0,0
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:
Fixed penalty added to source noise of WTGs with pure tones
WTG catalogue
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in 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: GE WIND ENERGY GE158 - 6.1 MW 6100 158.0 !O!
Noise: GE 6.1.158 no STE 107.0 dB +2dB

Source	Source/Date	Creator	Edited
Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01	30.5.2018	USER	23.11.2022 8.27

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	221,0	8,0	109,0	No	90,2	95,4	99,9	102,4	104,4	102,3	94,8	78,8
From Windcat	171,0	8,0	109,0	No	90,2	95,4	99,9	102,4	104,4	102,3	94,8	78,8

WTG: GE WIND ENERGY 5.3-158 Thrust 700 5300 158.0 !O!
Noise: 5.3-158 106.0 +2 dB HH200

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.12

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	200,0	8,0	108,0	No	89,2	94,6	99,2	101,6	103,3	101,1	93,7	78,0

WTG: GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O!
Noise: 5.5-158 NO 106 dB + 2 dB

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3/5.5-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.13

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	122,5	8,0	108,0	No	89,2	94,6	99,2	101,6	103,3	101,1	93,7	78,0

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DECIBEL - Assumptions for noise calculation

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

WTG: GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O!
Noise: 5.3-158 NO_107,8 dB

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.14

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	152,5	8,0	107,8	No	89,0	94,4	99,0	101,4	103,1	100,9	93,5	77,8

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	15.11.2022 10.20

DMS no.: 0128-4336_00

					Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	199,0	8,0	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: NORDEX N163/5,7MW 5700 163.0 !O!
Noise: N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB

Source	Source/Date	Creator	Edited
F008_276_A14_EN	20.3.2020	USER	22.11.2022 16.21

						Octave data							
Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]	63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	198,5	8,0	109,2	Yes	2,0	89,5	95,7	99,9	103,2	104,6	102,2	93,4	84,6

Noise sensitive area: A Lomarakennus A (Pyssynienen metsätie 156)

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 (Sarjankyläntie 1093)

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 Lomarakennnus C (Kurunoja)

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

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

Noise sensitive area: D Asuinrakennus D (Haapavesitie 1404)

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: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise sensitive area: E Asuinrakennus E (Säilynkankaantie 34)

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 (Ritamäentie 156)

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 Lomarakennus G (Virtaniementie 175)

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

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

Project:
Vasama_22_11_2022

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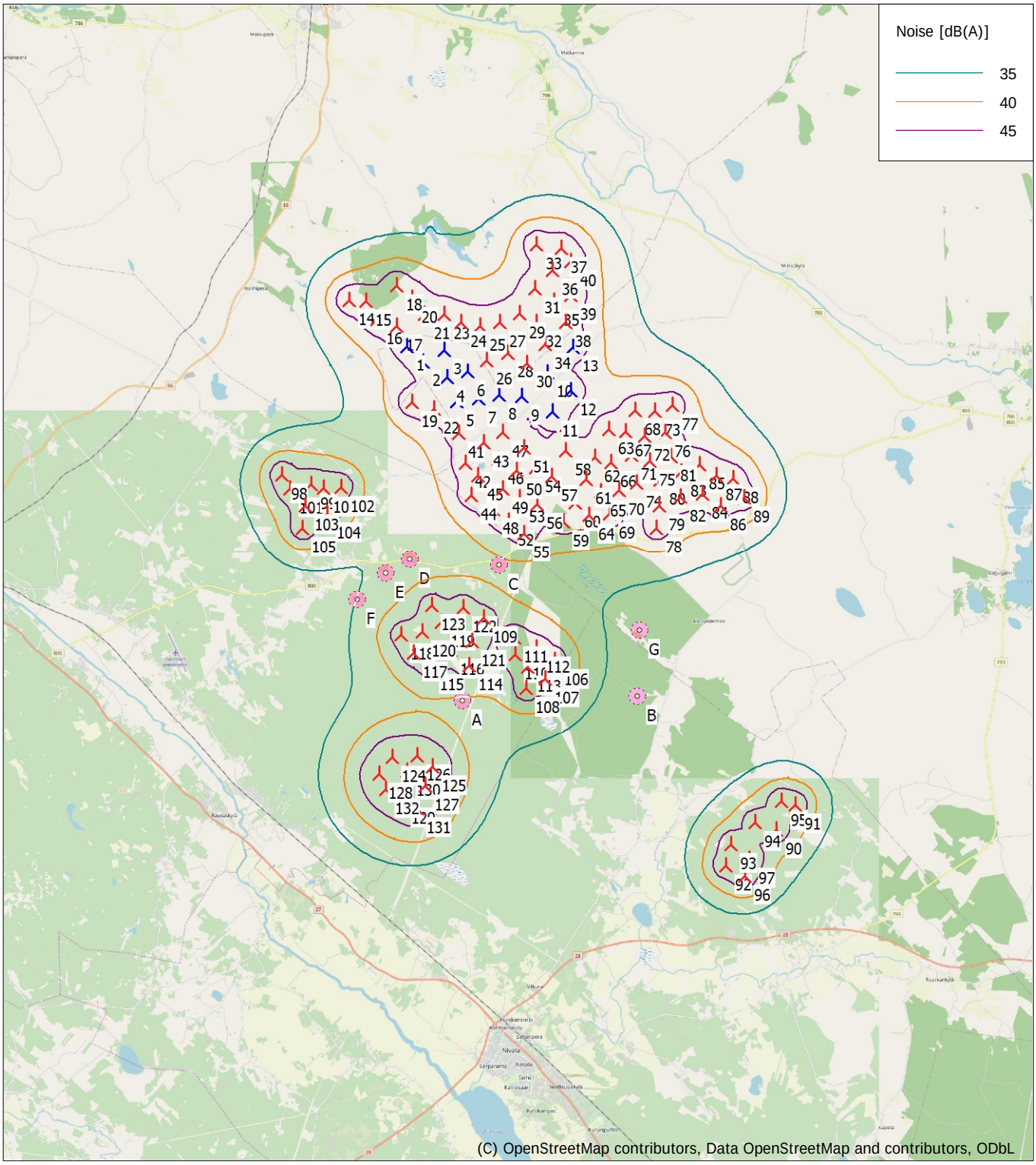
23.11.2022 8.50/3.5.584

DECIBEL - Map 8,0 m/s

Calculation: Vasama VE1_V172-7.2MWx18xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 480 North: 7 107 679

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

Liite 2. Vasaman tuulivoimahanke VE2 – melun leviämismallinnuksen tulokset (ISO 9613-2, YM2/2014)

Project:

Vasama_22_11_2022

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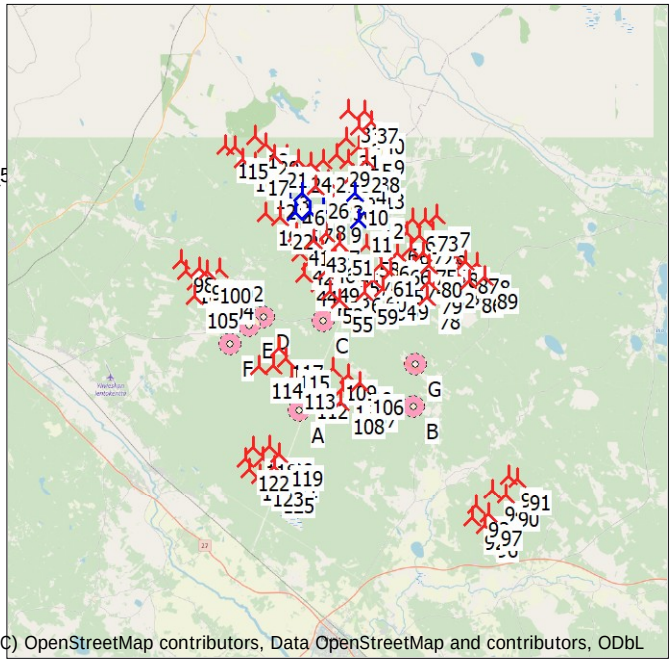
Calculated:
23.11.2022 8.43/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Vasama_5
Area type with hard ground: vesistöt
Ground factor for hard ground: 0,0
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:
Fixed penalty added to source noise of WTGs with pure tones
WTG catalogue
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:400 000
New WTG
Noise sensitive area

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

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)]
1	397 208	7 115 412	88,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
2	397 754	7 114 856	87,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
3	398 503	7 115 243	95,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
4	398 570	7 114 265	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
5	398 871	7 113 427	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
6	399 272	7 114 459	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
7	399 647	7 113 488	95,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
8	400 360	7 113 628	100,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
9	401 168	7 113 504	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
10	402 041	7 114 329	106,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
11	402 216	7 112 963	108,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
12	402 852	7 113 666	105,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
13	402 975	7 115 189	106,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
14	395 254	7 117 093	87,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
15	395 819	7 117 022	83,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
16	396 195	7 116 379	82,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
17	396 858	7 116 145	85,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
18	396 894	7 117 531	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
19	397 303	7 113 442	87,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
20	397 417	7 117 093	90,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
21	397 854	7 116 507	90,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
22	398 058	7 113 189	92,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
23	398 529	7 116 484	94,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
24	399 116	7 116 184	97,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
25	399 762	7 116 032	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
26	399 974	7 114 812	98,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
27	400 456	7 116 139	99,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
28	400 698	7 115 062	102,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
29	401 155	7 116 430	100,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
30	401 348	7 114 680	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
31	401 706	7 117 283	100,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
32	401 754	7 116 113	103,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
33	401 837	7 118 791	95,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
34	402 023	7 115 337	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
35	402 362	7 116 825	105,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
36	402 365	7 117 878	100,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
37	402 692	7 118 655	95,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
38	402 733	7 116 070	109,6	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
39	402 975	7 117 005	104,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
40	403 021	7 118 167	96,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	171,0	USER	GE 6.1.158 no STE 107.0 dB +2dB	8,0	109,0
41	398 896	7 112 332	92,5	PUU01	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
42	399 097	7 111 286	95,0	PUU02	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
43	399 784	7 111 972	97,5	PUU03	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
44	399 264	7 110 151	97,2	PUU04	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
45	399 536	7 110 832	95,4	PUU05	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
46	400 239	7 111 382	97,5	PUU06	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
47	400 444	7 112 292	97,3	PUU07	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
48	400 019	7 109 649	100,0	PUU08	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
49	400 380	7 110 348	100,0	PUU09	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
50	400 876	7 110 966	99,4	PUU10	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
51	401 152	7 111 752	100,0	PUU11	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
52	400 549	7 109 232	102,5	PUU12	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0

To be continued on next page...

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23.11.2022 8.43/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

	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)]
53	400 953	7 110 020	102,5	PUU13	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
54	401 537	7 111 046	104,5	PUU14	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
55	401 068	7 108 792	105,0	PUU15	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
56	401 564	7 109 758	104,1	PUU16	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
57	402 089	7 110 702	107,5	PUU17	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
58	402 589	7 111 603	106,9	PUU18	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
59	402 455	7 109 148	112,5	PUU19	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
60	402 889	7 109 778	110,0	PUU20	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
61	403 318	7 110 593	107,5	PUU21	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
62	403 622	7 111 352	106,3	PUU22	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
63	404 117	7 112 276	103,7	PUU23	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
64	403 379	7 109 327	115,0	PUU24	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
65	403 790	7 110 129	108,2	PUU25	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
66	404 210	7 111 152	105,6	PUU26	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
67	404 739	7 112 199	105,0	PUU27	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
68	405 100	7 112 943	100,6	PUU28	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
69	404 061	7 109 351	110,0	PUU29	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
70	404 420	7 110 174	106,8	PUU30	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
71	404 900	7 111 381	105,0	PUU31	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
72	405 395	7 112 030	102,5	PUU32	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
73	405 740	7 112 891	100,2	PUU33	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
74	405 042	7 110 380	105,9	PUU34	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
75	405 532	7 111 130	103,8	PUU35	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
76	406 114	7 112 133	103,1	PUU36	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
77	406 380	7 113 067	107,2	PUU37	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
78	405 707	7 108 791	111,2	PUU38	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
79	405 822	7 109 587	108,6	PUU39	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
80	405 893	7 110 455	104,7	PUU40	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
81	406 257	7 111 298	104,1	PUU41	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
82	406 558	7 109 872	106,5	PUU42	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
83	406 638	7 110 744	106,0	PUU43	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
84	407 324	7 109 954	108,3	PUU44	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
85	407 269	7 110 957	112,5	PUU45	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
86	407 963	7 109 542	113,5	PUU46	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
87	407 809	7 110 582	116,0	PUU47	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
88	408 414	7 110 457	120,0	PUU48	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
89	408 786	7 109 772	117,5	PUU49	Yes	GE WIND ENERGY	5.3-158 Thrust 700-5 300	5 300	158,0	200,0	USER	5.3-158 106.0 +2 dB HH200	8,0	108,0
90	409 573	7 098 129	122,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
91	410 264	7 098 972	122,5	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
92	407 742	7 096 948	109,1	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
93	407 993	7 097 672	109,3	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
94	408 857	7 098 427	115,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
95	409 752	7 099 120	115,4	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
96	408 404	7 096 567	110,0	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
97	408 619	7 097 160	117,5	GE WIND ENERGY 5.5-158 RD1...	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	USER	5.5-158 NO 106 dB + 2 dB	8,0	108,0
98	392 697	7 111 104	82,5	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
99	393 696	7 110 723	85,1	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
100	394 124	7 110 573	88,4	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
101	392 964	7 110 572	83,1	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
102	394 736	7 110 600	89,8	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
103	393 462	7 109 982	84,9	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
104	394 233	7 109 674	87,5	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
105	393 349	7 109 200	84,2	GE WIND ENERGY 5.3-158 RD1...	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	USER	5.3-158 NO_107,8 dB	8,0	107,8
106	402 014	7 104 309	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
107	401 637	7 103 661	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
108	400 968	7 103 344	104,9	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
109	400 636	7 105 142	105,1	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
110	401 395	7 104 737	107,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
111	401 057	7 104 087	103,5	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
112	399 017	7 104 219	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
113	398 397	7 104 778	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
114	396 683	7 105 368	98,3	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
115	398 090	7 105 743	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
116	397 412	7 105 444	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
117	397 770	7 106 329	100,0	VESTAS V172-7.2 7200 172.0 !O...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	200,0	USER	V172 - 7,2 MW PO7200 STE	8,0	106,9
118	396 213	7 101 101	92,7	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
119	397 616	7 100 723	97,6	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
120	397 086	7 101 114	95,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
121	397 318	7 100 046	97,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
122	395 741	7 100 512	93,4	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
123	396 517	7 099 615	95,1	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
124	396 717	7 100 560	95,3	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
125	397 043	7 099 258	95,9	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2
126	395 944	7 099 965	95,0	NORDEX N163/5,7MW 5700 163...	Yes	NORDEX	N163/5,7MW-5 700	5 700	163,0	198,5	USER	N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB	8,0	109,2

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)]	Distance to noise demand [m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	4,0	40,0	38,3	407
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	4,0	40,0	31,0	2 244
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	4,0	40,0	38,3	376
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	4,0	40,0	35,7	995
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	4,0	40,0	35,2	1 112
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	4,0	40,0	34,2	1 193
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	4,0	40,0	32,3	2 274

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23.11.2022 8.43/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Distances (m)

WTG	A	B	C	D	E	F	G
1	12519	14591	8272	7441	7952	9018	12790
2	11910	13833	7565	6919	7494	8624	12017
3	12259	13807	7739	7414	8054	9236	11906
4	11280	12913	6771	6473	7144	8358	11059
5	10442	12036	5886	5750	6478	7739	10204
6	11486	12762	6834	6856	7583	8838	10832
7	10542	11725	5828	6096	6887	8188	9811
8	10766	11557	5950	6553	7385	8710	9566
9	10797	11151	5910	6896	7772	9119	9091
10	11817	11695	6910	8082	8966	10316	9543
11	10569	10328	5670	7183	8108	9469	8194
12	11448	10876	6565	8129	9051	10412	8682
13	12921	12357	8020	9337	10228	11580	10141
14	14529	17064	10610	9295	9616	10469	15321
15	14334	16693	10297	9132	9506	10417	14913
16	13631	15949	9555	8449	8855	9807	14175
17	13291	15399	9082	8174	8646	9667	13586
18	14660	16583	10374	9559	10031	11040	14701
19	10553	12897	6427	5475	6019	7140	11223
20	14168	15950	9801	9128	9645	10705	14050
21	13549	15228	9120	8572	9133	10238	13321
22	10225	12259	5892	5313	5961	7167	10529
23	13500	14910	8951	8639	9257	10412	12953
24	13204	14396	8565	8467	9137	10338	12406
25	13087	14010	8359	8503	9222	10463	11977
26	11891	12798	7132	7438	8205	9487	10792
27	13266	13875	8462	8848	9607	10879	11791
28	12236	12777	7400	7973	8776	10081	10705
29	13661	13951	8805	9401	10190	11482	11817
30	11984	12215	7099	7967	8813	10145	10105
31	14604	14648	9726	10410	11203	12497	12472
32	13471	13497	8582	9402	10226	11543	11333
33	16108	16100	11236	11830	12597	13868	13903
34	12783	12680	7880	8886	9742	11078	10512
35	14308	14071	9406	10324	11155	12474	11869
36	15330	15109	10433	11241	12049	13351	12898
37	16163	15828	11263	12081	12884	14182	13601
38	13683	13265	8776	9893	10755	12093	11053
39	14648	14155	9741	10803	11651	12980	11927
40	15776	15302	10870	11815	12639	13953	13067
41	9348	11084	4817	4734	5510	6810	9333
42	8308	10101	3756	3895	4746	6088	8424
43	9048	10320	4306	4845	5710	7055	8493
44	7185	9086	2624	3106	4033	5395	7524
45	7888	9478	3210	3789	4696	6055	7793
46	8531	9583	3701	4669	5583	6943	7748
47	9463	10302	4619	5494	6381	7734	8374
48	6787	8232	1972	3410	4367	5705	6625
49	7545	8616	2676	4091	5042	6394	6862
50	8264	8920	3363	4858	5803	7161	7034
51	9095	9520	4191	5578	6509	7870	7543
52	6506	7586	1600	3719	4669	5967	5952
53	7377	8046	2471	4408	5365	6696	6239
54	8535	8721	3638	5439	6391	7742	6740
55	6260	6932	1439	4101	5027	6273	5272
56	7342	7532	2510	4855	5807	7110	5653
57	8416	8202	3587	5731	6689	8021	6170
58	9442	8918	4616	6623	7577	8925	6788
59	7201	6618	2729	5532	6459	7699	4642
60	7965	7078	3447	6112	7055	8327	4987
61	8884	7770	4300	6794	7748	9052	5596
62	9692	8467	5050	7390	8348	9674	6253
63	10740	9331	6068	8275	9231	10573	7082
64	7864	6519	3621	6473	7399	8631	4380
65	8754	7232	4384	7077	8021	9294	5024
66	9835	8203	5339	7835	8790	10100	5955

To be continued on next page...

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23.11.2022 8.43/3.5.584

DECIBEL - Main Result

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

...continued from previous page

WTG	A	B	C	D	E	F	G
67	11000	9227	6437	8775	9732	11064	6957
68	11821	9974	7222	9461	10417	11760	7698
69	8304	6425	4250	7146	8067	9288	4204
70	9168	7213	4941	7692	8633	9897	4959
71	10419	8409	6018	8559	9513	10820	6136
72	11235	9075	6811	9280	10237	11555	6798
73	12135	9960	7639	9986	10943	12278	7684
74	9723	7410	5584	8347	9288	10551	5135
75	10612	8187	6389	9051	10001	11288	5911
76	11756	9249	7439	9974	10930	12242	6982
77	12656	10212	8233	10631	11588	12919	7947
78	9077	5884	5664	8696	9588	10746	3621
79	9690	6688	5981	8920	9837	11045	4424
80	10350	7557	6375	9185	10123	11376	5290
81	11215	8446	7095	9790	10739	12021	6188
82	10427	7112	6769	9697	10617	11831	4891
83	11079	7978	7172	9981	10920	12174	5746
84	11065	7412	7522	10464	11383	12590	5264
85	11682	8348	7833	10646	11586	12840	6157
86	11325	7277	8028	11026	11931	13110	5236
87	11839	8170	8187	11072	12002	13233	6045
88	12232	8297	8715	11633	12558	13776	6247
89	12133	7865	8882	11874	12782	13964	5921
90	11882	6776	13416	15929	16341	16711	8476
91	12214	6744	13345	15989	16457	16912	8209
92	10849	6690	13146	15358	15652	15855	8749
93	10680	6170	12715	15029	15364	15629	8155
94	11107	6070	12705	15184	15584	15944	7849
95	11682	6247	12863	15483	15943	16389	7772
96	11611	7333	13843	16094	16399	16612	9334
97	11479	6936	13505	15836	16173	16436	8871
98	10114	14609	8204	5362	5011	5123	13599
99	9230	13569	7137	4337	4065	4360	12533
100	8875	13133	6686	3914	3691	4088	12083
101	9528	14094	7748	4842	4448	4528	13134
102	8597	12655	6153	3501	3408	4001	11549
103	8757	13359	7075	4112	3682	3773	12444
104	8059	12542	6246	3290	2916	3194	11614
105	8219	13065	6971	3899	3310	3161	12275
106	3542	3121	3852	6170	6641	7214	3100
107	2986	3270	4286	6296	6667	7103	3690
108	2268	3884	4414	6065	6338	6651	4430
109	2879	4726	2585	4569	5032	5652	4334
110	3190	3865	3196	5418	5892	6493	3610
111	2576	3938	3707	5582	5947	6400	4080
112	1266	5949	3644	4238	4340	4527	6040
113	1823	6685	3393	3467	3515	3708	6589
114	3140	8496	4171	2630	2209	1957	8287
115	2830	7291	2831	2461	2595	3039	6897
116	2789	7823	3538	2555	2406	2523	7560
117	3478	7821	2740	1795	1970	2605	7280
118	3144	8822	7670	6923	6423	5619	9688
119	2522	7560	7407	7272	6946	6384	8632
120	2490	7968	7249	6859	6471	5830	8900
121	3260	8065	8145	7931	7560	6916	9250
122	3879	9420	8418	7575	7027	6138	10371
123	4032	8969	8849	8375	7916	7136	10156
124	3151	8468	7907	7420	6983	6255	9490
125	4091	8631	8979	8714	8308	7597	9934
126	4109	9385	8790	8084	7564	6703	10457

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise 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 Lomarakennus A (Pyssynienen metsätie 156)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	12 519	12 520	3,32	109,0		0,00	92,95	-	-	0,00	0,00	-
10	11 817	11 819	4,00	109,0		0,00	92,45	-	-	0,00	0,00	-
100	8 875	8 876	6,89	107,8		0,00	89,96	-	-	0,00	0,00	-
101	9 528	9 529	6,01	107,8		0,00	90,58	-	-	0,00	0,00	-
102	8 597	8 599	7,28	107,8		0,00	89,69	-	-	0,00	0,00	-
103	8 757	8 758	7,05	107,8		0,00	89,85	-	-	0,00	0,00	-
104	8 059	8 060	8,09	107,8		0,00	89,13	-	-	0,00	0,00	-
105	8 219	8 220	7,84	107,8		0,00	89,30	-	-	0,00	0,00	-
106	3 542	3 548	20,36	106,9		0,00	82,00	-	-	0,00	0,00	-
107	2 986	2 993	22,49	106,9		0,00	80,52	-	-	0,00	0,00	-
108	2 268	2 277	25,80	106,9		0,00	78,15	-	-	0,00	0,00	-
109	2 879	2 886	22,93	106,9		0,00	80,21	-	-	0,00	0,00	-
11	10 569	10 571	5,33	109,0		0,00	91,48	-	-	0,00	0,00	-
110	3 190	3 197	21,67	106,9		0,00	81,09	-	-	0,00	0,00	-
111	2 576	2 584	24,28	106,9		0,00	79,24	-	-	0,00	0,00	-
112	1 266	1 282	32,36	106,9		0,00	73,16	-	-	0,00	0,00	-
113	1 823	1 833	28,34	106,9		0,00	76,26	-	-	0,00	0,00	-
114	3 140	3 146	21,87	106,9		0,00	80,96	-	-	0,00	0,00	-
115	2 830	2 837	23,14	106,9		0,00	80,06	-	-	0,00	0,00	-
116	2 789	2 796	23,32	106,9		0,00	79,93	-	-	0,00	0,00	-
117	3 478	3 483	20,59	106,9		0,00	81,84	-	-	0,00	0,00	-
118	3 144	3 149	23,60	109,2	2	0,00	80,96	-	-	0,00	0,00	-
119	2 522	2 529	26,63	109,2	2	0,00	79,06	-	-	0,00	0,00	-
12	11 448	11 451	4,38	109,0		0,00	92,18	-	-	0,00	0,00	-
120	2 490	2 498	26,80	109,2	2	0,00	78,95	-	-	0,00	0,00	-
121	3 260	3 266	23,09	109,2	2	0,00	81,28	-	-	0,00	0,00	-
122	3 879	3 883	20,64	109,2	2	0,00	82,78	-	-	0,00	0,00	-
123	4 032	4 036	20,09	109,2	2	0,00	83,12	-	-	0,00	0,00	-
124	3 151	3 157	23,57	109,2	2	0,00	80,99	-	-	0,00	0,00	-
125	4 091	4 096	19,88	109,2	2	0,00	83,25	-	-	0,00	0,00	-
126	4 109	4 113	19,82	109,2	2	0,00	83,28	-	-	0,00	0,00	-
13	12 921	12 923	2,94	109,0		0,00	93,23	-	-	0,00	0,00	-
14	14 529	14 529	1,81	109,0		0,00	94,25	-	-	0,00	0,00	-
15	14 334	14 335	1,97	109,0		0,00	94,13	-	-	0,00	0,00	-
16	13 631	13 631	2,58	109,0		0,00	93,69	-	-	0,00	0,00	-
17	13 291	13 292	2,88	109,0		0,00	93,47	-	-	0,00	0,00	-
18	14 660	14 661	1,70	109,0		0,00	94,32	-	-	0,00	0,00	-
19	10 553	10 554	5,68	109,0		0,00	91,47	-	-	0,00	0,00	-
2	11 910	11 912	3,91	109,0		0,00	92,52	-	-	0,00	0,00	-
20	14 168	14 169	2,11	109,0		0,00	94,03	-	-	0,00	0,00	-
21	13 549	13 550	2,65	109,0		0,00	93,64	-	-	0,00	0,00	-
22	10 225	10 226	6,06	109,0		0,00	91,19	-	-	0,00	0,00	-
23	13 500	13 501	2,70	109,0		0,00	93,61	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
24	13 204	13 205	2,96	109,0		0,00	93,41	-	-	0,00	0,00	-
25	13 087	13 088	3,08	109,0		0,00	93,34	-	-	0,00	0,00	-
26	11 891	11 893	4,24	109,0		0,00	92,51	-	-	0,00	0,00	-
27	13 266	13 267	2,91	109,0		0,00	93,46	-	-	0,00	0,00	-
28	12 236	12 237	3,89	109,0		0,00	92,75	-	-	0,00	0,00	-
29	13 661	13 662	2,55	109,0		0,00	93,71	-	-	0,00	0,00	-
3	12 259	12 261	3,57	109,0		0,00	92,77	-	-	0,00	0,00	-
30	11 984	11 985	4,14	109,0		0,00	92,57	-	-	0,00	0,00	-
31	14 604	14 605	1,75	109,0		0,00	94,29	-	-	0,00	0,00	-
32	13 471	13 472	2,72	109,0		0,00	93,59	-	-	0,00	0,00	-
33	16 108	16 109	0,56	109,0		0,00	95,14	-	-	0,00	0,00	-
34	12 783	12 784	3,36	109,0		0,00	93,13	-	-	0,00	0,00	-
35	14 308	14 309	1,99	109,0		0,00	94,11	-	-	0,00	0,00	-
36	15 330	15 331	1,16	109,0		0,00	94,71	-	-	0,00	0,00	-
37	16 163	16 163	0,52	109,0		0,00	95,17	-	-	0,00	0,00	-
38	13 683	13 684	2,53	109,0		0,00	93,72	-	-	0,00	0,00	-
39	14 648	14 649	1,71	109,0		0,00	94,32	-	-	0,00	0,00	-
4	11 280	11 282	4,56	109,0		0,00	92,05	-	-	0,00	0,00	-
40	15 776	15 777	0,81	109,0		0,00	94,96	-	-	0,00	0,00	-
41	9 348	9 350	6,10	108,0		0,00	90,42	-	-	0,00	0,00	-
42	8 308	8 310	7,53	108,0		0,00	89,39	-	-	0,00	0,00	-
43	9 048	9 050	6,51	108,0		0,00	90,13	-	-	0,00	0,00	-
44	7 185	7 188	9,29	108,0		0,00	88,13	-	-	0,00	0,00	-
45	7 888	7 890	8,16	108,0		0,00	88,94	-	-	0,00	0,00	-
46	8 531	8 533	7,21	108,0		0,00	89,62	-	-	0,00	0,00	-
47	9 463	9 465	5,95	108,0		0,00	90,52	-	-	0,00	0,00	-
48	6 787	6 790	9,97	108,0		0,00	87,64	-	-	0,00	0,00	-
49	7 545	7 548	8,69	108,0		0,00	88,56	-	-	0,00	0,00	-
5	10 442	10 444	5,47	109,0		0,00	91,38	-	-	0,00	0,00	-
50	8 264	8 266	7,59	108,0		0,00	89,35	-	-	0,00	0,00	-
51	9 095	9 097	6,43	108,0		0,00	90,18	-	-	0,00	0,00	-
52	6 506	6 509	10,48	108,0		0,00	87,27	-	-	0,00	0,00	-
53	7 377	7 380	8,97	108,0		0,00	88,36	-	-	0,00	0,00	-
54	8 535	8 538	7,20	108,0		0,00	89,63	-	-	0,00	0,00	-
55	6 260	6 263	10,95	108,0		0,00	86,94	-	-	0,00	0,00	-
56	7 342	7 344	9,02	108,0		0,00	88,32	-	-	0,00	0,00	-
57	8 416	8 419	7,37	108,0		0,00	89,50	-	-	0,00	0,00	-
58	9 442	9 444	5,98	108,0		0,00	90,50	-	-	0,00	0,00	-
59	7 201	7 204	9,26	108,0		0,00	88,15	-	-	0,00	0,00	-
6	11 486	11 488	4,34	109,0		0,00	92,20	-	-	0,00	0,00	-
60	7 965	7 968	8,04	108,0		0,00	89,03	-	-	0,00	0,00	-
61	8 884	8 887	6,71	108,0		0,00	89,97	-	-	0,00	0,00	-
62	9 692	9 694	5,66	108,0		0,00	90,73	-	-	0,00	0,00	-
63	10 740	10 742	4,42	108,0		0,00	91,62	-	-	0,00	0,00	-
64	7 864	7 866	8,19	108,0		0,00	88,92	-	-	0,00	0,00	-
65	8 754	8 757	6,89	108,0		0,00	89,85	-	-	0,00	0,00	-
66	9 835	9 837	5,48	108,0		0,00	90,86	-	-	0,00	0,00	-
67	11 000	11 002	4,13	108,0		0,00	91,83	-	-	0,00	0,00	-
68	11 821	11 823	3,26	108,0		0,00	92,45	-	-	0,00	0,00	-
69	8 304	8 306	7,53	108,0		0,00	89,39	-	-	0,00	0,00	-
7	10 542	10 544	5,37	109,0		0,00	91,46	-	-	0,00	0,00	-
70	9 168	9 171	6,33	108,0		0,00	90,25	-	-	0,00	0,00	-
71	10 419	10 421	4,78	108,0		0,00	91,36	-	-	0,00	0,00	-
72	11 235	11 237	3,87	108,0		0,00	92,01	-	-	0,00	0,00	-
73	12 135	12 137	2,94	108,0		0,00	92,68	-	-	0,00	0,00	-
74	9 723	9 725	5,62	108,0		0,00	90,76	-	-	0,00	0,00	-
75	10 612	10 614	4,56	108,0		0,00	91,52	-	-	0,00	0,00	-
76	11 756	11 758	3,32	108,0		0,00	92,41	-	-	0,00	0,00	-
77	12 656	12 658	2,43	108,0		0,00	93,05	-	-	0,00	0,00	-
78	9 077	9 080	6,45	108,0		0,00	90,16	-	-	0,00	0,00	-
79	9 690	9 692	5,66	108,0		0,00	90,73	-	-	0,00	0,00	-
8	10 766	10 769	5,11	109,0		0,00	91,64	-	-	0,00	0,00	-
80	10 350	10 352	4,86	108,0		0,00	91,30	-	-	0,00	0,00	-
81	11 215	11 216	3,89	108,0		0,00	92,00	-	-	0,00	0,00	-

To be continued on next page...

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23.11.2022 8.43/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
82	10 427	10 429	4,77	108,0		0,00	91,36	-	-	0,00	0,00	-
83	11 079	11 081	4,04	108,0		0,00	91,89	-	-	0,00	0,00	-
84	11 065	11 067	4,05	108,0		0,00	91,88	-	-	0,00	0,00	-
85	11 682	11 684	3,40	108,0		0,00	92,35	-	-	0,00	0,00	-
86	11 325	11 327	3,77	108,0		0,00	92,08	-	-	0,00	0,00	-
87	11 839	11 841	3,24	108,0		0,00	92,47	-	-	0,00	0,00	-
88	12 232	12 234	2,84	108,0		0,00	92,75	-	-	0,00	0,00	-
89	12 133	12 135	2,94	108,0		0,00	92,68	-	-	0,00	0,00	-
9	10 797	10 800	5,08	109,0		0,00	91,67	-	-	0,00	0,00	-
90	11 882	11 883	3,66	108,0		0,00	92,50	-	-	0,00	0,00	-
91	12 214	12 215	3,32	108,0		0,00	92,74	-	-	0,00	0,00	-
92	10 849	10 850	4,79	108,0		0,00	91,71	-	-	0,00	0,00	-
93	10 680	10 681	4,99	108,0		0,00	91,57	-	-	0,00	0,00	-
94	11 107	11 108	4,50	108,0		0,00	91,91	-	-	0,00	0,00	-
95	11 682	11 682	3,87	108,0		0,00	92,35	-	-	0,00	0,00	-
96	11 611	11 612	3,95	108,0		0,00	92,30	-	-	0,00	0,00	-
97	11 479	11 480	4,09	108,0		0,00	92,20	-	-	0,00	0,00	-
98	10 114	10 114	5,27	107,8		0,00	91,10	-	-	0,00	0,00	-
99	9 230	9 231	6,40	107,8		0,00	90,30	-	-	0,00	0,00	-
Sum			38,30									

- Data undefined due to calculation with octave data

Noise sensitive area: B Lomarakennus B (Sarjankyläntie 1093)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	14 591	14 592	1,50	109,0		0,00	94,28	-	-	0,00	0,00	-
10	11 695	11 697	4,13	109,0		0,00	92,36	-	-	0,00	0,00	-
100	13 133	13 134	2,05	107,8		0,00	93,37	-	-	0,00	0,00	-
101	14 094	14 095	1,18	107,8		0,00	93,98	-	-	0,00	0,00	-
102	12 655	12 656	2,50	107,8		0,00	93,05	-	-	0,00	0,00	-
103	13 359	13 359	1,84	107,8		0,00	93,52	-	-	0,00	0,00	-
104	12 542	12 542	2,61	107,8		0,00	92,97	-	-	0,00	0,00	-
105	13 065	13 065	2,11	107,8		0,00	93,32	-	-	0,00	0,00	-
106	3 121	3 127	21,94	106,9		0,00	80,90	-	-	0,00	0,00	-
107	3 270	3 276	21,36	106,9		0,00	81,31	-	-	0,00	0,00	-
108	3 884	3 888	19,20	106,9		0,00	82,80	-	-	0,00	0,00	-
109	4 726	4 729	16,68	106,9		0,00	84,50	-	-	0,00	0,00	-
11	10 328	10 330	5,60	109,0		0,00	91,28	-	-	0,00	0,00	-
110	3 865	3 870	19,26	106,9		0,00	82,75	-	-	0,00	0,00	-
111	3 938	3 943	19,02	106,9		0,00	82,92	-	-	0,00	0,00	-
112	5 949	5 952	13,65	106,9		0,00	86,49	-	-	0,00	0,00	-
113	6 685	6 688	12,28	106,9		0,00	87,51	-	-	0,00	0,00	-
114	8 496	8 498	9,48	106,9		0,00	89,59	-	-	0,00	0,00	-
115	7 291	7 293	11,28	106,9		0,00	88,26	-	-	0,00	0,00	-
116	7 823	7 825	10,45	106,9		0,00	88,87	-	-	0,00	0,00	-
117	7 821	7 823	10,45	106,9		0,00	88,87	-	-	0,00	0,00	-
118	8 822	8 824	9,55	109,2	2	0,00	89,91	-	-	0,00	0,00	-
119	7 560	7 562	11,48	109,2	2	0,00	88,57	-	-	0,00	0,00	-
12	10 876	10 878	4,99	109,0		0,00	91,73	-	-	0,00	0,00	-
120	7 968	7 970	10,82	109,2	2	0,00	89,03	-	-	0,00	0,00	-
121	8 065	8 067	10,67	109,2	2	0,00	89,13	-	-	0,00	0,00	-
122	9 420	9 421	8,74	109,2	2	0,00	90,48	-	-	0,00	0,00	-
123	8 969	8 971	9,35	109,2	2	0,00	90,06	-	-	0,00	0,00	-
124	8 468	8 470	10,06	109,2	2	0,00	89,56	-	-	0,00	0,00	-
125	8 631	8 633	9,83	109,2	2	0,00	89,72	-	-	0,00	0,00	-
126	9 385	9 387	8,79	109,2	2	0,00	90,45	-	-	0,00	0,00	-
13	12 357	12 359	3,47	109,0		0,00	92,84	-	-	0,00	0,00	-
14	17 064	17 064	-0,14	109,0		0,00	95,64	-	-	0,00	0,00	-
15	16 693	16 694	0,14	109,0		0,00	95,45	-	-	0,00	0,00	-
16	15 949	15 949	0,69	109,0		0,00	95,05	-	-	0,00	0,00	-
17	15 399	15 400	1,10	109,0		0,00	94,75	-	-	0,00	0,00	-
18	16 583	16 584	0,21	109,0		0,00	95,39	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
19	12 897	12 898	3,25	109,0		0,00	93,21	-	-	0,00	0,00	-
2	13 833	13 834	2,13	109,0		0,00	93,82	-	-	0,00	0,00	-
20	15 950	15 951	0,68	109,0		0,00	95,06	-	-	0,00	0,00	-
21	15 228	15 229	1,24	109,0		0,00	94,65	-	-	0,00	0,00	-
22	12 259	12 260	3,86	109,0		0,00	92,77	-	-	0,00	0,00	-
23	14 910	14 911	1,49	109,0		0,00	94,47	-	-	0,00	0,00	-
24	14 396	14 397	1,92	109,0		0,00	94,17	-	-	0,00	0,00	-
25	14 010	14 011	2,25	109,0		0,00	93,93	-	-	0,00	0,00	-
26	12 798	12 799	3,34	109,0		0,00	93,14	-	-	0,00	0,00	-
27	13 875	13 876	2,36	109,0		0,00	93,85	-	-	0,00	0,00	-
28	12 777	12 778	3,36	109,0		0,00	93,13	-	-	0,00	0,00	-
29	13 951	13 952	2,30	109,0		0,00	93,89	-	-	0,00	0,00	-
3	13 807	13 809	2,16	109,0		0,00	93,80	-	-	0,00	0,00	-
30	12 215	12 216	3,91	109,0		0,00	92,74	-	-	0,00	0,00	-
31	14 648	14 649	1,71	109,0		0,00	94,32	-	-	0,00	0,00	-
32	13 497	13 498	2,70	109,0		0,00	93,61	-	-	0,00	0,00	-
33	16 100	16 101	0,57	109,0		0,00	95,14	-	-	0,00	0,00	-
34	12 680	12 681	3,45	109,0		0,00	93,06	-	-	0,00	0,00	-
35	14 071	14 072	2,19	109,0		0,00	93,97	-	-	0,00	0,00	-
36	15 109	15 109	1,33	109,0		0,00	94,58	-	-	0,00	0,00	-
37	15 828	15 829	0,77	109,0		0,00	94,99	-	-	0,00	0,00	-
38	13 265	13 266	2,91	109,0		0,00	93,45	-	-	0,00	0,00	-
39	14 155	14 156	2,12	109,0		0,00	94,02	-	-	0,00	0,00	-
4	12 913	12 915	2,95	109,0		0,00	93,22	-	-	0,00	0,00	-
40	15 302	15 303	1,18	109,0		0,00	94,70	-	-	0,00	0,00	-
41	11 084	11 086	4,06	108,0		0,00	91,90	-	-	0,00	0,00	-
42	10 101	10 103	5,16	108,0		0,00	91,09	-	-	0,00	0,00	-
43	10 320	10 321	4,90	108,0		0,00	91,27	-	-	0,00	0,00	-
44	9 086	9 088	6,44	108,0		0,00	90,17	-	-	0,00	0,00	-
45	9 478	9 480	5,93	108,0		0,00	90,54	-	-	0,00	0,00	-
46	9 583	9 585	5,80	108,0		0,00	90,63	-	-	0,00	0,00	-
47	10 302	10 303	4,92	108,0		0,00	91,26	-	-	0,00	0,00	-
48	8 232	8 234	7,64	108,0		0,00	89,31	-	-	0,00	0,00	-
49	8 616	8 618	7,09	108,0		0,00	89,71	-	-	0,00	0,00	-
5	12 036	12 037	3,79	109,0		0,00	92,61	-	-	0,00	0,00	-
50	8 920	8 922	6,67	108,0		0,00	90,01	-	-	0,00	0,00	-
51	9 520	9 522	5,88	108,0		0,00	90,57	-	-	0,00	0,00	-
52	7 586	7 588	8,63	108,0		0,00	88,60	-	-	0,00	0,00	-
53	8 046	8 048	7,92	108,0		0,00	89,11	-	-	0,00	0,00	-
54	8 721	8 723	6,94	108,0		0,00	89,81	-	-	0,00	0,00	-
55	6 932	6 934	9,72	108,0		0,00	87,82	-	-	0,00	0,00	-
56	7 532	7 535	8,72	108,0		0,00	88,54	-	-	0,00	0,00	-
57	8 202	8 205	7,68	108,0		0,00	89,28	-	-	0,00	0,00	-
58	8 918	8 920	6,67	108,0		0,00	90,01	-	-	0,00	0,00	-
59	6 618	6 621	10,28	108,0		0,00	87,42	-	-	0,00	0,00	-
6	12 762	12 764	3,09	109,0		0,00	93,12	-	-	0,00	0,00	-
60	7 078	7 081	9,47	108,0		0,00	88,00	-	-	0,00	0,00	-
61	7 770	7 772	8,34	108,0		0,00	88,81	-	-	0,00	0,00	-
62	8 467	8 469	7,30	108,0		0,00	89,56	-	-	0,00	0,00	-
63	9 331	9 333	6,12	108,0		0,00	90,40	-	-	0,00	0,00	-
64	6 519	6 522	10,46	108,0		0,00	87,29	-	-	0,00	0,00	-
65	7 232	7 235	9,21	108,0		0,00	88,19	-	-	0,00	0,00	-
66	8 203	8 205	7,68	108,0		0,00	89,28	-	-	0,00	0,00	-
67	9 227	9 229	6,26	108,0		0,00	90,30	-	-	0,00	0,00	-
68	9 974	9 976	5,31	108,0		0,00	90,98	-	-	0,00	0,00	-
69	6 425	6 428	10,63	108,0		0,00	87,16	-	-	0,00	0,00	-
7	11 725	11 727	4,10	109,0		0,00	92,38	-	-	0,00	0,00	-
70	7 213	7 216	9,24	108,0		0,00	88,17	-	-	0,00	0,00	-
71	8 409	8 411	7,38	108,0		0,00	89,50	-	-	0,00	0,00	-
72	9 075	9 077	6,46	108,0		0,00	90,16	-	-	0,00	0,00	-
73	9 960	9 961	5,33	108,0		0,00	90,97	-	-	0,00	0,00	-
74	7 410	7 413	8,91	108,0		0,00	88,40	-	-	0,00	0,00	-
75	8 187	8 189	7,70	108,0		0,00	89,27	-	-	0,00	0,00	-
76	9 249	9 251	6,23	108,0		0,00	90,32	-	-	0,00	0,00	-

To be continued on next page...

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
77	10 212	10 214	5,03	108,0		0,00	91,18	-	-	0,00	0,00	-
78	5 884	5 887	11,77	108,0		0,00	86,40	-	-	0,00	0,00	-
79	6 688	6 691	10,15	108,0		0,00	87,51	-	-	0,00	0,00	-
8	11 557	11 558	4,27	109,0		0,00	92,26	-	-	0,00	0,00	-
80	7 557	7 559	8,68	108,0		0,00	88,57	-	-	0,00	0,00	-
81	8 446	8 448	7,33	108,0		0,00	89,54	-	-	0,00	0,00	-
82	7 112	7 114	9,41	108,0		0,00	88,04	-	-	0,00	0,00	-
83	7 978	7 980	8,02	108,0		0,00	89,04	-	-	0,00	0,00	-
84	7 412	7 415	8,91	108,0		0,00	88,40	-	-	0,00	0,00	-
85	8 348	8 350	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
86	7 277	7 279	9,13	108,0		0,00	88,24	-	-	0,00	0,00	-
87	8 170	8 173	7,73	108,0		0,00	89,25	-	-	0,00	0,00	-
88	8 297	8 299	7,54	108,0		0,00	89,38	-	-	0,00	0,00	-
89	7 865	7 867	8,19	108,0		0,00	88,92	-	-	0,00	0,00	-
9	11 151	11 153	4,69	109,0		0,00	91,95	-	-	0,00	0,00	-
90	6 776	6 777	10,73	108,0		0,00	87,62	-	-	0,00	0,00	-
91	6 744	6 746	10,79	108,0		0,00	87,58	-	-	0,00	0,00	-
92	6 690	6 691	10,89	108,0		0,00	87,51	-	-	0,00	0,00	-
93	6 170	6 172	11,91	108,0		0,00	86,81	-	-	0,00	0,00	-
94	6 070	6 071	12,12	108,0		0,00	86,67	-	-	0,00	0,00	-
95	6 247	6 248	11,76	108,0		0,00	86,92	-	-	0,00	0,00	-
96	7 333	7 334	9,73	108,0		0,00	88,31	-	-	0,00	0,00	-
97	6 936	6 937	10,43	108,0		0,00	87,82	-	-	0,00	0,00	-
98	14 609	14 610	0,74	107,8		0,00	94,29	-	-	0,00	0,00	-
99	13 569	13 570	1,65	107,8		0,00	93,65	-	-	0,00	0,00	-
Sum			30,99									

- Data undefined due to calculation with octave data

Noise sensitive area: C Lomarakennnus C (Kurunoja)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	8 272	8 275	8,25	109,0		0,00	89,35	-	-	0,00	0,00	-
10	6 910	6 914	10,38	109,0		0,00	87,79	-	-	0,00	0,00	-
100	6 686	6 688	10,41	107,8		0,00	87,51	-	-	0,00	0,00	-
101	7 748	7 749	8,58	107,8		0,00	88,79	-	-	0,00	0,00	-
102	6 153	6 154	11,44	107,8		0,00	86,78	-	-	0,00	0,00	-
103	7 075	7 077	9,71	107,8		0,00	88,00	-	-	0,00	0,00	-
104	6 246	6 248	11,25	107,8		0,00	86,91	-	-	0,00	0,00	-
105	6 971	6 973	9,89	107,8		0,00	87,87	-	-	0,00	0,00	-
106	3 852	3 857	19,30	106,9		0,00	82,73	-	-	0,00	0,00	-
107	4 286	4 291	17,94	106,9		0,00	83,65	-	-	0,00	0,00	-
108	4 414	4 418	17,56	106,9		0,00	83,90	-	-	0,00	0,00	-
109	2 585	2 593	24,24	106,9		0,00	79,28	-	-	0,00	0,00	-
11	5 670	5 674	13,10	109,0		0,00	86,08	-	-	0,00	0,00	-
110	3 196	3 202	21,65	106,9		0,00	81,11	-	-	0,00	0,00	-
111	3 707	3 712	19,79	106,9		0,00	82,39	-	-	0,00	0,00	-
112	3 644	3 650	20,00	106,9		0,00	82,24	-	-	0,00	0,00	-
113	3 393	3 399	20,90	106,9		0,00	81,63	-	-	0,00	0,00	-
114	4 171	4 175	18,29	106,9		0,00	83,41	-	-	0,00	0,00	-
115	2 831	2 838	23,14	106,9		0,00	80,06	-	-	0,00	0,00	-
116	3 538	3 544	20,38	106,9		0,00	81,99	-	-	0,00	0,00	-
117	2 740	2 747	23,54	106,9		0,00	79,78	-	-	0,00	0,00	-
118	7 670	7 673	11,29	109,2	2	0,00	88,70	-	-	0,00	0,00	-
119	7 407	7 409	11,73	109,2	2	0,00	88,40	-	-	0,00	0,00	-
12	6 565	6 568	11,05	109,0		0,00	87,35	-	-	0,00	0,00	-
120	7 249	7 251	12,00	109,2	2	0,00	88,21	-	-	0,00	0,00	-
121	8 145	8 147	10,55	109,2	2	0,00	89,22	-	-	0,00	0,00	-
122	8 418	8 420	10,14	109,2	2	0,00	89,51	-	-	0,00	0,00	-
123	8 849	8 851	9,52	109,2	2	0,00	89,94	-	-	0,00	0,00	-
124	7 907	7 909	10,92	109,2	2	0,00	88,96	-	-	0,00	0,00	-
125	8 979	8 981	9,33	109,2	2	0,00	90,07	-	-	0,00	0,00	-
126	8 790	8 792	9,60	109,2	2	0,00	89,88	-	-	0,00	0,00	-

To be continued on next page...

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23.11.2022 8.43/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
13	8 020	8 023	8,61	109,0		0,00	89,09	-	-	0,00	0,00	-
14	10 610	10 611	5,62	109,0		0,00	91,52	-	-	0,00	0,00	-
15	10 297	10 298	5,98	109,0		0,00	91,25	-	-	0,00	0,00	-
16	9 555	9 556	6,89	109,0		0,00	90,61	-	-	0,00	0,00	-
17	9 082	9 083	7,51	109,0		0,00	90,16	-	-	0,00	0,00	-
18	10 374	10 375	5,89	109,0		0,00	91,32	-	-	0,00	0,00	-
19	6 427	6 428	11,73	109,0		0,00	87,16	-	-	0,00	0,00	-
2	7 565	7 567	9,31	109,0		0,00	88,58	-	-	0,00	0,00	-
20	9 801	9 802	6,58	109,0		0,00	90,83	-	-	0,00	0,00	-
21	9 120	9 121	7,46	109,0		0,00	90,20	-	-	0,00	0,00	-
22	5 892	5 894	12,79	109,0		0,00	86,41	-	-	0,00	0,00	-
23	8 951	8 952	7,71	109,0		0,00	90,04	-	-	0,00	0,00	-
24	8 565	8 567	8,22	109,0		0,00	89,66	-	-	0,00	0,00	-
25	8 359	8 361	8,52	109,0		0,00	89,44	-	-	0,00	0,00	-
26	7 132	7 134	10,46	109,0		0,00	88,07	-	-	0,00	0,00	-
27	8 462	8 464	8,37	109,0		0,00	89,55	-	-	0,00	0,00	-
28	7 400	7 402	10,01	109,0		0,00	88,39	-	-	0,00	0,00	-
29	8 805	8 807	7,89	109,0		0,00	89,90	-	-	0,00	0,00	-
3	7 739	7 742	9,05	109,0		0,00	88,78	-	-	0,00	0,00	-
30	7 099	7 101	10,52	109,0		0,00	88,03	-	-	0,00	0,00	-
31	9 726	9 727	6,67	109,0		0,00	90,76	-	-	0,00	0,00	-
32	8 582	8 583	8,20	109,0		0,00	89,67	-	-	0,00	0,00	-
33	11 236	11 237	4,92	109,0		0,00	92,01	-	-	0,00	0,00	-
34	7 880	7 882	9,24	109,0		0,00	88,93	-	-	0,00	0,00	-
35	9 406	9 408	7,08	109,0		0,00	90,47	-	-	0,00	0,00	-
36	10 433	10 435	5,82	109,0		0,00	91,37	-	-	0,00	0,00	-
37	11 263	11 264	4,89	109,0		0,00	92,03	-	-	0,00	0,00	-
38	8 776	8 778	7,93	109,0		0,00	89,87	-	-	0,00	0,00	-
39	9 741	9 742	6,65	109,0		0,00	90,77	-	-	0,00	0,00	-
4	6 771	6 774	10,62	109,0		0,00	87,62	-	-	0,00	0,00	-
40	10 870	10 871	5,32	109,0		0,00	91,73	-	-	0,00	0,00	-
41	4 817	4 821	14,59	108,0		0,00	84,66	-	-	0,00	0,00	-
42	3 756	3 760	18,08	108,0		0,00	82,50	-	-	0,00	0,00	-
43	4 306	4 310	16,17	108,0		0,00	83,69	-	-	0,00	0,00	-
44	2 624	2 631	22,98	108,0		0,00	79,40	-	-	0,00	0,00	-
45	3 210	3 216	20,25	108,0		0,00	81,15	-	-	0,00	0,00	-
46	3 701	3 706	18,28	108,0		0,00	82,38	-	-	0,00	0,00	-
47	4 619	4 623	15,18	108,0		0,00	84,30	-	-	0,00	0,00	-
48	1 972	1 981	26,72	108,0		0,00	76,94	-	-	0,00	0,00	-
49	2 676	2 683	22,72	108,0		0,00	79,57	-	-	0,00	0,00	-
5	5 886	5 890	12,58	109,0		0,00	86,40	-	-	0,00	0,00	-
50	3 363	3 368	19,61	108,0		0,00	81,55	-	-	0,00	0,00	-
51	4 191	4 195	16,55	108,0		0,00	83,46	-	-	0,00	0,00	-
52	1 600	1 612	29,34	108,0		0,00	75,15	-	-	0,00	0,00	-
53	2 471	2 479	23,78	108,0		0,00	78,89	-	-	0,00	0,00	-
54	3 638	3 643	18,52	108,0		0,00	82,23	-	-	0,00	0,00	-
55	1 439	1 452	30,63	108,0		0,00	74,24	-	-	0,00	0,00	-
56	2 510	2 518	23,57	108,0		0,00	79,02	-	-	0,00	0,00	-
57	3 587	3 593	18,72	108,0		0,00	82,11	-	-	0,00	0,00	-
58	4 616	4 621	15,19	108,0		0,00	84,29	-	-	0,00	0,00	-
59	2 729	2 737	22,45	108,0		0,00	79,75	-	-	0,00	0,00	-
6	6 834	6 837	10,51	109,0		0,00	87,70	-	-	0,00	0,00	-
60	3 447	3 453	19,27	108,0		0,00	81,76	-	-	0,00	0,00	-
61	4 300	4 305	16,18	108,0		0,00	83,68	-	-	0,00	0,00	-
62	5 050	5 054	13,92	108,0		0,00	85,07	-	-	0,00	0,00	-
63	6 068	6 071	11,34	108,0		0,00	86,67	-	-	0,00	0,00	-
64	3 621	3 627	18,58	108,0		0,00	82,19	-	-	0,00	0,00	-
65	4 384	4 388	15,91	108,0		0,00	83,85	-	-	0,00	0,00	-
66	5 339	5 342	13,14	108,0		0,00	85,55	-	-	0,00	0,00	-
67	6 437	6 440	10,61	108,0		0,00	87,18	-	-	0,00	0,00	-
68	7 222	7 224	9,22	108,0		0,00	88,18	-	-	0,00	0,00	-
69	4 250	4 254	16,35	108,0		0,00	83,58	-	-	0,00	0,00	-
7	5 828	5 832	12,71	109,0		0,00	86,32	-	-	0,00	0,00	-
70	4 941	4 946	14,23	108,0		0,00	84,88	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
71	6 018	6 021	11,45	108,0		0,00	86,59	-	-	0,00	0,00	-
72	6 811	6 813	9,93	108,0		0,00	87,67	-	-	0,00	0,00	-
73	7 639	7 641	8,55	108,0		0,00	88,66	-	-	0,00	0,00	-
74	5 584	5 588	12,51	108,0		0,00	85,94	-	-	0,00	0,00	-
75	6 389	6 392	10,70	108,0		0,00	87,11	-	-	0,00	0,00	-
76	7 439	7 442	8,86	108,0		0,00	88,43	-	-	0,00	0,00	-
77	8 233	8 235	7,64	108,0		0,00	89,31	-	-	0,00	0,00	-
78	5 664	5 667	12,31	108,0		0,00	86,07	-	-	0,00	0,00	-
79	5 981	5 984	11,54	108,0		0,00	86,54	-	-	0,00	0,00	-
8	5 950	5 954	12,42	109,0		0,00	86,50	-	-	0,00	0,00	-
80	6 375	6 378	10,73	108,0		0,00	87,09	-	-	0,00	0,00	-
81	7 095	7 097	9,44	108,0		0,00	88,02	-	-	0,00	0,00	-
82	6 769	6 772	10,01	108,0		0,00	87,61	-	-	0,00	0,00	-
83	7 172	7 174	9,31	108,0		0,00	88,12	-	-	0,00	0,00	-
84	7 522	7 525	8,73	108,0		0,00	88,53	-	-	0,00	0,00	-
85	7 833	7 836	8,24	108,0		0,00	88,88	-	-	0,00	0,00	-
86	8 028	8 031	7,94	108,0		0,00	89,10	-	-	0,00	0,00	-
87	8 187	8 190	7,70	108,0		0,00	89,27	-	-	0,00	0,00	-
88	8 715	8 717	6,95	108,0		0,00	89,81	-	-	0,00	0,00	-
89	8 882	8 885	6,72	108,0		0,00	89,97	-	-	0,00	0,00	-
9	5 910	5 914	12,52	109,0		0,00	86,44	-	-	0,00	0,00	-
90	13 416	13 417	2,15	108,0		0,00	93,55	-	-	0,00	0,00	-
91	13 345	13 346	2,21	108,0		0,00	93,51	-	-	0,00	0,00	-
92	13 146	13 146	2,40	108,0		0,00	93,38	-	-	0,00	0,00	-
93	12 715	12 715	2,82	108,0		0,00	93,09	-	-	0,00	0,00	-
94	12 705	12 706	2,83	108,0		0,00	93,08	-	-	0,00	0,00	-
95	12 863	12 863	2,67	108,0		0,00	93,19	-	-	0,00	0,00	-
96	13 843	13 843	1,76	108,0		0,00	93,82	-	-	0,00	0,00	-
97	13 505	13 506	2,07	108,0		0,00	93,61	-	-	0,00	0,00	-
98	8 204	8 205	7,86	107,8		0,00	89,28	-	-	0,00	0,00	-
99	7 137	7 139	9,60	107,8		0,00	88,07	-	-	0,00	0,00	-
Sum			38,34									

- Data undefined due to calculation with octave data

Noise sensitive area: D Asuinrakennus D (Haapavesitie 1404)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	7 441	7 444	9,50	109,0		0,00	88,44	-	-	0,00	0,00	-
10	8 082	8 085	8,53	109,0		0,00	89,15	-	-	0,00	0,00	-
100	3 914	3 917	17,31	107,8		0,00	82,86	-	-	0,00	0,00	-
101	4 842	4 844	14,38	107,8		0,00	84,70	-	-	0,00	0,00	-
102	3 501	3 504	18,86	107,8		0,00	81,89	-	-	0,00	0,00	-
103	4 112	4 114	16,62	107,8		0,00	83,29	-	-	0,00	0,00	-
104	3 290	3 294	19,72	107,8		0,00	81,35	-	-	0,00	0,00	-
105	3 899	3 901	17,37	107,8		0,00	82,82	-	-	0,00	0,00	-
106	6 170	6 174	13,18	106,9		0,00	86,81	-	-	0,00	0,00	-
107	6 296	6 300	12,96	106,9		0,00	86,99	-	-	0,00	0,00	-
108	6 065	6 069	13,40	106,9		0,00	86,66	-	-	0,00	0,00	-
109	4 569	4 574	17,11	106,9		0,00	84,21	-	-	0,00	0,00	-
11	7 183	7 187	9,92	109,0		0,00	88,13	-	-	0,00	0,00	-
110	5 418	5 422	14,89	106,9		0,00	85,68	-	-	0,00	0,00	-
111	5 582	5 586	14,49	106,9		0,00	85,94	-	-	0,00	0,00	-
112	4 238	4 243	18,08	106,9		0,00	83,55	-	-	0,00	0,00	-
113	3 467	3 474	20,63	106,9		0,00	81,82	-	-	0,00	0,00	-
114	2 630	2 638	24,03	106,9		0,00	79,43	-	-	0,00	0,00	-
115	2 461	2 469	24,83	106,9		0,00	78,85	-	-	0,00	0,00	-
116	2 555	2 563	24,38	106,9		0,00	79,18	-	-	0,00	0,00	-
117	1 795	1 807	28,51	106,9		0,00	76,14	-	-	0,00	0,00	-
118	6 923	6 926	12,57	109,2	2	0,00	87,81	-	-	0,00	0,00	-
119	7 272	7 275	11,96	109,2	2	0,00	88,24	-	-	0,00	0,00	-
12	8 129	8 133	8,45	109,0		0,00	89,20	-	-	0,00	0,00	-
120	6 859	6 862	12,68	109,2	2	0,00	87,73	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
121	7 931	7 934	10,88	109,2	2	0,00	88,99	-	-	0,00	0,00	-
122	7 575	7 577	11,45	109,2	2	0,00	88,59	-	-	0,00	0,00	-
123	8 375	8 378	10,20	109,2	2	0,00	89,46	-	-	0,00	0,00	-
124	7 420	7 423	11,71	109,2	2	0,00	88,41	-	-	0,00	0,00	-
125	8 714	8 717	9,71	109,2	2	0,00	89,81	-	-	0,00	0,00	-
126	8 084	8 086	10,64	109,2	2	0,00	89,16	-	-	0,00	0,00	-
13	9 337	9 340	6,80	109,0		0,00	90,41	-	-	0,00	0,00	-
14	9 295	9 297	7,22	109,0		0,00	90,37	-	-	0,00	0,00	-
15	9 132	9 134	7,44	109,0		0,00	90,21	-	-	0,00	0,00	-
16	8 449	8 451	8,39	109,0		0,00	89,54	-	-	0,00	0,00	-
17	8 174	8 176	8,79	109,0		0,00	89,25	-	-	0,00	0,00	-
18	9 559	9 561	6,88	109,0		0,00	90,61	-	-	0,00	0,00	-
19	5 475	5 478	13,68	109,0		0,00	85,77	-	-	0,00	0,00	-
2	6 919	6 923	10,37	109,0		0,00	87,81	-	-	0,00	0,00	-
20	9 128	9 129	7,45	109,0		0,00	90,21	-	-	0,00	0,00	-
21	8 572	8 574	8,21	109,0		0,00	89,66	-	-	0,00	0,00	-
22	5 313	5 316	14,04	109,0		0,00	85,51	-	-	0,00	0,00	-
23	8 639	8 641	8,12	109,0		0,00	89,73	-	-	0,00	0,00	-
24	8 467	8 469	8,36	109,0		0,00	89,56	-	-	0,00	0,00	-
25	8 503	8 505	8,31	109,0		0,00	89,59	-	-	0,00	0,00	-
26	7 438	7 440	9,95	109,0		0,00	88,43	-	-	0,00	0,00	-
27	8 848	8 850	7,83	109,0		0,00	89,94	-	-	0,00	0,00	-
28	7 973	7 975	9,10	109,0		0,00	89,03	-	-	0,00	0,00	-
29	9 401	9 403	7,09	109,0		0,00	90,47	-	-	0,00	0,00	-
3	7 414	7 417	9,55	109,0		0,00	88,41	-	-	0,00	0,00	-
30	7 967	7 969	9,12	109,0		0,00	89,03	-	-	0,00	0,00	-
31	10 410	10 411	5,85	109,0		0,00	91,35	-	-	0,00	0,00	-
32	9 402	9 404	7,09	109,0		0,00	90,47	-	-	0,00	0,00	-
33	11 830	11 832	4,29	109,0		0,00	92,46	-	-	0,00	0,00	-
34	8 886	8 888	7,79	109,0		0,00	89,98	-	-	0,00	0,00	-
35	10 324	10 326	5,95	109,0		0,00	91,28	-	-	0,00	0,00	-
36	11 241	11 243	4,91	109,0		0,00	92,02	-	-	0,00	0,00	-
37	12 081	12 082	4,04	109,0		0,00	92,64	-	-	0,00	0,00	-
38	9 893	9 895	6,47	109,0		0,00	90,91	-	-	0,00	0,00	-
39	10 803	10 804	5,41	109,0		0,00	91,67	-	-	0,00	0,00	-
4	6 473	6 477	11,24	109,0		0,00	87,23	-	-	0,00	0,00	-
40	11 815	11 816	4,31	109,0		0,00	92,45	-	-	0,00	0,00	-
41	4 734	4 738	14,83	108,0		0,00	84,51	-	-	0,00	0,00	-
42	3 895	3 900	17,57	108,0		0,00	82,82	-	-	0,00	0,00	-
43	4 845	4 849	14,53	108,0		0,00	84,71	-	-	0,00	0,00	-
44	3 106	3 113	20,70	108,0		0,00	80,86	-	-	0,00	0,00	-
45	3 789	3 795	17,95	108,0		0,00	82,58	-	-	0,00	0,00	-
46	4 669	4 673	15,03	108,0		0,00	84,39	-	-	0,00	0,00	-
47	5 494	5 497	12,75	108,0		0,00	85,80	-	-	0,00	0,00	-
48	3 410	3 416	19,41	108,0		0,00	81,67	-	-	0,00	0,00	-
49	4 091	4 096	16,88	108,0		0,00	83,25	-	-	0,00	0,00	-
5	5 750	5 755	12,90	109,0		0,00	86,20	-	-	0,00	0,00	-
50	4 858	4 863	14,47	108,0		0,00	84,74	-	-	0,00	0,00	-
51	5 578	5 582	12,52	108,0		0,00	85,94	-	-	0,00	0,00	-
52	3 719	3 725	18,21	108,0		0,00	82,42	-	-	0,00	0,00	-
53	4 408	4 413	15,84	108,0		0,00	83,89	-	-	0,00	0,00	-
54	5 439	5 443	12,88	108,0		0,00	85,72	-	-	0,00	0,00	-
55	4 101	4 107	16,85	108,0		0,00	83,27	-	-	0,00	0,00	-
56	4 855	4 859	14,48	108,0		0,00	84,73	-	-	0,00	0,00	-
57	5 731	5 735	12,14	108,0		0,00	86,17	-	-	0,00	0,00	-
58	6 623	6 627	10,27	108,0		0,00	87,43	-	-	0,00	0,00	-
59	5 532	5 536	12,64	108,0		0,00	85,86	-	-	0,00	0,00	-
6	6 856	6 860	10,47	109,0		0,00	87,73	-	-	0,00	0,00	-
60	6 112	6 116	11,23	108,0		0,00	86,73	-	-	0,00	0,00	-
61	6 794	6 798	9,96	108,0		0,00	87,65	-	-	0,00	0,00	-
62	7 390	7 394	8,94	108,0		0,00	88,38	-	-	0,00	0,00	-
63	8 275	8 277	7,58	108,0		0,00	89,36	-	-	0,00	0,00	-
64	6 473	6 477	10,54	108,0		0,00	87,23	-	-	0,00	0,00	-
65	7 077	7 080	9,47	108,0		0,00	88,00	-	-	0,00	0,00	-

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23.11.2022 8.43/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
66	7 835	7 838	8,24	108,0		0,00	88,88	-	-	0,00	0,00	-
67	8 775	8 777	6,86	108,0		0,00	89,87	-	-	0,00	0,00	-
68	9 461	9 464	5,95	108,0		0,00	90,52	-	-	0,00	0,00	-
69	7 146	7 149	9,35	108,0		0,00	88,09	-	-	0,00	0,00	-
7	6 096	6 101	12,08	109,0		0,00	86,71	-	-	0,00	0,00	-
70	7 692	7 695	8,46	108,0		0,00	88,72	-	-	0,00	0,00	-
71	8 559	8 561	7,17	108,0		0,00	89,65	-	-	0,00	0,00	-
72	9 280	9 282	6,19	108,0		0,00	90,35	-	-	0,00	0,00	-
73	9 986	9 988	5,30	108,0		0,00	90,99	-	-	0,00	0,00	-
74	8 347	8 350	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
75	9 051	9 054	6,49	108,0		0,00	90,14	-	-	0,00	0,00	-
76	9 974	9 976	5,31	108,0		0,00	90,98	-	-	0,00	0,00	-
77	10 631	10 633	4,54	108,0		0,00	91,53	-	-	0,00	0,00	-
78	8 696	8 699	6,97	108,0		0,00	89,79	-	-	0,00	0,00	-
79	8 920	8 923	6,66	108,0		0,00	90,01	-	-	0,00	0,00	-
8	6 553	6 557	11,07	109,0		0,00	87,33	-	-	0,00	0,00	-
80	9 185	9 188	6,31	108,0		0,00	90,26	-	-	0,00	0,00	-
81	9 790	9 792	5,54	108,0		0,00	90,82	-	-	0,00	0,00	-
82	9 697	9 699	5,65	108,0		0,00	90,73	-	-	0,00	0,00	-
83	9 981	9 983	5,30	108,0		0,00	90,99	-	-	0,00	0,00	-
84	10 464	10 466	4,73	108,0		0,00	91,40	-	-	0,00	0,00	-
85	10 646	10 649	4,52	108,0		0,00	91,55	-	-	0,00	0,00	-
86	11 026	11 028	4,10	108,0		0,00	91,85	-	-	0,00	0,00	-
87	11 072	11 074	4,05	108,0		0,00	91,89	-	-	0,00	0,00	-
88	11 633	11 635	3,45	108,0		0,00	92,32	-	-	0,00	0,00	-
89	11 874	11 876	3,20	108,0		0,00	92,49	-	-	0,00	0,00	-
9	6 896	6 900	10,41	109,0		0,00	87,78	-	-	0,00	0,00	-
90	15 929	15 930	0,02	108,0		0,00	95,04	-	-	0,00	0,00	-
91	15 989	15 990	-0,03	108,0		0,00	95,08	-	-	0,00	0,00	-
92	15 358	15 359	0,47	108,0		0,00	94,73	-	-	0,00	0,00	-
93	15 029	15 030	0,74	108,0		0,00	94,54	-	-	0,00	0,00	-
94	15 184	15 184	0,61	108,0		0,00	94,63	-	-	0,00	0,00	-
95	15 483	15 484	0,37	108,0		0,00	94,80	-	-	0,00	0,00	-
96	16 094	16 095	-0,11	108,0		0,00	95,13	-	-	0,00	0,00	-
97	15 836	15 837	0,09	108,0		0,00	94,99	-	-	0,00	0,00	-
98	5 362	5 364	13,14	107,8		0,00	85,59	-	-	0,00	0,00	-
99	4 337	4 339	15,87	107,8		0,00	83,75	-	-	0,00	0,00	-
Sum			35,68									

- Data undefined due to calculation with octave data

Noise sensitive area: E Asuinrakennus E (Säilynkankaantie 34)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	7 952	7 955	8,71	109,0		0,00	89,01	-	-	0,00	0,00	-
10	8 966	8 969	7,29	109,0		0,00	90,05	-	-	0,00	0,00	-
100	3 691	3 694	18,13	107,8		0,00	82,35	-	-	0,00	0,00	-
101	4 448	4 450	15,52	107,8		0,00	83,97	-	-	0,00	0,00	-
102	3 408	3 411	19,24	107,8		0,00	81,66	-	-	0,00	0,00	-
103	3 682	3 685	18,16	107,8		0,00	82,33	-	-	0,00	0,00	-
104	2 916	2 920	21,37	107,8		0,00	80,31	-	-	0,00	0,00	-
105	3 310	3 313	19,64	107,8		0,00	81,41	-	-	0,00	0,00	-
106	6 641	6 644	12,35	106,9		0,00	87,45	-	-	0,00	0,00	-
107	6 667	6 670	12,31	106,9		0,00	87,48	-	-	0,00	0,00	-
108	6 338	6 342	12,88	106,9		0,00	87,04	-	-	0,00	0,00	-
109	5 032	5 037	15,85	106,9		0,00	85,04	-	-	0,00	0,00	-
11	8 108	8 111	8,48	109,0		0,00	89,18	-	-	0,00	0,00	-
110	5 892	5 896	13,78	106,9		0,00	86,41	-	-	0,00	0,00	-
111	5 947	5 951	13,66	106,9		0,00	86,49	-	-	0,00	0,00	-
112	4 340	4 345	17,77	106,9		0,00	83,76	-	-	0,00	0,00	-
113	3 515	3 521	20,46	106,9		0,00	81,93	-	-	0,00	0,00	-
114	2 209	2 218	26,11	106,9		0,00	77,92	-	-	0,00	0,00	-
115	2 595	2 603	24,19	106,9		0,00	79,31	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
116	2 406	2 415	25,10	106,9		0,00	78,66	-	-	0,00	0,00	-
117	1 970	1 981	27,44	106,9		0,00	76,94	-	-	0,00	0,00	-
118	6 423	6 427	13,50	109,2	2	0,00	87,16	-	-	0,00	0,00	-
119	6 946	6 949	12,53	109,2	2	0,00	87,84	-	-	0,00	0,00	-
12	9 051	9 054	7,17	109,0		0,00	90,14	-	-	0,00	0,00	-
120	6 471	6 474	13,41	109,2	2	0,00	87,22	-	-	0,00	0,00	-
121	7 560	7 563	11,47	109,2	2	0,00	88,57	-	-	0,00	0,00	-
122	7 027	7 030	12,38	109,2	2	0,00	87,94	-	-	0,00	0,00	-
123	7 916	7 918	10,90	109,2	2	0,00	88,97	-	-	0,00	0,00	-
124	6 983	6 986	12,46	109,2	2	0,00	87,88	-	-	0,00	0,00	-
125	8 308	8 311	10,30	109,2	2	0,00	89,39	-	-	0,00	0,00	-
126	7 564	7 567	11,47	109,2	2	0,00	88,58	-	-	0,00	0,00	-
13	10 228	10 230	5,73	109,0		0,00	91,20	-	-	0,00	0,00	-
14	9 616	9 617	6,81	109,0		0,00	90,66	-	-	0,00	0,00	-
15	9 506	9 507	6,95	109,0		0,00	90,56	-	-	0,00	0,00	-
16	8 855	8 856	7,82	109,0		0,00	89,95	-	-	0,00	0,00	-
17	8 646	8 647	8,11	109,0		0,00	89,74	-	-	0,00	0,00	-
18	10 031	10 032	6,30	109,0		0,00	91,03	-	-	0,00	0,00	-
19	6 019	6 021	12,53	109,0		0,00	86,59	-	-	0,00	0,00	-
2	7 494	7 497	9,42	109,0		0,00	88,50	-	-	0,00	0,00	-
20	9 645	9 647	6,77	109,0		0,00	90,69	-	-	0,00	0,00	-
21	9 133	9 135	7,44	109,0		0,00	90,21	-	-	0,00	0,00	-
22	5 961	5 963	12,65	109,0		0,00	86,51	-	-	0,00	0,00	-
23	9 257	9 258	7,28	109,0		0,00	90,33	-	-	0,00	0,00	-
24	9 137	9 138	7,43	109,0		0,00	90,22	-	-	0,00	0,00	-
25	9 222	9 224	7,32	109,0		0,00	90,30	-	-	0,00	0,00	-
26	8 205	8 207	8,75	109,0		0,00	89,28	-	-	0,00	0,00	-
27	9 607	9 609	6,82	109,0		0,00	90,65	-	-	0,00	0,00	-
28	8 776	8 778	7,93	109,0		0,00	89,87	-	-	0,00	0,00	-
29	10 190	10 191	6,11	109,0		0,00	91,16	-	-	0,00	0,00	-
3	8 054	8 057	8,56	109,0		0,00	89,12	-	-	0,00	0,00	-
30	8 813	8 815	7,87	109,0		0,00	89,90	-	-	0,00	0,00	-
31	11 203	11 205	4,95	109,0		0,00	91,99	-	-	0,00	0,00	-
32	10 226	10 228	6,06	109,0		0,00	91,20	-	-	0,00	0,00	-
33	12 597	12 598	3,53	109,0		0,00	93,01	-	-	0,00	0,00	-
34	9 742	9 744	6,65	109,0		0,00	90,77	-	-	0,00	0,00	-
35	11 155	11 157	5,01	109,0		0,00	91,95	-	-	0,00	0,00	-
36	12 049	12 050	4,07	109,0		0,00	92,62	-	-	0,00	0,00	-
37	12 884	12 885	3,26	109,0		0,00	93,20	-	-	0,00	0,00	-
38	10 755	10 757	5,46	109,0		0,00	91,63	-	-	0,00	0,00	-
39	11 651	11 652	4,48	109,0		0,00	92,33	-	-	0,00	0,00	-
4	7 144	7 148	9,99	109,0		0,00	88,08	-	-	0,00	0,00	-
40	12 639	12 640	3,49	109,0		0,00	93,04	-	-	0,00	0,00	-
41	5 510	5 514	12,69	108,0		0,00	85,83	-	-	0,00	0,00	-
42	4 746	4 750	14,80	108,0		0,00	84,53	-	-	0,00	0,00	-
43	5 710	5 714	12,20	108,0		0,00	86,14	-	-	0,00	0,00	-
44	4 033	4 039	17,08	108,0		0,00	83,12	-	-	0,00	0,00	-
45	4 696	4 700	14,95	108,0		0,00	84,44	-	-	0,00	0,00	-
46	5 583	5 587	12,51	108,0		0,00	85,94	-	-	0,00	0,00	-
47	6 381	6 384	10,72	108,0		0,00	87,10	-	-	0,00	0,00	-
48	4 367	4 372	15,97	108,0		0,00	83,81	-	-	0,00	0,00	-
49	5 042	5 046	13,95	108,0		0,00	85,06	-	-	0,00	0,00	-
5	6 478	6 481	11,23	109,0		0,00	87,23	-	-	0,00	0,00	-
50	5 803	5 807	11,96	108,0		0,00	86,28	-	-	0,00	0,00	-
51	6 509	6 512	10,48	108,0		0,00	87,27	-	-	0,00	0,00	-
52	4 669	4 674	15,03	108,0		0,00	84,39	-	-	0,00	0,00	-
53	5 365	5 370	13,07	108,0		0,00	85,60	-	-	0,00	0,00	-
54	6 391	6 395	10,70	108,0		0,00	87,12	-	-	0,00	0,00	-
55	5 027	5 032	13,99	108,0		0,00	85,03	-	-	0,00	0,00	-
56	5 807	5 811	11,95	108,0		0,00	86,29	-	-	0,00	0,00	-
57	6 689	6 692	10,15	108,0		0,00	87,51	-	-	0,00	0,00	-
58	7 577	7 580	8,64	108,0		0,00	88,59	-	-	0,00	0,00	-
59	6 459	6 463	10,57	108,0		0,00	87,21	-	-	0,00	0,00	-
6	7 583	7 587	9,28	109,0		0,00	88,60	-	-	0,00	0,00	-

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
60	7 055	7 059	9,50	108,0		0,00	87,97	-	-	0,00	0,00	-
61	7 748	7 751	8,37	108,0		0,00	88,79	-	-	0,00	0,00	-
62	8 348	8 351	7,47	108,0		0,00	89,43	-	-	0,00	0,00	-
63	9 231	9 233	6,25	108,0		0,00	90,31	-	-	0,00	0,00	-
64	7 399	7 402	8,93	108,0		0,00	88,39	-	-	0,00	0,00	-
65	8 021	8 024	7,95	108,0		0,00	89,09	-	-	0,00	0,00	-
66	8 790	8 793	6,84	108,0		0,00	89,88	-	-	0,00	0,00	-
67	9 732	9 734	5,61	108,0		0,00	90,77	-	-	0,00	0,00	-
68	10 417	10 419	4,79	108,0		0,00	91,36	-	-	0,00	0,00	-
69	8 067	8 070	7,88	108,0		0,00	89,14	-	-	0,00	0,00	-
7	6 887	6 890	10,42	109,0		0,00	87,76	-	-	0,00	0,00	-
70	8 633	8 636	7,06	108,0		0,00	89,73	-	-	0,00	0,00	-
71	9 513	9 516	5,88	108,0		0,00	90,57	-	-	0,00	0,00	-
72	10 237	10 239	5,00	108,0		0,00	91,20	-	-	0,00	0,00	-
73	10 943	10 945	4,19	108,0		0,00	91,78	-	-	0,00	0,00	-
74	9 288	9 291	6,17	108,0		0,00	90,36	-	-	0,00	0,00	-
75	10 001	10 003	5,28	108,0		0,00	91,00	-	-	0,00	0,00	-
76	10 930	10 932	4,20	108,0		0,00	91,77	-	-	0,00	0,00	-
77	11 588	11 590	3,50	108,0		0,00	92,28	-	-	0,00	0,00	-
78	9 588	9 590	5,79	108,0		0,00	90,64	-	-	0,00	0,00	-
79	9 837	9 840	5,48	108,0		0,00	90,86	-	-	0,00	0,00	-
8	7 385	7 388	9,59	109,0		0,00	88,37	-	-	0,00	0,00	-
80	10 123	10 125	5,13	108,0		0,00	91,11	-	-	0,00	0,00	-
81	10 739	10 741	4,42	108,0		0,00	91,62	-	-	0,00	0,00	-
82	10 617	10 620	4,55	108,0		0,00	91,52	-	-	0,00	0,00	-
83	10 920	10 922	4,21	108,0		0,00	91,77	-	-	0,00	0,00	-
84	11 383	11 385	3,71	108,0		0,00	92,13	-	-	0,00	0,00	-
85	11 586	11 588	3,50	108,0		0,00	92,28	-	-	0,00	0,00	-
86	11 931	11 933	3,14	108,0		0,00	92,54	-	-	0,00	0,00	-
87	12 002	12 004	3,07	108,0		0,00	92,59	-	-	0,00	0,00	-
88	12 558	12 560	2,52	108,0		0,00	92,98	-	-	0,00	0,00	-
89	12 782	12 784	2,31	108,0		0,00	93,13	-	-	0,00	0,00	-
9	7 772	7 776	9,00	109,0		0,00	88,81	-	-	0,00	0,00	-
90	16 341	16 341	-0,30	108,0		0,00	95,27	-	-	0,00	0,00	-
91	16 457	16 458	-0,39	108,0		0,00	95,33	-	-	0,00	0,00	-
92	15 652	15 653	0,24	108,0		0,00	94,89	-	-	0,00	0,00	-
93	15 364	15 365	0,47	108,0		0,00	94,73	-	-	0,00	0,00	-
94	15 584	15 585	0,29	108,0		0,00	94,85	-	-	0,00	0,00	-
95	15 943	15 944	0,01	108,0		0,00	95,05	-	-	0,00	0,00	-
96	16 399	16 399	-0,34	108,0		0,00	95,30	-	-	0,00	0,00	-
97	16 173	16 174	-0,17	108,0		0,00	95,18	-	-	0,00	0,00	-
98	5 011	5 013	13,97	107,8		0,00	85,00	-	-	0,00	0,00	-
99	4 065	4 067	16,78	107,8		0,00	83,19	-	-	0,00	0,00	-
Sum			35,23									

- Data undefined due to calculation with octave data

Noise sensitive area: F Asuinrakennus F (Ritamäentie 156)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	9 018	9 021	7,22	109,0		0,00	90,11	-	-	0,00	0,00	-
10	10 316	10 318	5,62	109,0		0,00	91,27	-	-	0,00	0,00	-
100	4 088	4 091	16,70	107,8		0,00	83,24	-	-	0,00	0,00	-
101	4 528	4 530	15,27	107,8		0,00	84,12	-	-	0,00	0,00	-
102	4 001	4 004	17,00	107,8		0,00	83,05	-	-	0,00	0,00	-
103	3 773	3 776	17,82	107,8		0,00	82,54	-	-	0,00	0,00	-
104	3 194	3 198	20,13	107,8		0,00	81,10	-	-	0,00	0,00	-
105	3 161	3 165	20,27	107,8		0,00	81,01	-	-	0,00	0,00	-
106	7 214	7 217	11,40	106,9		0,00	88,17	-	-	0,00	0,00	-
107	7 103	7 106	11,58	106,9		0,00	88,03	-	-	0,00	0,00	-
108	6 651	6 655	12,33	106,9		0,00	87,46	-	-	0,00	0,00	-
109	5 652	5 656	14,33	106,9		0,00	86,05	-	-	0,00	0,00	-
11	9 469	9 472	6,64	109,0		0,00	90,53	-	-	0,00	0,00	-

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23.11.2022 8.43/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
110	6 493	6 497	12,61	106,9		0,00	87,25	-	-	0,00	0,00	-
111	6 400	6 403	12,77	106,9		0,00	87,13	-	-	0,00	0,00	-
112	4 527	4 532	17,23	106,9		0,00	84,13	-	-	0,00	0,00	-
113	3 708	3 713	19,78	106,9		0,00	82,40	-	-	0,00	0,00	-
114	1 957	1 969	27,51	106,9		0,00	76,88	-	-	0,00	0,00	-
115	3 039	3 046	22,27	106,9		0,00	80,67	-	-	0,00	0,00	-
116	2 523	2 532	24,53	106,9		0,00	79,07	-	-	0,00	0,00	-
117	2 605	2 613	24,15	106,9		0,00	79,34	-	-	0,00	0,00	-
118	5 619	5 623	15,31	109,2	2	0,00	86,00	-	-	0,00	0,00	-
119	6 384	6 387	13,57	109,2	2	0,00	87,11	-	-	0,00	0,00	-
12	10 412	10 415	5,51	109,0		0,00	91,35	-	-	0,00	0,00	-
120	5 830	5 834	14,78	109,2	2	0,00	86,32	-	-	0,00	0,00	-
121	6 916	6 919	12,58	109,2	2	0,00	87,80	-	-	0,00	0,00	-
122	6 138	6 141	14,06	109,2	2	0,00	86,77	-	-	0,00	0,00	-
123	7 136	7 139	12,19	109,2	2	0,00	88,07	-	-	0,00	0,00	-
124	6 255	6 259	13,83	109,2	2	0,00	86,93	-	-	0,00	0,00	-
125	7 597	7 600	11,41	109,2	2	0,00	88,62	-	-	0,00	0,00	-
126	6 703	6 706	12,97	109,2	2	0,00	87,53	-	-	0,00	0,00	-
13	11 580	11 582	4,25	109,0		0,00	92,28	-	-	0,00	0,00	-
14	10 469	10 470	5,78	109,0		0,00	91,40	-	-	0,00	0,00	-
15	10 417	10 419	5,84	109,0		0,00	91,36	-	-	0,00	0,00	-
16	9 807	9 809	6,57	109,0		0,00	90,83	-	-	0,00	0,00	-
17	9 667	9 669	6,75	109,0		0,00	90,71	-	-	0,00	0,00	-
18	11 040	11 042	5,13	109,0		0,00	91,86	-	-	0,00	0,00	-
19	7 140	7 142	10,45	109,0		0,00	88,08	-	-	0,00	0,00	-
2	8 624	8 627	7,75	109,0		0,00	89,72	-	-	0,00	0,00	-
20	10 705	10 706	5,51	109,0		0,00	91,59	-	-	0,00	0,00	-
21	10 238	10 239	6,05	109,0		0,00	91,21	-	-	0,00	0,00	-
22	7 167	7 169	10,40	109,0		0,00	88,11	-	-	0,00	0,00	-
23	10 412	10 414	5,84	109,0		0,00	91,35	-	-	0,00	0,00	-
24	10 338	10 339	5,93	109,0		0,00	91,29	-	-	0,00	0,00	-
25	10 463	10 465	5,78	109,0		0,00	91,39	-	-	0,00	0,00	-
26	9 487	9 489	6,98	109,0		0,00	90,54	-	-	0,00	0,00	-
27	10 879	10 880	5,31	109,0		0,00	91,73	-	-	0,00	0,00	-
28	10 081	10 083	6,24	109,0		0,00	91,07	-	-	0,00	0,00	-
29	11 482	11 483	4,66	109,0		0,00	92,20	-	-	0,00	0,00	-
3	9 236	9 239	6,93	109,0		0,00	90,31	-	-	0,00	0,00	-
30	10 145	10 146	6,16	109,0		0,00	91,13	-	-	0,00	0,00	-
31	12 497	12 498	3,63	109,0		0,00	92,94	-	-	0,00	0,00	-
32	11 542	11 544	4,59	109,0		0,00	92,25	-	-	0,00	0,00	-
33	13 868	13 869	2,37	109,0		0,00	93,84	-	-	0,00	0,00	-
34	11 078	11 079	5,09	109,0		0,00	91,89	-	-	0,00	0,00	-
35	12 474	12 476	3,65	109,0		0,00	92,92	-	-	0,00	0,00	-
36	13 351	13 352	2,83	109,0		0,00	93,51	-	-	0,00	0,00	-
37	14 182	14 184	2,10	109,0		0,00	94,04	-	-	0,00	0,00	-
38	12 093	12 095	4,03	109,0		0,00	92,65	-	-	0,00	0,00	-
39	12 980	12 982	3,17	109,0		0,00	93,27	-	-	0,00	0,00	-
4	8 358	8 361	8,12	109,0		0,00	89,45	-	-	0,00	0,00	-
40	13 953	13 954	2,30	109,0		0,00	93,89	-	-	0,00	0,00	-
41	6 810	6 813	9,93	108,0		0,00	87,67	-	-	0,00	0,00	-
42	6 088	6 091	11,29	108,0		0,00	86,69	-	-	0,00	0,00	-
43	7 055	7 058	9,51	108,0		0,00	87,97	-	-	0,00	0,00	-
44	5 395	5 399	12,99	108,0		0,00	85,65	-	-	0,00	0,00	-
45	6 055	6 059	11,37	108,0		0,00	86,65	-	-	0,00	0,00	-
46	6 943	6 946	9,70	108,0		0,00	87,84	-	-	0,00	0,00	-
47	7 734	7 737	8,39	108,0		0,00	88,77	-	-	0,00	0,00	-
48	5 705	5 709	12,20	108,0		0,00	86,13	-	-	0,00	0,00	-
49	6 394	6 398	10,69	108,0		0,00	87,12	-	-	0,00	0,00	-
5	7 739	7 742	9,04	109,0		0,00	88,78	-	-	0,00	0,00	-
50	7 161	7 164	9,33	108,0		0,00	88,10	-	-	0,00	0,00	-
51	7 870	7 873	8,18	108,0		0,00	88,92	-	-	0,00	0,00	-
52	5 967	5 971	11,57	108,0		0,00	86,52	-	-	0,00	0,00	-
53	6 696	6 699	10,14	108,0		0,00	87,52	-	-	0,00	0,00	-
54	7 742	7 745	8,38	108,0		0,00	88,78	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
55	6 273	6 276	10,92	108,0		0,00	86,95	-	-	0,00	0,00	-
56	7 110	7 113	9,41	108,0		0,00	88,04	-	-	0,00	0,00	-
57	8 021	8 024	7,95	108,0		0,00	89,09	-	-	0,00	0,00	-
58	8 925	8 927	6,66	108,0		0,00	90,01	-	-	0,00	0,00	-
59	7 699	7 702	8,45	108,0		0,00	88,73	-	-	0,00	0,00	-
6	8 838	8 841	7,46	109,0		0,00	89,93	-	-	0,00	0,00	-
60	8 327	8 330	7,50	108,0		0,00	89,41	-	-	0,00	0,00	-
61	9 052	9 055	6,49	108,0		0,00	90,14	-	-	0,00	0,00	-
62	9 674	9 676	5,68	108,0		0,00	90,71	-	-	0,00	0,00	-
63	10 573	10 575	4,61	108,0		0,00	91,49	-	-	0,00	0,00	-
64	8 631	8 634	7,06	108,0		0,00	89,72	-	-	0,00	0,00	-
65	9 294	9 297	6,17	108,0		0,00	90,37	-	-	0,00	0,00	-
66	10 100	10 102	5,16	108,0		0,00	91,09	-	-	0,00	0,00	-
67	11 064	11 066	4,06	108,0		0,00	91,88	-	-	0,00	0,00	-
68	11 760	11 762	3,32	108,0		0,00	92,41	-	-	0,00	0,00	-
69	9 288	9 291	6,17	108,0		0,00	90,36	-	-	0,00	0,00	-
7	8 188	8 191	8,37	109,0		0,00	89,27	-	-	0,00	0,00	-
70	9 897	9 899	5,41	108,0		0,00	90,91	-	-	0,00	0,00	-
71	10 820	10 822	4,33	108,0		0,00	91,69	-	-	0,00	0,00	-
72	11 555	11 557	3,53	108,0		0,00	92,26	-	-	0,00	0,00	-
73	12 278	12 280	2,80	108,0		0,00	92,78	-	-	0,00	0,00	-
74	10 551	10 553	4,63	108,0		0,00	91,47	-	-	0,00	0,00	-
75	11 288	11 290	3,81	108,0		0,00	92,05	-	-	0,00	0,00	-
76	12 242	12 243	2,83	108,0		0,00	92,76	-	-	0,00	0,00	-
77	12 919	12 921	2,18	108,0		0,00	93,23	-	-	0,00	0,00	-
78	10 746	10 748	4,41	108,0		0,00	91,63	-	-	0,00	0,00	-
79	11 045	11 047	4,08	108,0		0,00	91,86	-	-	0,00	0,00	-
8	8 710	8 713	7,63	109,0		0,00	89,80	-	-	0,00	0,00	-
80	11 376	11 378	3,72	108,0		0,00	92,12	-	-	0,00	0,00	-
81	12 021	12 023	3,05	108,0		0,00	92,60	-	-	0,00	0,00	-
82	11 831	11 833	3,25	108,0		0,00	92,46	-	-	0,00	0,00	-
83	12 174	12 176	2,90	108,0		0,00	92,71	-	-	0,00	0,00	-
84	12 590	12 592	2,50	108,0		0,00	93,00	-	-	0,00	0,00	-
85	12 840	12 842	2,26	108,0		0,00	93,17	-	-	0,00	0,00	-
86	13 110	13 112	2,00	108,0		0,00	93,35	-	-	0,00	0,00	-
87	13 233	13 235	1,89	108,0		0,00	93,43	-	-	0,00	0,00	-
88	13 776	13 778	1,41	108,0		0,00	93,78	-	-	0,00	0,00	-
89	13 964	13 965	1,24	108,0		0,00	93,90	-	-	0,00	0,00	-
9	9 119	9 123	7,10	109,0		0,00	90,20	-	-	0,00	0,00	-
90	16 711	16 712	-0,58	108,0		0,00	95,46	-	-	0,00	0,00	-
91	16 912	16 913	-0,72	108,0		0,00	95,56	-	-	0,00	0,00	-
92	15 855	15 856	0,08	108,0		0,00	95,00	-	-	0,00	0,00	-
93	15 629	15 630	0,25	108,0		0,00	94,88	-	-	0,00	0,00	-
94	15 944	15 944	0,01	108,0		0,00	95,05	-	-	0,00	0,00	-
95	16 389	16 390	-0,33	108,0		0,00	95,29	-	-	0,00	0,00	-
96	16 612	16 613	-0,50	108,0		0,00	95,41	-	-	0,00	0,00	-
97	16 436	16 436	-0,37	108,0		0,00	95,32	-	-	0,00	0,00	-
98	5 123	5 125	13,70	107,8		0,00	85,19	-	-	0,00	0,00	-
99	4 360	4 362	15,80	107,8		0,00	83,79	-	-	0,00	0,00	-
Sum			34,24									

- Data undefined due to calculation with octave data

Noise sensitive area: G Lomarakennus G (Virtaniementie 175)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	12 790	12 792	3,07	109,0		0,00	93,14	-	-	0,00	0,00	-
10	9 543	9 546	6,54	109,0		0,00	90,60	-	-	0,00	0,00	-
100	12 083	12 084	3,07	107,8		0,00	92,64	-	-	0,00	0,00	-
101	13 134	13 134	2,05	107,8		0,00	93,37	-	-	0,00	0,00	-
102	11 549	11 550	3,63	107,8		0,00	92,25	-	-	0,00	0,00	-
103	12 444	12 444	2,71	107,8		0,00	92,90	-	-	0,00	0,00	-
104	11 614	11 614	3,56	107,8		0,00	92,30	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
105	12 275	12 275	2,88	107,8		0,00	92,78	-	-	0,00	0,00	-
106	3 100	3 106	22,03	106,9		0,00	80,84	-	-	0,00	0,00	-
107	3 690	3 695	19,85	106,9		0,00	82,35	-	-	0,00	0,00	-
108	4 430	4 434	17,51	106,9		0,00	83,94	-	-	0,00	0,00	-
109	4 334	4 338	17,79	106,9		0,00	83,75	-	-	0,00	0,00	-
11	8 194	8 196	8,36	109,0		0,00	89,27	-	-	0,00	0,00	-
110	3 610	3 615	20,12	106,9		0,00	82,16	-	-	0,00	0,00	-
111	4 080	4 084	18,57	106,9		0,00	83,22	-	-	0,00	0,00	-
112	6 040	6 043	13,45	106,9		0,00	86,62	-	-	0,00	0,00	-
113	6 589	6 591	12,44	106,9		0,00	87,38	-	-	0,00	0,00	-
114	8 287	8 289	9,77	106,9		0,00	89,37	-	-	0,00	0,00	-
115	6 897	6 900	11,92	106,9		0,00	87,78	-	-	0,00	0,00	-
116	7 560	7 562	10,85	106,9		0,00	88,57	-	-	0,00	0,00	-
117	7 280	7 283	11,29	106,9		0,00	88,25	-	-	0,00	0,00	-
118	9 688	9 689	8,39	109,2	2	0,00	90,73	-	-	0,00	0,00	-
119	8 632	8 634	9,82	109,2	2	0,00	89,72	-	-	0,00	0,00	-
12	8 682	8 685	7,67	109,0		0,00	89,78	-	-	0,00	0,00	-
120	8 900	8 902	9,45	109,2	2	0,00	89,99	-	-	0,00	0,00	-
121	9 250	9 252	8,97	109,2	2	0,00	90,32	-	-	0,00	0,00	-
122	10 371	10 373	7,55	109,2	2	0,00	91,32	-	-	0,00	0,00	-
123	10 156	10 158	7,81	109,2	2	0,00	91,14	-	-	0,00	0,00	-
124	9 490	9 491	8,65	109,2	2	0,00	90,55	-	-	0,00	0,00	-
125	9 934	9 935	8,08	109,2	2	0,00	90,94	-	-	0,00	0,00	-
126	10 457	10 458	7,45	109,2	2	0,00	91,39	-	-	0,00	0,00	-
13	10 141	10 143	5,82	109,0		0,00	91,12	-	-	0,00	0,00	-
14	15 321	15 322	1,17	109,0		0,00	94,71	-	-	0,00	0,00	-
15	14 913	14 914	1,49	109,0		0,00	94,47	-	-	0,00	0,00	-
16	14 175	14 176	2,11	109,0		0,00	94,03	-	-	0,00	0,00	-
17	13 586	13 587	2,62	109,0		0,00	93,66	-	-	0,00	0,00	-
18	14 701	14 702	1,67	109,0		0,00	94,35	-	-	0,00	0,00	-
19	11 223	11 224	4,94	109,0		0,00	92,00	-	-	0,00	0,00	-
2	12 017	12 019	3,81	109,0		0,00	92,60	-	-	0,00	0,00	-
20	14 050	14 050	2,21	109,0		0,00	93,95	-	-	0,00	0,00	-
21	13 321	13 321	2,86	109,0		0,00	93,49	-	-	0,00	0,00	-
22	10 529	10 530	5,72	109,0		0,00	91,45	-	-	0,00	0,00	-
23	12 953	12 954	3,20	109,0		0,00	93,25	-	-	0,00	0,00	-
24	12 406	12 407	3,72	109,0		0,00	92,87	-	-	0,00	0,00	-
25	11 977	11 978	4,14	109,0		0,00	92,57	-	-	0,00	0,00	-
26	10 792	10 793	5,41	109,0		0,00	91,66	-	-	0,00	0,00	-
27	11 791	11 792	4,33	109,0		0,00	92,43	-	-	0,00	0,00	-
28	10 705	10 706	5,51	109,0		0,00	91,59	-	-	0,00	0,00	-
29	11 817	11 818	4,31	109,0		0,00	92,45	-	-	0,00	0,00	-
3	11 906	11 908	3,92	109,0		0,00	92,52	-	-	0,00	0,00	-
30	10 105	10 107	6,21	109,0		0,00	91,09	-	-	0,00	0,00	-
31	12 472	12 473	3,65	109,0		0,00	92,92	-	-	0,00	0,00	-
32	11 333	11 334	4,82	109,0		0,00	92,09	-	-	0,00	0,00	-
33	13 903	13 903	2,34	109,0		0,00	93,86	-	-	0,00	0,00	-
34	10 512	10 514	5,73	109,0		0,00	91,44	-	-	0,00	0,00	-
35	11 869	11 870	4,25	109,0		0,00	92,49	-	-	0,00	0,00	-
36	12 898	12 899	3,25	109,0		0,00	93,21	-	-	0,00	0,00	-
37	13 601	13 602	2,61	109,0		0,00	93,67	-	-	0,00	0,00	-
38	11 053	11 054	5,12	109,0		0,00	91,87	-	-	0,00	0,00	-
39	11 927	11 928	4,20	109,0		0,00	92,53	-	-	0,00	0,00	-
4	11 059	11 060	4,79	109,0		0,00	91,88	-	-	0,00	0,00	-
40	13 067	13 068	3,09	109,0		0,00	93,32	-	-	0,00	0,00	-
41	9 333	9 334	6,13	108,0		0,00	90,40	-	-	0,00	0,00	-
42	8 424	8 426	7,36	108,0		0,00	89,51	-	-	0,00	0,00	-
43	8 493	8 495	7,26	108,0		0,00	89,58	-	-	0,00	0,00	-
44	7 524	7 526	8,73	108,0		0,00	88,53	-	-	0,00	0,00	-
45	7 793	7 795	8,30	108,0		0,00	88,84	-	-	0,00	0,00	-
46	7 748	7 750	8,37	108,0		0,00	88,79	-	-	0,00	0,00	-
47	8 374	8 376	7,43	108,0		0,00	89,46	-	-	0,00	0,00	-
48	6 625	6 628	10,27	108,0		0,00	87,43	-	-	0,00	0,00	-
49	6 862	6 865	9,84	108,0		0,00	87,73	-	-	0,00	0,00	-

To be continued on next page...

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23.11.2022 8.43/3.5.584

DECIBEL - Detailed results

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + TuomiperäNoise calculation model: ISO 9613-2 General 8,0 m/s

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WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Pure tones [dB]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
5	10 204	10 206	5,75	109,0		0,00	91,18	-	-	0,00	0,00	-
50	7 034	7 036	9,54	108,0		0,00	87,95	-	-	0,00	0,00	-
51	7 543	7 546	8,70	108,0		0,00	88,55	-	-	0,00	0,00	-
52	5 952	5 955	11,61	108,0		0,00	86,50	-	-	0,00	0,00	-
53	6 239	6 242	10,99	108,0		0,00	86,91	-	-	0,00	0,00	-
54	6 740	6 742	10,06	108,0		0,00	87,58	-	-	0,00	0,00	-
55	5 272	5 275	13,32	108,0		0,00	85,45	-	-	0,00	0,00	-
56	5 653	5 656	12,34	108,0		0,00	86,05	-	-	0,00	0,00	-
57	6 170	6 173	11,12	108,0		0,00	86,81	-	-	0,00	0,00	-
58	6 788	6 791	9,97	108,0		0,00	87,64	-	-	0,00	0,00	-
59	4 642	4 646	15,11	108,0		0,00	84,34	-	-	0,00	0,00	-
6	10 832	10 834	5,04	109,0		0,00	91,70	-	-	0,00	0,00	-
60	4 987	4 991	14,10	108,0		0,00	84,96	-	-	0,00	0,00	-
61	5 596	5 600	12,48	108,0		0,00	85,96	-	-	0,00	0,00	-
62	6 253	6 256	10,96	108,0		0,00	86,93	-	-	0,00	0,00	-
63	7 082	7 084	9,46	108,0		0,00	88,01	-	-	0,00	0,00	-
64	4 380	4 385	15,93	108,0		0,00	83,84	-	-	0,00	0,00	-
65	5 024	5 027	14,00	108,0		0,00	85,03	-	-	0,00	0,00	-
66	5 955	5 958	11,60	108,0		0,00	86,50	-	-	0,00	0,00	-
67	6 957	6 960	9,68	108,0		0,00	87,85	-	-	0,00	0,00	-
68	7 698	7 701	8,45	108,0		0,00	88,73	-	-	0,00	0,00	-
69	4 204	4 209	16,50	108,0		0,00	83,48	-	-	0,00	0,00	-
7	9 811	9 813	6,22	109,0		0,00	90,84	-	-	0,00	0,00	-
70	4 959	4 962	14,18	108,0		0,00	84,91	-	-	0,00	0,00	-
71	6 136	6 139	11,19	108,0		0,00	86,76	-	-	0,00	0,00	-
72	6 798	6 800	9,96	108,0		0,00	87,65	-	-	0,00	0,00	-
73	7 684	7 686	8,47	108,0		0,00	88,71	-	-	0,00	0,00	-
74	5 135	5 138	13,69	108,0		0,00	85,22	-	-	0,00	0,00	-
75	5 911	5 914	11,71	108,0		0,00	86,44	-	-	0,00	0,00	-
76	6 982	6 984	9,63	108,0		0,00	87,88	-	-	0,00	0,00	-
77	7 947	7 950	8,07	108,0		0,00	89,01	-	-	0,00	0,00	-
78	3 621	3 626	18,59	108,0		0,00	82,19	-	-	0,00	0,00	-
79	4 424	4 428	15,79	108,0		0,00	83,92	-	-	0,00	0,00	-
8	9 566	9 568	6,52	109,0		0,00	90,62	-	-	0,00	0,00	-
80	5 290	5 294	13,27	108,0		0,00	85,48	-	-	0,00	0,00	-
81	6 188	6 191	11,09	108,0		0,00	86,83	-	-	0,00	0,00	-
82	4 891	4 895	14,37	108,0		0,00	84,80	-	-	0,00	0,00	-
83	5 746	5 749	12,11	108,0		0,00	86,19	-	-	0,00	0,00	-
84	5 264	5 268	13,34	108,0		0,00	85,43	-	-	0,00	0,00	-
85	6 157	6 160	11,15	108,0		0,00	86,79	-	-	0,00	0,00	-
86	5 236	5 240	13,41	108,0		0,00	85,39	-	-	0,00	0,00	-
87	6 045	6 048	11,39	108,0		0,00	86,63	-	-	0,00	0,00	-
88	6 247	6 250	10,97	108,0		0,00	86,92	-	-	0,00	0,00	-
89	5 921	5 924	11,68	108,0		0,00	86,45	-	-	0,00	0,00	-
9	9 091	9 093	7,12	109,0		0,00	90,17	-	-	0,00	0,00	-
90	8 476	8 477	7,90	108,0		0,00	89,56	-	-	0,00	0,00	-
91	8 209	8 210	8,30	108,0		0,00	89,29	-	-	0,00	0,00	-
92	8 749	8 750	7,50	108,0		0,00	89,84	-	-	0,00	0,00	-
93	8 155	8 156	8,38	108,0		0,00	89,23	-	-	0,00	0,00	-
94	7 849	7 850	8,87	108,0		0,00	88,90	-	-	0,00	0,00	-
95	7 772	7 773	8,99	108,0		0,00	88,81	-	-	0,00	0,00	-
96	9 334	9 334	6,68	108,0		0,00	90,40	-	-	0,00	0,00	-
97	8 871	8 872	7,32	108,0		0,00	89,96	-	-	0,00	0,00	-
98	13 599	13 599	1,62	107,8		0,00	93,67	-	-	0,00	0,00	-
99	12 533	12 534	2,62	107,8		0,00	92,96	-	-	0,00	0,00	-
Sum			32,29									

- Data undefined due to calculation with octave data

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DECIBEL - Assumptions for noise calculation

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise calculation model:
ISO 9613-2 General
Wind speed (in 10 m height):
8,0 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0,4
Area object with hard ground: Area object (Roughness): REGIONS_Vasama_5_5_2022_5.w2r (5)
Area type with hard ground: vesistöt
Ground factor for hard ground: 0,0
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:
Fixed penalty added to source noise of WTGs with pure tones
WTG catalogue
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in 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: GE WIND ENERGY GE158 - 6.1 MW 6100 158.0 !O!
Noise: GE 6.1.158 no STE 107.0 dB +2dB

Source	Source/Date	Creator	Edited
Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01	30.5.2018	USER	23.11.2022 8.27

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	221,0	8,0	109,0	No	90,2	95,4	99,9	102,4	104,4	102,3	94,8	78,8
From Windcat	171,0	8,0	109,0	No	90,2	95,4	99,9	102,4	104,4	102,3	94,8	78,8

WTG: GE WIND ENERGY 5.3-158 Thrust 700 5300 158.0 !O!
Noise: 5.3-158 106.0 +2 dB HH200

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.12

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	200,0	8,0	108,0	No	89,2	94,6	99,2	101,6	103,3	101,1	93,7	78,0

WTG: GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O!
Noise: 5.5-158 NO 106 dB + 2 dB

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3/5.5-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.13

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	122,5	8,0	108,0	No	89,2	94,6	99,2	101,6	103,3	101,1	93,7	78,0

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DECIBEL - Assumptions for noise calculation

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

WTG: GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O!
Noise: 5.3-158 NO_107,8 dB

Source	Source/Date	Creator	Edited
Noise_Emission-NO_5.3-158-50Hz_IEC_EN_r01	12.3.2018	USER	14.11.2022 12.14

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	152,5	8,0	107,8	No	89,0	94,4	99,0	101,4	103,1	100,9	93,5	77,8

WTG: VESTAS V172-7.2 7200 172.0 !O!
Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Vestas	15.11.2022	USER	15.11.2022 10.20

DMS no.: 0128-4336_00

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	106,9	No	90,4	98,0	101,3	101,5	99,9	95,4	87,9	77,2

WTG: NORDEX N163/5,7MW 5700 163.0 !O!
Noise: N163-5,7MW Mode 0 no STE - 109.2 dB(A) + 2 dB

Source	Source/Date	Creator	Edited
F008_276_A14_EN	20.3.2020	USER	22.11.2022 16.21

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Penalty [dB]	Octave data 63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	198,5	8,0	109,2	Yes	2,0	89,5	95,7	99,9	103,2	104,6	102,2	93,4	84,6

Noise sensitive area: A Lomarakennus A (Pyssynienen metsätie 156)

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 (Sarjankyläntie 1093)

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 Lomarakennnus C (Kurunoja)

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

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

Noise sensitive area: D Asuinrakennus D (Haapavesitie 1404)

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: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä

Noise sensitive area: E Asuinrakennus E (Säilynkankaantie 34)

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 (Ritamäentie 156)

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 Lomarakennus G (Virtaniementie 175)

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

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

Project:
Vasama_22_11_2022

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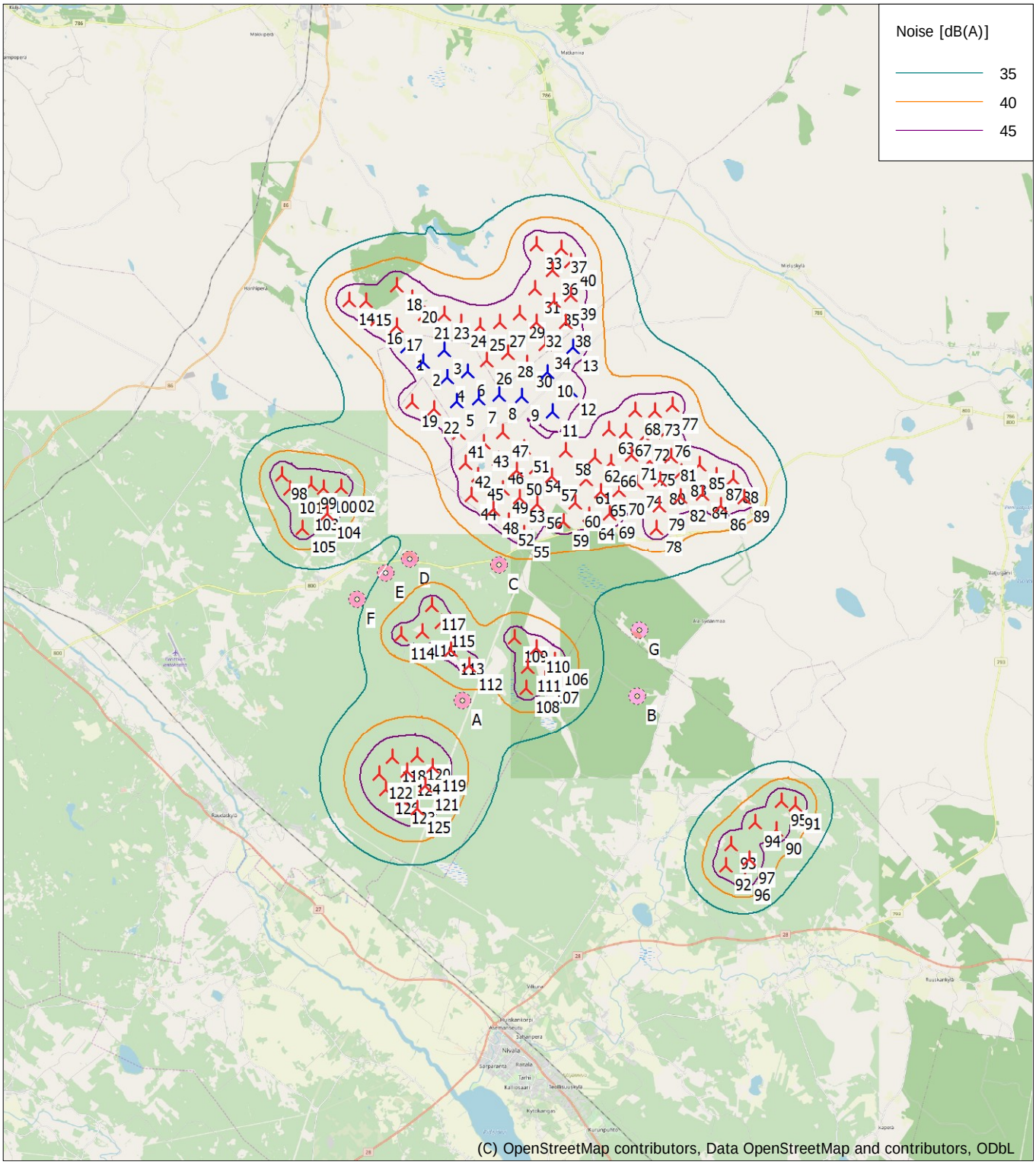
FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
23.11.2022 8.43/3.5.584

DECIBEL - Map 8,0 m/s

Calculation: Vasama VE2_V172-7.2MWx12xHH200 + Urakkaneva + Rahkola-Hautakangas + Puutionsaari + Kukonaho + Tuomiperä



0 2,5 5 7,5 10km

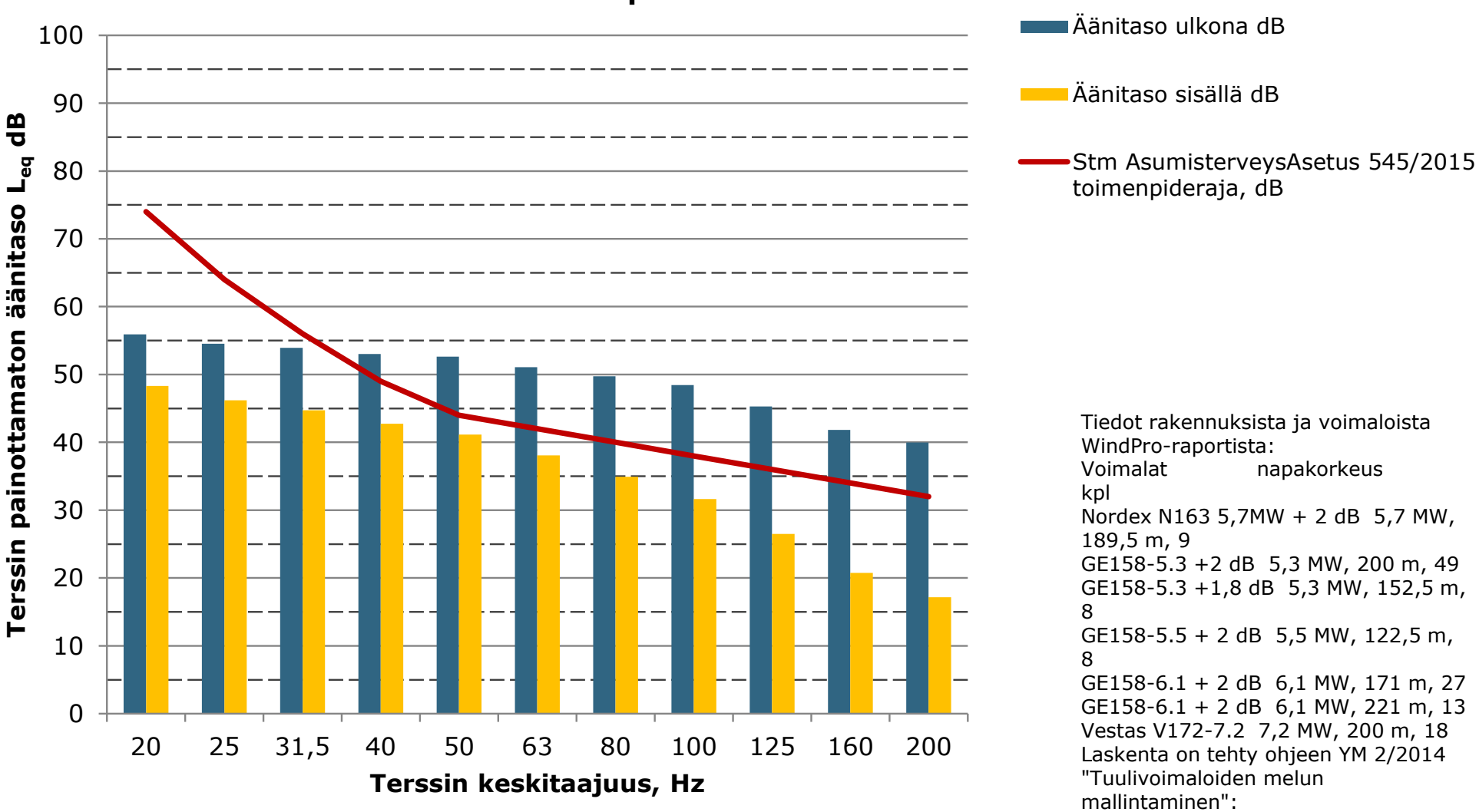
Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 480 North: 7 107 679

New WTG Noise sensitive area

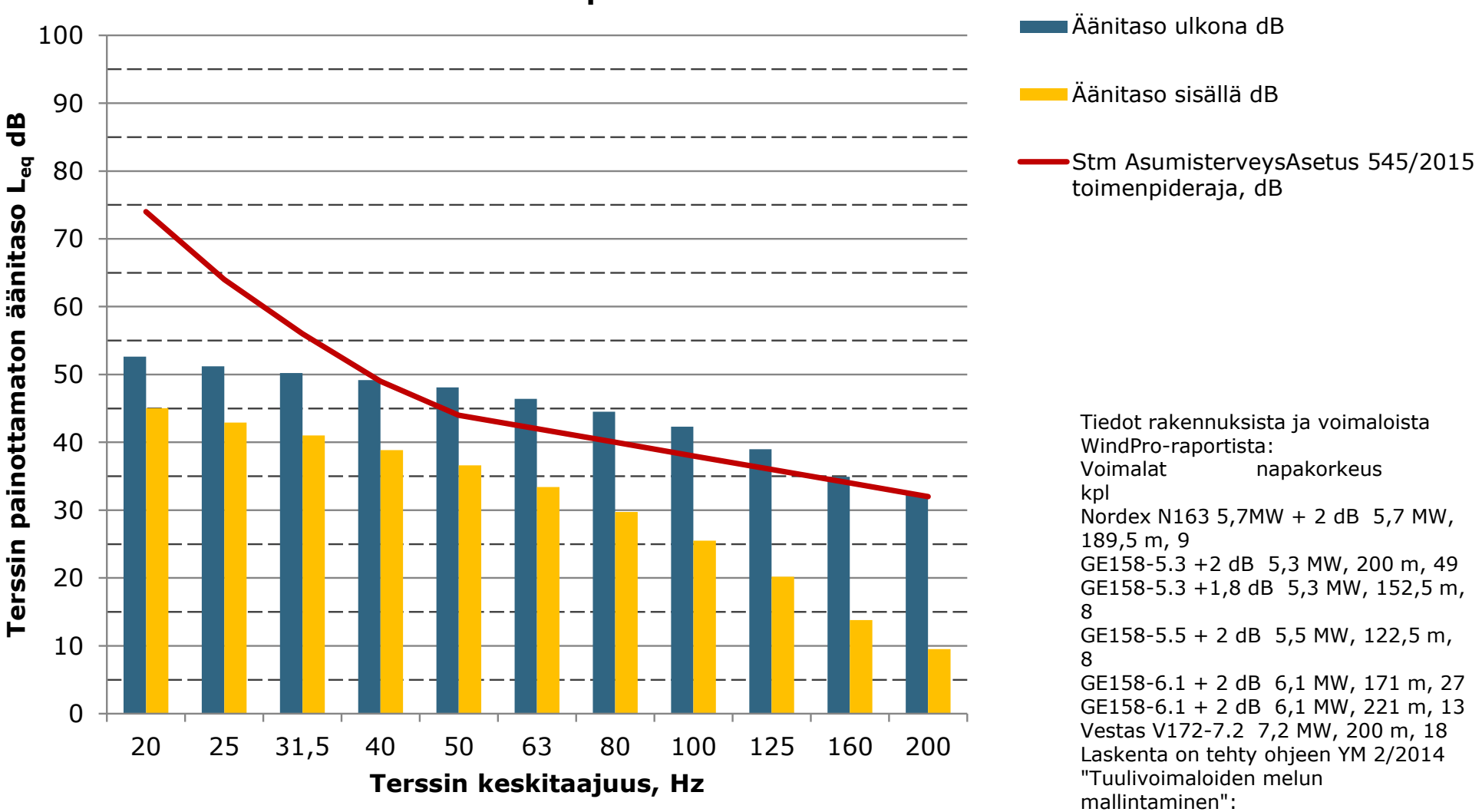
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s

Height above sea level from active line object

Liite 3. Vasaman tuulivoimahanke VE1 – matalataajuisen melun rakennuskohtaiset arvot



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Nordex N163 5,7MW + 2 dB 5,7 MW, 189,5 m, 9
GE158-5.3 +2 dB 5,3 MW, 200 m, 49
GE158-5.3 +1,8 dB 5,3 MW, 152,5 m, 8
GE158-5.5 + 2 dB 5,5 MW, 122,5 m, 8
GE158-6.1 + 2 dB 6,1 MW, 171 m, 27
GE158-6.1 + 2 dB 6,1 MW, 221 m, 13
Vestas V172-7.2 7,2 MW, 200 m, 18
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



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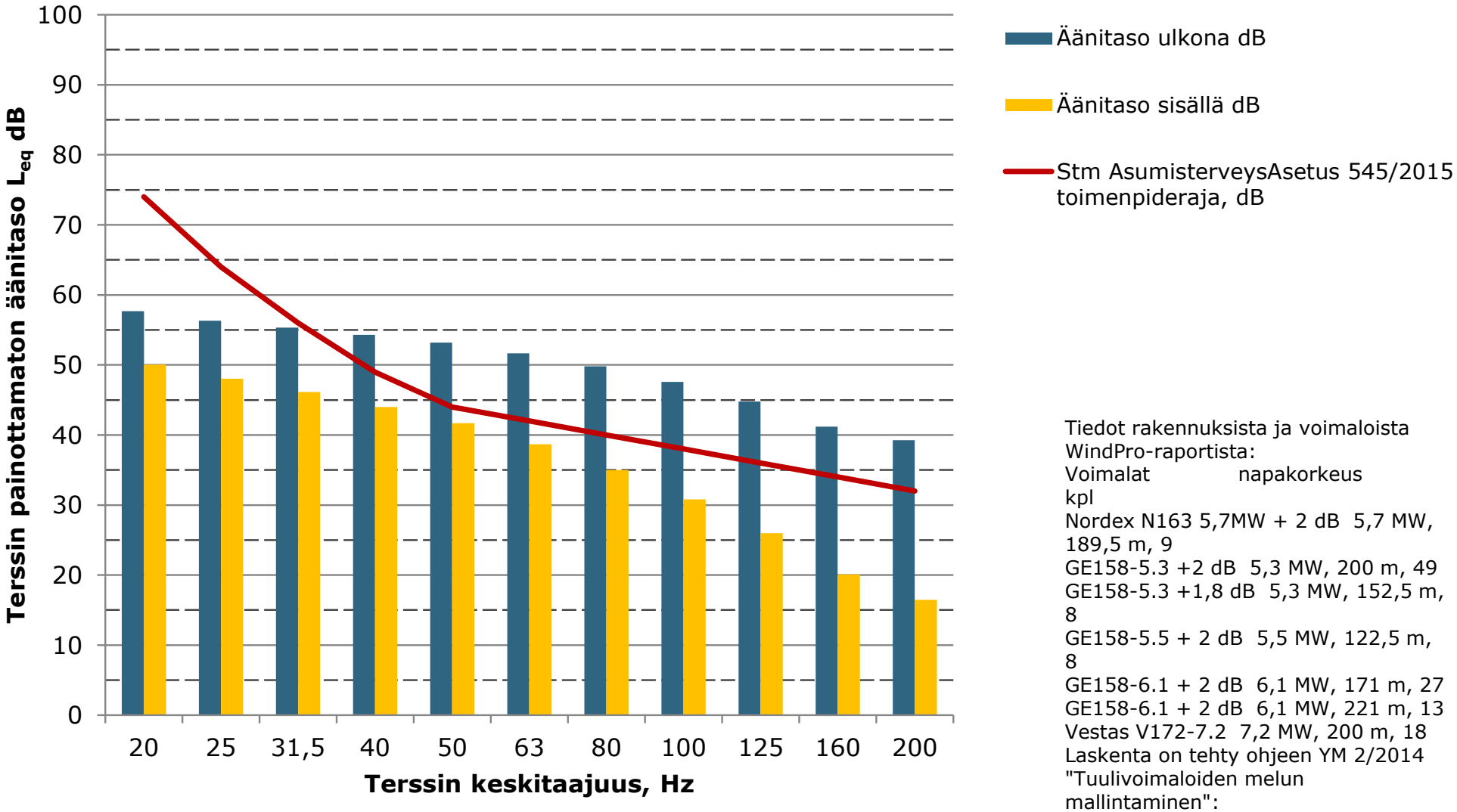
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":


Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennnus C (Kurunoja), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili 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
Nordex N163 5,7MW + 2 dB 5,7 MW, 189,5 m, 9
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Vestas V172-7.2 7,2 MW, 200 m, 18
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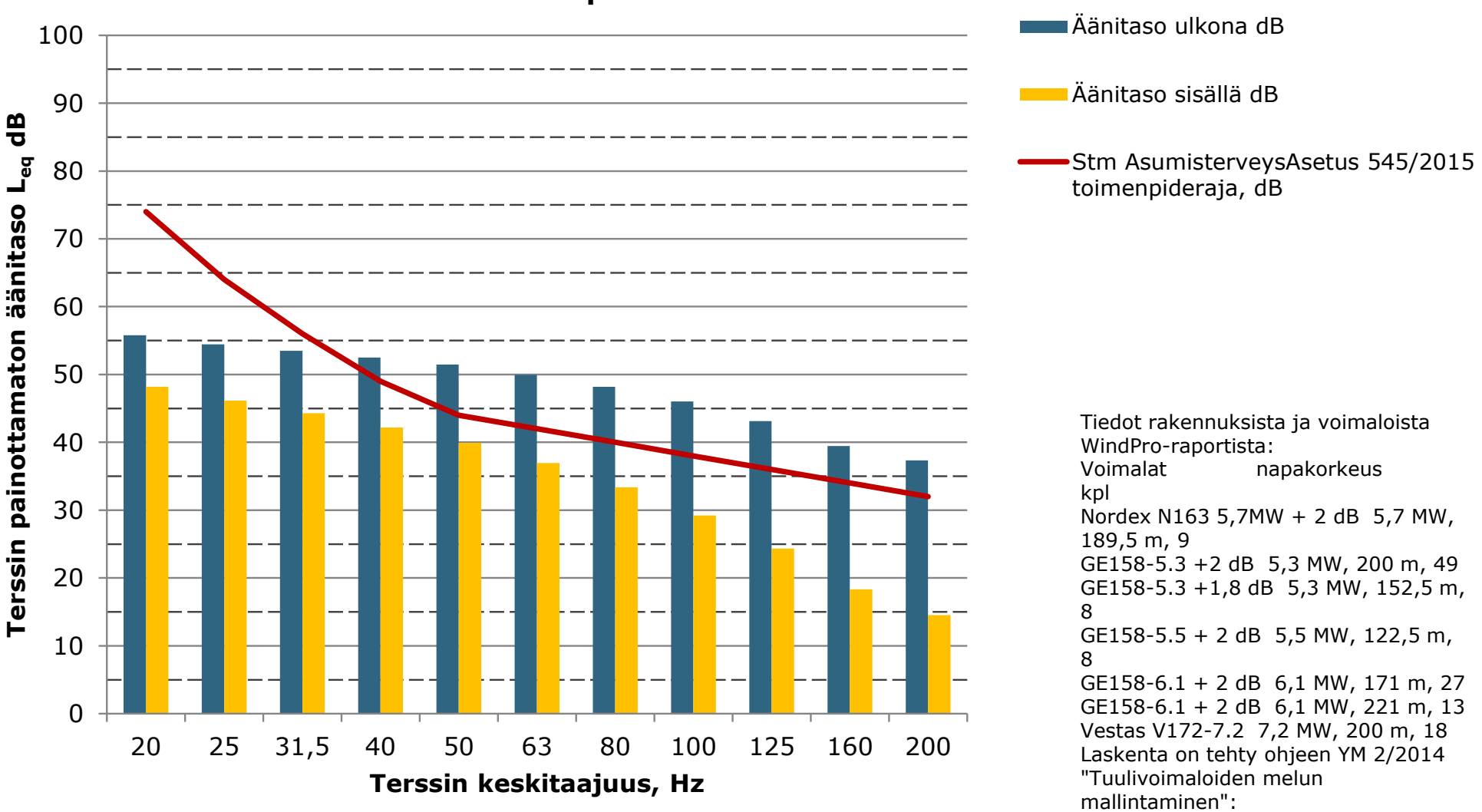

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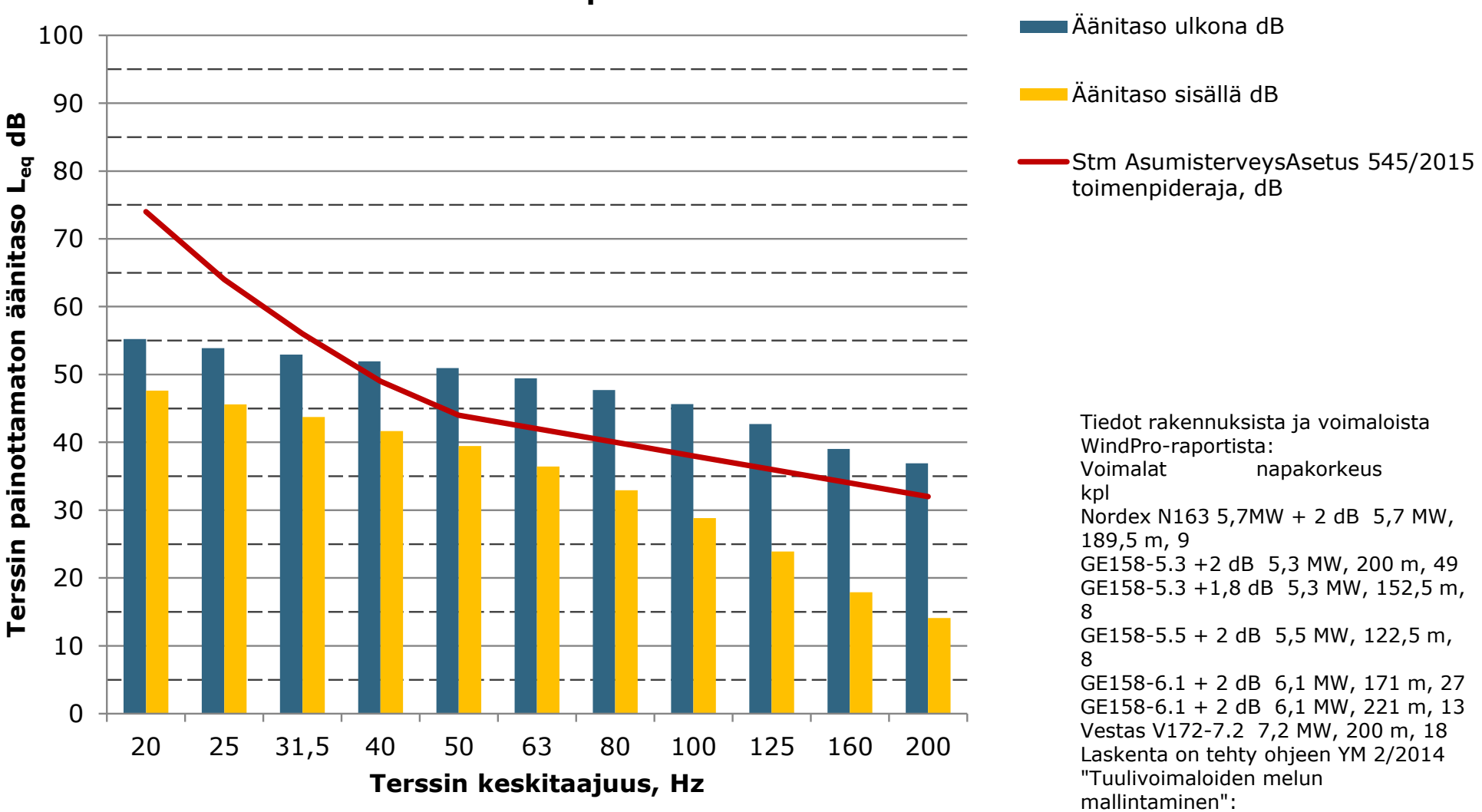

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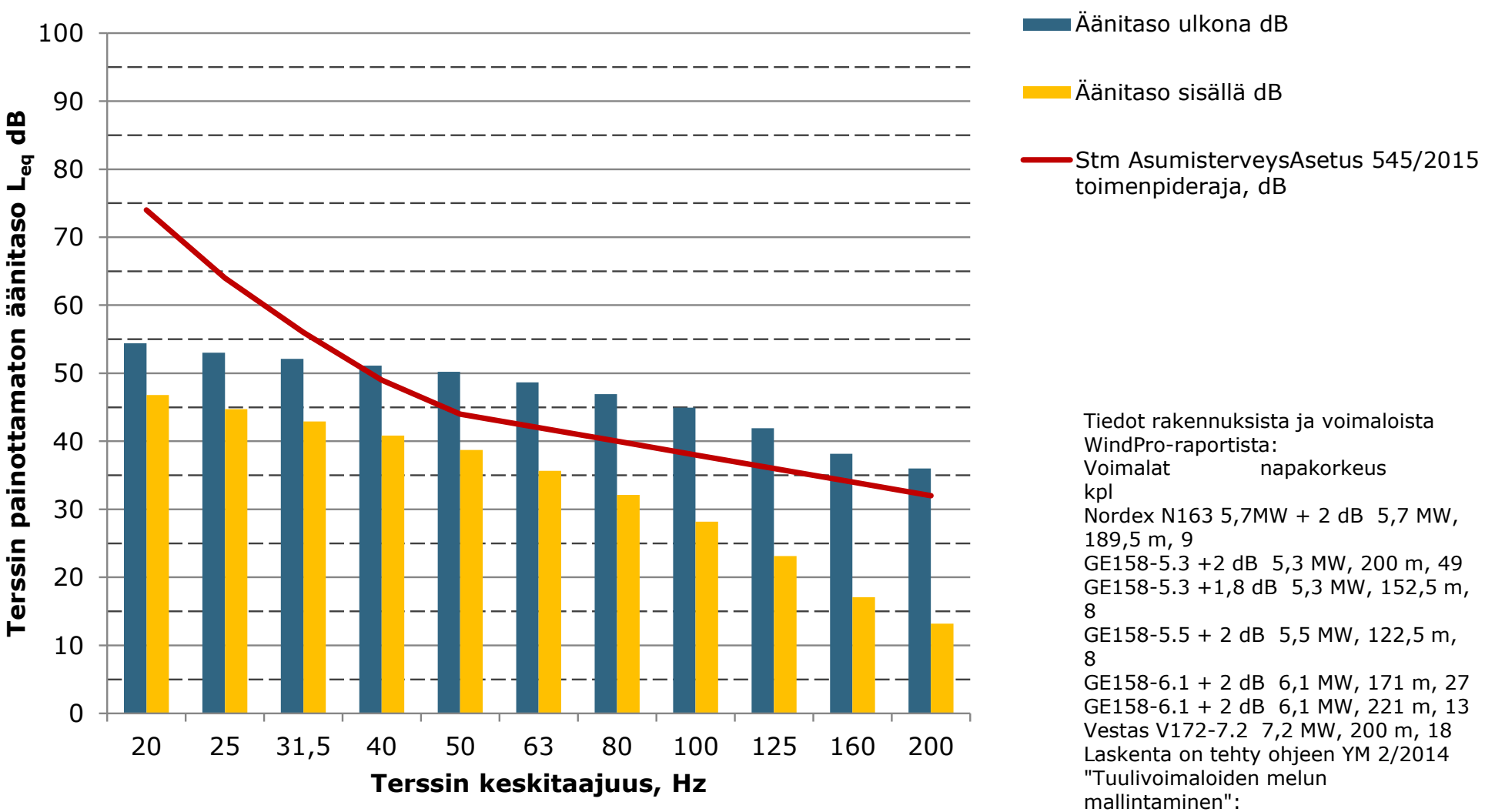

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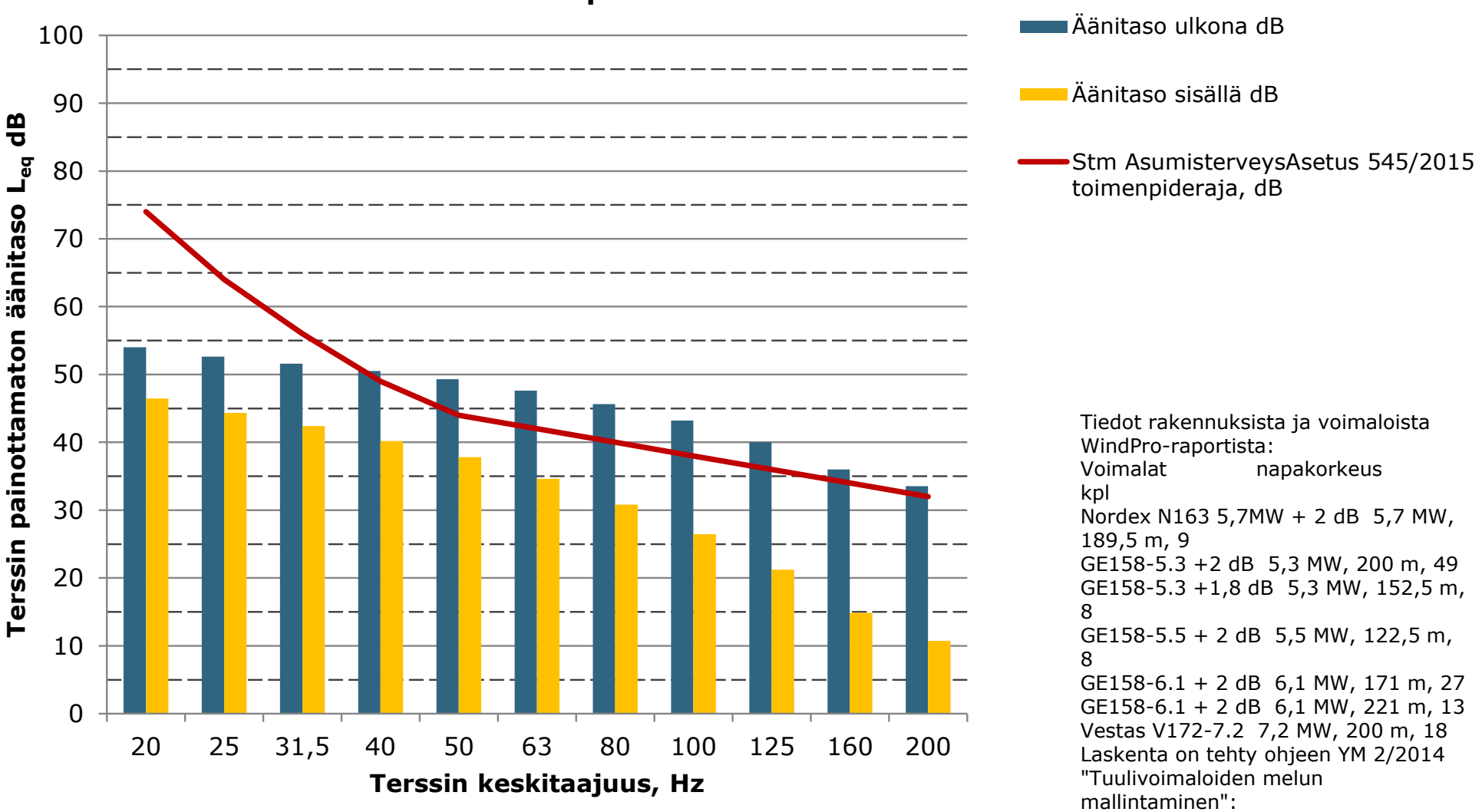

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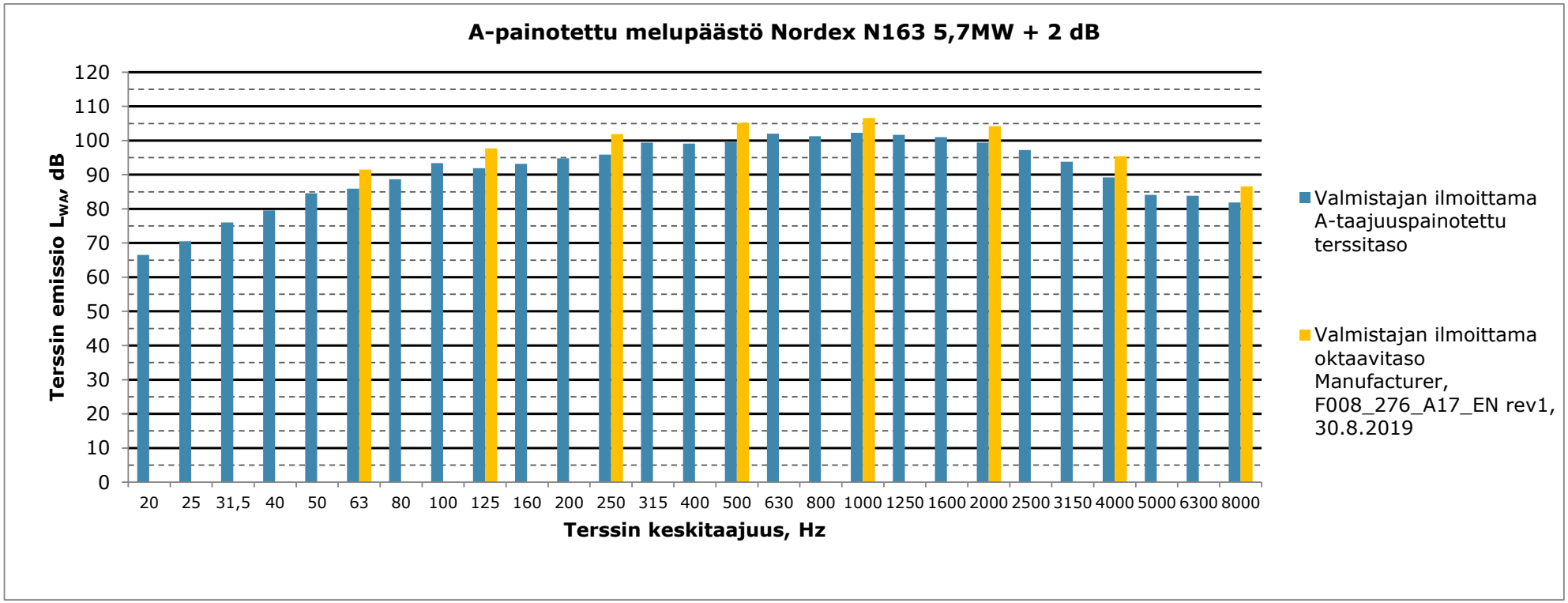
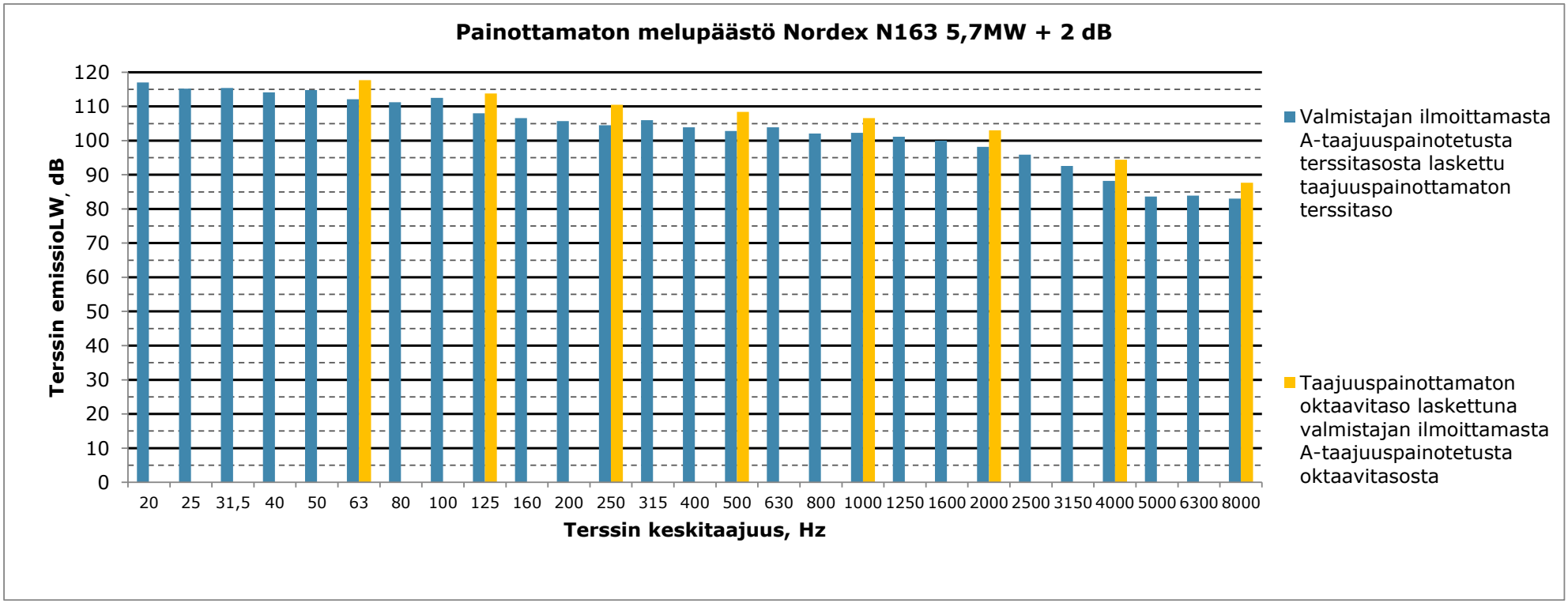
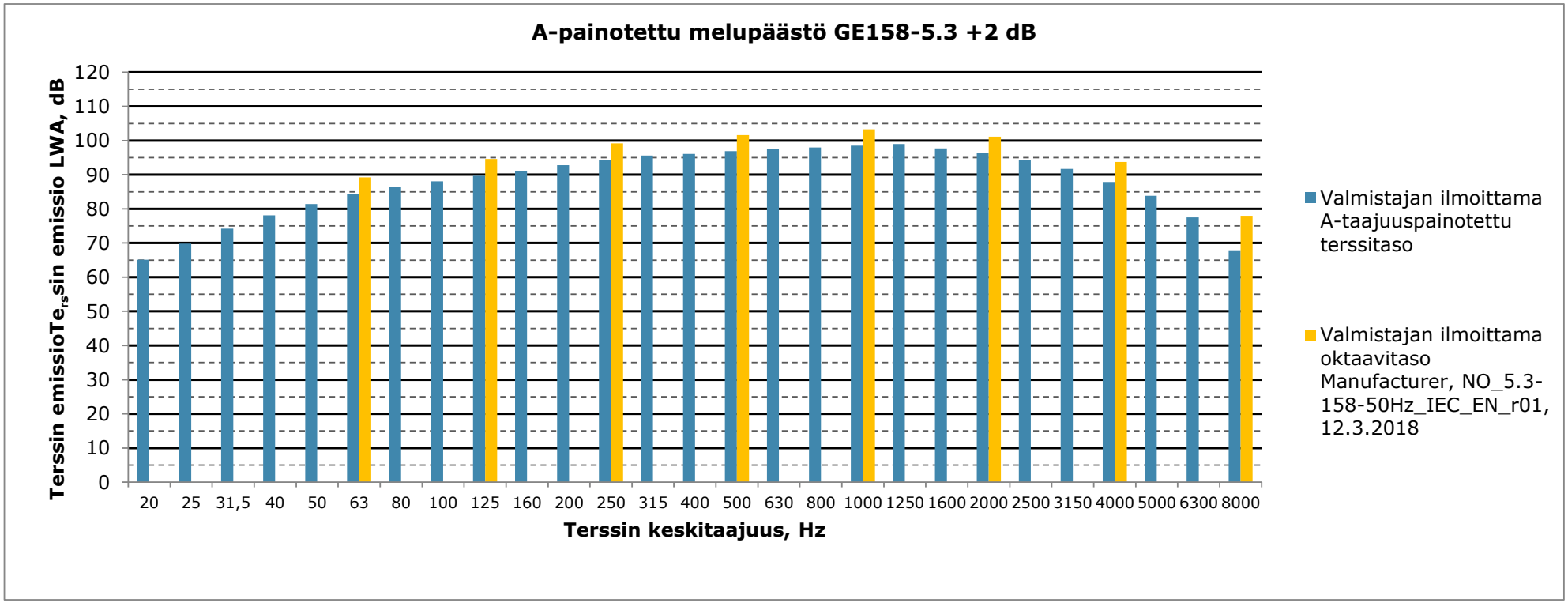
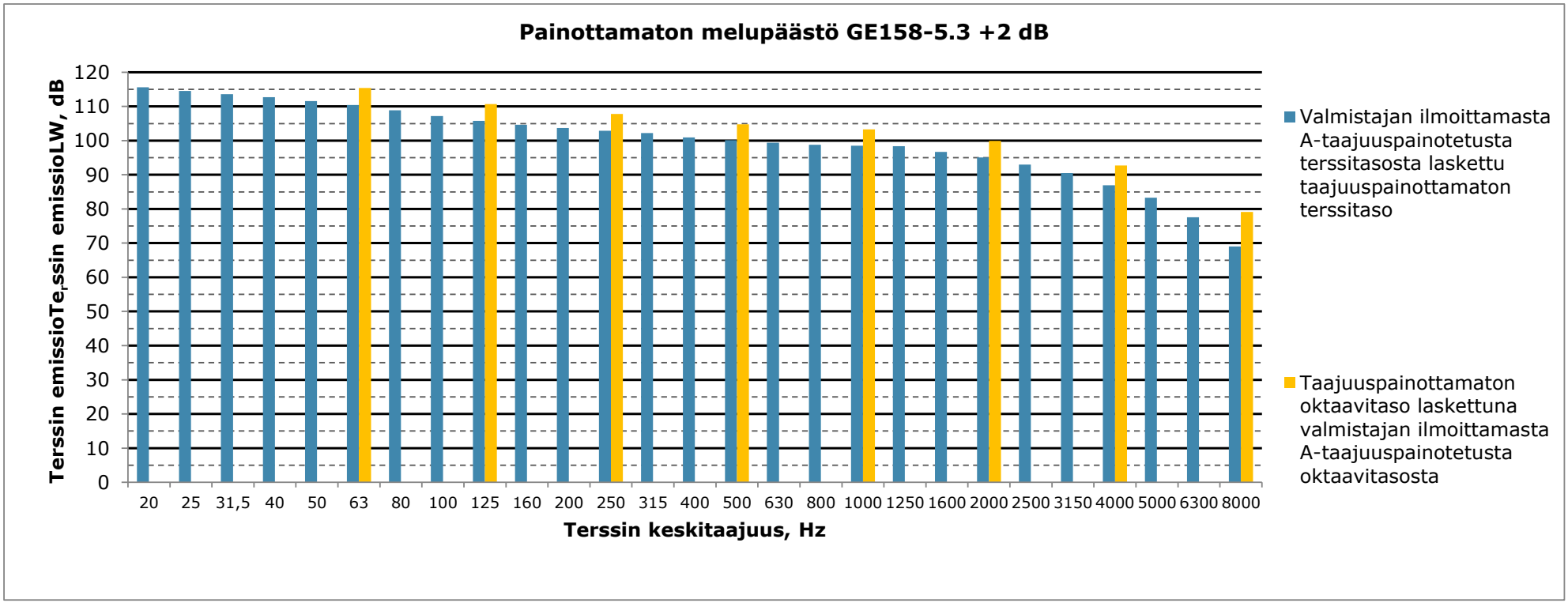
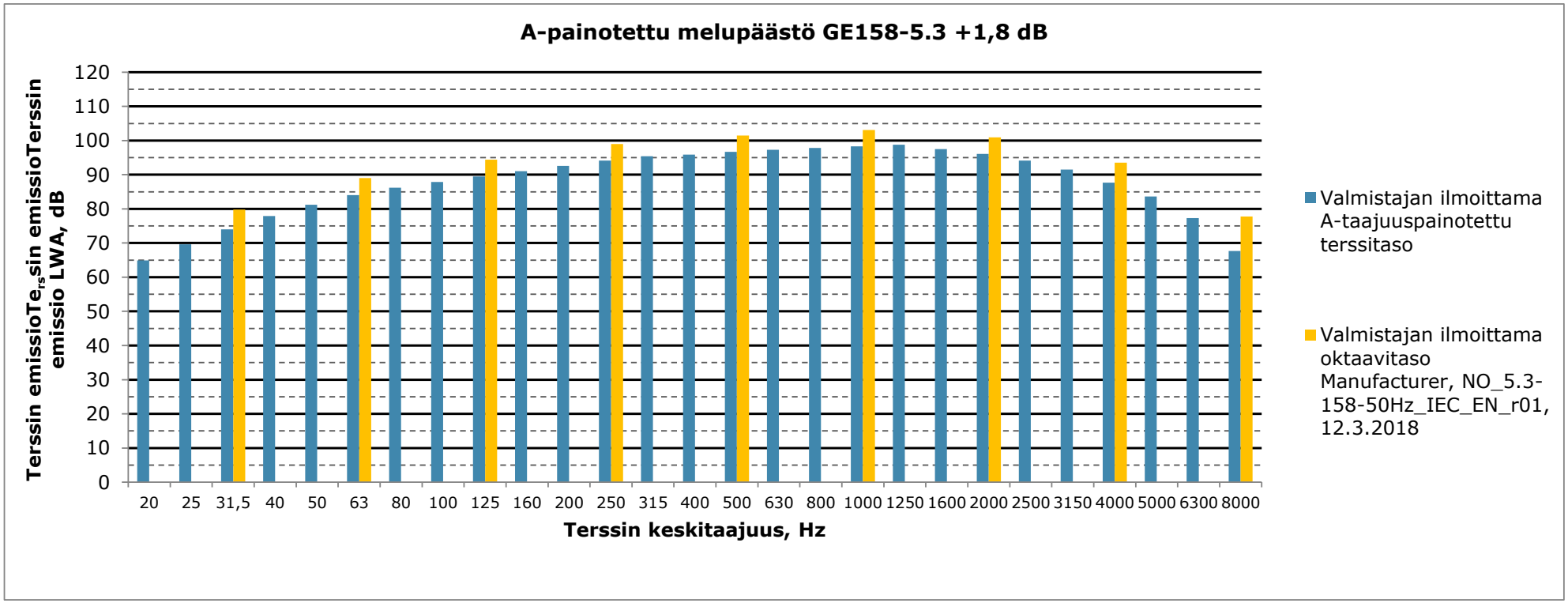
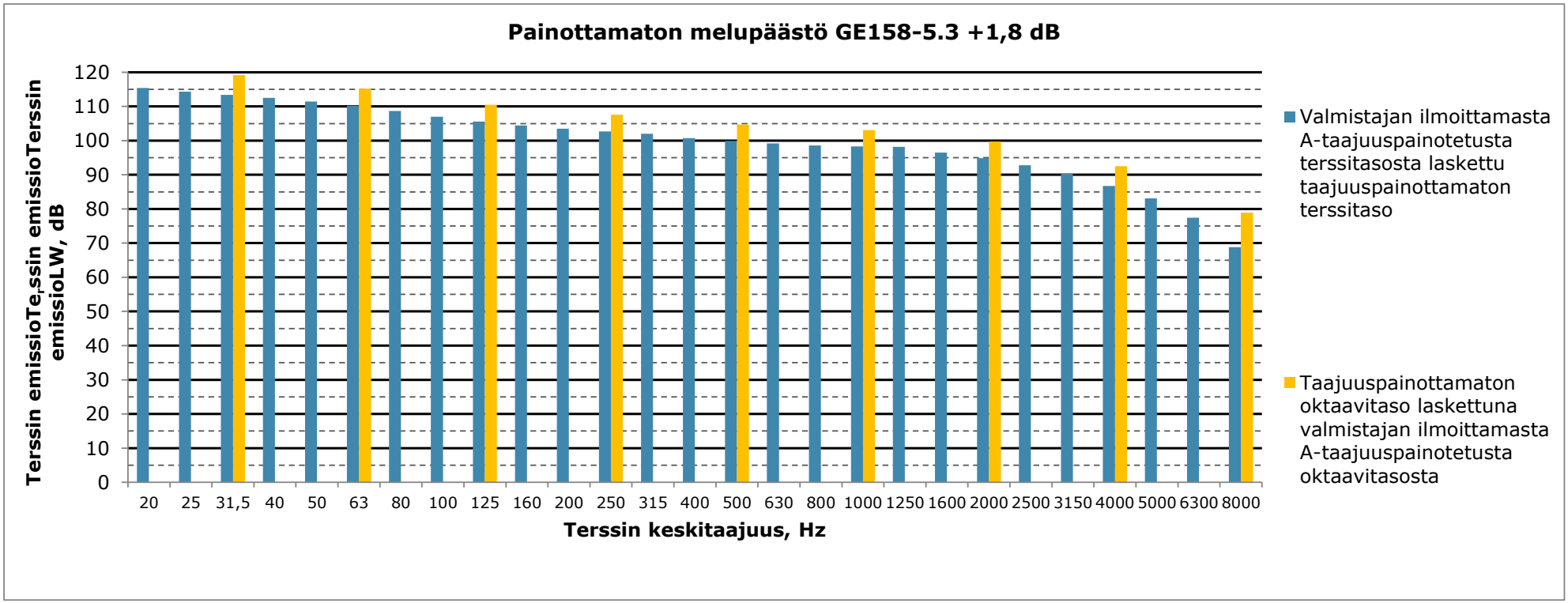

A-painotettu melupäästö Nordex N163 5,7MW + 2 dB
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN rev1, 30.8.2019

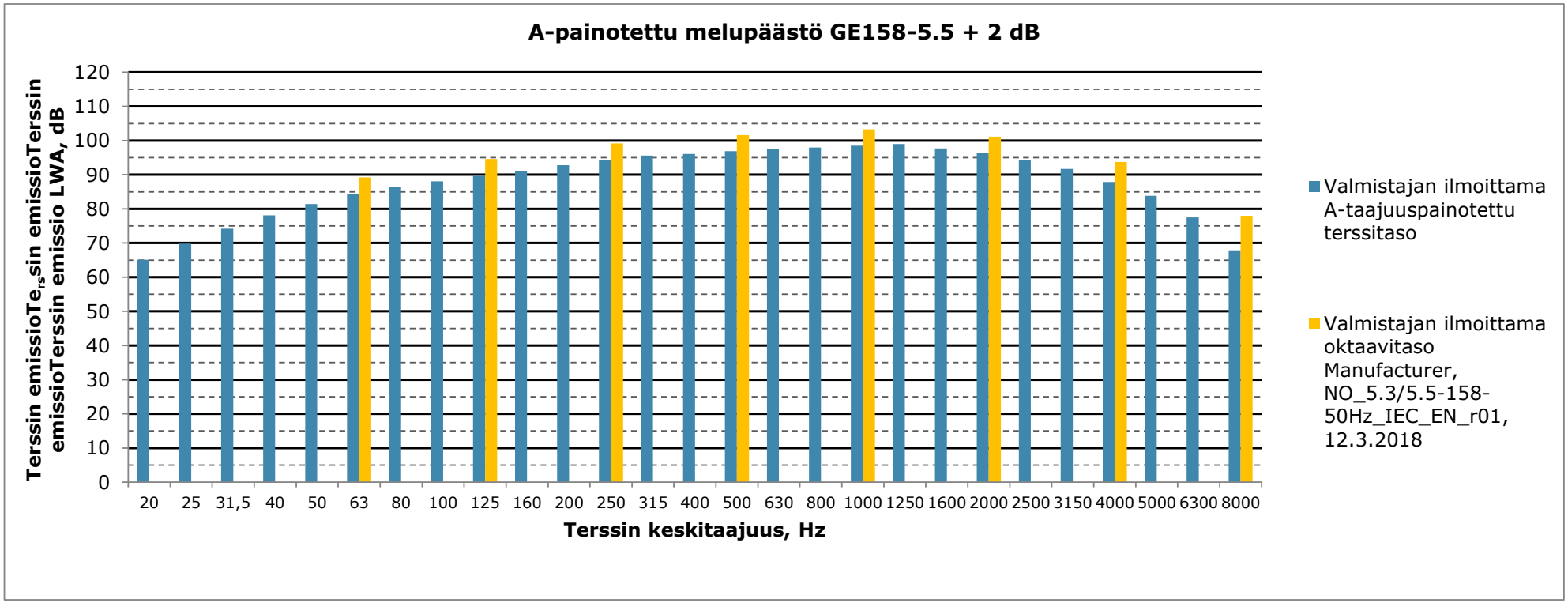

Painottamaton melupäästö Nordex N163 5,7MW + 2 dB
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

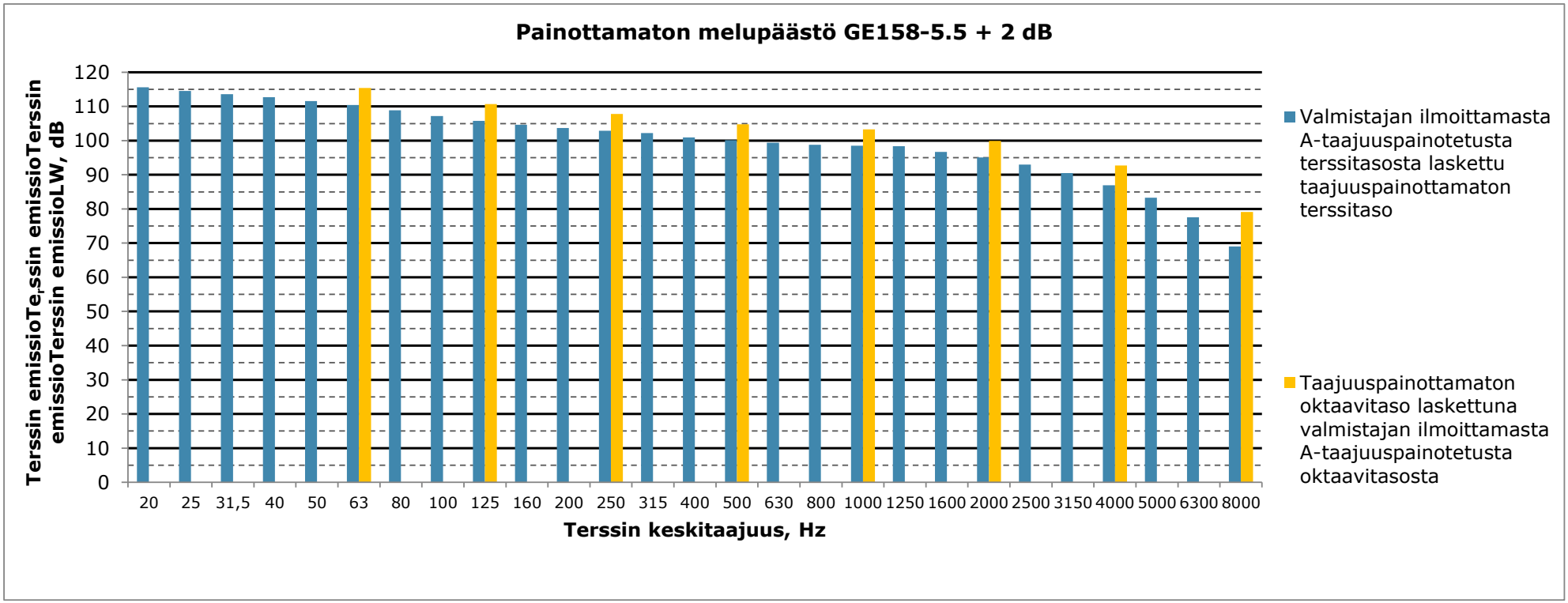

A-painotettu melupäästö GE158-5.3 +2 dB
Terssin emissioTe$_{rs}$sin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, NO_5.3-158-50Hz_IEC_EN_r01, 12.3.2018

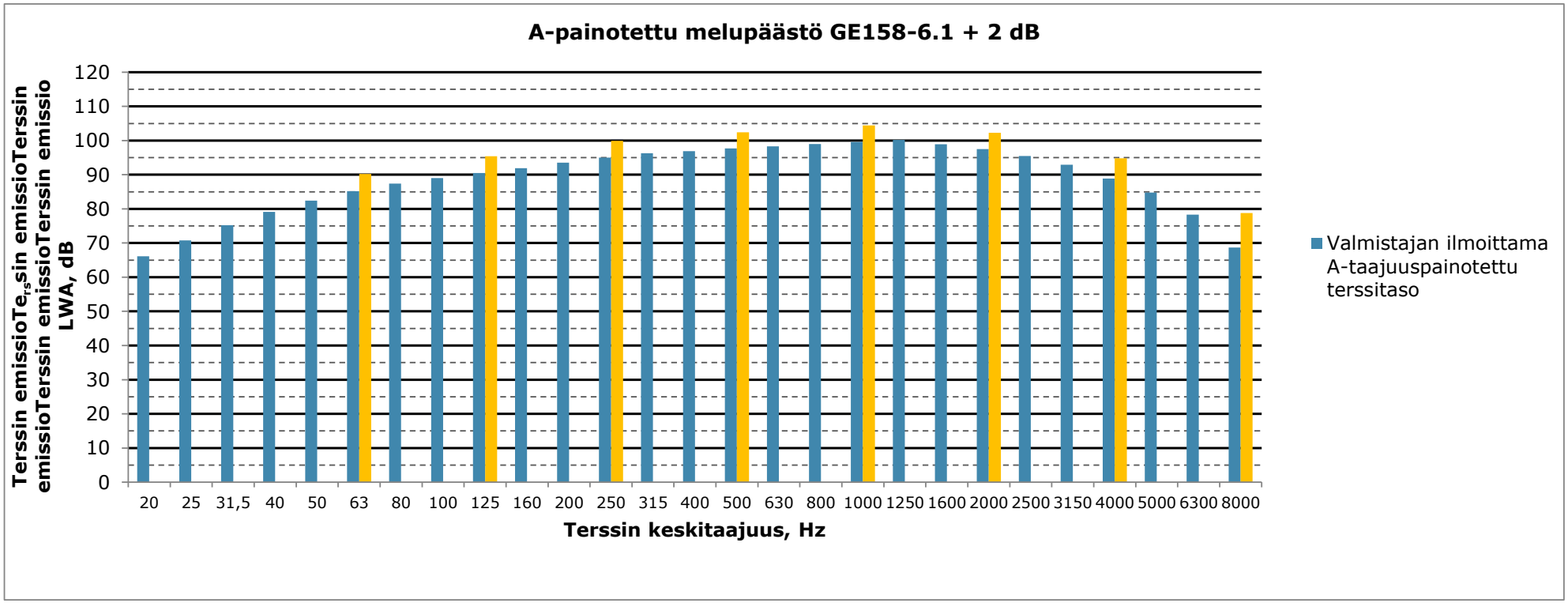

Painottamaton melupäästö GE158-5.3 +2 dB
Terssin emissioTe,ssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

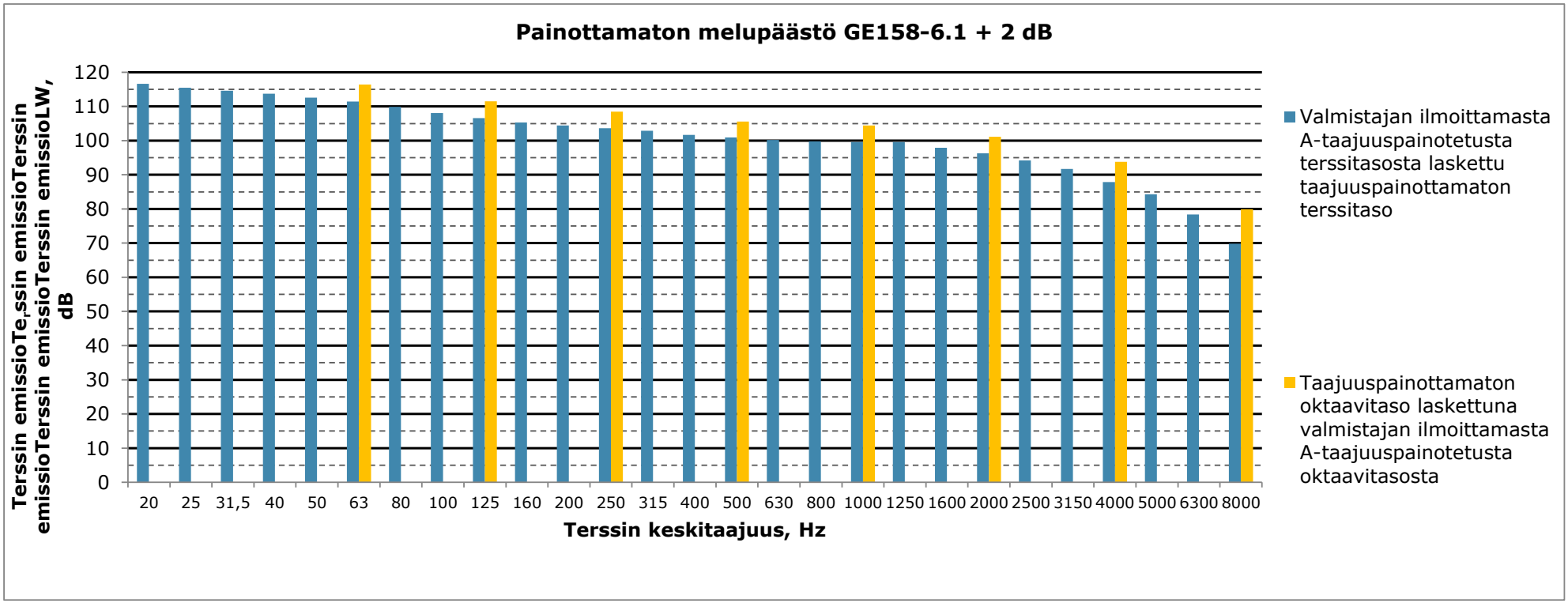

A-painotettu melupäästö GE158-5.3 +1,8 dB
Terssin emissioTe$_{rs}$sin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, NO_5.3-158-50Hz_IEC_EN_r01, 12.3.2018

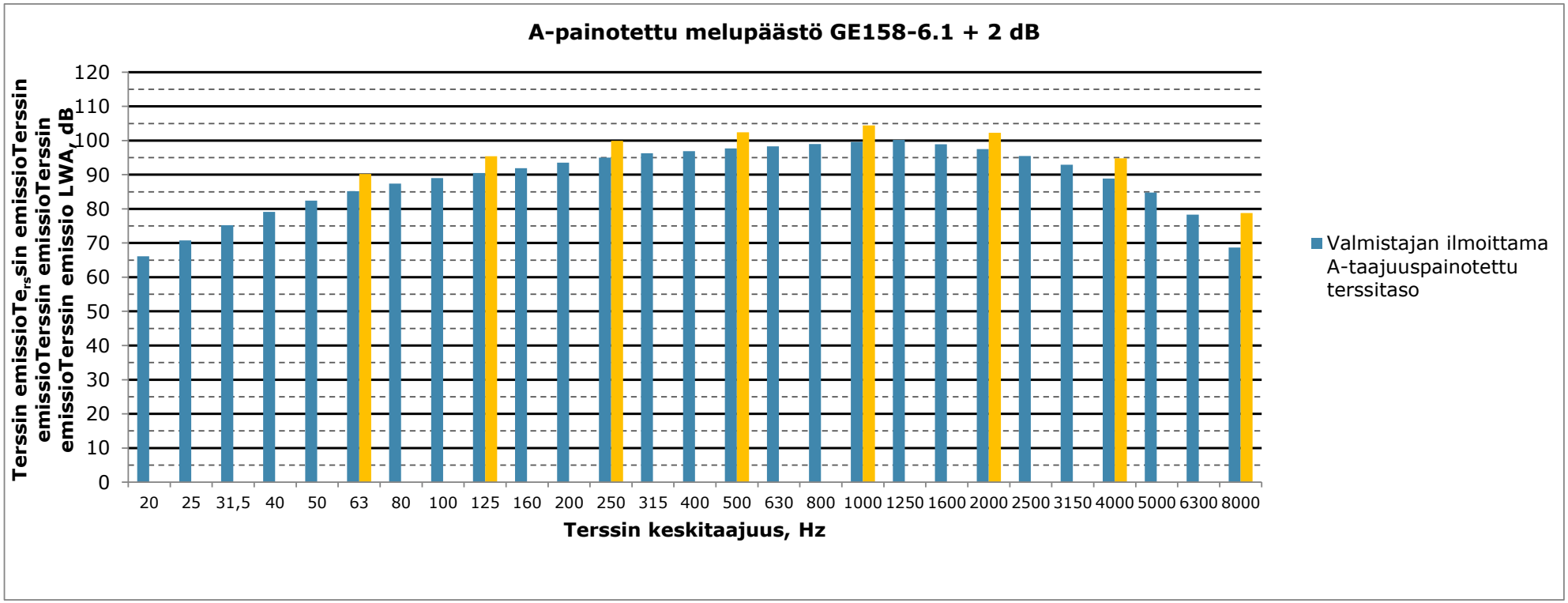

Painottamaton melupäästö GE158-5.3 +1,8 dB
Terssin emissioTe,ssin emissioTerssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

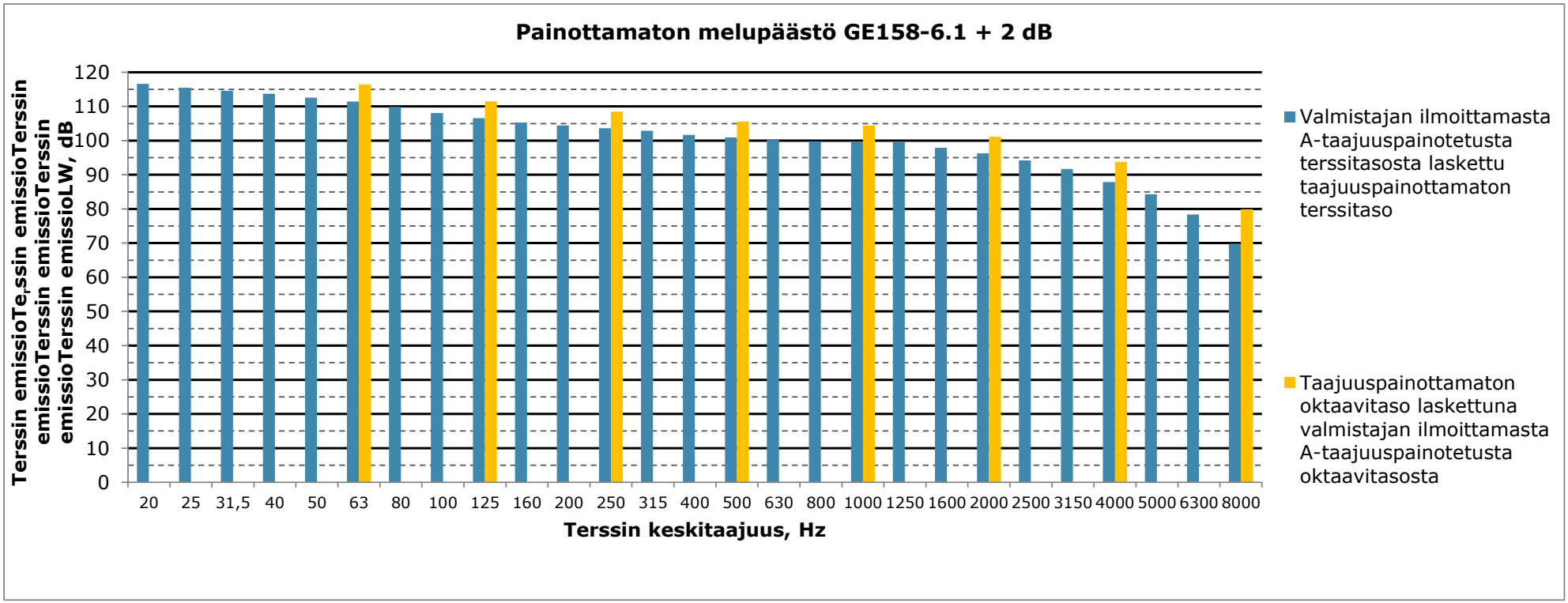

A-painotettu melupäästö GE158-5.5 + 2 dB
Terssin emissioTe$_{rs}$sin emissioTerssin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, NO_5.3/5.5-158-50Hz_IEC_EN_r01, 12.3.2018

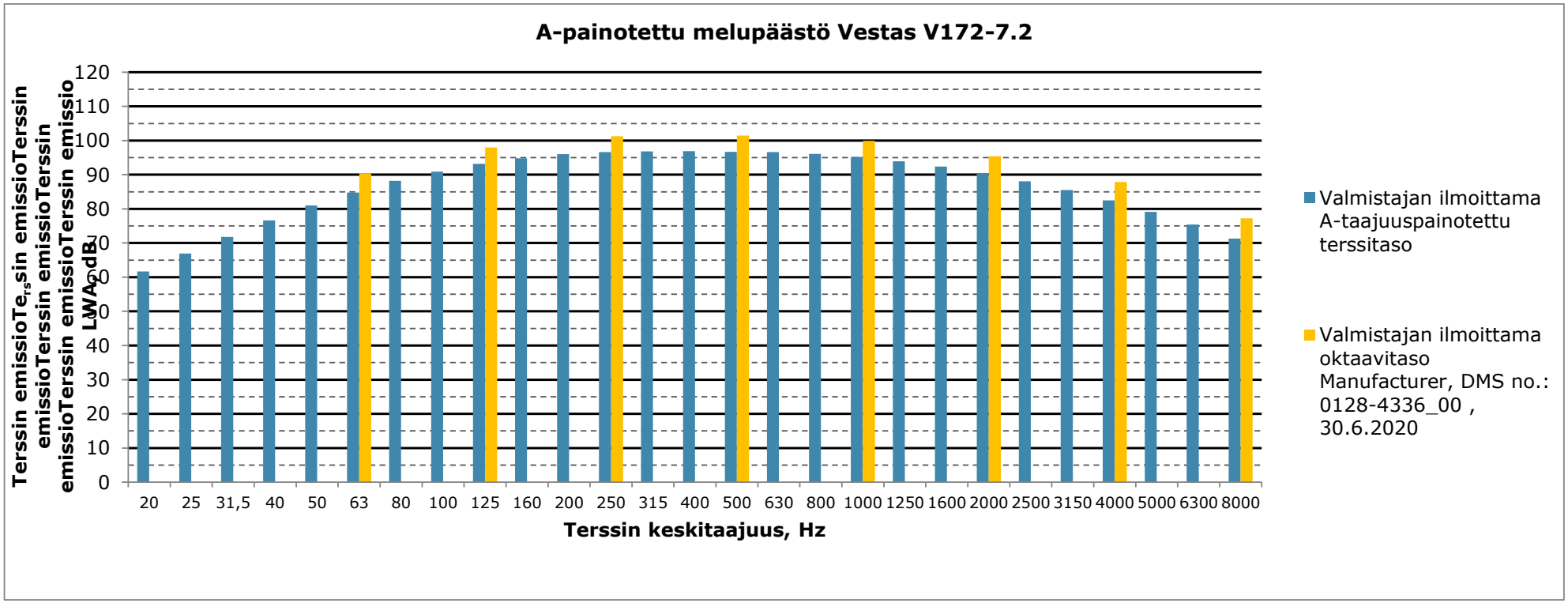

Painottamaton melupäästö GE158-5.5 + 2 dB
Terssin emissioTe,ssin emissioTerssin emissioTerssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

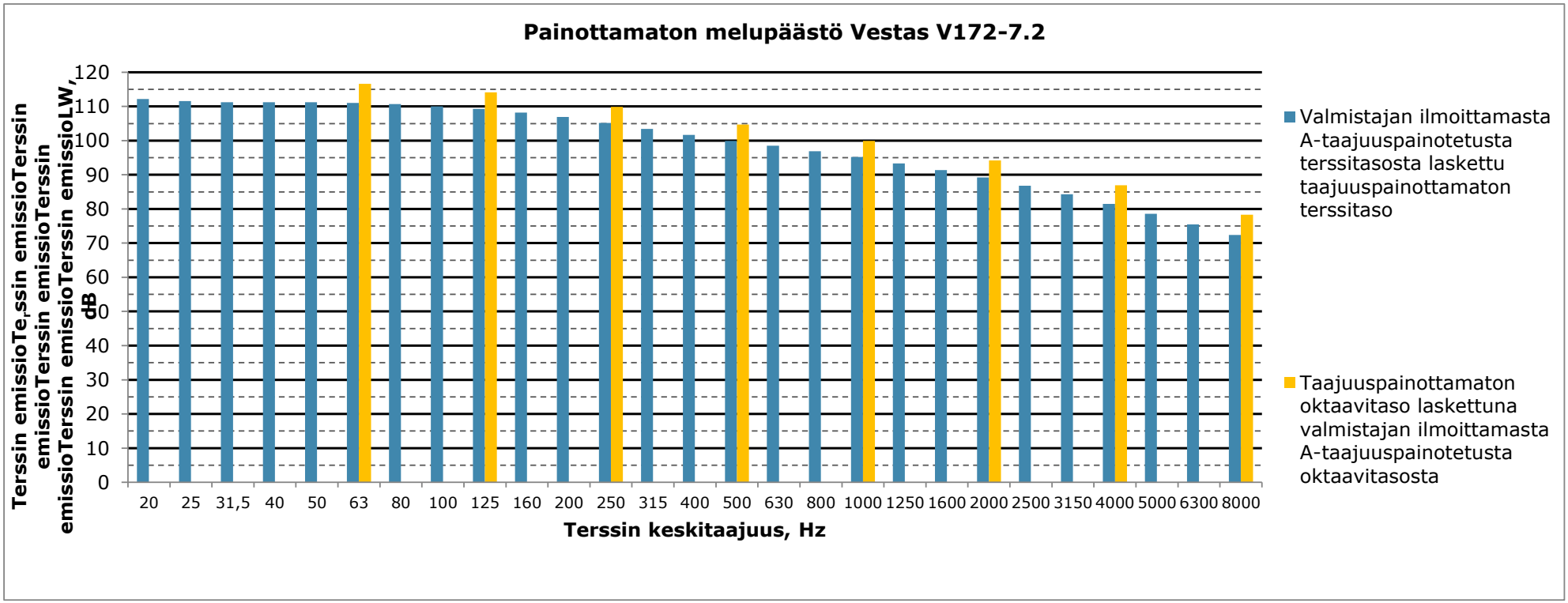

A-painotettu melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso


Painottamaton melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin 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

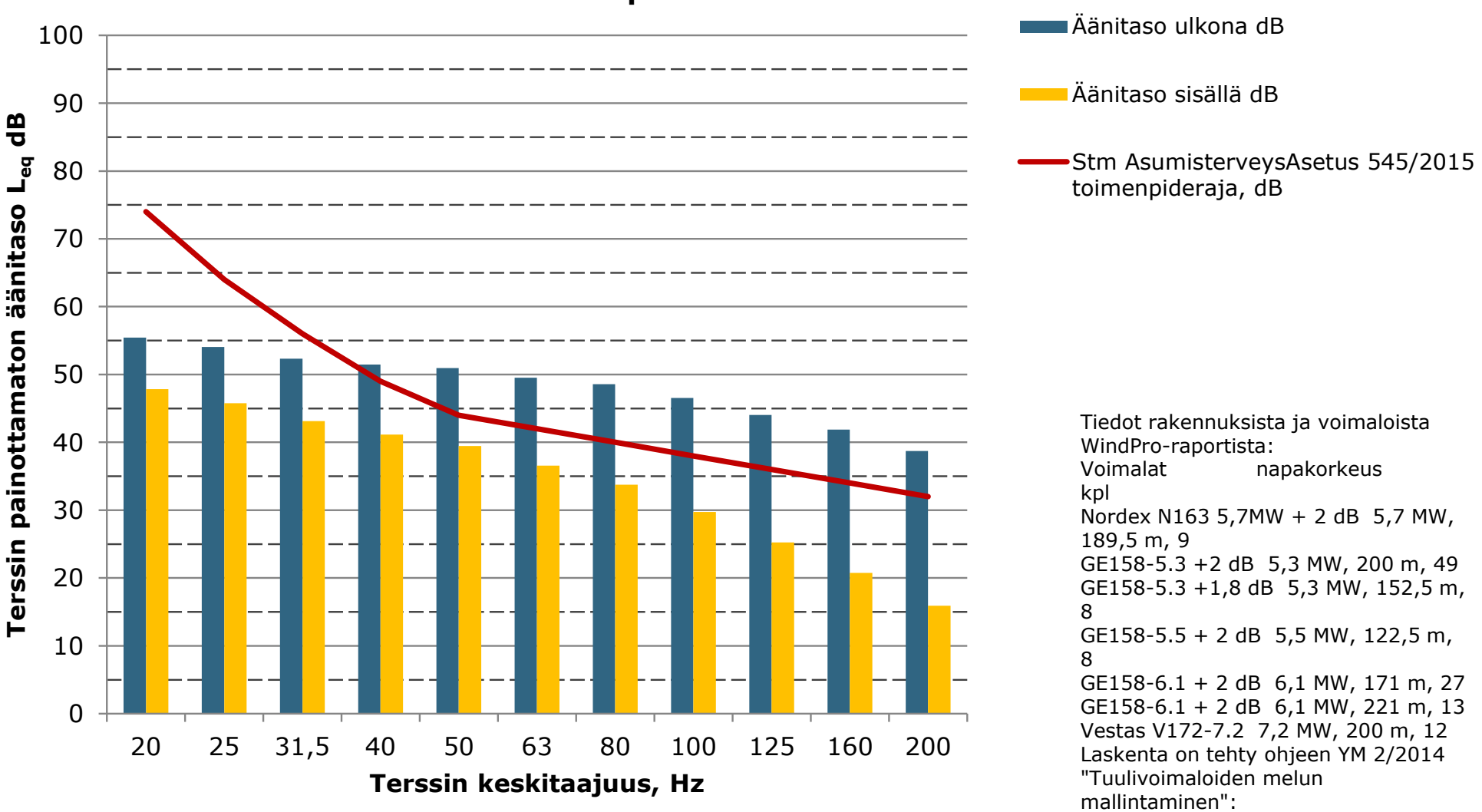

A-painotettu melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso


Painottamaton melupäästö GE158-6.1 + 2 dB
Terssin emissioTe,ssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin 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


A-painotettu melupäästö Vestas V172-7.2
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio
LWA,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 Manufacturer, DMS no.: 0128-4336_00 , 30.6.2020


Painottamaton melupäästö Vestas V172-7.2
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin 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

Liite 4. Vasaman tuulivoimahanke VE2 – matalataajuisen melun rakennuskohtaiset arvot



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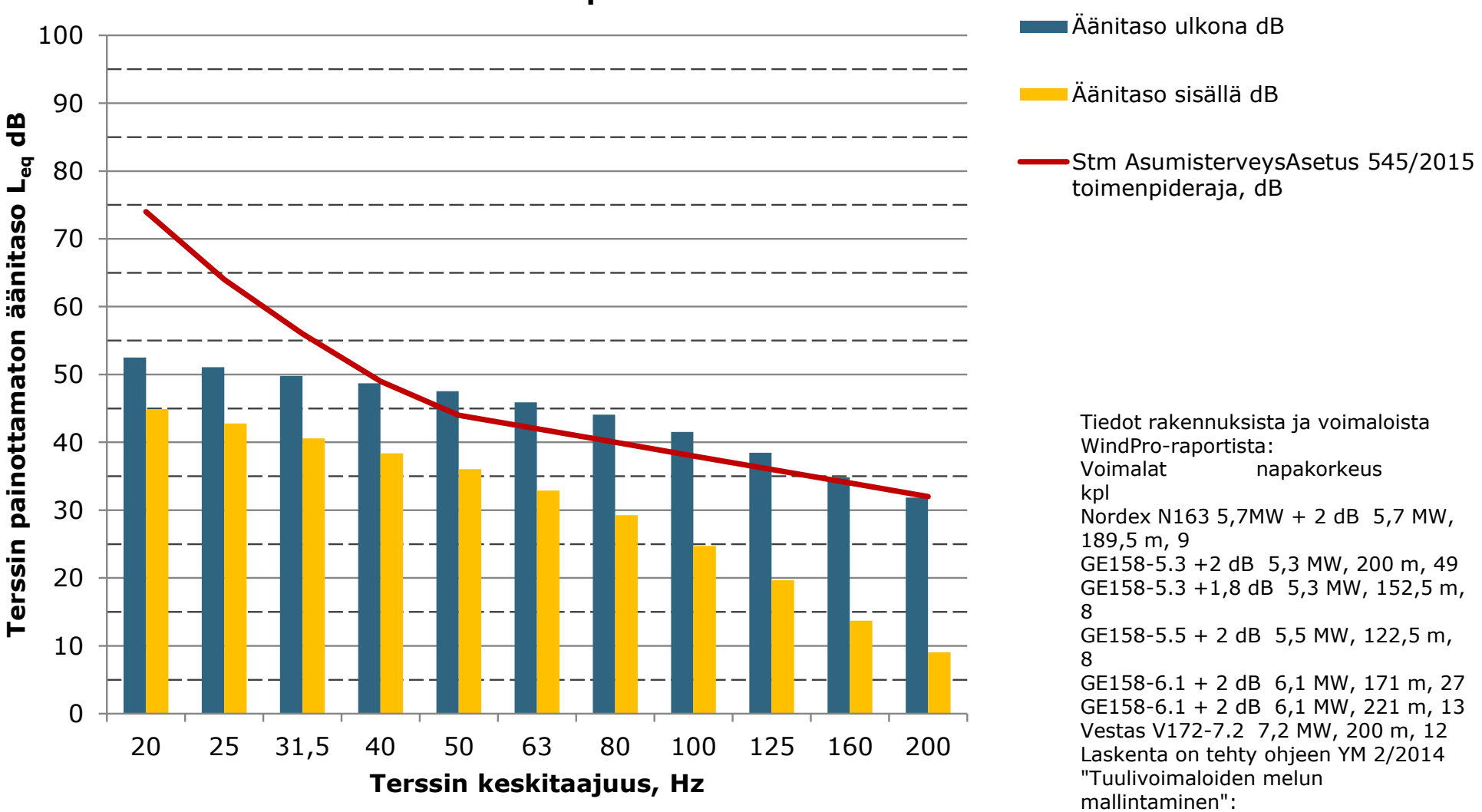
GE158-5.3 +2 dB 5,3 MW, 200 m, 49
GE158-5.3 +1,8 dB 5,3 MW, 152,5 m, 8
GE158-5.5 + 2 dB 5,5 MW, 122,5 m, 8
GE158-6.1 + 2 dB 6,1 MW, 171 m, 27
GE158-6.1 + 2 dB 6,1 MW, 221 m, 13
Vestas V172-7.2 7,2 MW, 200 m, 12
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Nordex N163 5,7MW + 2 dB 5,7 MW, 189,5 m, 9
GE158-5.3 +2 dB 5,3 MW, 200 m, 49
GE158-5.3 +1,8 dB 5,3 MW, 152,5 m, 8
GE158-5.5 + 2 dB 5,5 MW, 122,5 m, 8
GE158-6.1 + 2 dB 6,1 MW, 171 m, 27
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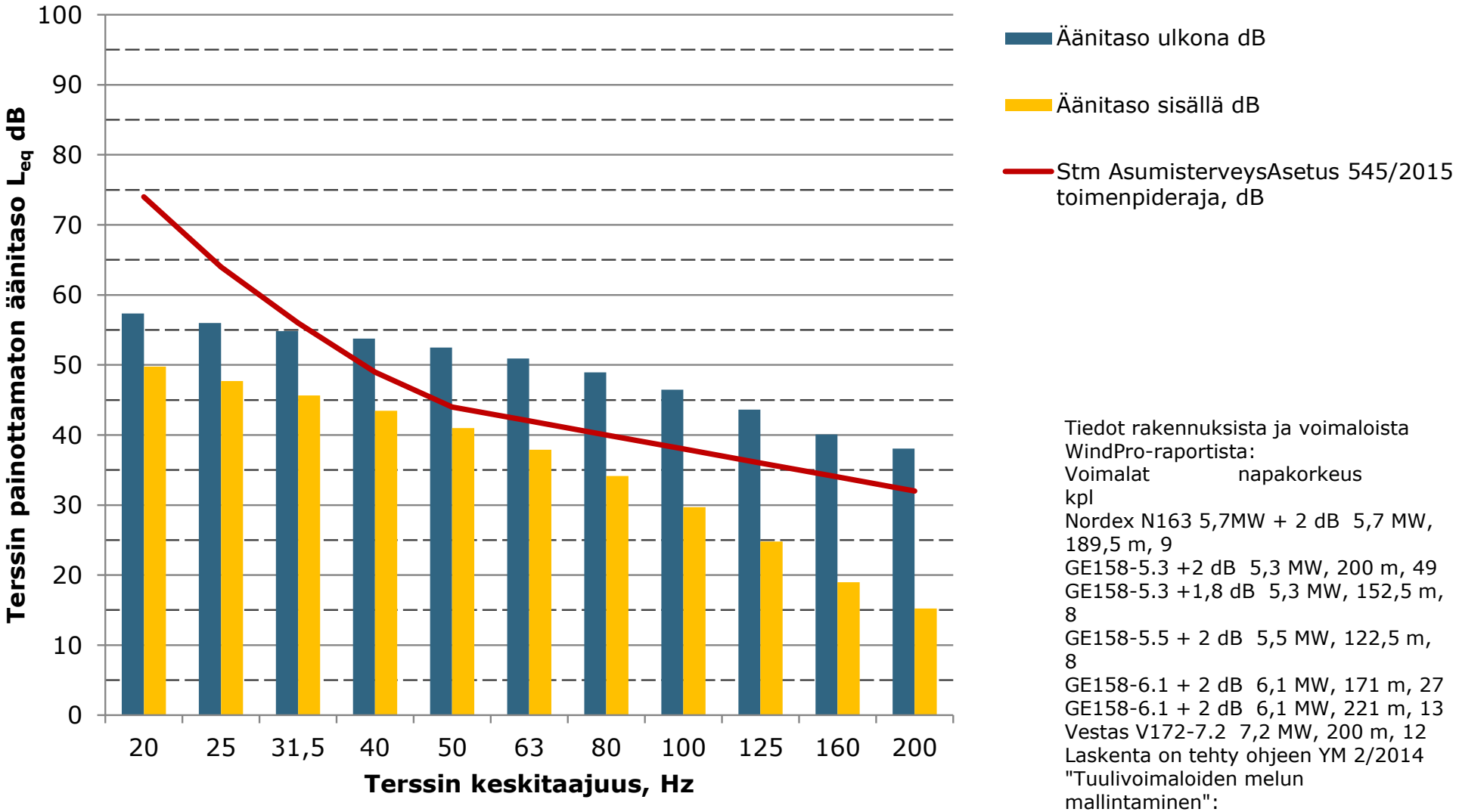
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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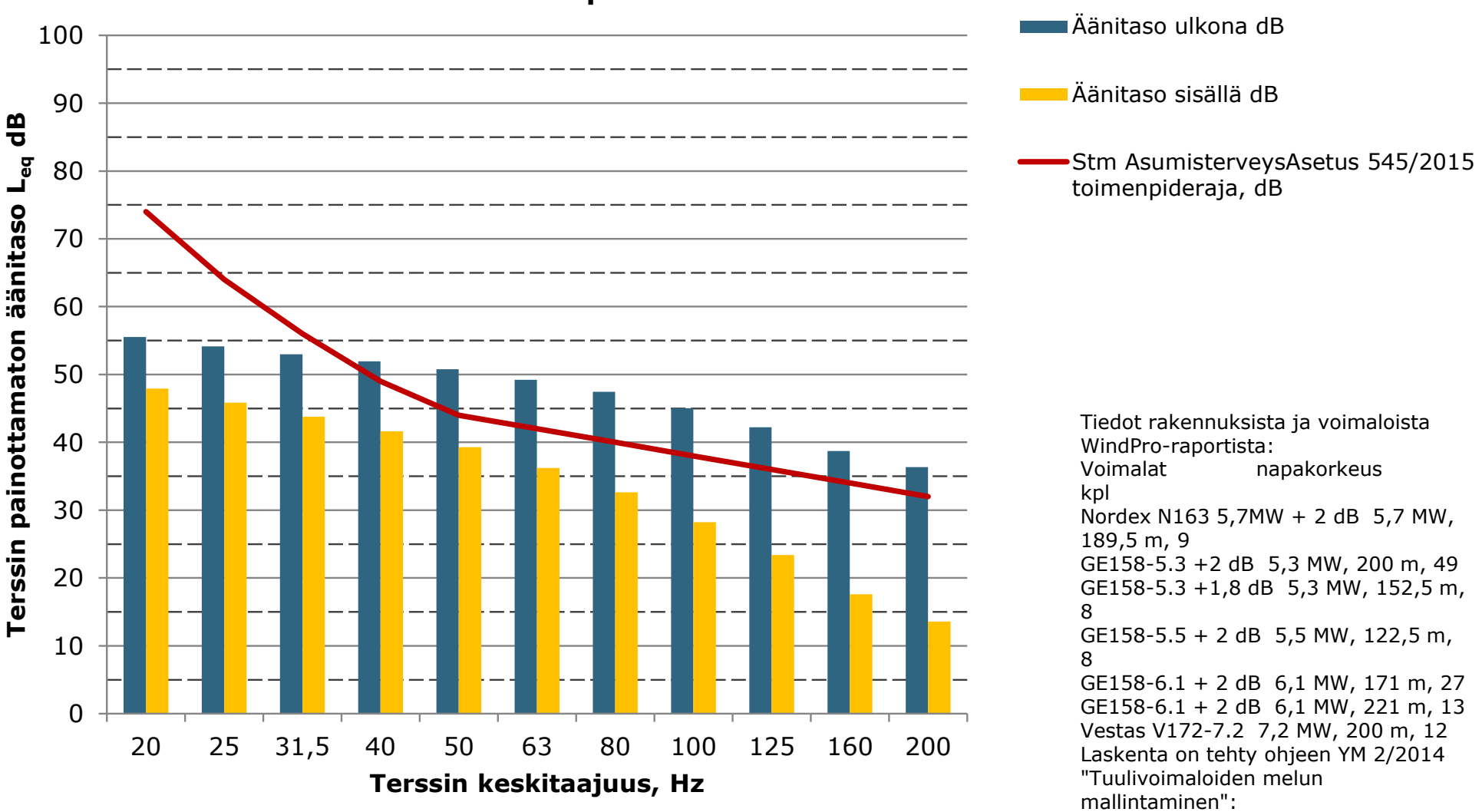
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



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GE158-5.5 + 2 dB 5,5 MW, 122,5 m, 8
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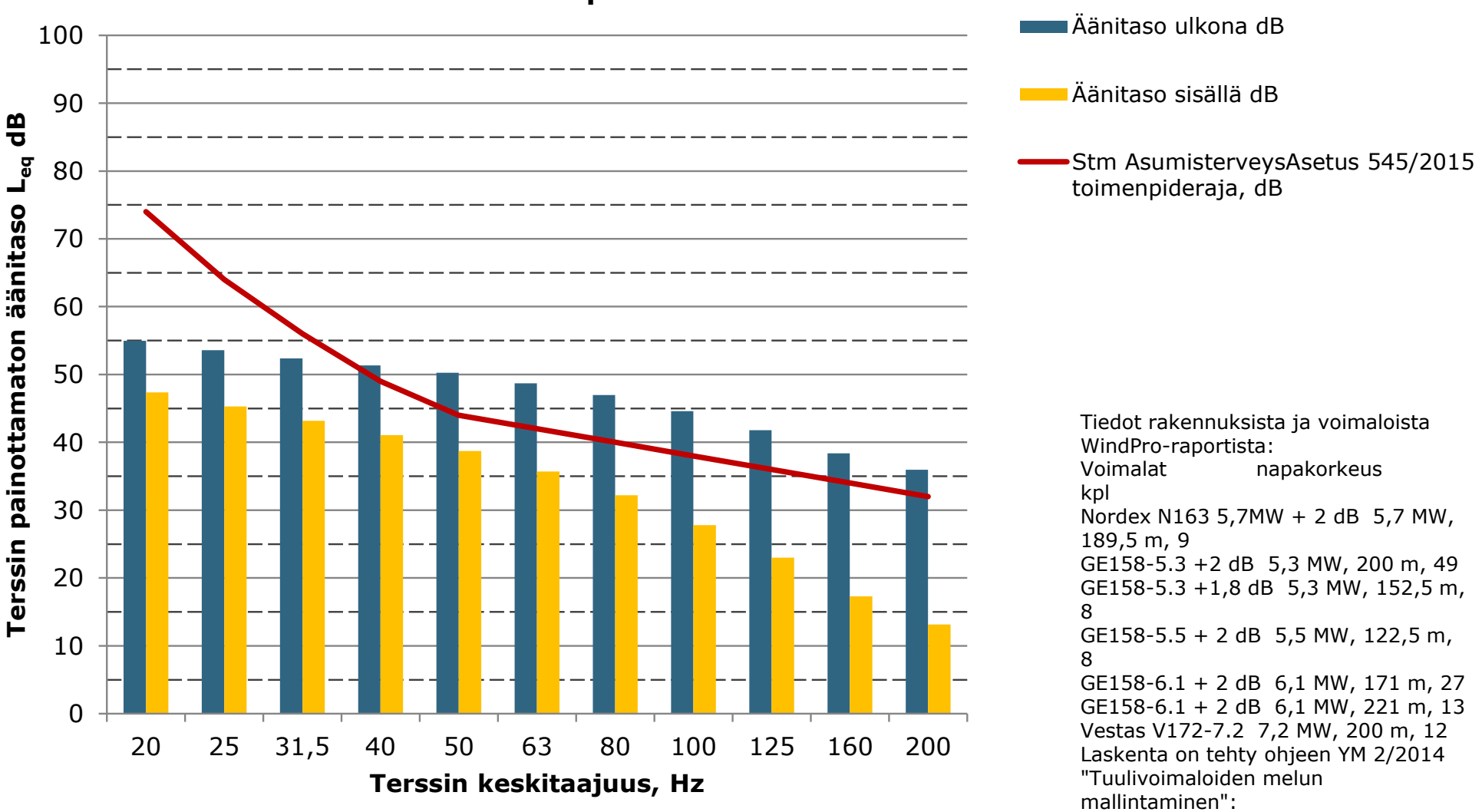
GE158-6.1 + 2 dB 6,1 MW, 221 m, 13
Vestas V172-7.2 7,2 MW, 200 m, 12
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
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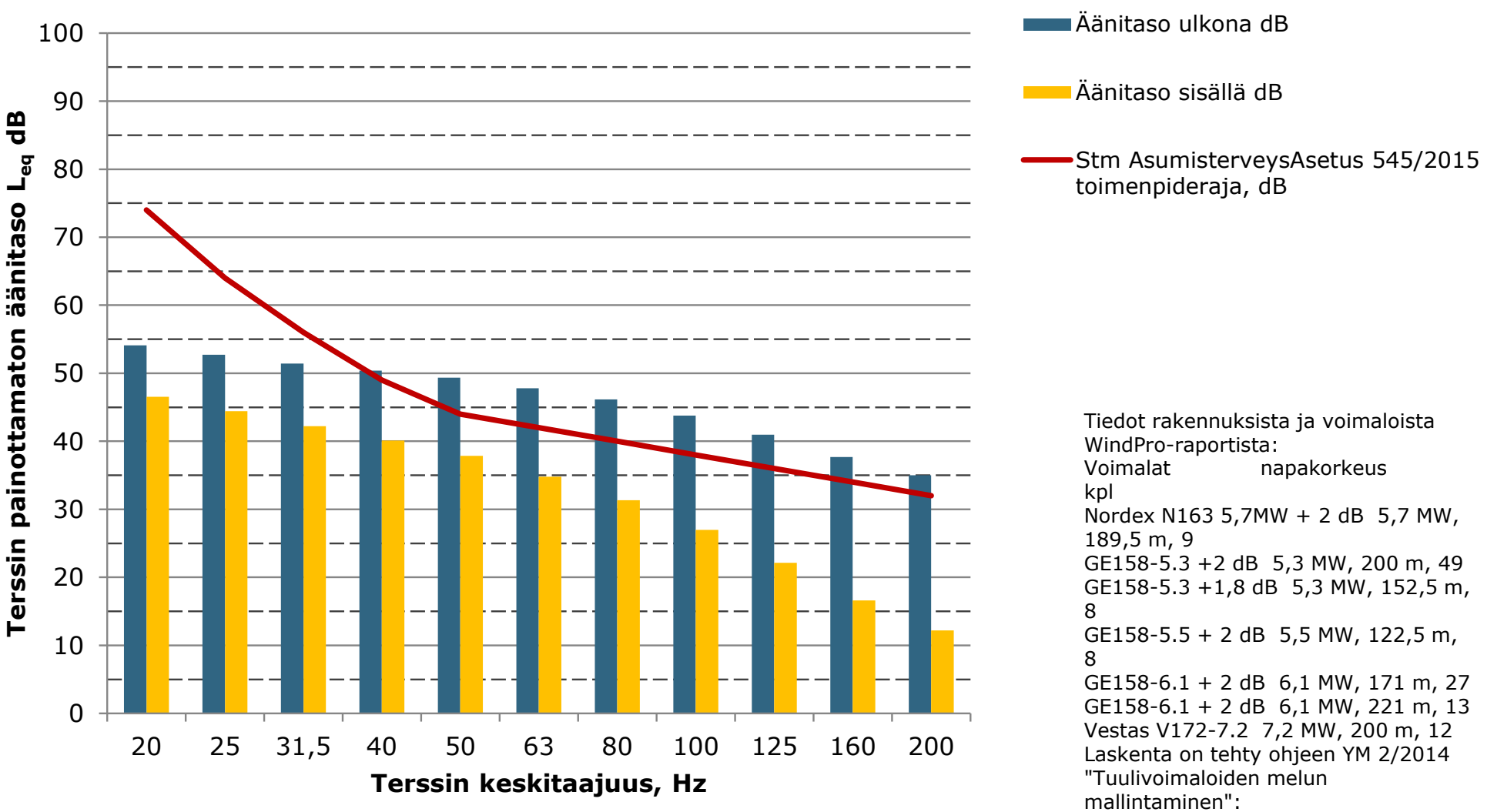
Vestas V172-7.2 7,2 MW, 200 m, 12
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":



Tiedot rakennuksista ja voimaloista WindPro-raportista:
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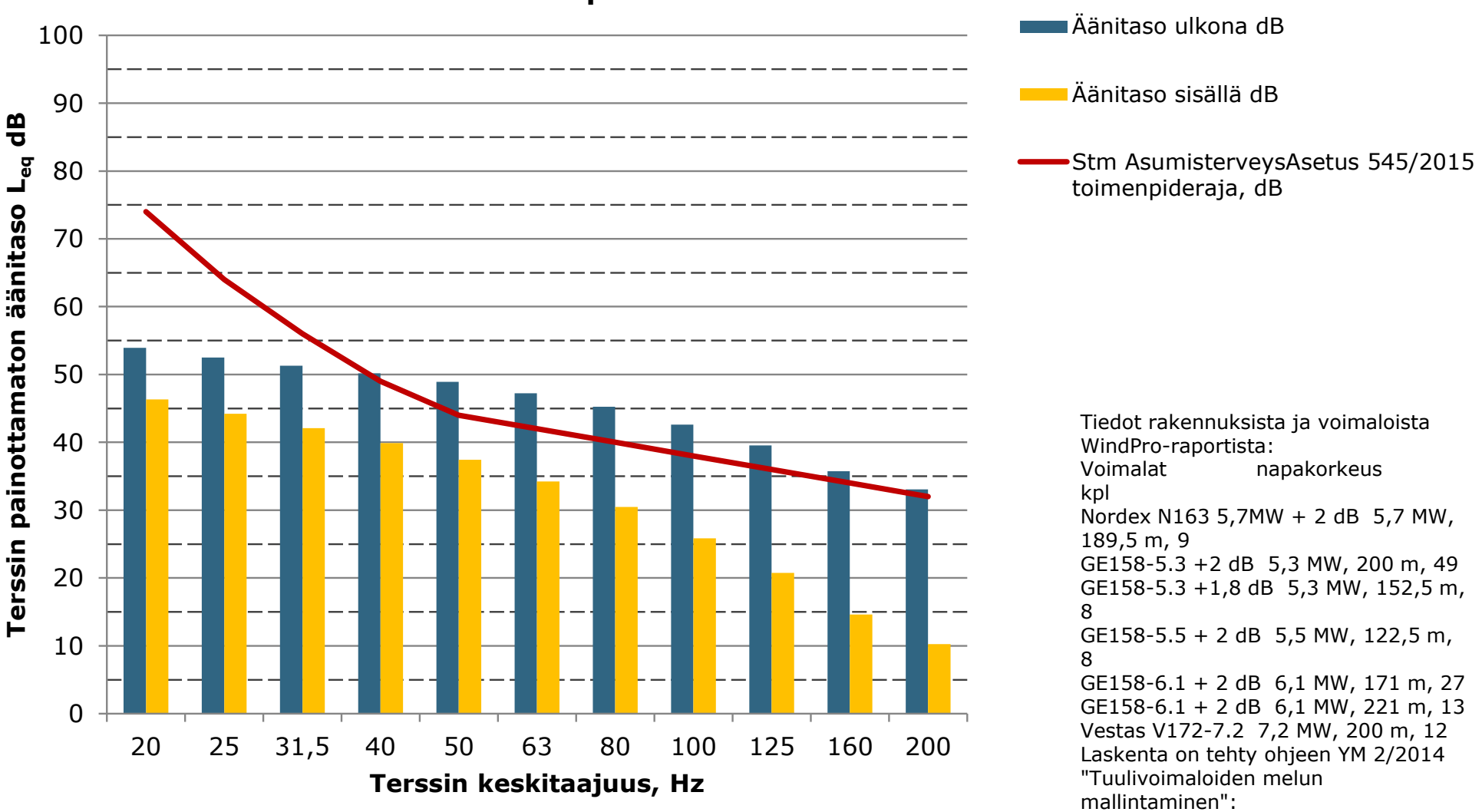

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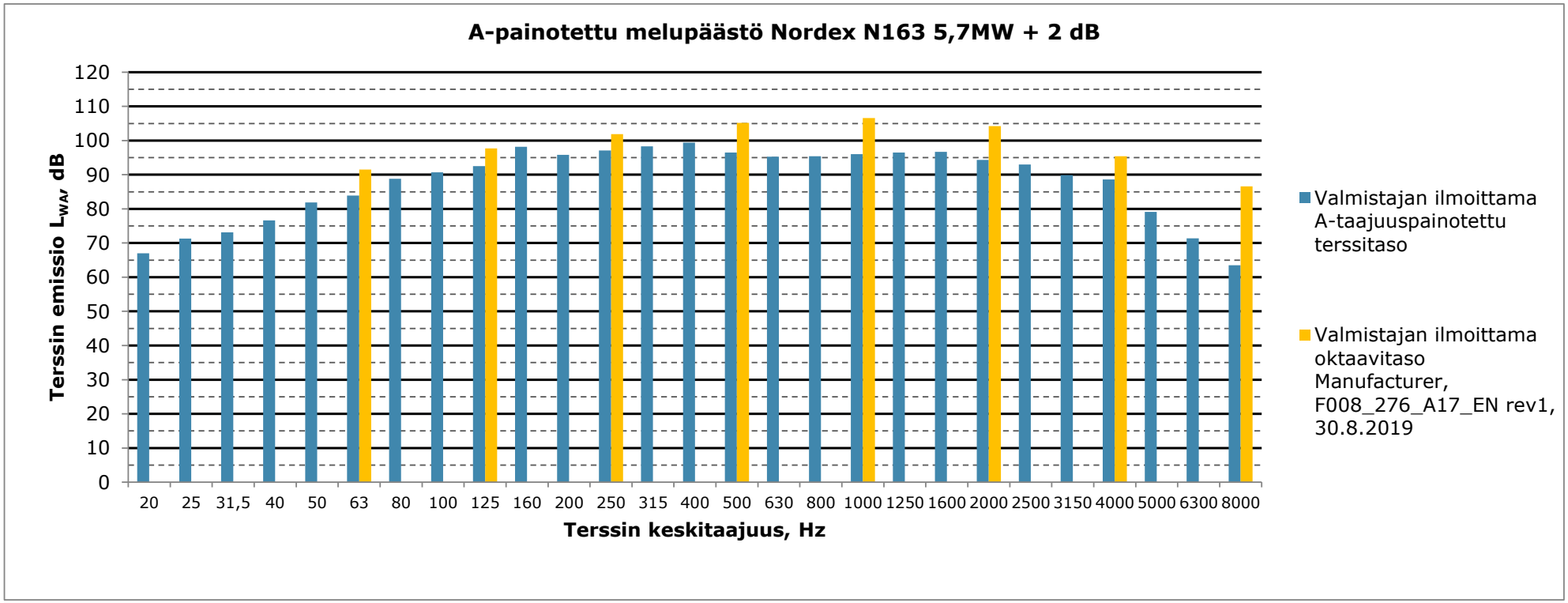
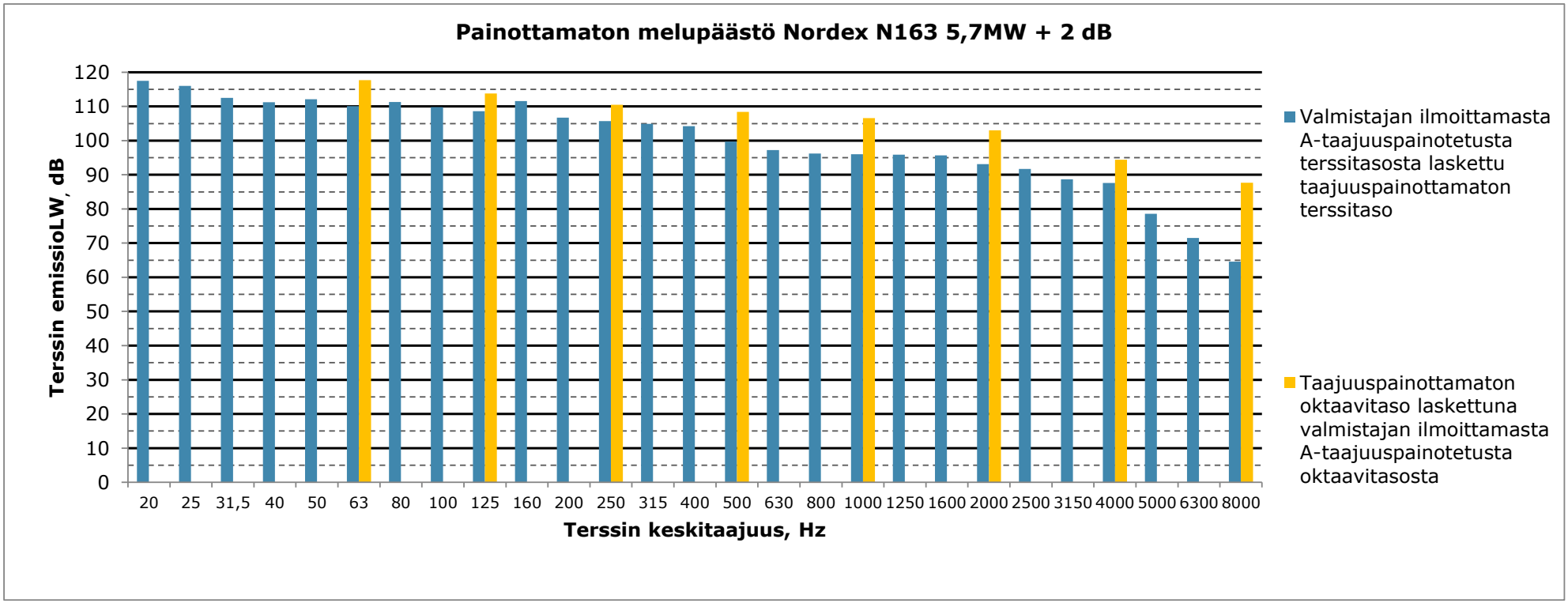
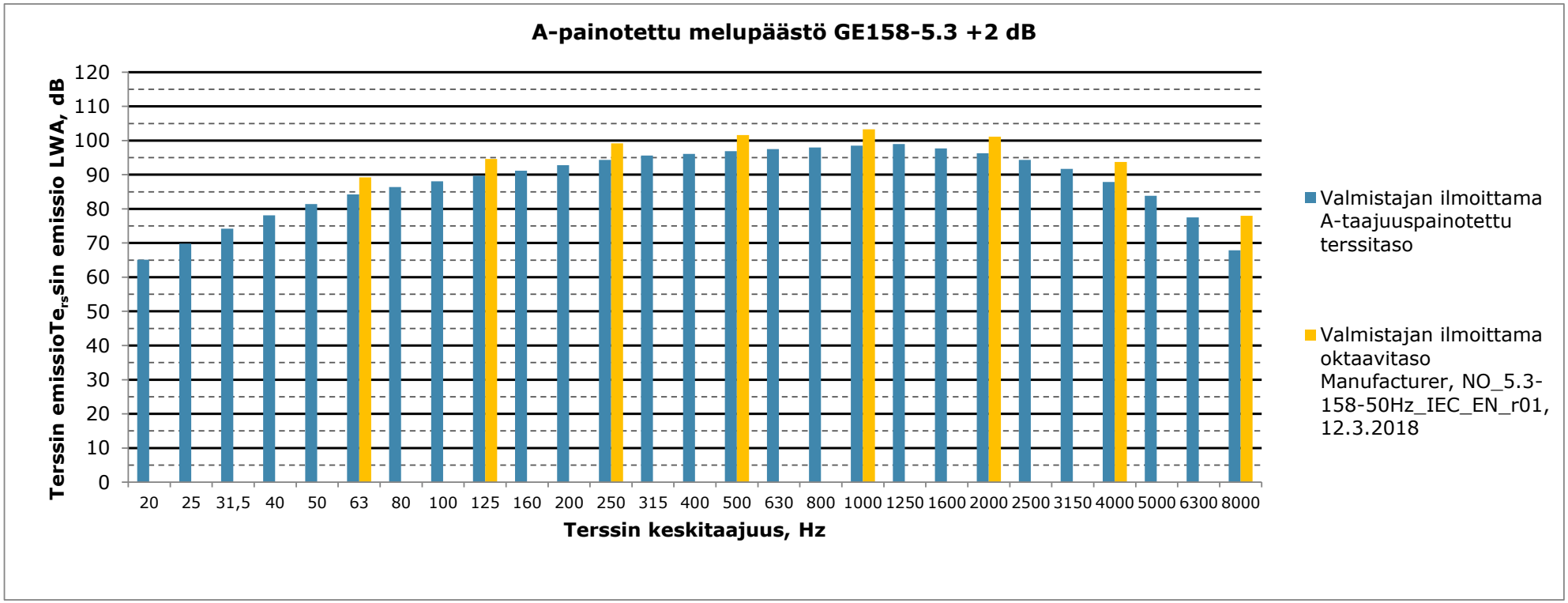
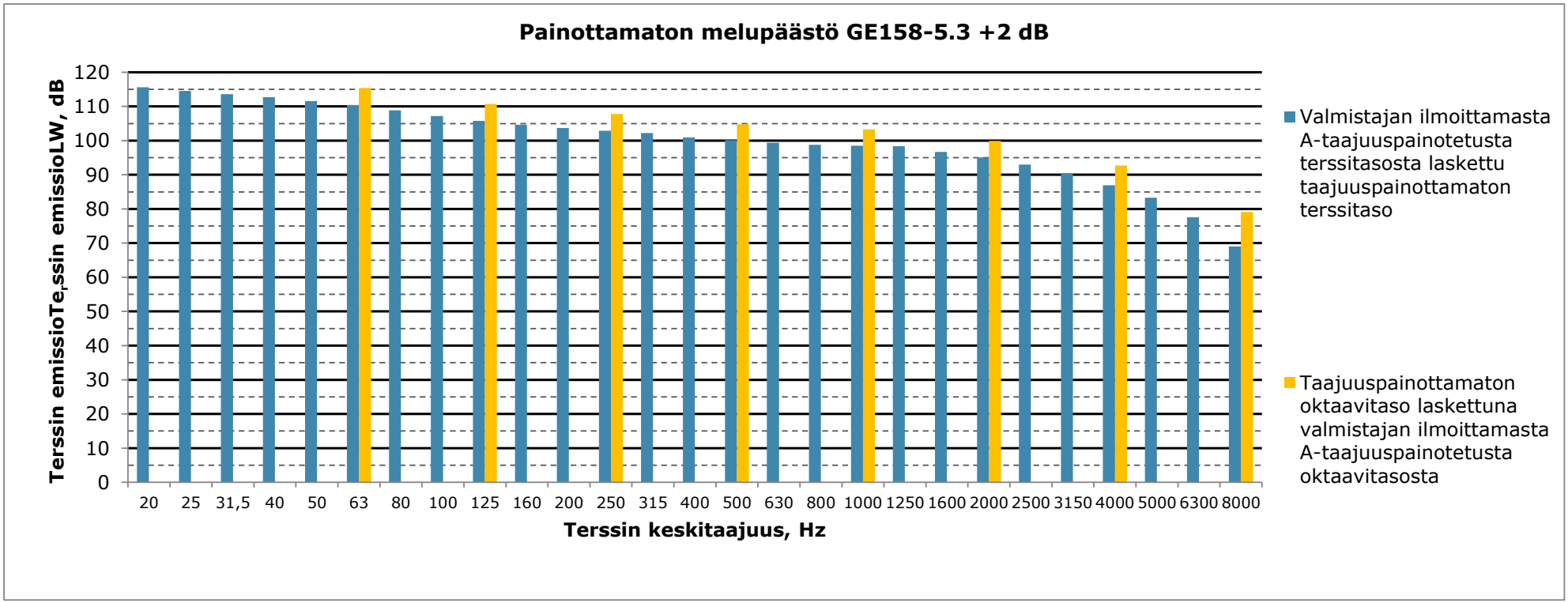
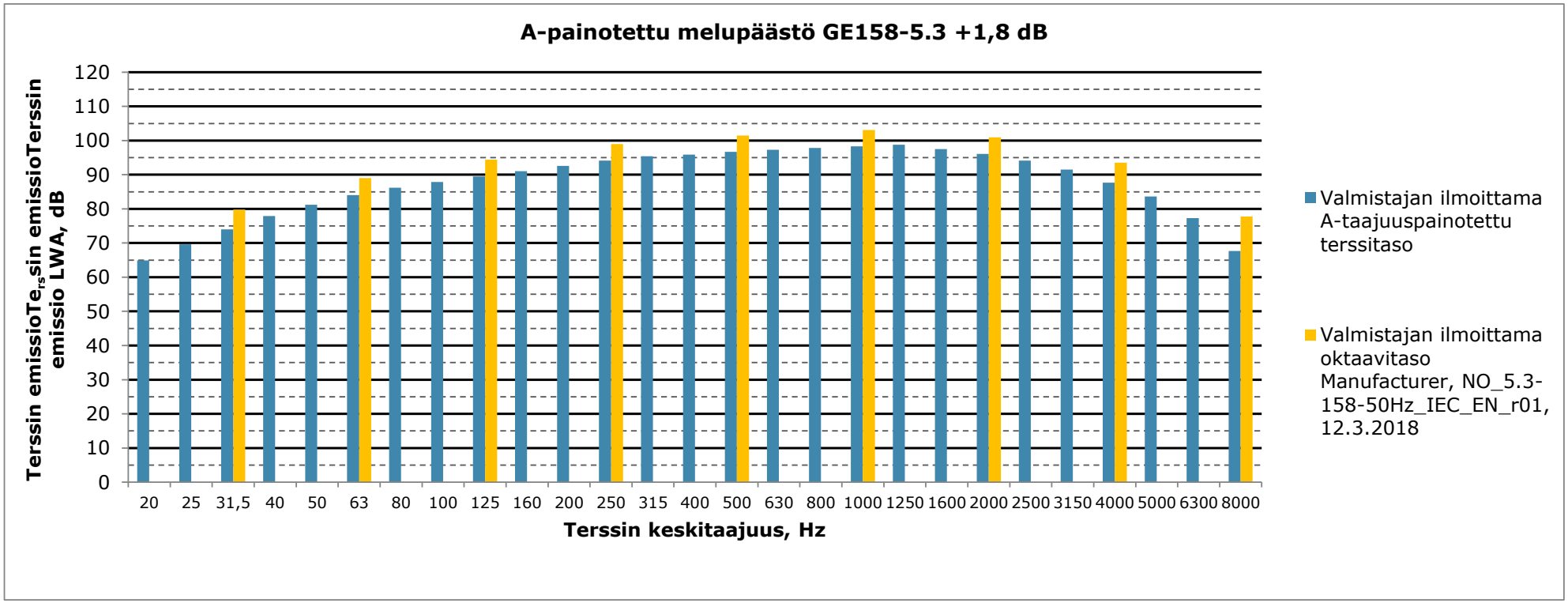
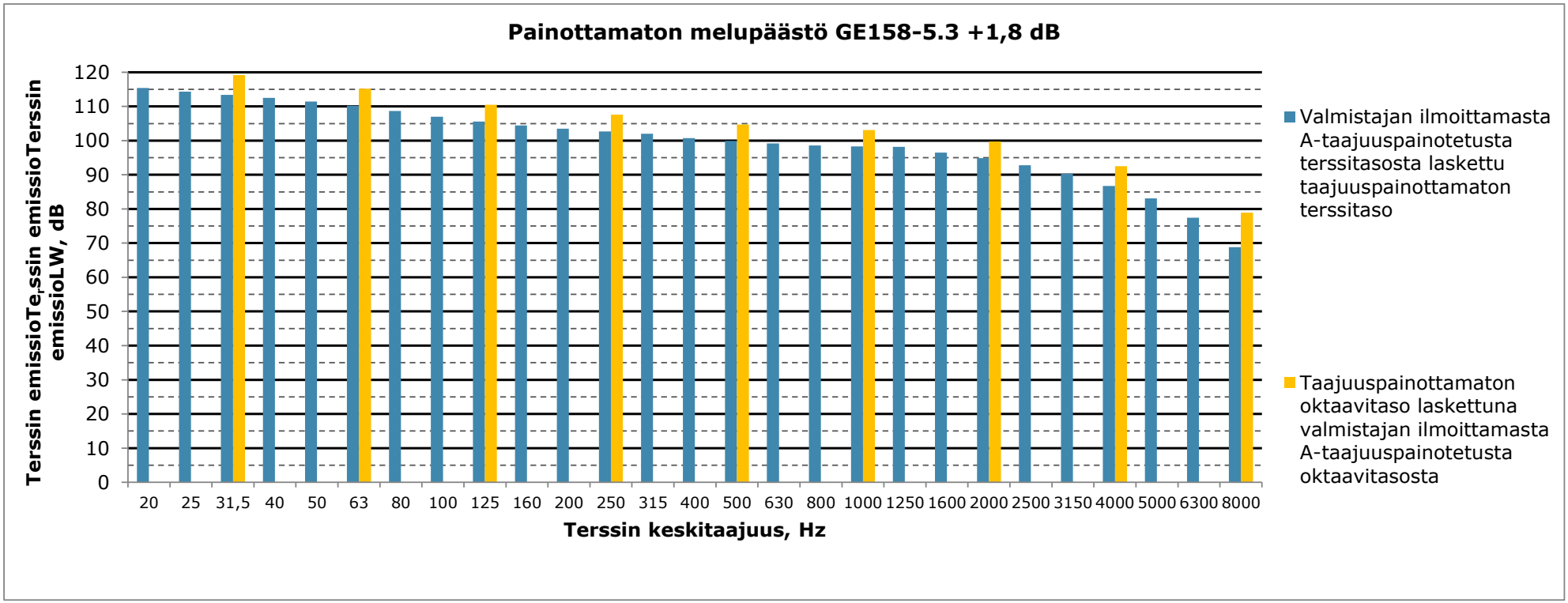

A-painotettu melupäästö Nordex N163 5,7MW + 2 dB
Terssin emissio L_{WA}, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, F008_276_A17_EN rev1, 30.8.2019

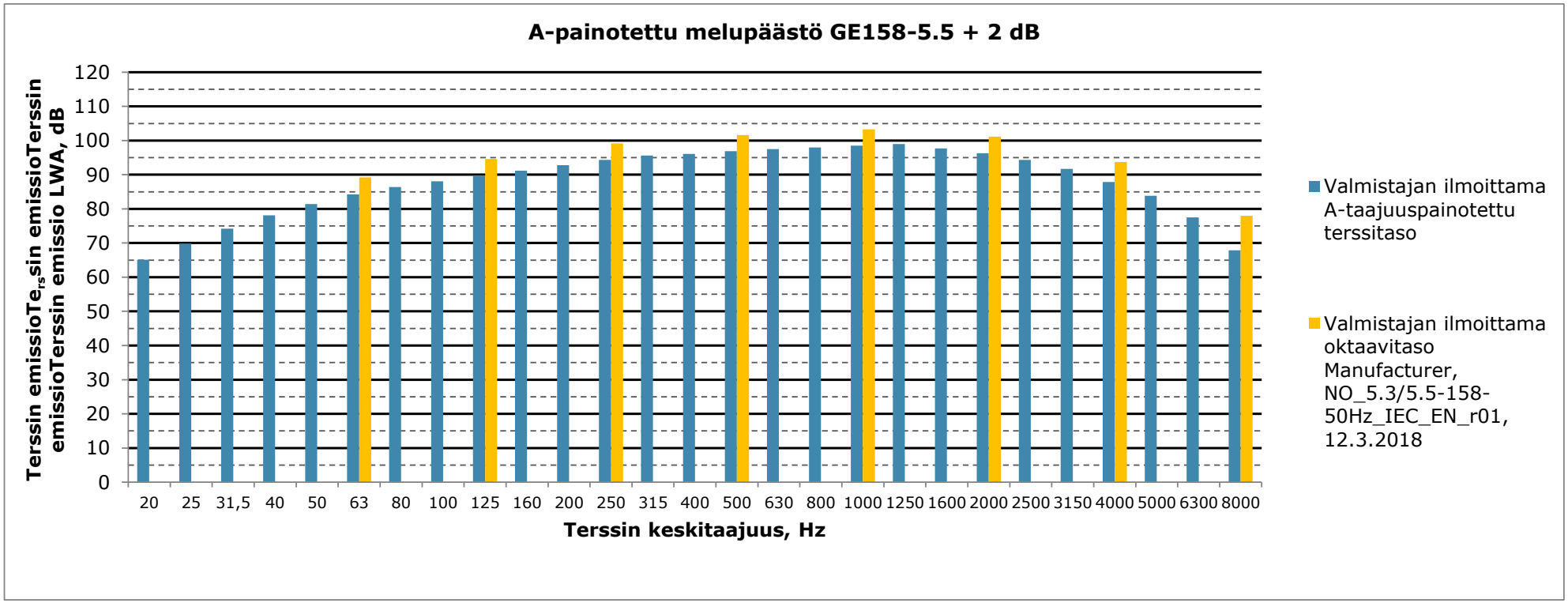

Painottamaton melupäästö Nordex N163 5,7MW + 2 dB
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

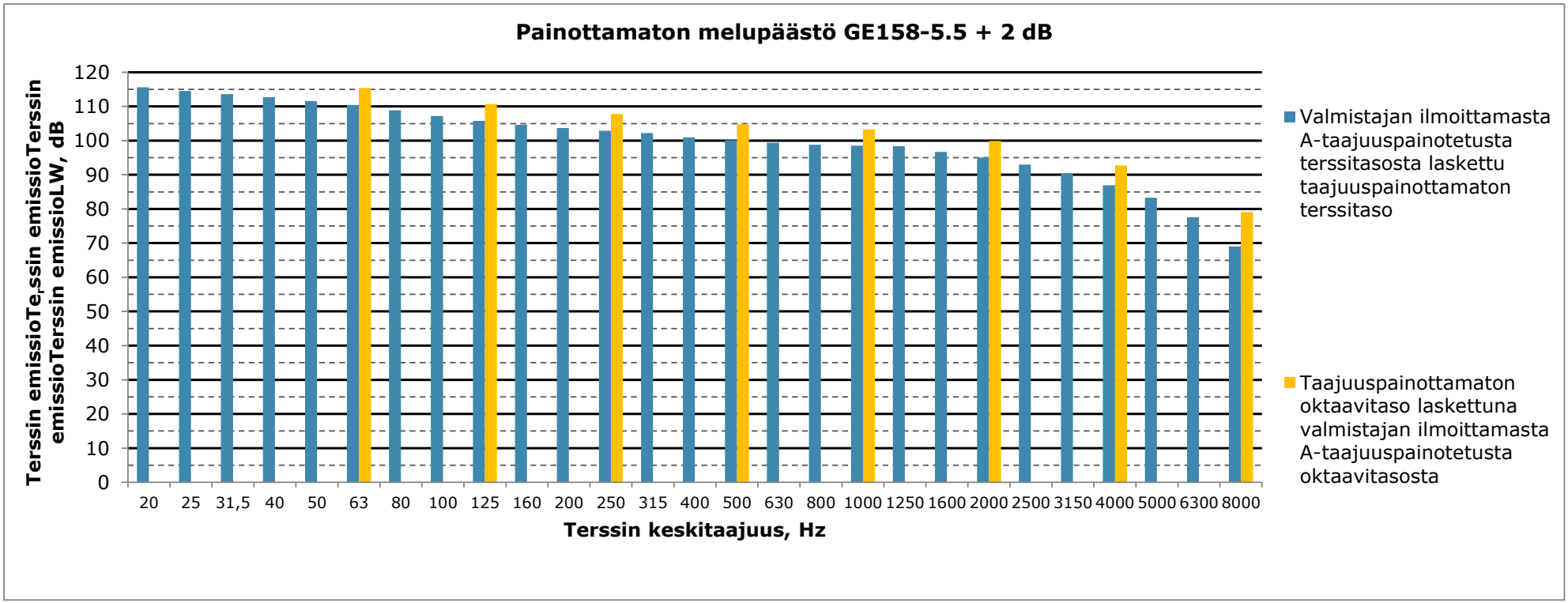

A-painotettu melupäästö GE158-5.3 +2 dB
Terssin emissioTe$_{rs}$sin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, NO_5.3-158-50Hz_IEC_EN_r01, 12.3.2018

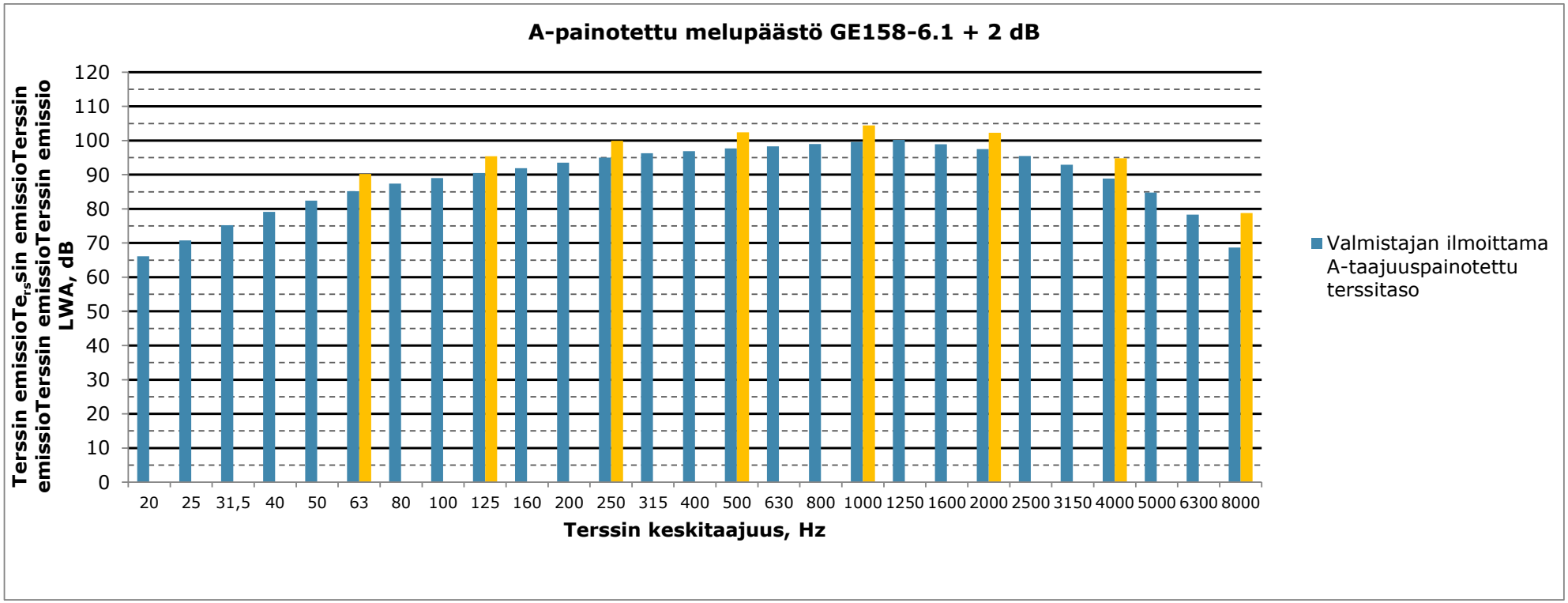

Painottamaton melupäästö GE158-5.3 +2 dB
Terssin emissioTe,ssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

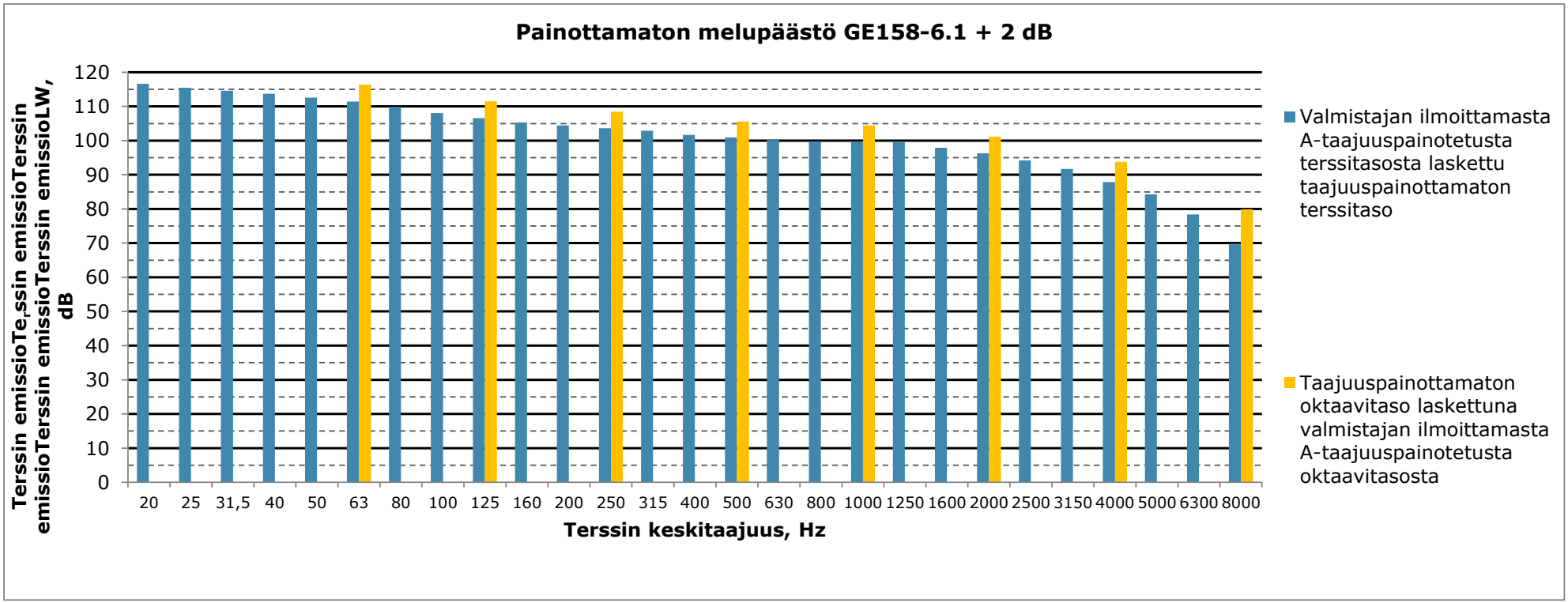

A-painotettu melupäästö GE158-5.3 +1,8 dB
Terssin emissioTe$_{rs}$sin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso
Valmistajan ilmoittama oktaavitaso Manufacturer, NO_5.3-158-50Hz_IEC_EN_r01, 12.3.2018

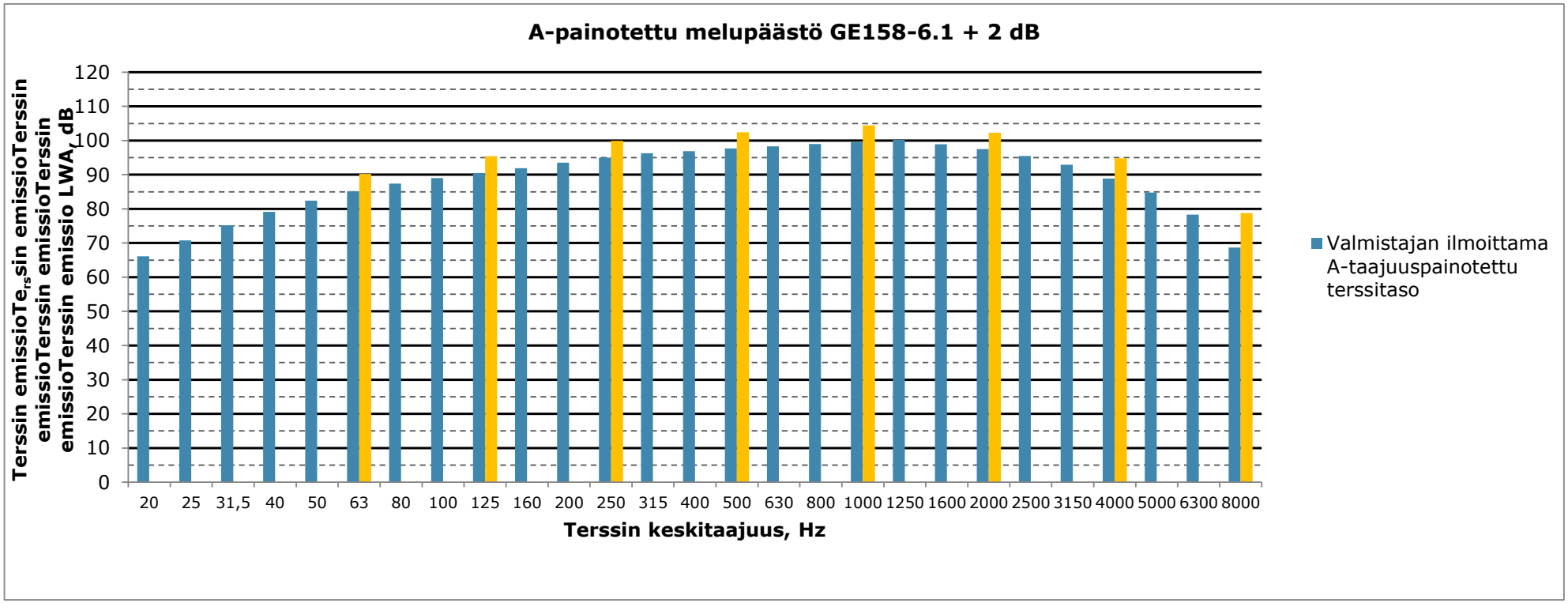

Painottamaton melupäästö GE158-5.3 +1,8 dB
Terssin emissioTe,ssin emissioTerssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö GE158-5.5 + 2 dB
Terssin emissioTe$_{rs}$sin emissioTerssin emissioTerssin emissio LWA, 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 Manufacturer, NO_5.3/5.5-158-50Hz_IEC_EN_r01, 12.3.2018


Painottamaton melupäästö GE158-5.5 + 2 dB
Terssin emissioTe,ssin emissioTerssin emissioTerssin 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


A-painotettu melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio LWA, 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


Painottamaton melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin 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


A-painotettu melupäästö GE158-6.1 + 2 dB
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio LWA, dB
120
110
100
90
80
70
60
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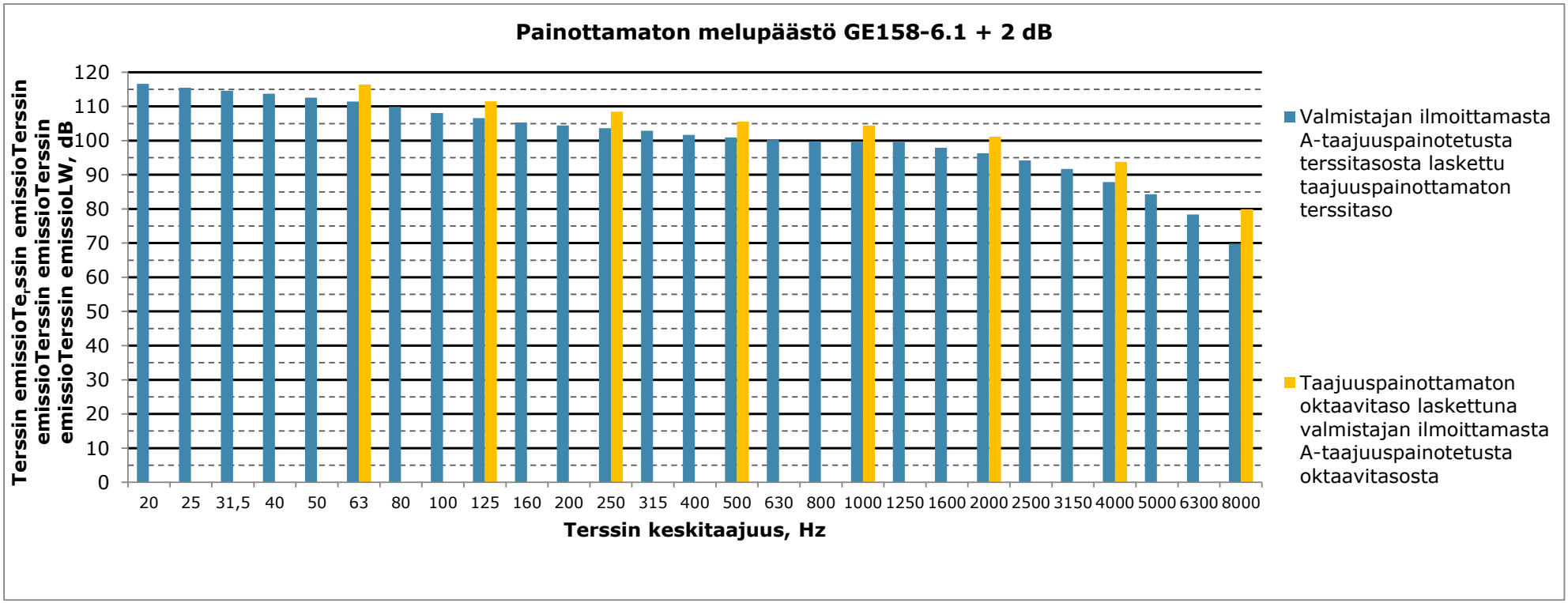
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittama A-taajuuspainotettu terssitaso


Painottamaton melupäästö GE158-6.1 + 2 dB
Terssin emissioTe,ssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioLW, dB
120
110
100
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80
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40
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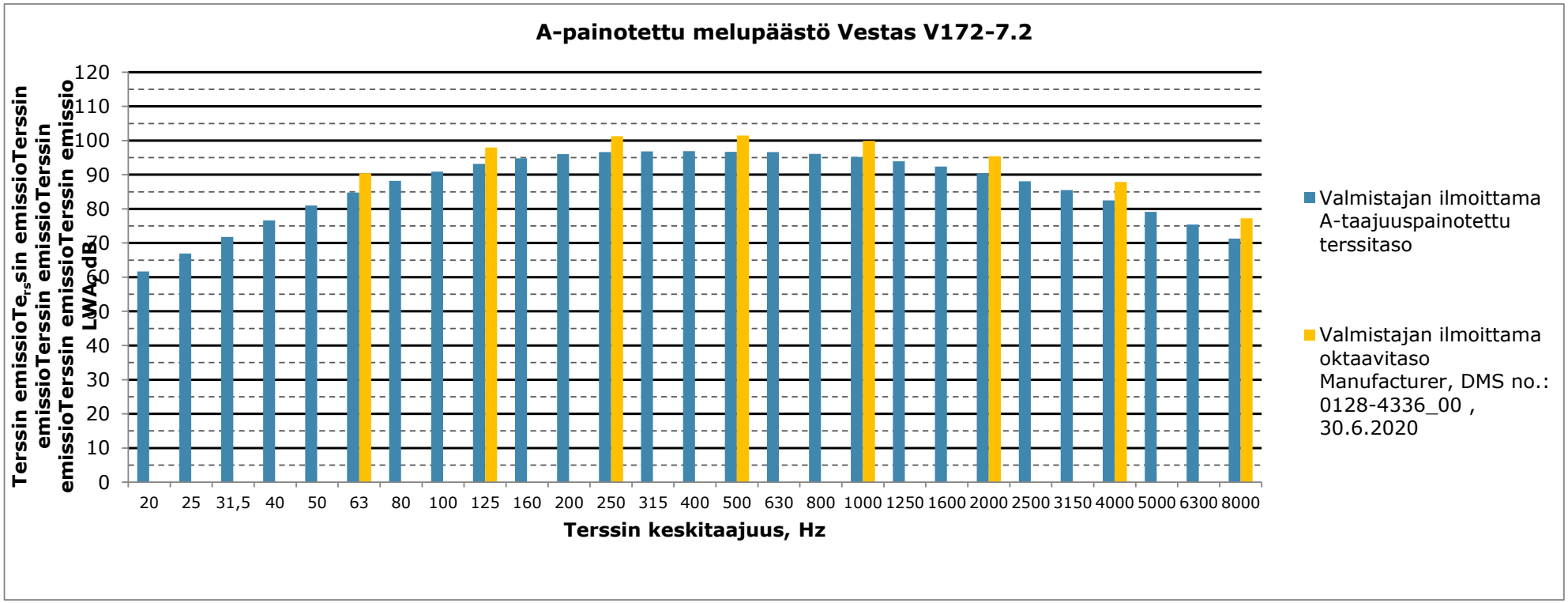
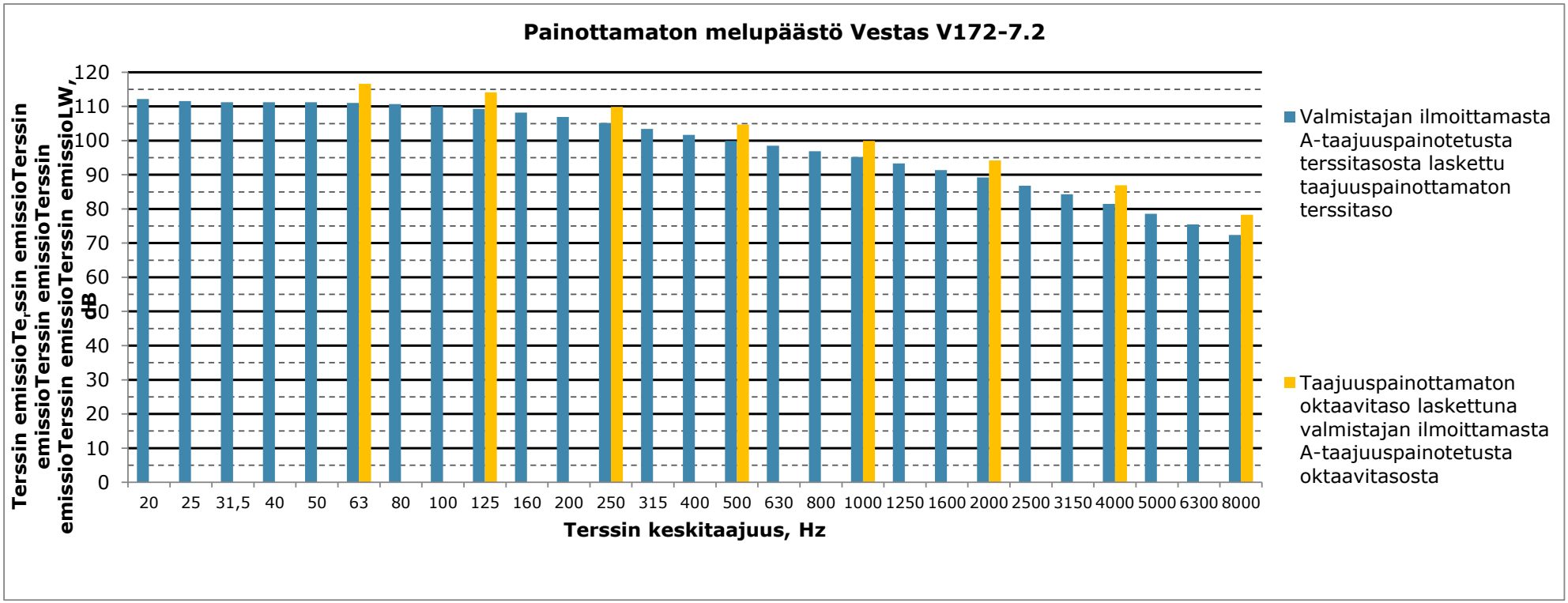
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V172-7.2
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissio
LWA,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 Manufacturer, DMS no.: 0128-4336_00 , 30.6.2020


Painottamaton melupäästö Vestas V172-7.2
Terssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin emissioTerssin 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

Liite 5. Vasaman tuulivoimahanke VE1 – varjostusmallinnuksen tulokset ”Real Case, no forest”

Project:
Vasama_22_11_2022

Licensed user:
FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

Assumptions for shadow calculations

Maximum distance for influence	2 500	m
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-2_N64,00_E025,00 (5)

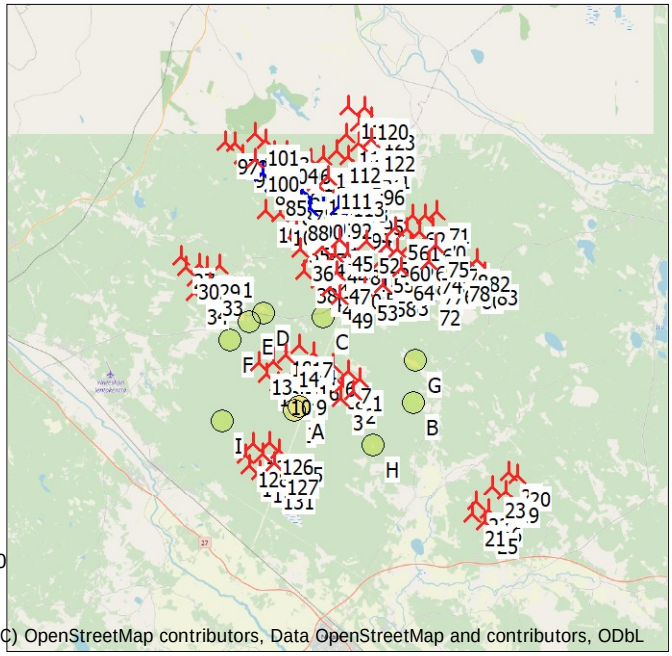
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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_Vasama_5_5_2022_0
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:400 000
New WTG
Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	402 014	7 104 309	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
2	401 637	7 103 661	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
3	400 968	7 103 344	104,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
4	399 564	7 105 835	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
5	400 647	7 104 532	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
6	400 636	7 105 142	105,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
7	401 395	7 104 737	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
8	401 057	7 104 087	103,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
9	399 017	7 104 219	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
10	397 644	7 104 266	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
11	398 397	7 104 778	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
12	397 070	7 104 723	99,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
13	396 683	7 105 368	98,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
14	398 090	7 105 743	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
15	397 412	7 105 444	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
16	399 135	7 105 052	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
17	398 868	7 106 249	100,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
18	397 770	7 106 329	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
19	409 573	7 098 129	122,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
20	410 264	7 098 972	122,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
21	407 742	7 096 948	109,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
22	407 993	7 097 672	109,3	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
23	408 857	7 098 427	115,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
24	409 752	7 099 120	115,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
25	408 404	7 096 567	110,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
26	408 619	7 097 160	117,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
27	392 697	7 111 104	82,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
28	393 696	7 110 723	85,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
29	394 124	7 110 573	88,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
30	392 964	7 110 572	83,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
31	394 736	7 110 600	89,8	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
32	393 462	7 109 982	84,9	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
33	394 233	7 109 674	87,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
34	393 349	7 109 200	84,2	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4

To be continued on next page...

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23.11.2022 12.07/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

	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]
35	398 896	7 112 332	92,5	PUU01	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
36	399 097	7 111 286	95,0	PUU02	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
37	399 784	7 111 972	97,5	PUU03	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
38	399 264	7 110 151	97,2	PUU04	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
39	399 536	7 110 832	95,4	PUU05	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
40	400 239	7 111 382	97,5	PUU06	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
41	400 444	7 112 292	97,3	PUU07	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
42	400 019	7 109 649	100,0	PUU08	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
43	400 380	7 110 348	100,0	PUU09	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
44	400 876	7 110 966	99,4	PUU10	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
45	401 152	7 111 752	100,0	PUU11	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
46	400 549	7 109 232	102,5	PUU12	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
47	400 953	7 110 020	102,5	PUU13	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
48	401 537	7 111 046	104,5	PUU14	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
49	401 068	7 108 792	105,0	PUU15	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
50	401 564	7 109 758	104,1	PUU16	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
51	402 089	7 110 702	107,5	PUU17	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
52	402 589	7 111 603	106,9	PUU18	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
53	402 455	7 109 148	112,5	PUU19	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
54	402 889	7 109 778	110,0	PUU20	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
55	403 318	7 110 593	107,5	PUU21	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
56	403 622	7 111 352	106,3	PUU22	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
57	404 117	7 112 276	103,7	PUU23	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
58	403 379	7 109 327	115,0	PUU24	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
59	403 790	7 110 129	108,2	PUU25	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
60	404 210	7 111 152	105,6	PUU26	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
61	404 739	7 112 199	105,0	PUU27	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
62	405 100	7 112 943	100,6	PUU28	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
63	404 061	7 109 351	110,0	PUU29	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
64	404 420	7 110 174	106,8	PUU30	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
65	404 900	7 111 381	105,0	PUU31	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
66	405 395	7 112 030	102,5	PUU32	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
67	405 740	7 112 891	100,2	PUU33	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
68	405 042	7 110 380	105,9	PUU34	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
69	405 532	7 111 130	103,8	PUU35	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
70	406 114	7 112 133	103,1	PUU36	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
71	406 380	7 113 067	107,2	PUU37	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
72	405 707	7 108 791	111,2	PUU38	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
73	405 822	7 109 587	108,6	PUU39	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
74	405 893	7 110 455	104,7	PUU40	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
75	406 257	7 111 298	104,1	PUU41	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
76	406 558	7 109 872	106,5	PUU42	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
77	406 638	7 110 744	106,0	PUU43	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
78	407 324	7 109 954	108,3	PUU44	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
79	407 269	7 110 957	112,5	PUU45	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
80	407 963	7 109 542	113,5	PUU46	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
81	407 809	7 110 582	116,0	PUU47	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
82	408 414	7 110 457	120,0	PUU48	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
83	408 786	7 109 772	117,5	PUU49	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
84	397 208	7 115 412	88,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
85	397 754	7 114 856	87,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
86	398 503	7 115 243	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
87	398 570	7 114 265	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
88	398 871	7 113 427	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
89	399 272	7 114 459	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
90	399 647	7 113 488	95,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
91	400 360	7 113 628	100,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
92	401 168	7 113 504	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
93	402 041	7 114 329	106,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
94	402 216	7 112 963	108,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
95	402 852	7 113 666	105,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
96	402 975	7 115 189	106,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
97	395 254	7 117 093	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
98	395 819	7 117 022	83,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

To be continued on next page...

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23.11.2022 12.07/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

	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]
99	396 195	7 116 379	82,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
100	396 858	7 116 145	85,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
101	396 894	7 117 531	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
102	397 303	7 113 442	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
103	397 417	7 117 093	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
104	397 854	7 116 507	90,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
105	398 058	7 113 189	92,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
106	398 529	7 116 484	94,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
107	399 116	7 116 184	97,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
108	399 762	7 116 032	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
109	399 974	7 114 812	98,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
110	400 456	7 116 139	99,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
111	400 698	7 115 062	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
112	401 155	7 116 430	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
113	401 348	7 114 680	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
114	401 706	7 117 283	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
115	401 754	7 116 113	103,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
116	401 837	7 118 791	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
117	402 023	7 115 337	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
118	402 362	7 116 825	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
119	402 365	7 117 878	100,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
120	402 692	7 118 655	95,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
121	402 733	7 116 070	109,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
122	402 975	7 117 005	104,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
123	403 021	7 118 167	96,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
124	396 213	7 101 101	92,7	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
125	397 616	7 100 723	97,6	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
126	397 086	7 101 114	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
127	397 318	7 100 046	97,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
128	395 741	7 100 512	93,4	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
129	396 517	7 099 615	95,1	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
130	396 717	7 100 560	95,3	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
131	397 043	7 099 258	95,9	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
132	395 944	7 099 965	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Pyssynienen metsätie 156)	14:27
B	Lomarakennus B (Sarjankyläntie 1093)	0:00
C	Lomarakennnus C (Kurunoja)	4:48
D	Asuinrakennus D (Haapavesitie 1404)	3:09
E	Asuinrakennus E (Säilynkankaantie 34)	5:39

To be continued on next page...

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23.11.2022 12.07/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
F	Asuinrakennus F (Ritamäentie 156)	2:17
G	Lomarakennus G (Virtaniementie 175)	0:00
H	Asuinrakennus H (Purotie 55)	0:00
I	Lomarakennus I (Hirvinevan haara 147)	3:17
J	Lomaasunto J (Pyssyniemen metsätie 2)	4:02

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (20)	0:00
2	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (21)	0:00
3	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (22)	1:39
4	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (23)	2:26
5	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (24)	4:04
6	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (25)	0:00
7	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (26)	0:00
8	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (27)	0:00
9	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (28)	0:00
10	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (29)	4:23
11	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (30)	0:00
12	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (31)	6:29
13	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (32)	4:15
14	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (33)	1:23
15	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (34)	1:28
16	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (35)	0:00
17	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (36)	2:21
18	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (37)	4:59
19	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (276)	0:00
20	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (277)	0:00
21	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (278)	0:00
22	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (279)	0:00
23	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (280)	0:00
24	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (281)	0:00
25	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (282)	0:00
26	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (283)	0:00
27	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (284)	0:00
28	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (285)	0:00
29	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (286)	0:00
30	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (287)	0:00
31	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (288)	0:00
32	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (289)	0:00
33	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (290)	0:00
34	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (291)	0:00
35	PUU01	0:00
36	PUU02	0:00
37	PUU03	0:00
38	PUU04	0:00
39	PUU05	0:00
40	PUU06	0:00
41	PUU07	0:00
42	PUU08	0:00
43	PUU09	0:00
44	PUU10	0:00
45	PUU11	0:00
46	PUU12	0:00
47	PUU13	0:00
48	PUU14	0:00
49	PUU15	0:00
50	PUU16	0:00
51	PUU17	0:00
52	PUU18	0:00
53	PUU19	0:00

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23.11.2022 12.07/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

No.	Name	Expected [h/year]
54	PUU20	0:00
55	PUU21	0:00
56	PUU22	0:00
57	PUU23	0:00
58	PUU24	0:00
59	PUU25	0:00
60	PUU26	0:00
61	PUU27	0:00
62	PUU28	0:00
63	PUU29	0:00
64	PUU30	0:00
65	PUU31	0:00
66	PUU32	0:00
67	PUU33	0:00
68	PUU34	0:00
69	PUU35	0:00
70	PUU36	0:00
71	PUU37	0:00
72	PUU38	0:00
73	PUU39	0:00
74	PUU40	0:00
75	PUU41	0:00
76	PUU42	0:00
77	PUU43	0:00
78	PUU44	0:00
79	PUU45	0:00
80	PUU46	0:00
81	PUU47	0:00
82	PUU48	0:00
83	PUU49	0:00
84	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (350)	0:00
85	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (351)	0:00
86	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (352)	0:00
87	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (353)	0:00
88	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (354)	0:00
89	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (355)	0:00
90	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (356)	0:00
91	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (357)	0:00
92	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (358)	0:00
93	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (359)	0:00
94	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (360)	0:00
95	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (361)	0:00
96	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (362)	0:00
97	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (363)	0:00
98	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (364)	0:00
99	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (365)	0:00
100	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (366)	0:00
101	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (367)	0:00
102	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (368)	0:00
103	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (369)	0:00
104	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (370)	0:00
105	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (371)	0:00
106	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (372)	0:00
107	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (373)	0:00
108	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (374)	0:00
109	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (375)	0:00
110	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (376)	0:00
111	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (377)	0:00
112	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (378)	0:00
113	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (379)	0:00
114	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (380)	0:00
115	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (381)	0:00
116	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (382)	0:00
117	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (383)	0:00
118	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (384)	0:00

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SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

No.	Name	Expected [h/year]
119	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (385)	0:00
120	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (386)	0:00
121	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (387)	0:00
122	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (388)	0:00
123	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (389)	0:00
124	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (470)	1:45
125	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (471)	1:25
126	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (472)	1:42
127	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (473)	0:00
128	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (474)	1:31
129	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (475)	0:00
130	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (476)	0:00
131	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (477)	0:00
132	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (478)	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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Vasama_22_11_2022

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SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February			March	April			May			June		
1	10.12	09.03		15.11 (126)	07.32	06.43			04.57			03.20		04.44 (5)
	14.37	16.06	5	15.16 (126)	17.37	20.09			21.41			23.19	45	22.12 (10)
2	10.11	09.00		15.10 (126)	07.28	06.39			04.54			03.18		04.45 (5)
	14.39	16.10	10	15.20 (126)	17.40	20.12			21.44			23.22	45	22.14 (10)
3	10.10	08.57		15.09 (126)	07.25	06.36			04.50			03.15		04.45 (5)
	14.41	16.13	15	15.24 (126)	17.43	20.15			21.48			23.24	46	22.14 (10)
4	10.09	08.54		15.09 (126)	07.21	06.32			04.47			03.13		04.45 (5)
	14.43	16.16	17	15.26 (126)	17.46	20.18			21.51			23.27	47	22.16 (10)
5	10.07	08.51		15.10 (126)	07.18	06.28			04.44			03.11		04.46 (5)
	14.45	16.20	17	15.27 (126)	17.49	20.21			21.54			23.30	46	22.17 (10)
6	10.06	08.48		15.09 (126)	07.14	06.25			04.40			03.08		04.46 (5)
	14.47	16.23	18	15.27 (126)	17.52	20.24			21.57			23.32	46	22.17 (10)
7	10.04	08.45		15.09 (126)	07.11	06.21			04.37			03.06		04.47 (5)
	14.50	16.26	18	15.27 (126)	17.55	20.27			22.00			23.34	45	22.18 (10)
8	10.03	08.42		15.10 (126)	07.07	06.18		06.50 (3)	04.33			03.04		04.48 (5)
	14.52	16.30	16	15.26 (126)	17.58	20.30	7	06.57 (3)	22.04			23.37	45	22.19 (10)
9	10.01	08.38		15.11 (126)	07.04	06.14		06.47 (3)	04.30			03.03		04.49 (5)
	14.55	16.33	15	15.26 (126)	18.01	20.33	12	06.59 (3)	22.07			23.39	44	22.20 (10)
10	09.59	08.35		15.12 (126)	07.00	06.11		06.43 (3)	04.27			03.01		04.49 (5)
	14.57	16.36	13	15.25 (126)	18.04	20.36	16	06.59 (3)	22.10			23.41	43	22.20 (10)
11	09.57	08.32		15.13 (126)	06.57	06.07		06.41 (3)	04.23			02.58		04.50 (5)
	15.00	16.39	11	15.24 (126)	18.07	20.39	19	07.00 (3)	22.13			23.43	41	22.20 (10)
12	09.55	08.29		15.16 (126)	06.53	06.04		06.41 (3)	04.20			02.56		04.50 (5)
	15.03	16.43	5	15.21 (126)	18.10	20.42	20	07.01 (3)	22.17			23.45	42	22.21 (10)
13	09.53	08.25			06.50	06.00		06.40 (3)	04.17			02.55		04.52 (5)
	15.06	16.46			18.13	20.45	20	07.00 (3)	22.20			23.46	40	22.22 (10)
14	09.51	08.22			06.46	05.57		06.40 (3)	04.14			02.54		04.52 (5)
	15.09	16.49			18.16	20.48	21	07.01 (3)	22.23			23.48	39	22.22 (10)
15	09.49	08.19			06.43	05.53		06.39 (3)	04.10		04.55 (5)	02.53		04.54 (5)
	15.12	16.52			18.19	20.51	21	07.00 (3)	22.26	1	04.56 (5)	23.49	38	22.23 (10)
16	09.47	08.16			06.39	05.50		06.39 (3)	04.07		04.53 (5)	02.52		04.55 (5)
	15.15	16.56			18.22	20.54	20	06.59 (3)	22.30	5	04.58 (5)	23.51	34	22.22 (10)
17	09.44	08.12			06.36	05.46		06.40 (3)	04.04		04.50 (5)	02.51		21.49 (12)
	15.18	16.59			18.25	20.57	19	06.59 (3)	22.33	9	04.59 (5)	23.52	34	22.23 (10)
18	09.42	08.09			06.32	05.42		06.40 (3)	04.01		04.48 (5)	02.51		21.50 (12)
	15.21	17.02			18.28	21.00	17	06.57 (3)	22.36	12	05.00 (5)	23.53	33	22.23 (10)
19	09.39	08.06			06.29	05.39		06.41 (3)	03.58		04.45 (5)	02.51		21.50 (12)
	15.24	17.05			18.31	21.03	15	06.56 (3)	22.39	15	05.00 (5)	23.53	34	22.24 (10)
20	09.37	08.02			06.25	05.35		06.42 (3)	03.55		04.43 (5)	02.51		21.50 (12)
	15.27	17.08			18.34	21.07	12	06.54 (3)	22.42	18	05.01 (5)	23.54	34	22.24 (10)
21	09.34	07.59			06.22	05.32		06.45 (3)	03.52		04.43 (5)	02.51		21.51 (12)
	15.30	17.12			18.37	21.10	7	06.52 (3)	22.46	20	21.51 (12)	23.54	33	22.24 (10)
22	09.32	07.55			06.18	05.28			03.48		04.42 (5)	02.51		21.50 (12)
	15.34	17.15			18.40	21.13			22.49	25	21.53 (12)	23.54	34	22.24 (10)
23	09.29	07.52			06.15	05.25			03.45		04.42 (5)	02.51		21.51 (12)
	15.37	17.18			18.43	21.16			22.52	28	21.56 (12)	23.54	34	22.25 (10)
24	09.26	07.49			06.11	05.21			03.42		04.42 (5)	02.52		21.51 (12)
	15.40	17.21			18.46	21.19			22.55	32	21.58 (12)	23.54	33	22.24 (10)
25	09.24	07.45			06.07	05.18			03.40		04.42 (5)	02.53		21.52 (12)
	15.43	17.24			18.48	21.22			22.58	35	22.01 (12)	23.54	33	22.25 (10)
26	09.21	07.42			06.04	05.15			03.37		04.43 (5)	02.54		21.51 (12)
	15.47	17.27			18.51	21.25			23.01	36	22.03 (12)	23.53	33	22.24 (10)
27	09.18	07.38			06.00	05.11			03.34		04.43 (5)	02.55		04.56 (5)
	15.50	17.30			18.54	21.28			23.04	39	22.05 (12)	23.53	37	22.25 (10)
28	09.15	07.35			05.57	05.08			03.31		04.43 (5)	02.56		04.56 (5)
	15.53	17.33			18.57	21.32			23.07	40	22.06 (12)	23.52	38	22.25 (10)
29	09.12				06.53	05.04			03.28		04.43 (5)	02.58		04.55 (5)
	15.56				20.00	21.35			23.10	40	22.06 (12)	23.51	40	22.25 (10)
30	09.09				06.50	05.01			03.25		04.43 (5)	02.59		04.55 (5)
	16.00				20.03	21.38			23.13	40	22.06 (12)	23.50	41	22.25 (10)
31	09.06				06.46				03.23		04.43 (5)			
	16.03				20.06				23.16	43	22.09 (10)			
Potential sun hours	172	238			363	451			569			623		
Total, worst case			160				226			438			1177	
Sun reduction			0,33				0,41			0,47			0,48	
Oper. time red.			0,99				0,99			0,99			0,99	
Wind dir. red.			0,62				0,61			0,62			0,64	
Total reduction			0,20				0,24			0,29			0,30	
Total, real			33				55			127			357	

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

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

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	July			August			September			October			November			December
1	03.01		04.54 (5)	04.25			06.01		06.40 (3)	07.27			08.00		14.41 (126)	09.35
	23.48	42	22.25 (10)	22.27			20.40	19	06.59 (3)	18.53			16.07	14	14.55 (126)	14.44
2	03.01		04.54 (5)	04.29			06.03		06.42 (3)	07.30			08.04		14.40 (126)	09.38
	23.47	43	22.25 (10)	22.23			20.36	16	06.58 (3)	18.50			16.04	16	14.56 (126)	14.42
3	03.03		04.54 (5)	04.32			06.06		06.45 (3)	07.32			08.07		14.40 (126)	09.40
	23.45	44	22.25 (10)	22.20			20.33	12	06.57 (3)	18.46			16.01	17	14.57 (126)	14.40
4	03.05		04.54 (5)	04.35			06.09		06.47 (3)	07.35			08.10		14.39 (126)	09.43
	23.44	44	22.25 (10)	22.17			20.29	7	06.54 (3)	18.43			15.58	17	14.56 (126)	14.38
5	03.07		04.53 (5)	04.38			06.12			07.38			08.13		14.39 (126)	09.46
	23.42	45	22.24 (10)	22.13			20.25			18.39			15.55	18	14.57 (126)	14.36
6	03.09		04.53 (5)	04.41			06.15			07.41			08.16		14.39 (126)	09.48
	23.40	45	22.24 (10)	22.10			20.22			18.36			15.51	18	14.57 (126)	14.34
7	03.12		04.52 (5)	04.44			06.18			07.44			08.20		14.39 (126)	09.51
	23.38	46	22.23 (10)	22.07			20.18			18.32			15.48	18	14.57 (126)	14.33
8	03.14		04.52 (5)	04.48			06.21			07.47			08.23		14.40 (126)	09.53
	23.36	46	22.23 (10)	22.03			20.15			18.29			15.45	14	14.54 (126)	14.31
9	03.16		04.52 (5)	04.51			06.24			07.50			08.26		14.41 (126)	09.55
	23.33	47	22.23 (10)	22.00			20.11			18.25			15.42	9	14.50 (126)	14.30
10	03.19		04.52 (5)	04.54			06.27			07.53			08.29		14.42 (126)	09.57
	23.31	46	22.22 (10)	21.56			20.08			18.22			15.39	4	14.46 (126)	14.29
11	03.22		04.52 (5)	04.57			06.29			07.56			08.33			09.59
	23.29	45	22.21 (10)	21.53			20.04			18.18			15.36			14.28
12	03.24		04.51 (5)	05.00			06.32			07.59			08.36			10.01
	23.26	44	22.18 (10)	21.50			20.01			18.15			15.33			14.27
13	03.27		04.51 (5)	05.03			06.35			08.02			08.39			10.03
	23.24	40	22.14 (12)	21.46			19.57			18.11			15.30			14.26
14	03.30		04.52 (5)	05.06			06.38			08.05			08.42			10.05
	23.21	40	22.15 (12)	21.43			19.54			18.08			15.27			14.25
15	03.33		04.52 (5)	05.09			06.41			08.08			08.46			10.06
	23.18	40	22.15 (12)	21.39			19.50			18.04			15.24			14.25
16	03.36		04.52 (5)	05.12			06.44			08.11			08.49			10.08
	23.16	40	22.15 (12)	21.36			19.46			18.01			15.21			14.24
17	03.39		04.52 (5)	05.16			06.47			08.14			08.52			10.09
	23.13	38	22.13 (12)	21.32			19.43			17.58			15.18			14.24
18	03.42		04.51 (5)	05.19			06.49			08.17			08.55			10.10
	23.10	36	22.11 (12)	21.29			19.39			17.54			15.16			14.24
19	03.45		04.51 (5)	05.22			06.52			08.20			08.58			10.11
	23.07	34	22.09 (12)	21.25			19.36			17.51			15.13			14.24
20	03.48		04.52 (5)	05.25			06.55			08.23			09.02			10.12
	23.04	30	22.07 (12)	21.22			19.32			17.47			15.10			14.24
21	03.51		04.52 (5)	05.28			06.58			08.26			09.05			10.13
	23.01	27	22.05 (12)	21.18			19.29			17.44			15.07			14.24
22	03.54		04.53 (5)	05.31		06.49 (3)	07.01			08.29			09.08			10.14
	22.58	22	22.03 (12)	21.15	8	06.57 (3)	19.25			17.41			15.05			14.24
23	03.57		04.53 (5)	05.34		06.46 (3)	07.04			08.32			09.11			10.14
	22.55	19	05.12 (5)	21.11	12	06.58 (3)	19.22			17.37			15.02			14.25
24	04.00		04.54 (5)	05.37		06.44 (3)	07.07			08.35			09.14			10.15
	22.52	17	05.11 (5)	21.08	16	07.00 (3)	19.18			17.34			15.00			14.26
25	04.03		04.57 (5)	05.40		06.43 (3)	07.09			07.38			09.17			10.15
	22.49	14	05.11 (5)	21.04	18	07.01 (3)	19.14			16.31			14.57			14.26
26	04.06		04.59 (5)	05.43		06.42 (3)	07.12			07.41			09.20			10.15
	22.46	11	05.10 (5)	21.01	20	07.02 (3)	19.11			16.27			14.55			14.27
27	04.09		05.02 (5)	05.46		06.41 (3)	07.15			07.45			09.23			10.15
	22.43	7	05.09 (5)	20.57	20	07.01 (3)	19.07			16.24			14.52			14.28
28	04.13		05.04 (5)	05.49		06.40 (3)	07.18			07.48			09.26			10.14
	22.40	4	05.08 (5)	20.54	21	07.01 (3)	19.04			16.21			14.50			14.30
29	04.16			05.52		06.40 (3)	07.21			07.51			09.29			10.14
	22.36			20.50	21	07.01 (3)	19.00			16.17			14.48			14.31
30	04.19			05.55		06.40 (3)	07.24			07.54		14.45 (126)	09.32			10.13
	22.33			20.47	21	07.01 (3)	18.57			16.14	7	14.52 (126)	14.46			14.33
31	04.22			05.58		06.40 (3)				07.57		14.42 (126)				10.13
	22.30			20.43	20	07.00 (3)				16.11	11	14.53 (126)				14.34
Potential sun hours	608			508			393			305			199			138
Total, worst case		956			177			54			18			145		
Sun reduction		0,38			0,31			0,33			0,35			0,24		
Oper. time red.		0,99			0,99			0,99			0,99			0,99		
Wind dir. red.		0,63			0,61			0,61			0,62			0,62		
Total reduction		0,24			0,19			0,20			0,21			0,15		
Total, real		226			33			11			4			21		

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

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

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23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: B - Lomarakennus B (Sarjankyläntie 1093)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.36	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.43
2	10.10	09.00	07.28	06.39	04.53	03.17	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.41
3	10.09	08.57	07.24	06.35	04.50	03.15	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.09	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.43	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.24	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.22	17.51	20.24	21.57	23.32	23.39	22.09	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.06	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.32
8	10.02	08.41	07.07	06.17	04.33	03.04	03.13	04.47	06.20	07.47	08.22	09.52
	14.52	16.29	17.57	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.30	03.02	03.16	04.50	06.23	07.49	08.26	09.55
	14.54	16.32	18.00	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.36	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.39	14.28
11	09.57	08.31	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	15.00	16.39	18.06	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.27
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.02	16.42	18.09	20.42	22.16	23.44	23.26	21.49	20.00	18.14	15.33	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.27	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.04
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.24	14.24
16	09.46	08.15	06.39	05.49	04.07	02.52	03.35	05.12	06.43	08.10	08.48	10.07
	15.14	16.55	18.21	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.45	04.04	02.51	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.32	23.51	23.12	21.32	19.42	17.57	15.18	14.23
18	09.41	08.08	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.02	18.27	21.00	22.36	23.52	23.09	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.36	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.25	09.04	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.04	14.24
23	09.29	07.52	06.14	05.24	03.45	02.51	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.24
24	09.26	07.48	06.10	05.21	03.42	02.52	04.00	05.36	07.06	08.35	09.14	10.14
	15.39	17.21	18.45	21.18	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.03	05.39	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.49	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.10	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.56	04.12	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.03	16.20	14.50	14.29
29	09.12		06.53	05.04	03.28	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.47	14.31
30	09.09		06.49	05.00	03.25	02.59	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.37	23.13	23.49	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.22	05.57		07.57		10.12
	16.03		20.06		23.16		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: C - Lomarakennnus C (Kurunoja)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March	April	May	June	July	August	September	October			November			December		
1	10.12			09.04		13.30 (4)	07.32	06.42	04.57	03.19	03.00	04.25	06.00	07.27			08.01		14.36 (17)	09.35		13.10 (4)
	14.36			16.06	19	13.49 (4)	17.36	20.09	21.41	23.20	23.49	22.27	20.40	18.53			16.07	25	15.01 (17)	14.43	9	13.19 (4)
2	10.11			09.01		13.31 (4)	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.30			08.04		14.36 (17)	09.38		13.12 (4)
	14.38			16.09	24	15.19 (17)	17.39	20.12	21.45	23.22	23.48	22.24	20.36	18.50			16.04	25	15.01 (17)	14.41	3	13.15 (4)
3	10.10			08.57		13.33 (4)	07.25	06.35	04.50	03.14	03.02	04.31	06.06	07.32			08.07		14.37 (17)	09.41		
	14.40			16.13	27	15.24 (17)	17.42	20.15	21.48	23.25	23.46	22.20	20.33	18.46			16.01	24	15.01 (17)	14.39		
4	10.09			08.54		13.36 (4)	07.21	06.32	04.47	03.12	03.04	04.34	06.09	07.35			08.10		14.37 (17)	09.44		
	14.42			16.16	27	15.28 (17)	17.46	20.18	21.51	23.28	23.44	22.17	20.29	18.43			15.57	23	15.00 (17)	14.37		
5	10.08			08.51		15.09 (17)	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38			08.13		14.38 (17)	09.46		
	14.44			16.19	20	15.29 (17)	17.49	20.21	21.54	23.30	23.42	22.14	20.25	18.39			15.54	22	15.00 (17)	14.35		
6	10.06			08.48		15.08 (17)	07.14	06.25	04.40	03.08	03.08	04.41	06.15	07.41			08.17		14.38 (17)	09.49		
	14.47			16.23	21	15.29 (17)	17.52	20.24	21.57	23.33	23.41	22.10	20.22	18.36			15.51	20	14.58 (17)	14.34		
7	10.05			08.45		15.07 (17)	07.11	06.21	04.36	03.05	03.11	04.44	06.18	07.44			08.20		13.05 (4)	09.51		
	14.49			16.26	23	15.30 (17)	17.55	20.27	22.01	23.35	23.38	22.07	20.18	18.32			15.48	27	14.57 (17)	14.32		
8	10.03			08.42		15.07 (17)	07.07	06.18	04.33	03.03	03.13	04.47	06.21	07.47			08.23		13.03 (4)	09.53		
	14.52			16.29	24	15.31 (17)	17.58	20.30	22.04	23.38	23.36	22.03	20.15	18.29			15.45	26	14.53 (17)	14.31		
9	10.02			08.39		15.07 (17)	07.04	06.14	04.30	03.02	03.15	04.50	06.24	07.50			08.26		13.01 (4)	09.56		
	14.54			16.32	24	15.31 (17)	18.01	20.33	22.07	23.40	23.34	22.00	20.11	18.25			15.42	24	14.49 (17)	14.29		
10	10.00		13.29 (4)	08.35		15.06 (17)	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.53			08.30		13.00 (4)	09.58		
	14.57	2	13.31 (4)	16.36	25	15.31 (17)	18.04	20.36	22.10	23.42	23.32	21.57	20.08	18.22			15.39	20	13.20 (4)	14.28		
11	09.58		13.28 (4)	08.32		15.06 (17)	06.57	06.07	04.23	02.56	03.21	04.57	06.29	07.56			08.33		13.00 (4)	10.00		
	15.00	10	13.38 (4)	16.39	25	15.31 (17)	18.07	20.39	22.14	23.44	23.29	21.53	20.04	18.18			15.36	22	13.22 (4)	14.27		
12	09.56		13.27 (4)	08.29		15.07 (17)	06.53	06.03	04.20	02.55	03.23	05.00	06.32	07.59			08.36		13.00 (4)	10.02		
	15.02	13	13.40 (4)	16.42	25	15.32 (17)	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15			15.33	23	13.23 (4)	14.26		
13	09.54		13.27 (4)	08.26		15.07 (17)	06.50	06.00	04.16	02.54	03.26	05.03	06.35	08.02			08.39		12.59 (4)	10.04		
	15.05	15	13.42 (4)	16.46	24	15.31 (17)	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.11			15.30	24	13.23 (4)	14.25		
14	09.52		13.26 (4)	08.22		15.07 (17)	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.05			08.43		12.59 (4)	10.05		
	15.08	17	13.43 (4)	16.49	24	15.31 (17)	18.16	20.48	22.23	23.49	23.22	21.43	19.53	18.08			15.27	24	13.23 (4)	14.24		
15	09.49		13.26 (4)	08.19		15.07 (17)	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08			08.46		12.58 (4)	10.07		
	15.11	18	13.44 (4)	16.52	23	15.30 (17)	18.19	20.51	22.27	23.50	23.19	21.39	19.50	18.04			15.24	25	13.23 (4)	14.24		
16	09.47		13.25 (4)	08.16		15.09 (17)	06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11			08.49		12.59 (4)	10.08		
	15.14	21	13.46 (4)	16.55	21	15.30 (17)	18.22	20.54	22.30	23.52	23.16	21.36	19.46	18.01			15.21	26	13.25 (4)	14.23		
17	09.45		13.25 (4)	08.12		15.10 (17)	06.36	05.46	04.03	02.50	03.38	05.15	06.46	08.14			08.52		12.59 (4)	10.10		
	15.17	22	13.47 (4)	16.59	18	15.28 (17)	18.25	20.57	22.33	23.53	23.13	21.32	19.43	17.57			15.18	26	13.25 (4)	14.23		
18	09.42		13.25 (4)	08.09		15.11 (17)	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.17			08.56		12.59 (4)	10.11		
	15.20	23	13.48 (4)	17.02	16	15.27 (17)	18.28	21.00	22.36	23.54	23.10	21.29	19.39	17.54			15.15	25	13.24 (4)	14.23		
19	09.40		13.24 (4)	08.06		15.14 (17)	06.29	05.39	03.57	02.50	03.44	05.21	06.52	08.20			08.59		13.00 (4)	10.12		
	15.23	24	13.48 (4)	17.05	11	15.25 (17)	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51			15.12	25	13.25 (4)	14.23		
20	09.37		13.24 (4)	08.02			06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.23			09.02		13.00 (4)	10.13		
	15.27	25	13.49 (4)	17.08			18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47			15.10	25	13.25 (4)	14.23		
21	09.35		13.24 (4)	07.59			06.21	05.32	03.51	02.50	03.50	05.27	06.58	08.26			09.05		13.01 (4)	10.14		
	15.30	25	13.49 (4)	17.11			18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44			15.07	24	13.25 (4)	14.23		
22	09.32		13.25 (4)	07.56			06.18	05.28	03.48	02.50	03.53	05.30	07.01	08.29		15.48 (17)	09.08		13.01 (4)	10.14		
	15.33	25	13.50 (4)	17.14			18.40	21.13	22.49	23.55	22.59	21.15	19.25	17.40	3	15.51 (17)	15.04	24	13.25 (4)	14.23		
23	09.29		13.25 (4)	07.52			06.14	05.25	03.45	02.50	03.56	05.33	07.04	08.32		15.43 (17)	09.11		13.02 (4)	10.15		
	15.36	25	13.50 (4)	17.18			18.43	21.16	22.52	23.55	22.56	21.11	19.21	17.37	13	15.56 (17)	15.02	23	13.25 (4)	14.24		
24	09.27		13.25 (4)	07.49			06.11	05.21	03.42	02.51	03.59	05.36	07.06	08.35		15.41 (17)	09.15		13.03 (4)	10.15		
	15.39	25	13.50 (4)	17.21			18.45	21.19	22.56	23.55	22.53	21.08	19.18	17.34	16	15.57 (17)	14.59	22	13.25 (4)	14.25		
25	09.24		13.25 (4)	07.45			06.07	05.18	03.39	02.52	04.03	05.39	07.09	07.38		14.40 (17)	09.18		13.03 (4)	10.15		
	15.43	26	13.51 (4)	17.24			18.48	21.22	22.59	23.55	22.49	21.04	19.14	16.30	19	14.59 (17)	14.57	21	13.24 (4)	14.26		
26	09.21		13.25 (4)	07.42			06.04	05.14	03.36	02.53	04.06	05.42	07.12	07.42		14.38 (17)	09.21		13.04 (4)	10.15		
	15.46	26	13.51 (4)	17.27			18.51	21.25	23.02	23.54	22.46	21.01	19.11	16.27	21	14.59 (17)	14.54	20	13.24 (4)	14.27		
27	09.18		13.27 (4)	07.38			06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.45		14.37 (17)	09.24		13.05 (4)	10.15		
	15.49	25	13.52 (4)	17.30			18.54	21.29	23.05	23.54	22.43	20.57	19.07	16.24	23	15.00 (17)	14.52	19	13.24 (4)	14.28		
28	09.15		13.27 (4)	07.35			05.57	05.07	03.30	02.55	04.12	05.48	07.18	07.48		14.36 (17)	09.27		13.06 (4)	10.15		
	15.53	25	13.52 (4)	17.33			18.57	21.32	23.08	23.53	22.40	20.54	19.04	16.20	24	15.00 (17)	14.50	17	13.23 (4)	14.29		
29	09.12		13.27 (4)				06.53	05.04	03.27	02.57	04.15	05.51	07.21	07.51		14.36 (17)	09.30		13.07 (4)	10.15		
	15.56	24	13.51 (4)				20.00	21.35	23.11	23.52	22.37	20.50	19.00	16.17	25	15.01 (17)	14.47	16	13.23 (4)	14.30		
30	09.10		13.28 (4)				06.50	05.00	03.25	02.58	04.18	05.54	07.24	07.54		14.36 (17)	09.33		13.08 (4)	10.14		
	15.59	23	13.51 (4)				20.03	21.38	23.14	23.50	22.33	20.47	18.57	16.14	25	15.01 (17)	14.45	14	13.22 (4)	14.32		
31	09.07		13.29 (4)				06.46		03.22		04.22	05.57		07.57		14.36 (17)				10.13		
	16.03	21	13.50 (4)				20.06		23.17		22.30	20.43		16.10	26	15.02 (17)				14.34		
Potential sun hours	171			238			363	451	569	624	608	508	393	305			198			137		
Total, worst case		460			421										195			681			12	
Sun reduction		0,18			0,33										0,35			0,24			0,22	
Oper. time red.		0,99			0,99										0,99			0,99			0,99	
Wind dir. red.		0,65			0,62										0,62			0,64			0,65	
Total reduction		0,12			0,21										0,21			0,15			0,14	
Total, real		55			87										42			104			2	

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

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

Project:

Vasama_22_11_2022

Licensed user:
FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:

23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: D - Asuinrakennus D (Haapavesitie 1404)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January		February			March	April	May	June	July	August	September	October			November			December
1	10.13		09.04		10.31 (14)	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27			08.01		10.08 (18)	09.36
	14.36		16.06	30	11.01 (18)	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53			16.07	19	10.27 (18)	14.43
2	10.12		09.01		10.32 (14)	07.28	06.39	04.54	03.17	03.00	04.28	06.03	07.30			08.04		10.06 (18)	09.38
	14.38		16.09	29	11.01 (18)	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50			16.04	22	10.28 (18)	14.41
3	10.11		08.58		10.33 (14)	07.25	06.36	04.50	03.15	03.02	04.31	06.06	07.33			08.07		10.05 (18)	09.41
	14.40		16.13	28	11.01 (18)	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46			16.01	24	10.29 (18)	14.39
4	10.09		08.55		10.34 (18)	07.21	06.32	04.47	03.12	03.04	04.35	06.09	07.36			08.10		10.05 (18)	09.44
	14.42		16.16	27	11.01 (18)	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	25	10.30 (18)	14.37
5	10.08		08.52		10.34 (18)	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38			08.14		10.05 (18)	09.46
	14.44		16.19	26	11.00 (18)	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39			15.54	25	10.30 (18)	14.36
6	10.07		08.48		10.34 (18)	07.15	06.25	04.40	03.08	03.08	04.41	06.15	07.41			08.17		10.04 (18)	09.49
	14.47		16.23	26	11.00 (18)	17.52	20.24	21.58	23.33	23.41	22.10	20.22	18.36			15.51	27	10.31 (18)	14.34
7	10.05		08.45		10.36 (18)	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44			08.20		10.04 (18)	09.51
	14.49		16.26	24	11.00 (18)	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32			15.48	27	10.31 (18)	14.32
8	10.04		08.42		10.36 (18)	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47			08.23		10.03 (14)	09.54
	14.52		16.29	23	10.59 (18)	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29			15.45	28	10.31 (18)	14.31
9	10.02		08.39		10.37 (18)	07.04	06.14	04.30	03.02	03.16	04.50	06.24	07.50			08.27		10.03 (14)	09.56
	14.54		16.33	21	10.58 (18)	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25			15.42	28	10.31 (18)	14.30
10	10.00		08.36		10.38 (18)	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53			08.30		10.02 (14)	09.58
	14.57		16.36	19	10.57 (18)	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	29	10.31 (18)	14.28
11	09.58		08.32		10.41 (18)	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56			08.33		10.01 (14)	10.00
	15.00		16.39	15	10.56 (18)	18.07	20.39	22.14	23.44	23.30	21.53	20.04	18.18			15.36	30	10.31 (18)	14.27
12	09.56		08.29		10.43 (18)	06.54	06.04	04.20	02.55	03.24	05.00	06.32	07.59			08.36		10.01 (14)	10.02
	15.03		16.43	9	10.52 (18)	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15			15.33	30	10.31 (18)	14.26
13	09.54		08.26			06.50	06.00	04.17	02.54	03.26	05.03	06.35	08.02			08.40		10.01 (14)	10.04
	15.05		16.46			18.13	20.45	22.20	23.48	23.25	21.47	19.57	18.11			15.30	30	10.31 (18)	14.25
14	09.52		08.23			06.46	05.57	04.13	02.53	03.29	05.06	06.38	08.05			08.43		10.01 (14)	10.06
	15.08		16.49			18.16	20.48	22.24	23.49	23.22	21.43	19.54	18.08			15.27	29	10.30 (18)	14.25
15	09.50		08.19			06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08			08.46		10.02 (14)	10.07
	15.11		16.52			18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05			15.24	28	10.30 (18)	14.24
16	09.47		08.16			06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11			08.49		10.02 (14)	10.09
	15.14		16.56			18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01			15.21	28	10.30 (18)	14.24
17	09.45		08.13			06.36	05.46	04.04	02.51	03.38	05.15	06.47	08.14			08.53		10.02 (14)	10.10
	15.17		16.59			18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58			15.18	27	10.29 (18)	14.23
18	09.43		08.09			06.32	05.42	04.00	02.50	03.41	05.18	06.50	08.17			08.56		10.03 (14)	10.11
	15.21		17.02			18.28	21.01	22.37	23.54	23.11	21.29	19.39	17.54			15.15	25	10.28 (18)	14.23
19	09.40		08.06			06.29	05.39	03.57	02.50	03.44	05.22	06.52	08.20			08.59		10.03 (14)	10.12
	15.24		17.05			18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51			15.13	24	10.27 (18)	14.23
20	09.38		08.03		10.38 (14)	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23			09.02		10.05 (14)	10.13
	15.27	5	17.08		10.43 (14)	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47			15.10	21	10.26 (18)	14.23
21	09.35		07.59		10.34 (14)	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26			09.05		10.09 (14)	10.14
	15.30	14	17.12		10.48 (18)	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44			15.07	14	10.23 (18)	14.23
22	09.32		07.56		10.30 (14)	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29			09.09		10.14 (14)	10.15
	15.33	21	17.15		10.51 (18)	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41			15.04	5	10.19 (14)	14.24
23	09.30		07.52		10.29 (14)	06.15	05.25	03.45	02.51	03.56	05.34	07.04	08.32			09.12			10.15
	15.36	24	17.18		10.53 (18)	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37			15.02			14.24
24	09.27		07.49		10.29 (14)	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36			09.15			10.15
	15.40	25	17.21		10.54 (18)	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34			14.59			14.25
25	09.24		07.46		10.29 (14)	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39			09.18			10.16
	15.43	27	17.24		10.56 (18)	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.30			14.57			14.26
26	09.21		07.42		10.29 (14)	06.04	05.14	03.36	02.53	04.06	05.43	07.12	07.42			09.21			10.16
	15.46	28	17.27		10.57 (18)	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27			14.54			14.27
27	09.19		07.39		10.29 (14)	06.00	05.11	03.33	02.54	04.09	05.46	07.15	07.45			09.24			10.16
	15.50	29	17.30		10.58 (18)	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24			14.52			14.28
28	09.16		07.35		10.29 (14)	05.57	05.07	03.30	02.55	04.12	05.49	07.18	07.48			09.27			10.15
	15.53	29	17.33		10.58 (18)	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.20			14.50			14.29
29	09.13				10.29 (14)	06.53	05.04	03.28	02.57	04.15	05.52	07.21	07.51			09.30			10.15
	15.56	30			10.59 (18)	20.01	21.35	23.11	23.52	22.37	20.51	19.00	16.17			14.47			14.31
30	09.10				10.29 (14)	06.50	05.01	03.25	02.58	04.19	05.55	07.24	07.54		10.12 (18)	09.33			10.14
	16.00	30			10.59 (18)	20.03	21.38	23.14	23.51	22.34	20.47	18.57	16.14	10	10.22 (18)	14.45			14.32
31	09.07				10.30 (14)	06.46		03.22		04.22	05.58		07.58		10.09 (18)				10.14
	16.03	30			11.00 (18)	20.06		23.17		22.30	20.44		16.11	16	10.25 (18)				14.34
Potential sun hours	171		238			363	451	569	624	608	508	393	305			198			137
Total, worst case		292		277										26			545		
Sun reduction		0,18		0,33										0,35			0,24		
Oper. time red.		0,99		0,99										0,99			0,99		
Wind dir. red.		0,67		0,67										0,67			0,67		
Total reduction		0,12		0,22										0,23			0,16		
Total, real		36		61										6			86		

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

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

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March			April	May	June
1	10.13			09.04		10.09 (15)	07.32		08.42 (18)	06.43	04.57	03.20
	14.36			16.06	23	11.33 (13)	17.37	21	09.03 (18)	20.09	21.42	23.20
2	10.12			09.01		10.09 (15)	07.28		08.42 (18)	06.39	04.54	03.17
	14.38			16.10	21	10.30 (15)	17.40	19	09.01 (18)	20.12	21.45	23.23
3	10.11			08.58		10.09 (15)	07.25		08.44 (18)	06.36	04.50	03.15
	14.40			16.13	20	10.29 (15)	17.43	16	09.00 (18)	20.15	21.48	23.25
4	10.09			08.55		10.10 (15)	07.22		08.46 (18)	06.32	04.47	03.12
	14.42			16.16	19	10.29 (15)	17.46	11	08.57 (18)	20.18	21.51	23.28
5	10.08			08.52		10.10 (15)	07.18			06.29	04.43	03.10
	14.45			16.20	19	10.29 (15)	17.49			20.21	21.54	23.31
6	10.07			08.48		10.10 (15)	07.15			06.25	04.40	03.08
	14.47			16.23	18	10.28 (15)	17.52			20.24	21.58	23.33
7	10.05			08.45		10.12 (15)	07.11			06.21	04.37	03.06
	14.49			16.26	16	10.28 (15)	17.55			20.27	22.01	23.36
8	10.04			08.42		10.14 (15)	07.08			06.18	04.33	03.04
	14.52			16.30	12	10.26 (15)	17.58			20.30	22.04	23.38
9	10.02		11.25 (13)	08.39		10.16 (15)	07.04			06.14	04.30	03.02
	14.54	5	11.30 (13)	16.33	7	10.23 (15)	18.01			20.33	22.07	23.40
10	10.00		11.21 (13)	08.36			07.01			06.11	04.27	03.00
	14.57	11	11.32 (13)	16.36			18.04			20.36	22.11	23.42
11	09.58		11.19 (13)	08.32			06.57			06.07	04.23	02.57
	15.00	14	11.33 (13)	16.39			18.07			20.39	22.14	23.44
12	09.56		11.18 (13)	08.29			06.54			06.04	04.20	02.55
	15.03	16	11.34 (13)	16.43			18.10			20.42	22.17	23.46
13	09.54		11.18 (13)	08.26			06.50			06.00	04.17	02.54
	15.06	17	11.35 (13)	16.46			18.13			20.46	22.20	23.48
14	09.52		11.18 (13)	08.23			06.47			05.57	04.13	02.53
	15.09	19	11.37 (13)	16.49			18.16			20.49	22.24	23.49
15	09.50		11.17 (13)	08.19			06.43			05.53	04.10	02.52
	15.11	20	11.37 (13)	16.52			18.19			20.52	22.27	23.51
16	09.47		11.18 (13)	08.16			06.39			05.50	04.07	02.51
	15.14	20	11.38 (13)	16.56			18.22			20.55	22.30	23.52
17	09.45		11.18 (13)	08.13		08.52 (18)	06.36			05.46	04.04	02.51
	15.18	21	11.39 (13)	16.59	3	08.55 (18)	18.25			20.58	22.33	23.53
18	09.43		11.18 (13)	08.09		08.48 (18)	06.32			05.43	04.01	02.50
	15.21	21	11.39 (13)	17.02	12	09.00 (18)	18.28			21.01	22.37	23.54
19	09.40		11.18 (13)	08.06		08.46 (18)	06.29			05.39	03.57	02.50
	15.24	22	11.40 (13)	17.05	16	09.02 (18)	18.31			21.04	22.40	23.55
20	09.38		11.18 (13)	08.03		08.44 (18)	06.25			05.35	03.54	02.50
	15.27	23	11.41 (13)	17.08	19	09.03 (18)	18.34			21.07	22.43	23.55
21	09.35		11.19 (13)	07.59		08.43 (18)	06.22			05.32	03.51	02.50
	15.30	22	11.41 (13)	17.12	20	09.03 (18)	18.37			21.10	22.46	23.55
22	09.32		11.19 (13)	07.56		08.42 (18)	06.18			05.28	03.48	02.50
	15.33	22	11.41 (13)	17.15	23	09.05 (18)	18.40			21.13	22.50	23.56
23	09.30		11.19 (13)	07.52		08.41 (18)	06.15			05.25	03.45	02.51
	15.37	23	11.42 (13)	17.18	24	09.05 (18)	18.43			21.16	22.53	23.56
24	09.27		11.20 (13)	07.49		08.41 (18)	06.11			05.21	03.42	02.51
	15.40	22	11.42 (13)	17.21	24	09.05 (18)	18.46			21.19	22.56	23.55
25	09.24		10.18 (15)	07.46		08.41 (18)	06.08			05.18	03.39	02.52
	15.43	28	11.42 (13)	17.24	24	09.05 (18)	18.49			21.23	22.59	23.55
26	09.21		10.14 (15)	07.42		08.41 (18)	06.04			05.14	03.36	02.53
	15.46	31	11.41 (13)	17.27	24	09.05 (18)	18.52			21.26	23.02	23.55
27	09.19		10.10 (15)	07.39		08.41 (18)	06.01			05.11	03.33	02.54
	15.50	36	11.41 (13)	17.30	23	09.04 (18)	18.55			21.29	23.05	23.54
28	09.16		10.09 (15)	07.35		08.42 (18)	05.57			05.08	03.31	02.56
	15.53	37	11.41 (13)	17.34	22	09.04 (18)	18.58			21.32	23.08	23.53
29	09.13		10.09 (15)				06.53			05.04	03.28	02.57
	15.56	36	11.40 (13)				20.01			21.35	23.11	23.52
30	09.10		10.09 (15)				06.50			05.01	03.25	02.59
	16.00	34	11.39 (13)				20.04			21.38	23.14	23.51
31	09.07		10.08 (15)				06.46				03.22	
	16.03	31	11.37 (13)				20.07				23.17	
Potential sun hours	171			238			363			451	569	624
Total, worst case		531			389			67				
Sun reduction		0,18			0,33			0,32				
Oper. time red.		0,99			0,99			0,99				
Wind dir. red.		0,66			0,65			0,64				
Total reduction		0,12			0,22			0,21				
Total, real		65			84			14				

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	July	August	September	October			November			December		
1	03.00	04.25	06.01	07.27			08.01			09.36		11.01 (13)
	23.49	22.27	20.40	18.53			16.07			14.43	14	11.15 (13)
2	03.00	04.28	06.04	07.30			08.04		09.45 (15)	09.38		11.03 (13)
	23.48	22.24	20.36	18.50			16.04	8	09.53 (15)	14.41	12	11.15 (13)
3	03.02	04.32	06.06	07.33			08.07		09.43 (15)	09.41		11.09 (13)
	23.46	22.21	20.33	18.46			16.01	13	09.56 (15)	14.39	5	11.14 (13)
4	03.04	04.35	06.09	07.36			08.10		09.42 (15)	09.44		
	23.45	22.17	20.29	18.43			15.58	15	09.57 (15)	14.38		
5	03.06	04.38	06.12	07.39			08.14		09.41 (15)	09.46		
	23.43	22.14	20.26	18.39			15.55	17	09.58 (15)	14.36		
6	03.09	04.41	06.15	07.41			08.17		09.40 (15)	09.49		
	23.41	22.11	20.22	18.36			15.51	19	09.59 (15)	14.34		
7	03.11	04.44	06.18	07.44			08.20		09.40 (15)	09.51		
	23.39	22.07	20.19	18.32			15.48	20	10.00 (15)	14.33		
8	03.13	04.47	06.21	07.47			08.23		09.40 (15)	09.54		
	23.37	22.04	20.15	18.29			15.45	20	10.00 (15)	14.31		
9	03.16	04.51	06.24	07.50		09.22 (18)	08.27		09.40 (15)	09.56		
	23.34	22.00	20.12	18.25	8	09.30 (18)	15.42	20	10.00 (15)	14.30		
10	03.18	04.54	06.27	07.53		09.19 (18)	08.30		09.40 (15)	09.58		
	23.32	21.57	20.08	18.22	14	09.33 (18)	15.39	24	11.05 (13)	14.28		
11	03.21	04.57	06.30	07.56		09.17 (18)	08.33		09.40 (15)	10.00		
	23.30	21.54	20.04	18.18	17	09.34 (18)	15.36	31	11.09 (13)	14.27		
12	03.24	05.00	06.33	07.59		09.15 (18)	08.36		09.40 (15)	10.02		
	23.27	21.50	20.01	18.15	20	09.35 (18)	15.33	34	11.10 (13)	14.26		
13	03.27	05.03	06.35	08.02		09.15 (18)	08.40		09.41 (15)	10.04		
	23.24	21.47	19.57	18.12	22	09.37 (18)	15.30	35	11.12 (13)	14.25		
14	03.29	05.06	06.38	08.05		09.14 (18)	08.43		09.41 (15)	10.06		
	23.22	21.43	19.54	18.08	23	09.37 (18)	15.27	36	11.12 (13)	14.25		
15	03.32	05.09	06.41	08.08		09.13 (18)	08.46		09.43 (15)	10.07		
	23.19	21.40	19.50	18.05	24	09.37 (18)	15.24	36	11.14 (13)	14.24		
16	03.35	05.12	06.44	08.11		09.12 (18)	08.49		09.47 (15)	10.09		
	23.16	21.36	19.47	18.01	25	09.37 (18)	15.21	32	11.14 (13)	14.24		
17	03.38	05.16	06.47	08.14		09.13 (18)	08.53		09.51 (15)	10.10		
	23.14	21.33	19.43	17.58	24	09.37 (18)	15.18	27	11.15 (13)	14.23		
18	03.41	05.19	06.50	08.17		09.13 (18)	08.56		10.54 (13)	10.11		
	23.11	21.29	19.40	17.54	23	09.36 (18)	15.15	22	11.16 (13)	14.23		
19	03.44	05.22	06.53	08.20		09.12 (18)	08.59		10.53 (13)	10.12		
	23.08	21.26	19.36	17.51	23	09.35 (18)	15.13	23	11.16 (13)	14.23		
20	03.47	05.25	06.55	08.23		09.13 (18)	09.02		10.54 (13)	10.13		
	23.05	21.22	19.32	17.47	22	09.35 (18)	15.10	22	11.16 (13)	14.23		
21	03.50	05.28	06.58	08.26		09.14 (18)	09.05		10.54 (13)	10.14		
	23.02	21.19	19.29	17.44	20	09.34 (18)	15.07	22	11.16 (13)	14.23		
22	03.53	05.31	07.01	08.29		09.15 (18)	09.09		10.54 (13)	10.15		
	22.59	21.15	19.25	17.41	18	09.33 (18)	15.05	23	11.17 (13)	14.24		
23	03.57	05.34	07.04	08.32		09.16 (18)	09.12		10.54 (13)	10.15		
	22.56	21.12	19.22	17.37	15	09.31 (18)	15.02	22	11.16 (13)	14.24		
24	04.00	05.37	07.07	08.36		09.19 (18)	09.15		10.55 (13)	10.15		
	22.53	21.08	19.18	17.34	10	09.29 (18)	14.59	22	11.17 (13)	14.25		
25	04.03	05.40	07.10	07.39			09.18		10.56 (13)	10.16		
	22.50	21.05	19.15	16.31			14.57	21	11.17 (13)	14.26		
26	04.06	05.43	07.13	07.42			09.21		10.56 (13)	10.16		
	22.47	21.01	19.11	16.27			14.55	20	11.16 (13)	14.27		
27	04.09	05.46	07.15	07.45			09.24		10.57 (13)	10.16		
	22.43	20.58	19.08	16.24			14.52	19	11.16 (13)	14.28		
28	04.12	05.49	07.18	07.48			09.27		10.57 (13)	10.15		
	22.40	20.54	19.04	16.21			14.50	19	11.16 (13)	14.29		
29	04.16	05.52	07.21	07.51			09.30		10.58 (13)	10.15		
	22.37	20.51	19.01	16.17			14.48	18	11.16 (13)	14.31		
30	04.19	05.55	07.24	07.54			09.33		10.59 (13)	10.14		
	22.34	20.47	18.57	16.14			14.45	16	11.15 (13)	14.32		
31	04.22	05.58		07.58						10.14		
	22.30	20.44		16.11						14.34		
Potential sun hours	608	508	393	305			198			137		
Total, worst case					308			656			31	
Sun reduction					0,35			0,24			0,22	
Oper. time red.					0,99			0,99			0,99	
Wind dir. red.					0,64			0,66			0,66	
Total reduction					0,22			0,16			0,14	
Total, real					69			104			4	

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

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

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: F - Asuinrakennus F (Ritamäentie 156)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February			March			April	May	June	July	August	September	October			November	December
1	10.13	09.04			07.32		08.54 (13)	06.43	04.57	03.20	03.01	04.25	06.01	07.27			08.01	09.36
	14.36	16.06			17.37	16	09.10 (13)	20.10	21.42	23.20	23.49	22.27	20.40	18.54			16.08	14.44
2	10.12	09.01			07.29		08.56 (13)	06.39	04.54	03.18	03.01	04.29	06.04	07.30			08.04	09.38
	14.38	16.10			17.40	11	09.07 (13)	20.13	21.45	23.23	23.48	22.24	20.37	18.50			16.04	14.42
3	10.11	08.58			07.25			06.36	04.50	03.15	03.03	04.32	06.07	07.33			08.07	09.41
	14.40	16.13			17.43			20.15	21.48	23.25	23.46	22.21	20.33	18.47			16.01	14.40
4	10.09	08.55			07.22			06.32	04.47	03.13	03.05	04.35	06.09	07.36			08.10	09.44
	14.43	16.16			17.46			20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	14.38
5	10.08	08.52			07.18			06.29	04.44	03.10	03.07	04.38	06.12	07.39			08.14	09.46
	14.45	16.20			17.49			20.21	21.55	23.31	23.43	22.14	20.26	18.40			15.55	14.36
6	10.07	08.48			07.15			06.25	04.40	03.08	03.09	04.41	06.15	07.42			08.17	09.49
	14.47	16.23			17.52			20.24	21.58	23.33	23.41	22.11	20.22	18.36			15.52	14.34
7	10.05	08.45			07.11			06.22	04.37	03.06	03.11	04.44	06.18	07.44			08.20	09.51
	14.50	16.26			17.55			20.27	22.01	23.35	23.39	22.07	20.19	18.33			15.48	14.33
8	10.04	08.42			07.08			06.18	04.34	03.04	03.14	04.48	06.21	07.47			08.23	09.54
	14.52	16.30			17.58			20.30	22.04	23.38	23.36	22.04	20.15	18.29			15.45	14.31
9	10.02	08.39			07.04			06.14	04.30	03.02	03.16	04.51	06.24	07.50			08.27	09.56
	14.55	16.33			18.01			20.33	22.07	23.40	23.34	22.00	20.12	18.26			15.42	14.30
10	10.00	08.36			07.01			06.11	04.27	03.00	03.19	04.54	06.27	07.53			08.30	09.58
	14.57	16.36			18.04			20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	14.29
11	09.58	08.32			06.57			06.07	04.23	02.57	03.21	04.57	06.30	07.56		09.33 (13)	08.33	10.00
	15.00	16.40			18.07			20.39	22.14	23.44	23.29	21.54	20.05	18.19	5	09.38 (13)	15.36	14.28
12	09.56	08.29			06.54			06.04	04.20	02.56	03.24	05.00	06.33	07.59		09.30 (13)	08.36	10.02
	15.03	16.43			18.10			20.43	22.17	23.46	23.27	21.50	20.01	18.15	12	09.42 (13)	15.33	14.27
13	09.54	08.26			06.50			06.00	04.17	02.54	03.27	05.03	06.35	08.02		09.27 (13)	08.40	10.04
	15.06	16.46			18.13			20.46	22.20	23.47	23.24	21.47	19.57	18.12	17	09.44 (13)	15.30	14.26
14	09.52	08.23			06.47			05.57	04.14	02.53	03.30	05.06	06.38	08.05		09.25 (13)	08.43	10.06
	15.09	16.49			18.16			20.49	22.24	23.49	23.22	21.43	19.54	18.08	20	09.45 (13)	15.27	14.25
15	09.50	08.19		08.59 (13)	06.43			05.53	04.10	02.52	03.33	05.09	06.41	08.08		09.24 (13)	08.46	10.07
	15.12	16.53	10	09.09 (13)	18.19			20.52	22.27	23.50	23.19	21.40	19.50	18.05	21	09.45 (13)	15.24	14.24
16	09.47	08.16		08.56 (13)	06.40			05.50	04.07	02.52	03.35	05.13	06.44	08.11		09.23 (13)	08.49	10.09
	15.15	16.56	15	09.11 (13)	18.22			20.55	22.30	23.52	23.16	21.36	19.47	18.01	23	09.46 (13)	15.21	14.24
17	09.45	08.13		08.54 (13)	06.36			05.46	04.04	02.51	03.38	05.16	06.47	08.14		09.23 (13)	08.53	10.10
	15.18	16.59	18	09.12 (13)	18.25			20.58	22.33	23.53	23.14	21.33	19.43	17.58	24	09.47 (13)	15.18	14.24
18	09.43	08.09		08.54 (13)	06.32			05.43	04.01	02.51	03.41	05.19	06.50	08.17		09.22 (13)	08.56	10.11
	15.21	17.02	20	09.14 (13)	18.28			21.01	22.37	23.54	23.11	21.29	19.40	17.54	24	09.46 (13)	15.16	14.23
19	09.40	08.06		08.53 (13)	06.29			05.39	03.58	02.50	03.44	05.22	06.53	08.20		09.22 (13)	08.59	10.12
	15.24	17.05	21	09.14 (13)	18.31			21.04	22.40	23.54	23.08	21.26	19.36	17.51	24	09.46 (13)	15.13	14.23
20	09.38	08.03		08.52 (13)	06.25			05.36	03.55	02.50	03.47	05.25	06.55	08.23		09.22 (13)	09.02	10.13
	15.27	17.09	23	09.15 (13)	18.34			21.07	22.43	23.55	23.05	21.22	19.33	17.48	24	09.46 (13)	15.10	14.23
21	09.35	07.59		08.52 (13)	06.22			05.32	03.51	02.50	03.51	05.28	06.58	08.26		09.22 (13)	09.05	10.14
	15.30	17.12	24	09.16 (13)	18.37			21.10	22.46	23.55	23.02	21.19	19.29	17.44	23	09.45 (13)	15.07	14.24
22	09.32	07.56		08.51 (13)	06.18			05.29	03.48	02.51	03.54	05.31	07.01	08.29		09.23 (13)	09.09	10.15
	15.34	17.15	24	09.15 (13)	18.40			21.13	22.50	23.55	22.59	21.15	19.25	17.41	22	09.45 (13)	15.05	14.24
23	09.30	07.53		08.51 (13)	06.15			05.25	03.45	02.51	03.57	05.34	07.04	08.33		09.23 (13)	09.12	10.15
	15.37	17.18	24	09.15 (13)	18.43			21.16	22.53	23.55	22.56	21.12	19.22	17.37	21	09.44 (13)	15.02	14.25
24	09.27	07.49		08.50 (13)	06.11			05.22	03.42	02.52	04.00	05.37	07.07	08.36		09.24 (13)	09.15	10.15
	15.40	17.21	25	09.15 (13)	18.46			21.19	22.56	23.55	22.53	21.08	19.18	17.34	20	09.44 (13)	15.00	14.25
25	09.24	07.46		08.51 (13)	06.08			05.18	03.39	02.52	04.03	05.40	07.10	07.39		08.25 (13)	09.18	10.16
	15.43	17.24	24	09.15 (13)	18.49			21.23	22.59	23.55	22.50	21.05	19.15	16.31	17	08.42 (13)	14.57	14.26
26	09.21	07.42		08.51 (13)	06.04			05.15	03.36	02.53	04.06	05.43	07.13	07.42		08.27 (13)	09.21	10.16
	15.47	17.27	23	09.14 (13)	18.52			21.26	23.02	23.54	22.47	21.01	19.11	16.27	13	08.40 (13)	14.55	14.27
27	09.19	07.39		08.52 (13)	06.01			05.11	03.34	02.55	04.09	05.46	07.15	07.45		08.29 (13)	09.24	10.15
	15.50	17.31	20	09.12 (13)	18.55			21.29	23.05	23.54	22.43	20.58	19.08	16.24	8	08.37 (13)	14.52	14.28
28	09.16	07.35		08.53 (13)	05.57			05.08	03.31	02.56	04.13	05.49	07.18	07.48			09.27	10.15
	15.53	17.34	19	09.12 (13)	18.58			21.32	23.08	23.53	22.40	20.54	19.04	16.21			14.50	14.30
29	09.13				06.54			05.04	03.28	02.57	04.16	05.52	07.21	07.51			09.30	10.15
	15.56				20.01			21.35	23.11	23.52	22.37	20.51	19.01	16.17			14.48	14.31
30	09.10				06.50			05.01	03.25	02.59	04.19	05.55	07.24	07.54			09.33	10.14
	16.00				20.04			21.38	23.14	23.51	22.34	20.47	18.57	16.14			14.46	14.32
31	09.07				06.46				03.23		04.22	05.58		07.58				10.14
	16.03				20.07				23.17		22.30	20.44		16.11				14.34
Potential sun hours	171	238			363			451	569	623	608	508	393	305			198	137
Total, worst case			290			27									318			
Sun reduction			0,33			0,32									0,35			
Oper. time red.			0,99			0,99									0,99			
Wind dir. red.			0,64			0,64									0,64			
Total reduction			0,21			0,21									0,22			
Total, real			62			6									71			

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

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

Project:
Vasama_22_11_2022

Licensed user:
FCG Finnish Consulting Group Oy
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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: G - Lomarakennus G (Virtaniementie 175)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.31	06.42	04.57	03.19	03.00	04.25	06.00	07.26	08.00	09.35
	14.36	16.06	17.36	20.09	21.41	23.19	23.48	22.26	20.39	18.53	16.07	14.43
2	10.11	09.00	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.29	08.03	09.38
	14.38	16.09	17.39	20.12	21.44	23.22	23.47	22.23	20.36	18.49	16.04	14.41
3	10.10	08.57	07.24	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.20	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.10	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.44	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.37	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.24	04.40	03.08	03.08	04.41	06.15	07.41	08.16	09.48
	14.46	16.22	17.51	20.24	21.57	23.32	23.40	22.10	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.05	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.38	22.06	20.18	18.32	15.48	14.32
8	10.03	08.41	07.07	06.17	04.33	03.03	03.13	04.47	06.20	07.47	08.23	09.53
	14.51	16.29	17.57	20.30	22.03	23.37	23.36	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.29	03.02	03.15	04.50	06.23	07.50	08.26	09.55
	14.54	16.32	18.00	20.33	22.07	23.39	23.33	21.59	20.11	18.25	15.41	14.29
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.35	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.38	14.28
11	09.57	08.32	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	14.59	16.39	18.06	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.35	14.27
12	09.55	08.28	06.53	06.03	04.19	02.55	03.23	04.59	06.32	07.58	08.36	10.01
	15.02	16.42	18.09	20.42	22.16	23.45	23.26	21.49	20.00	18.14	15.32	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.26	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.20	23.46	23.23	21.46	19.57	18.11	15.29	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.05
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.26	14.24
15	09.49	08.19	06.42	05.52	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.23	14.24
16	09.46	08.15	06.39	05.49	04.06	02.51	03.35	05.12	06.43	08.10	08.48	10.08
	15.14	16.55	18.21	20.54	22.29	23.51	23.15	21.35	19.46	18.00	15.21	14.23
17	09.44	08.12	06.35	05.45	04.03	02.50	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.33	23.52	23.13	21.32	19.42	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.01	18.27	21.00	22.36	23.53	23.10	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.26	17.08	18.33	21.06	22.42	23.54	23.04	21.21	19.32	17.47	15.09	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.08	10.14
	15.33	17.14	18.39	21.12	22.49	23.54	22.58	21.14	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.24	03.45	02.50	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.52	23.54	22.55	21.11	19.21	17.37	15.01	14.24
24	09.26	07.48	06.10	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.14	10.14
	15.39	17.20	18.45	21.19	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.02	05.39	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.30	14.56	14.26
26	09.21	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.15
	15.46	17.27	18.51	21.25	23.01	23.53	22.46	21.00	19.10	16.27	14.54	14.26
27	09.18	07.38	06.00	05.10	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.53	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.55	04.12	05.48	07.18	07.47	09.26	10.14
	15.52	17.33	18.57	21.31	23.07	23.52	22.39	20.53	19.03	16.20	14.49	14.29
29	09.12		06.53	05.03	03.27	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.51	22.36	20.50	19.00	16.17	14.47	14.30
30	09.09		06.49	05.00	03.25	02.58	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.38	23.13	23.50	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.21	05.57		07.57		10.13
	16.02		20.06		23.16		22.30	20.43		16.10		14.33
Potential sun hours	172	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: H - Asuinrakennus H (Purotie 55)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.37	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.44
2	10.10	09.00	07.28	06.39	04.54	03.18	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.42
3	10.09	08.57	07.24	06.35	04.50	03.15	03.03	04.32	06.06	07.32	08.06	09.40
	14.41	16.13	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.01	14.40
4	10.08	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.45	20.18	21.50	23.26	23.43	22.16	20.29	18.42	15.58	14.38
5	10.07	08.51	07.17	06.28	04.43	03.11	03.07	04.38	06.12	07.38	08.13	09.45
	14.45	16.19	17.49	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.31	23.39	22.09	20.22	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.19	09.50
	14.50	16.26	17.55	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.33
8	10.02	08.41	07.07	06.18	04.33	03.04	03.14	04.47	06.21	07.47	08.22	09.52
	14.52	16.29	17.58	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.00	08.38	07.03	06.14	04.30	03.03	03.16	04.51	06.23	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.27	03.01	03.19	04.54	06.26	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.40	23.30	21.56	20.07	18.22	15.39	14.29
11	09.57	08.32	06.56	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.32	09.59
	15.00	16.39	18.07	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.28
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.03	16.42	18.10	20.42	22.16	23.44	23.26	21.49	20.00	18.15	15.33	14.27
13	09.53	08.25	06.49	06.00	04.17	02.55	03.27	05.03	06.35	08.01	08.39	10.02
	15.06	16.46	18.13	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.56	04.14	02.54	03.30	05.06	06.38	08.04	08.42	10.04
	15.09	16.49	18.16	20.48	22.23	23.47	23.20	21.42	19.53	18.08	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.53	03.33	05.09	06.41	08.07	08.45	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.46	08.15	06.39	05.49	04.07	02.52	03.36	05.12	06.43	08.10	08.48	10.07
	15.15	16.55	18.22	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.46	04.04	02.52	03.39	05.15	06.46	08.13	08.52	10.09
	15.18	16.59	18.25	20.57	22.32	23.51	23.12	21.32	19.43	17.57	15.18	14.24
18	09.41	08.09	06.32	05.42	04.01	02.51	03.42	05.18	06.49	08.16	08.55	10.10
	15.21	17.02	18.27	21.00	22.35	23.52	23.09	21.28	19.39	17.54	15.15	14.24
19	09.39	08.05	06.28	05.39	03.58	02.51	03.45	05.21	06.52	08.19	08.58	10.11
	15.24	17.05	18.30	21.03	22.39	23.53	23.06	21.25	19.35	17.51	15.13	14.24
20	09.36	08.02	06.25	05.35	03.54	02.51	03.48	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.24
21	09.34	07.58	06.21	05.32	03.51	02.51	03.51	05.28	06.58	08.26	09.04	10.12
	15.30	17.11	18.36	21.09	22.45	23.53	23.01	21.18	19.28	17.44	15.07	14.24
22	09.31	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.05	14.24
23	09.29	07.52	06.14	05.25	03.45	02.52	03.57	05.34	07.03	08.32	09.11	10.14
	15.37	17.18	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.25
24	09.26	07.48	06.11	05.21	03.42	02.52	04.00	05.37	07.06	08.35	09.14	10.14
	15.40	17.21	18.45	21.19	22.54	23.53	22.52	21.07	19.18	17.34	15.00	14.26
25	09.23	07.45	06.07	05.18	03.39	02.53	04.03	05.40	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.48	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.04	05.14	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.44	09.23	10.14
	15.50	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.56	05.07	03.31	02.56	04.13	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.04	16.20	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.51	07.21	07.50	09.29	10.13
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.49	05.00	03.25	02.59	04.19	05.54	07.23	07.54	09.32	10.13
	16.00		20.03	21.37	23.13	23.49	22.33	20.46	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.57		07.57		10.12
	16.03		20.06		23.15		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March			April	May	June
1	10.12			09.04		10.06 (128)	07.32		08.52 (124)	06.43	04.58	03.21
	14.37			16.07	21	10.27 (128)	17.37	7	08.59 (124)	20.09	21.41	23.19
2	10.11			09.01		10.06 (128)	07.28			06.39	04.54	03.18
	14.39			16.10	21	10.27 (128)	17.40			20.12	21.45	23.22
3	10.10			08.58		10.06 (128)	07.25			06.36	04.51	03.16
	14.41			16.13	21	10.27 (128)	17.43			20.15	21.48	23.25
4	10.09			08.54		10.07 (128)	07.22			06.32	04.47	03.13
	14.43			16.17	20	10.27 (128)	17.46			20.18	21.51	23.27
5	10.08			08.51		10.07 (128)	07.18			06.29	04.44	03.11
	14.45			16.20	20	10.27 (128)	17.49			20.21	21.54	23.30
6	10.06			08.48		10.08 (128)	07.15			06.25	04.41	03.09
	14.48			16.23	18	10.26 (128)	17.52			20.24	21.57	23.32
7	10.05			08.45		10.08 (128)	07.11			06.22	04.37	03.07
	14.50			16.27	17	10.25 (128)	17.55			20.27	22.01	23.35
8	10.03			08.42		10.10 (128)	07.08			06.18	04.34	03.05
	14.53			16.30	15	10.25 (128)	17.58			20.30	22.04	23.37
9	10.01			08.39		10.12 (128)	07.04			06.15	04.31	03.03
	14.55			16.33	11	10.23 (128)	18.01			20.33	22.07	23.39
10	09.59			08.35		10.14 (128)	07.01			06.11	04.27	03.01
	14.58			16.36	6	10.20 (128)	18.04			20.36	22.10	23.41
11	09.58			08.32			06.57			06.08	04.24	03.00
	15.01			16.40			18.07			20.39	22.14	23.43
12	09.56			08.29			06.54			06.04	04.21	02.57
	15.03			16.43			18.10			20.42	22.17	23.45
13	09.54			08.26			06.50			06.00	04.17	02.55
	15.06			16.46			18.13			20.45	22.20	23.47
14	09.51			08.22			06.47			05.57	04.14	02.54
	15.09			16.50			18.16			20.48	22.23	23.48
15	09.49			08.19		08.58 (124)	06.43			05.53	04.11	02.53
	15.12			16.53	2	09.00 (124)	18.19			20.52	22.27	23.50
16	09.47			08.16		08.54 (124)	06.40			05.50	04.08	02.53
	15.15			16.56	9	09.03 (124)	18.22			20.55	22.30	23.51
17	09.45			08.13		08.50 (124)	06.36			05.46	04.04	02.52
	15.18			16.59	15	09.05 (124)	18.25			20.58	22.33	23.52
18	09.42			08.09		08.48 (124)	06.33			05.43	04.01	02.52
	15.21			17.02	18	09.06 (124)	18.28			21.01	22.36	23.53
19	09.40			08.06		08.48 (124)	06.29			05.39	03.58	02.51
	15.24			17.06	19	09.07 (124)	18.31			21.04	22.39	23.53
20	09.37			08.03		08.47 (124)	06.25			05.36	03.55	02.51
	15.28			17.09	20	09.07 (124)	18.34			21.07	22.43	23.54
21	09.35			07.59		08.46 (124)	06.22			05.32	03.52	02.51
	15.31			17.12	21	09.07 (124)	18.37			21.10	22.46	23.54
22	09.32			07.56		08.46 (124)	06.18			05.29	03.49	02.52
	15.34			17.15	22	09.08 (124)	18.40			21.13	22.49	23.55
23	09.29			07.52		08.46 (124)	06.15			05.25	03.46	02.52
	15.37			17.18	22	09.08 (124)	18.43			21.16	22.52	23.55
24	09.27			07.49		08.46 (124)	06.11			05.22	03.43	02.53
	15.40			17.21	21	09.07 (124)	18.46			21.19	22.55	23.54
25	09.24		10.17 (128)	07.46		08.47 (124)	06.08			05.18	03.40	02.53
	15.44	2	10.19 (128)	17.25	20	09.07 (124)	18.49			21.22	22.58	23.54
26	09.21		10.13 (128)	07.42		08.47 (124)	06.04			05.15	03.37	02.54
	15.47	8	10.21 (128)	17.28	19	09.06 (124)	18.52			21.26	23.01	23.54
27	09.18		10.09 (128)	07.39		08.48 (124)	06.01			05.11	03.34	02.56
	15.50	14	10.23 (128)	17.31	16	09.04 (124)	18.55			21.29	23.05	23.53
28	09.15		10.07 (128)	07.35		08.50 (124)	05.57			05.08	03.31	02.57
	15.54	17	10.24 (128)	17.34	13	09.03 (124)	18.58			21.32	23.08	23.52
29	09.12		10.07 (128)				06.54			05.05	03.29	02.58
	15.57	18	10.25 (128)				20.01			21.35	23.11	23.51
30	09.10		10.07 (128)				06.50			05.01	03.26	03.00
	16.00	19	10.26 (128)				20.04			21.38	23.13	23.50
31	09.07		10.06 (128)				06.46				03.23	
	16.03	20	10.26 (128)				20.07				23.16	
Potential sun hours	172			238			363			451	569	622
Total, worst case		98			407			7				
Sun reduction		0,18			0,33			0,32				
Oper. time red.		0,99			0,99			0,99				
Wind dir. red.		0,67			0,65			0,64				
Total reduction		0,12			0,22			0,21				
Total, real		12			88			1				

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

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

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	July	August	September	October			November			December
1	03.00	04.26	06.01	07.27			08.01		09.43 (128)	09.35
	23.48	22.27	20.40	18.54			16.08	7	09.50 (128)	14.44
2	03.02	04.29	06.04	07.30			08.04		09.41 (128)	09.38
	23.47	22.24	20.36	18.50			16.05	12	09.53 (128)	14.42
3	03.03	04.32	06.07	07.33			08.07		09.39 (128)	09.41
	23.45	22.20	20.33	18.47			16.01	16	09.55 (128)	14.40
4	03.05	04.35	06.10	07.36			08.10		09.39 (128)	09.43
	23.44	22.17	20.29	18.43			15.58	17	09.56 (128)	14.38
5	03.07	04.38	06.13	07.39			08.13		09.38 (128)	09.46
	23.42	22.14	20.26	18.40			15.55	19	09.57 (128)	14.37
6	03.10	04.42	06.15	07.42			08.17		09.37 (128)	09.48
	23.40	22.10	20.22	18.36			15.52	20	09.57 (128)	14.35
7	03.12	04.45	06.18	07.44			08.20		09.37 (128)	09.51
	23.38	22.07	20.19	18.33			15.49	20	09.57 (128)	14.33
8	03.14	04.48	06.21	07.47			08.23		09.37 (128)	09.53
	23.36	22.03	20.15	18.29			15.46	20	09.57 (128)	14.32
9	03.17	04.51	06.24	07.50			08.26		09.37 (128)	09.55
	23.34	22.00	20.12	18.26			15.43	20	09.57 (128)	14.31
10	03.19	04.54	06.27	07.53			08.30		09.37 (128)	09.58
	23.31	21.57	20.08	18.22			15.39	20	09.57 (128)	14.29
11	03.22	04.57	06.30	07.56			08.33		09.37 (128)	10.00
	23.29	21.53	20.04	18.19			15.36	20	09.57 (128)	14.28
12	03.25	05.00	06.33	07.59			08.36		09.38 (128)	10.02
	23.26	21.50	20.01	18.15			15.33	20	09.58 (128)	14.27
13	03.28	05.04	06.36	08.02		09.24 (124)	08.39		09.39 (128)	10.03
	23.24	21.46	19.57	18.12	10	09.34 (124)	15.30	18	09.57 (128)	14.26
14	03.30	05.07	06.38	08.05		09.22 (124)	08.43		09.40 (128)	10.05
	23.21	21.43	19.54	18.08	14	09.36 (124)	15.27	16	09.56 (128)	14.26
15	03.33	05.10	06.41	08.08		09.20 (124)	08.46		09.42 (128)	10.07
	23.19	21.40	19.50	18.05	17	09.37 (124)	15.25	13	09.55 (128)	14.25
16	03.36	05.13	06.44	08.11		09.19 (124)	08.49		09.46 (128)	10.08
	23.16	21.36	19.47	18.01	19	09.38 (124)	15.22	8	09.54 (128)	14.25
17	03.39	05.16	06.47	08.14		09.19 (124)	08.52		09.51 (128)	10.09
	23.13	21.33	19.43	17.58	20	09.39 (124)	15.19	2	09.53 (128)	14.24
18	03.42	05.19	06.50	08.17		09.18 (124)	08.56			10.11
	23.10	21.29	19.40	17.55	21	09.39 (124)	15.16			14.24
19	03.45	05.22	06.53	08.20		09.17 (124)	08.59			10.12
	23.07	21.26	19.36	17.51	21	09.38 (124)	15.13			14.24
20	03.48	05.25	06.56	08.23		09.17 (124)	09.02			10.13
	23.04	21.22	19.33	17.48	22	09.39 (124)	15.11			14.24
21	03.51	05.28	06.58	08.26		09.17 (124)	09.05			10.13
	23.01	21.19	19.29	17.44	21	09.38 (124)	15.08			14.24
22	03.54	05.31	07.01	08.29		09.17 (124)	09.08			10.14
	22.58	21.15	19.25	17.41	20	09.37 (124)	15.05			14.25
23	03.57	05.34	07.04	08.32		09.18 (124)	09.11			10.14
	22.55	21.12	19.22	17.38	19	09.37 (124)	15.03			14.25
24	04.00	05.37	07.07	08.36		09.18 (124)	09.14			10.15
	22.52	21.08	19.18	17.34	17	09.35 (124)	15.00			14.26
25	04.04	05.40	07.10	07.39		08.21 (124)	09.18			10.15
	22.49	21.05	19.15	16.31	13	08.34 (124)	14.58			14.27
26	04.07	05.43	07.13	07.42		08.24 (124)	09.21			10.15
	22.46	21.01	19.11	16.28	8	08.32 (124)	14.55			14.28
27	04.10	05.46	07.16	07.45			09.24			10.15
	22.43	20.58	19.08	16.24			14.53			14.29
28	04.13	05.49	07.18	07.48			09.27			10.15
	22.40	20.54	19.04	16.21			14.51			14.30
29	04.16	05.52	07.21	07.51			09.30			10.14
	22.37	20.51	19.01	16.18			14.48			14.32
30	04.19	05.55	07.24	07.54			09.32			10.14
	22.33	20.47	18.57	16.14			14.46			14.33
31	04.23	05.58		07.57						10.13
	22.30	20.43		16.11						14.35
Potential sun hours	607	508	393	305			199			138
Total, worst case					242			268		
Sun reduction					0,35			0,24		
Oper. time red.					0,99			0,99		
Wind dir. red.					0,64			0,67		
Total reduction					0,22			0,16		
Total, real					54			42		

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

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

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: J - Lomaasunto J (Pyssyniemen metsätie 2)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March	April	May	June		
1	10.12			09.03		13.58 (125)	07.32	06.43	04.57	03.20		
	14.37			16.06	18	15.16 (126)	17.37	20.09	21.41	23.19		
2	10.11			09.00		15.03 (126)	07.28	06.39	04.54	03.18		
	14.39			16.10	17	15.20 (126)	17.40	20.12	21.44	23.22		
3	10.10			08.57		15.02 (126)	07.25	06.36	04.50	03.15		
	14.41			16.13	19	15.21 (126)	17.43	20.15	21.48	23.24		
4	10.09			08.54		15.02 (126)	07.21	06.32	04.47	03.13		
	14.43			16.16	19	15.21 (126)	17.46	20.18	21.51	23.27		
5	10.07			08.51		15.02 (126)	07.18	06.28	04.44	03.11		
	14.45			16.20	21	15.23 (126)	17.49	20.21	21.54	23.30		
6	10.06			08.48		15.02 (126)	07.14	06.25	04.40	03.09		
	14.47			16.23	21	15.23 (126)	17.52	20.24	21.57	23.32		
7	10.04			08.45		15.02 (126)	07.11	06.21	04.37	03.06		
	14.50			16.26	21	15.23 (126)	17.55	20.27	22.00	23.34		
8	10.03			08.42		15.02 (126)	07.07	06.18	04.34	03.04		
	14.52			16.30	20	15.22 (126)	17.58	20.30	22.04	23.37		
9	10.01			08.38		15.03 (126)	07.04	06.14	04.30	03.03		22.26 (12)
	14.55			16.33	20	15.23 (126)	18.01	20.33	22.07	23.39	3	22.29 (12)
10	09.59			08.35		15.03 (126)	07.00	06.11	04.27	03.01		22.26 (12)
	14.58			16.36	19	15.22 (126)	18.04	20.36	22.10	23.41	4	22.30 (12)
11	09.57			08.32		15.04 (126)	06.57	06.07	04.24	02.58		22.26 (12)
	15.00			16.39	17	15.21 (126)	18.07	20.39	22.13	23.43	5	22.31 (12)
12	09.55			08.29		15.05 (126)	06.53	06.04	04.20	02.56		22.25 (12)
	15.03			16.43	15	15.20 (126)	18.10	20.42	22.17	23.45	7	22.32 (12)
13	09.53			08.25		15.07 (126)	06.50	06.00	04.17	02.55		22.26 (12)
	15.06			16.46	12	15.19 (126)	18.13	20.45	22.20	23.46	8	22.34 (12)
14	09.51		13.49 (125)	08.22		15.11 (126)	06.46	05.57	04.14	02.54		22.25 (12)
	15.09	5	13.54 (125)	16.49	4	15.15 (126)	18.16	20.48	22.23	23.48	9	22.34 (12)
15	09.49		13.49 (125)	08.19			06.43	05.53	04.10	02.53		22.26 (12)
	15.12	10	13.59 (125)	16.52			18.19	20.51	22.26	23.49	9	22.35 (12)
16	09.47		13.49 (125)	08.16			06.39	05.50	04.07	02.52		22.25 (12)
	15.15	15	14.04 (125)	16.56			18.22	20.54	22.30	23.51	11	22.36 (12)
17	09.44		13.49 (125)	08.12			06.36	05.46	04.04	02.52		22.26 (12)
	15.18	17	14.06 (125)	16.59			18.25	20.57	22.33	23.52	11	22.37 (12)
18	09.42		13.49 (125)	08.09			06.32	05.43	04.01	02.51		22.26 (12)
	15.21	18	14.07 (125)	17.02			18.28	21.00	22.36	23.53	11	22.37 (12)
19	09.39		13.49 (125)	08.06			06.29	05.39	03.58	02.51		22.26 (12)
	15.24	18	14.07 (125)	17.05			18.31	21.03	22.39	23.53	12	22.38 (12)
20	09.37		13.49 (125)	08.02			06.25	05.35	03.55	02.51		22.26 (12)
	15.27	19	14.08 (125)	17.08			18.34	21.07	22.42	23.54	12	22.38 (12)
21	09.34		13.49 (125)	07.59			06.22	05.32	03.52	02.51		22.26 (12)
	15.30	20	14.09 (125)	17.12			18.37	21.10	22.46	23.54	12	22.38 (12)
22	09.32		13.49 (125)	07.56			06.18	05.28	03.49	02.51		22.26 (12)
	15.34	20	14.09 (125)	17.15			18.40	21.13	22.49	23.54	12	22.38 (12)
23	09.29		13.49 (125)	07.52			06.15	05.25	03.45	02.52		22.27 (12)
	15.37	20	14.09 (125)	17.18			18.43	21.16	22.52	23.54	12	22.39 (12)
24	09.26		13.49 (125)	07.49			06.11	05.21	03.43	02.52		22.27 (12)
	15.40	21	14.10 (125)	17.21			18.46	21.19	22.55	23.54	12	22.39 (12)
25	09.24		13.49 (125)	07.45			06.07	05.18	03.40	02.53		22.28 (12)
	15.43	21	14.10 (125)	17.24			18.49	21.22	22.58	23.54	11	22.39 (12)
26	09.21		13.50 (125)	07.42			06.04	05.15	03.37	02.54		22.27 (12)
	15.47	19	14.09 (125)	17.27			18.51	21.25	23.01	23.53	11	22.38 (12)
27	09.18		13.50 (125)	07.38			06.00	05.11	03.34	02.55		22.28 (12)
	15.50	19	14.09 (125)	17.30			18.54	21.28	23.04	23.53	10	22.38 (12)
28	09.15		13.51 (125)	07.35			05.57	05.08	03.31	02.56		22.29 (12)
	15.53	18	14.09 (125)	17.33			18.57	21.32	23.07	23.52	9	22.38 (12)
29	09.12		13.52 (125)				06.53	05.04	03.28	02.58		22.29 (12)
	15.56	16	14.08 (125)				20.00	21.35	23.10	23.51	8	22.37 (12)
30	09.09		13.53 (125)				06.50	05.01	03.26	02.59		22.30 (12)
	16.00	15	15.07 (126)				20.03	21.38	23.13	23.50	7	22.37 (12)
31	09.06		13.55 (125)				06.46		03.23			
	16.03	19	15.12 (126)				20.06		23.16			
Potential sun hours	172			238			363	451	569	623		
Total, worst case		310			243						206	
Sun reduction		0,18			0,33						0,48	
Oper. time red.		0,99			0,99						0,99	
Wind dir. red.		0,65			0,62						0,66	
Total reduction		0,12			0,21						0,31	
Total, real		37			50						65	

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

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

Project:
Vasama_22_11_2022

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Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: J - Lomaasunto J (Pyssyniemen metsätie 2)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	July			August	September	October			November			December
1	03.01		22.30 (12)	04.25	06.01	07.27			08.00		14.33 (126)	09.35
	23.48	6	22.36 (12)	22.27	20.40	18.53			16.07	18	14.51 (126)	14.44
2	03.01		22.30 (12)	04.29	06.03	07.30			08.04		14.32 (126)	09.38
	23.47	5	22.35 (12)	22.23	20.36	18.50			16.04	20	14.52 (126)	14.42
3	03.03		22.32 (12)	04.32	06.06	07.32			08.07		14.32 (126)	09.40
	23.45	3	22.35 (12)	22.20	20.33	18.46			16.01	21	14.53 (126)	14.40
4	03.05		22.32 (12)	04.35	06.09	07.35			08.10		14.31 (126)	09.43
	23.44	1	22.33 (12)	22.17	20.29	18.43			15.58	21	14.52 (126)	14.38
5	03.07			04.38	06.12	07.38			08.13		14.32 (126)	09.46
	23.42			22.13	20.25	18.39			15.55	20	14.52 (126)	14.36
6	03.09			04.41	06.15	07.41			08.16		14.32 (126)	09.48
	23.40			22.10	20.22	18.36			15.52	20	14.52 (126)	14.35
7	03.12			04.44	06.18	07.44			08.20		14.32 (126)	09.51
	23.38			22.07	20.18	18.32			15.48	20	14.52 (126)	14.33
8	03.14			04.48	06.21	07.47			08.23		14.33 (126)	09.53
	23.36			22.03	20.15	18.29			15.45	19	14.52 (126)	14.32
9	03.16			04.51	06.24	07.50			08.26		14.34 (126)	09.55
	23.33			22.00	20.11	18.25			15.42	16	14.50 (126)	14.30
10	03.19			04.54	06.27	07.53			08.29		13.28 (125)	09.57
	23.31			21.56	20.08	18.22			15.39	18	14.46 (126)	14.29
11	03.22			04.57	06.30	07.56			08.33		13.26 (125)	09.59
	23.29			21.53	20.04	18.18			15.36	18	14.42 (126)	14.28
12	03.24			05.00	06.32	07.59			08.36		13.24 (125)	10.01
	23.26			21.50	20.01	18.15			15.33	15	13.39 (125)	14.27
13	03.27			05.03	06.35	08.02			08.39		13.23 (125)	10.03
	23.24			21.46	19.57	18.11			15.30	17	13.40 (125)	14.26
14	03.30			05.06	06.38	08.05			08.42		13.24 (125)	10.05
	23.21			21.43	19.54	18.08			15.27	18	13.42 (125)	14.25
15	03.33			05.09	06.41	08.08			08.46		13.23 (125)	10.06
	23.18			21.39	19.50	18.05			15.24	19	13.42 (125)	14.25
16	03.36			05.13	06.44	08.11			08.49		13.23 (125)	10.08
	23.16			21.36	19.46	18.01			15.21	19	13.42 (125)	14.24
17	03.39			05.16	06.47	08.14			08.52		13.22 (125)	10.09
	23.13			21.32	19.43	17.58			15.18	20	13.42 (125)	14.24
18	03.42			05.19	06.50	08.17			08.55		13.23 (125)	10.10
	23.10			21.29	19.39	17.54			15.16	20	13.43 (125)	14.24
19	03.45			05.22	06.52	08.20			08.58		13.23 (125)	10.11
	23.07			21.25	19.36	17.51			15.13	20	13.43 (125)	14.24
20	03.48			05.25	06.55	08.23			09.02		13.24 (125)	10.12
	23.04			21.22	19.32	17.47			15.10	20	13.44 (125)	14.24
21	03.51			05.28	06.58	08.26			09.05		13.24 (125)	10.13
	23.01			21.18	19.29	17.44			15.07	20	13.44 (125)	14.24
22	03.54			05.31	07.01	08.29			09.08		13.25 (125)	10.14
	22.58			21.15	19.25	17.41			15.05	19	13.44 (125)	14.24
23	03.57			05.34	07.04	08.32			09.11		13.25 (125)	10.14
	22.55			21.11	19.22	17.37			15.02	19	13.44 (125)	14.25
24	04.00			05.37	07.07	08.35			09.14		13.26 (125)	10.14
	22.52			21.08	19.18	17.34			15.00	18	13.44 (125)	14.26
25	04.03			05.40	07.09	07.38			09.17		13.27 (125)	10.15
	22.49			21.04	19.15	16.31			14.57	17	13.44 (125)	14.26
26	04.06			05.43	07.12	07.41			09.20		13.27 (125)	10.15
	22.46			21.01	19.11	16.27			14.55	16	13.43 (125)	14.27
27	04.10			05.46	07.15	07.45			09.23		13.28 (125)	10.15
	22.43			20.57	19.07	16.24			14.52	11	13.39 (125)	14.29
28	04.13			05.49	07.18	07.48		14.39 (126)	09.26		13.29 (125)	10.14
	22.40			20.54	19.04	16.21	7	14.46 (126)	14.50	5	13.34 (125)	14.30
29	04.16			05.52	07.21	07.51		14.36 (126)	09.29			10.14
	22.36			20.50	19.00	16.17	12	14.48 (126)	14.48			14.31
30	04.19			05.55	07.24	07.54		14.35 (126)	09.32			10.13
	22.33			20.47	18.57	16.14	15	14.50 (126)	14.46			14.33
31	04.22			05.58		07.57		14.33 (126)				10.13
	22.30			20.43		16.11	17	14.50 (126)				14.34
Potential sun hours	608			508	393	305			199			138
Total, worst case		15					51			504		
Sun reduction		0,38					0,35			0,24		
Oper. time red.		0,99					0,99			0,99		
Wind dir. red.		0,66					0,62			0,64		
Total reduction		0,25					0,22			0,15		
Total, real		4					11			76		

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

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

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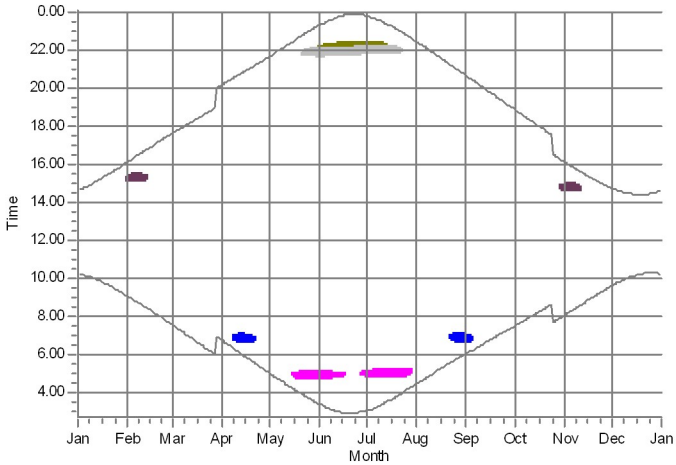
Calculated:
23.11.2022 12.07/3.5.584

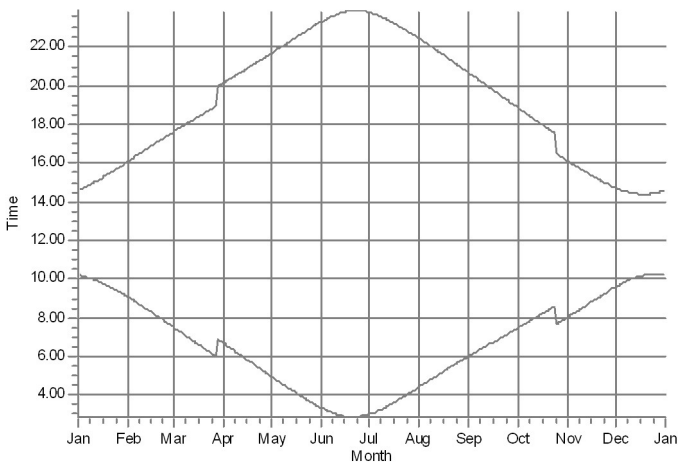
SHADOW - Calendar, graphical

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

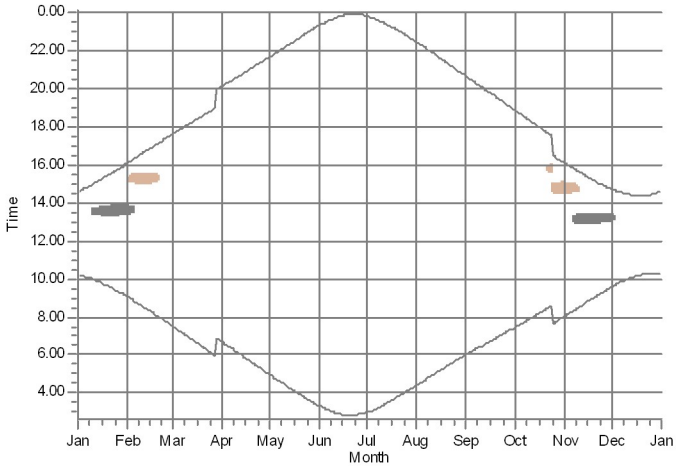
A: Lomarakennus A (Pyssynienen metsätie 156)



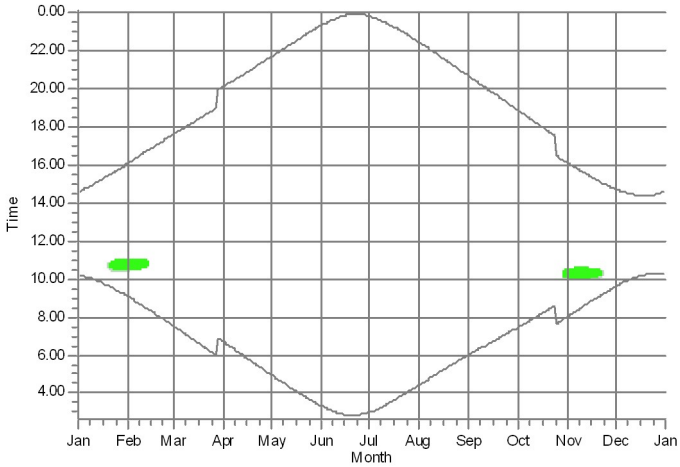
B: Lomarakennus B (Sarjankyläntie 1093)



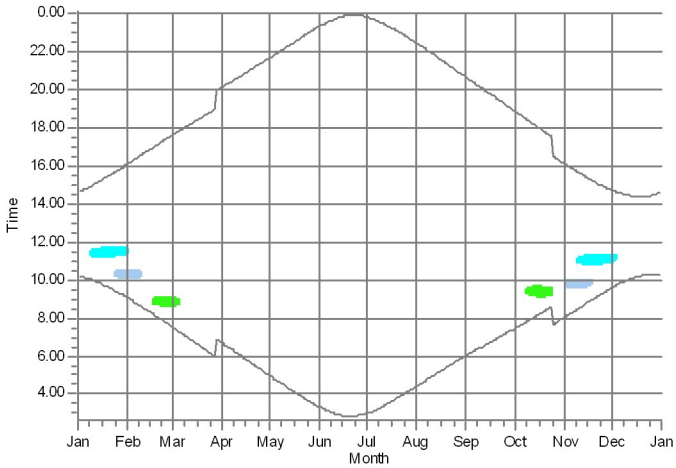
C: Lomarakennnus C (Kurunoja)



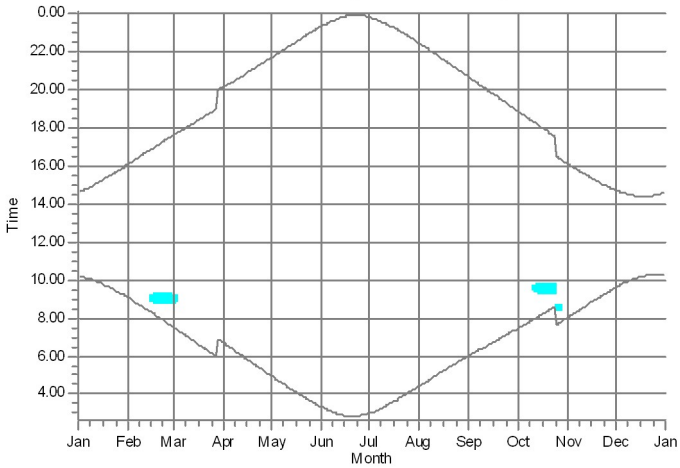
D: Asuinrakennus D (Haapavesitie 1404)



E: Asuinrakennus E (Säilynkankaantie 34)



F: Asuinrakennus F (Ritamäentie 156)



WTGs

3: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (22)
4: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (23)
5: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (24)
10: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (29)
12: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (31)
13: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (32)
14: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (33)
15: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (34)
17: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (36)
18: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (37)
126: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (472)

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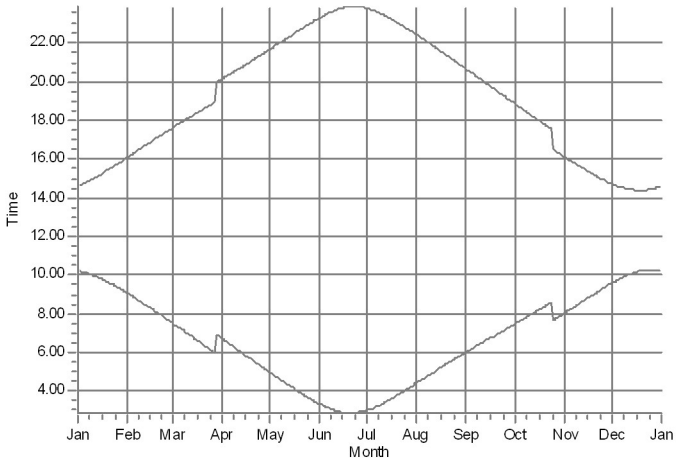
Calculated:
23.11.2022 12.07/3.5.584

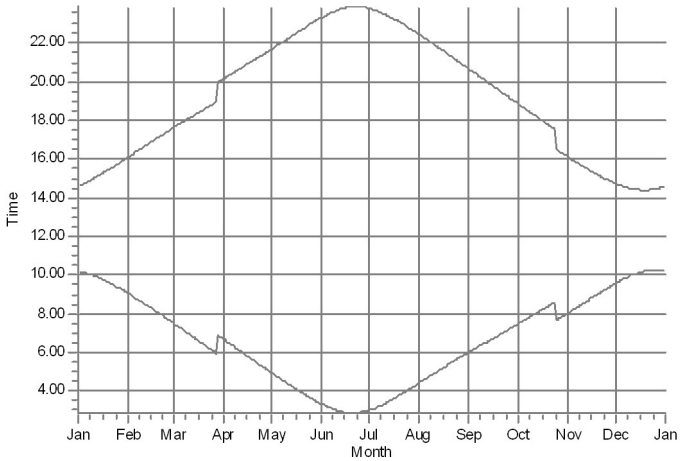
SHADOW - Calendar, graphical

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122

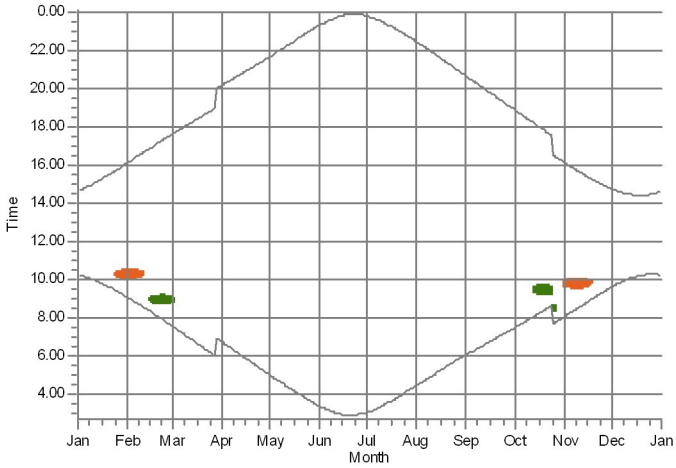
G: Lomarakennus G (Virtaniementie 175)



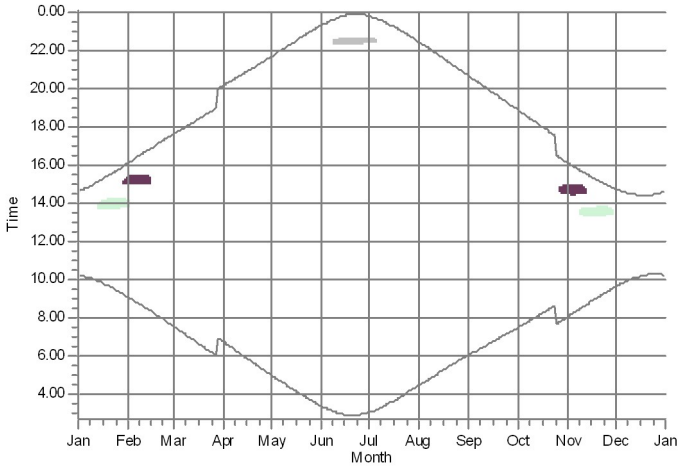
H: Asuinrakennus H (Purotie 55)



I: Lomarakennus I (Hirvinevan haara 147)



J: Lomaasunto J (Pyssyniemen metsätie 2)



WTGs

12: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (31)
124: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (470)
125: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (471)
126: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (472)
128: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (474)

Project:
Vasama_22_11_2022

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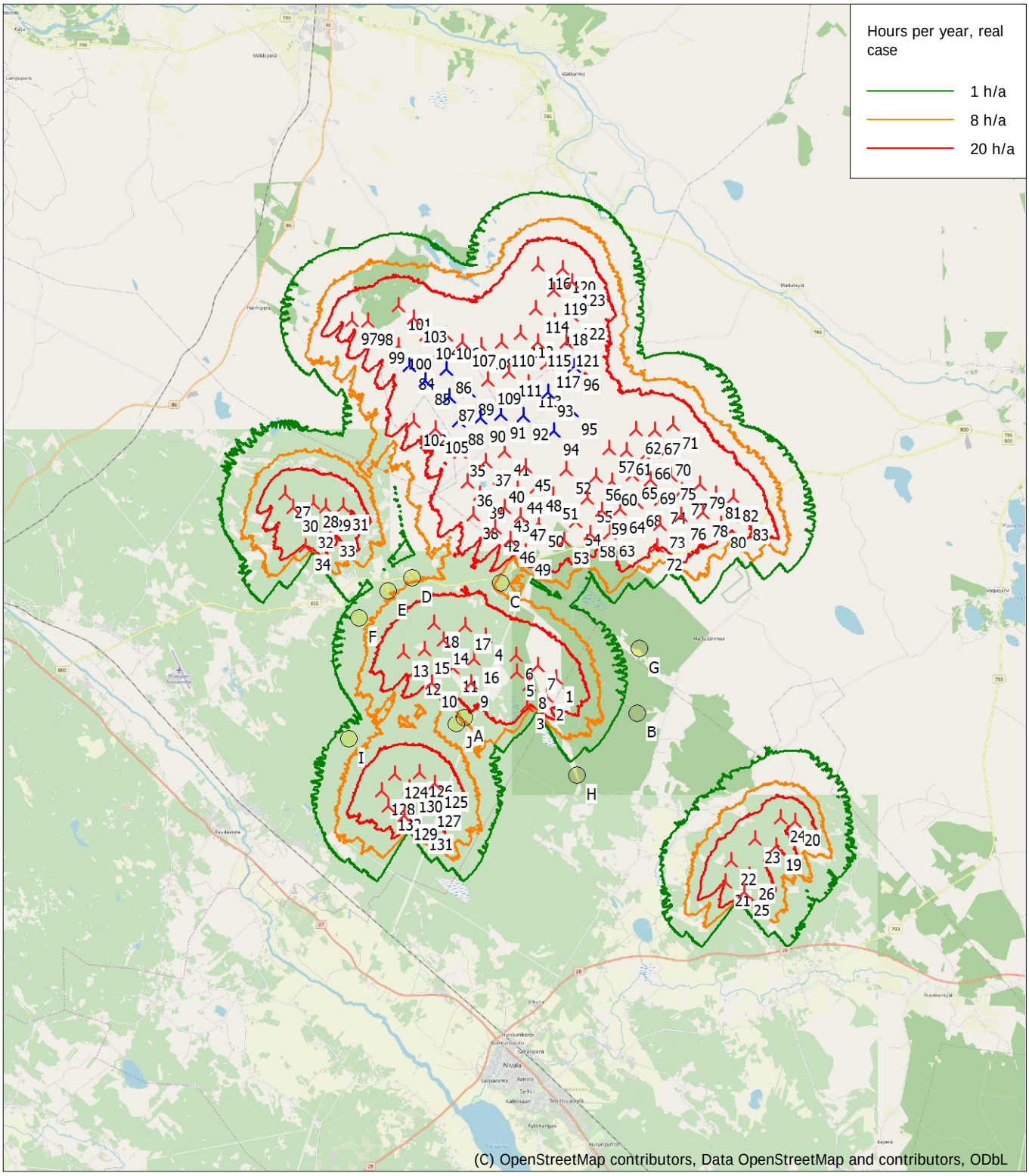
Calculated:
23.11.2022 12.07/3.5.584

SHADOW - Map

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case no forest_20221122



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 340 North: 7 108 110

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Vasama_5_5_2022_0.wpo (1)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Liite 6. Vasaman tuulivoimahanke VE1 – varjostusmallinnuksen tulokset ”Real Case, Luke forest”

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23.11.2022 10.55/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

Assumptions for shadow calculations

Maximum distance for influence	2 500	m
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-2_N64,00_E025,00 (5)

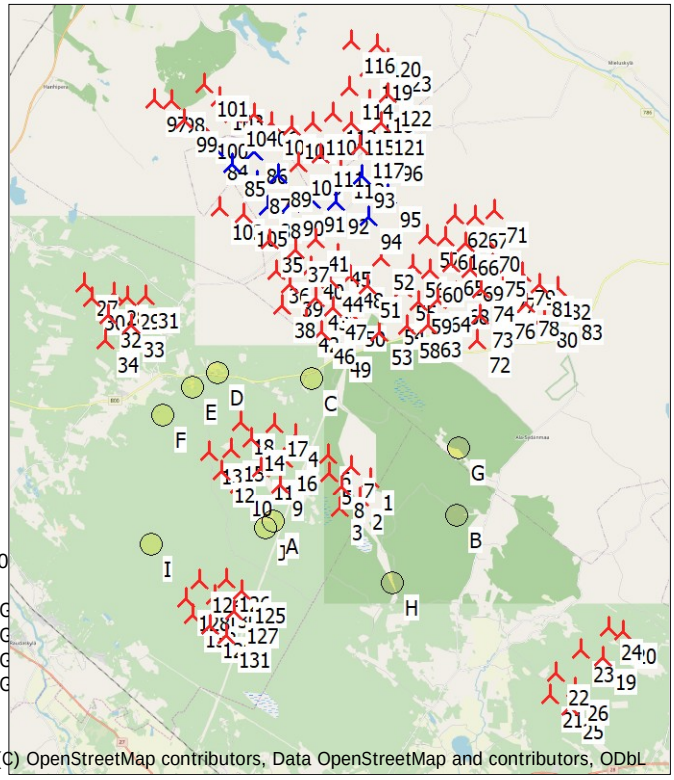
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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_Vasama_5_5_2022_0
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:250 000
New WTG
Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	402 014	7 104 309	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
2	401 637	7 103 661	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
3	400 968	7 103 344	104,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
4	399 564	7 105 835	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
5	400 647	7 104 532	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
6	400 636	7 105 142	105,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
7	401 395	7 104 737	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
8	401 057	7 104 087	103,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
9	399 017	7 104 219	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
10	397 644	7 104 266	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
11	398 397	7 104 778	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
12	397 070	7 104 723	99,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
13	396 683	7 105 368	98,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
14	398 090	7 105 743	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
15	397 412	7 105 444	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
16	399 135	7 105 052	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
17	398 868	7 106 249	100,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
18	397 770	7 106 329	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
19	409 573	7 098 129	122,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
20	410 264	7 098 972	122,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
21	407 742	7 096 948	109,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
22	407 993	7 097 672	109,3	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
23	408 857	7 098 427	115,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
24	409 752	7 099 120	115,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
25	408 404	7 096 567	110,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
26	408 619	7 097 160	117,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
27	392 697	7 111 104	82,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
28	393 696	7 110 723	85,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
29	394 124	7 110 573	88,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4

To be continued on next page...

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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

	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]
30	392 964	7 110 572	83,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
31	394 736	7 110 600	89,8	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
32	393 462	7 109 982	84,9	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
33	394 233	7 109 674	87,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
34	393 349	7 109 200	84,2	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
35	398 896	7 112 332	92,5	PUU01	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
36	399 097	7 111 286	95,0	PUU02	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
37	399 784	7 111 972	97,5	PUU03	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
38	399 264	7 110 151	97,2	PUU04	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
39	399 536	7 110 832	95,4	PUU05	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
40	400 239	7 111 382	97,5	PUU06	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
41	400 444	7 112 292	97,3	PUU07	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
42	400 019	7 109 649	100,0	PUU08	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
43	400 380	7 110 348	100,0	PUU09	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
44	400 876	7 110 966	99,4	PUU10	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
45	401 152	7 111 752	100,0	PUU11	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
46	400 549	7 109 232	102,5	PUU12	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
47	400 953	7 110 020	102,5	PUU13	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
48	401 537	7 111 046	104,5	PUU14	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
49	401 068	7 108 792	105,0	PUU15	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
50	401 564	7 109 758	104,1	PUU16	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
51	402 089	7 110 702	107,5	PUU17	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
52	402 589	7 111 603	106,9	PUU18	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
53	402 455	7 109 148	112,5	PUU19	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
54	402 889	7 109 778	110,0	PUU20	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
55	403 318	7 110 593	107,5	PUU21	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
56	403 622	7 111 352	106,3	PUU22	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
57	404 117	7 112 276	103,7	PUU23	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
58	403 379	7 109 327	115,0	PUU24	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
59	403 790	7 110 129	108,2	PUU25	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
60	404 210	7 111 152	105,6	PUU26	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
61	404 739	7 112 199	105,0	PUU27	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
62	405 100	7 112 943	100,6	PUU28	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
63	404 061	7 109 351	110,0	PUU29	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
64	404 420	7 110 174	106,8	PUU30	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
65	404 900	7 111 381	105,0	PUU31	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
66	405 395	7 112 030	102,5	PUU32	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
67	405 740	7 112 891	100,2	PUU33	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
68	405 042	7 110 380	105,9	PUU34	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
69	405 532	7 111 130	103,8	PUU35	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
70	406 114	7 112 133	103,1	PUU36	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
71	406 380	7 113 067	107,2	PUU37	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
72	405 707	7 108 791	111,2	PUU38	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
73	405 822	7 109 587	108,6	PUU39	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
74	405 893	7 110 455	104,7	PUU40	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
75	406 257	7 111 298	104,1	PUU41	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
76	406 558	7 109 872	106,5	PUU42	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
77	406 638	7 110 744	106,0	PUU43	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
78	407 324	7 109 954	108,3	PUU44	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
79	407 269	7 110 957	112,5	PUU45	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
80	407 963	7 109 542	113,5	PUU46	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
81	407 809	7 110 582	116,0	PUU47	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
82	408 414	7 110 457	120,0	PUU48	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
83	408 786	7 109 772	117,5	PUU49	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
84	397 208	7 115 412	88,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
85	397 754	7 114 856	87,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
86	398 503	7 115 243	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
87	398 570	7 114 265	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
88	398 871	7 113 427	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
89	399 272	7 114 459	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
90	399 647	7 113 488	95,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
91	400 360	7 113 628	100,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
92	401 168	7 113 504	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
93	402 041	7 114 329	106,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

To be continued on next page...

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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

	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]
94	402 216	7 112 963	108,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
95	402 852	7 113 666	105,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
96	402 975	7 115 189	106,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
97	395 254	7 117 093	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
98	395 819	7 117 022	83,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
99	396 195	7 116 379	82,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
100	396 858	7 116 145	85,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
101	396 894	7 117 531	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
102	397 303	7 113 442	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
103	397 417	7 117 093	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
104	397 854	7 116 507	90,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
105	398 058	7 113 189	92,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
106	398 529	7 116 484	94,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
107	399 116	7 116 184	97,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
108	399 762	7 116 032	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
109	399 974	7 114 812	98,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
110	400 456	7 116 139	99,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
111	400 698	7 115 062	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
112	401 155	7 116 430	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
113	401 348	7 114 680	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
114	401 706	7 117 283	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
115	401 754	7 116 113	103,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
116	401 837	7 118 791	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
117	402 023	7 115 337	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
118	402 362	7 116 825	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
119	402 365	7 117 878	100,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
120	402 692	7 118 655	95,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
121	402 733	7 116 070	109,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
122	402 975	7 117 005	104,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
123	403 021	7 118 167	96,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
124	396 213	7 101 101	92,7	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
125	397 616	7 100 723	97,6	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
126	397 086	7 101 114	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
127	397 318	7 100 046	97,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
128	395 741	7 100 512	93,4	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
129	396 517	7 099 615	95,1	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
130	396 717	7 100 560	95,3	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
131	397 043	7 099 258	95,9	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
132	395 944	7 099 965	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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23.11.2022 10.55/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Pyssynienen metsätie 156)	0:00
B	Lomarakennus B (Sarjankyläntie 1093)	0:00
C	Lomarakennnus C (Kurunoja)	0:00
D	Asuinrakennus D (Haapavesitie 1404)	3:09
E	Asuinrakennus E (Säilynkankaantie 34)	0:00
F	Asuinrakennus F (Ritamäentie 156)	0:00
G	Lomarakennus G (Virtaniementie 175)	0:00
H	Asuinrakennus H (Purotie 55)	0:00
I	Lomarakennus I (Hirvinevan haara 147)	0:00
J	Lomaasunto J (Pyssyniemen metsätie 2)	0:00

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (20)	0:00
2	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (21)	0:00
3	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (22)	0:00
4	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (23)	0:00
5	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (24)	0:00
6	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (25)	0:00
7	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (26)	0:00
8	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (27)	0:00
9	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (28)	0:00
10	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (29)	0:00
11	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (30)	0:00
12	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (31)	0:00
13	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (32)	0:00
14	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (33)	1:23
15	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (34)	0:00
16	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (35)	0:00
17	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (36)	0:00
18	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (37)	2:47
19	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (276)	0:00
20	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (277)	0:00
21	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (278)	0:00
22	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (279)	0:00
23	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (280)	0:00
24	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (281)	0:00
25	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (282)	0:00
26	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (283)	0:00
27	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (284)	0:00
28	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (285)	0:00
29	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (286)	0:00
30	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (287)	0:00
31	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (288)	0:00
32	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (289)	0:00
33	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (290)	0:00
34	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (291)	0:00
35	PUU01	0:00
36	PUU02	0:00
37	PUU03	0:00
38	PUU04	0:00
39	PUU05	0:00
40	PUU06	0:00
41	PUU07	0:00
42	PUU08	0:00
43	PUU09	0:00
44	PUU10	0:00
45	PUU11	0:00
46	PUU12	0:00
47	PUU13	0:00

To be continued on next page...

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23.11.2022 10.55/3.5.584

SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

No.	Name	Expected [h/year]
48	PUU14	0:00
49	PUU15	0:00
50	PUU16	0:00
51	PUU17	0:00
52	PUU18	0:00
53	PUU19	0:00
54	PUU20	0:00
55	PUU21	0:00
56	PUU22	0:00
57	PUU23	0:00
58	PUU24	0:00
59	PUU25	0:00
60	PUU26	0:00
61	PUU27	0:00
62	PUU28	0:00
63	PUU29	0:00
64	PUU30	0:00
65	PUU31	0:00
66	PUU32	0:00
67	PUU33	0:00
68	PUU34	0:00
69	PUU35	0:00
70	PUU36	0:00
71	PUU37	0:00
72	PUU38	0:00
73	PUU39	0:00
74	PUU40	0:00
75	PUU41	0:00
76	PUU42	0:00
77	PUU43	0:00
78	PUU44	0:00
79	PUU45	0:00
80	PUU46	0:00
81	PUU47	0:00
82	PUU48	0:00
83	PUU49	0:00
84	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (350)	0:00
85	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (351)	0:00
86	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (352)	0:00
87	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (353)	0:00
88	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (354)	0:00
89	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (355)	0:00
90	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (356)	0:00
91	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (357)	0:00
92	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (358)	0:00
93	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (359)	0:00
94	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (360)	0:00
95	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (361)	0:00
96	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (362)	0:00
97	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (363)	0:00
98	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (364)	0:00
99	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (365)	0:00
100	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (366)	0:00
101	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (367)	0:00
102	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (368)	0:00
103	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (369)	0:00
104	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (370)	0:00
105	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (371)	0:00
106	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (372)	0:00
107	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (373)	0:00
108	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (374)	0:00
109	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (375)	0:00
110	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (376)	0:00
111	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (377)	0:00
112	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (378)	0:00

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SHADOW - Main Result

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

No.	Name	Expected [h/year]
113	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (379)	0:00
114	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (380)	0:00
115	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (381)	0:00
116	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (382)	0:00
117	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (383)	0:00
118	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (384)	0:00
119	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (385)	0:00
120	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (386)	0:00
121	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (387)	0:00
122	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (388)	0:00
123	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (389)	0:00
124	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (470)	0:00
125	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (471)	0:00
126	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (472)	0:00
127	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (473)	0:00
128	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (474)	0:00
129	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (475)	0:00
130	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (476)	0:00
131	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (477)	0:00
132	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (478)	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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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Vasama_22_11_2022

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23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.00	09.35
	14.37	16.06	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.53	16.07	14.44
2	10.11	09.00	07.28	06.39	04.54	03.18	03.01	04.29	06.03	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.44	23.22	23.47	22.23	20.36	18.50	16.04	14.42
3	10.10	08.57	07.25	06.36	04.50	03.15	03.03	04.32	06.06	07.32	08.07	09.40
	14.41	16.13	17.43	20.15	21.48	23.24	23.45	22.20	20.33	18.46	16.01	14.40
4	10.09	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.07	08.51	07.18	06.28	04.44	03.11	03.07	04.38	06.12	07.38	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.55	14.36
6	10.06	08.48	07.14	06.25	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.51	14.34
7	10.04	08.45	07.11	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.00	23.34	23.38	22.07	20.18	18.32	15.48	14.33
8	10.03	08.42	07.07	06.18	04.33	03.04	03.14	04.48	06.21	07.47	08.23	09.53
	14.52	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.45	14.31
9	10.01	08.38	07.04	06.14	04.30	03.03	03.16	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.33	22.00	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.41	23.31	21.56	20.08	18.22	15.39	14.29
11	09.57	08.32	06.57	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.33	09.59
	15.00	16.39	18.07	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.36	14.28
12	09.55	08.29	06.53	06.04	04.20	02.56	03.24	05.00	06.32	07.59	08.36	10.01
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.53	08.25	06.50	06.00	04.17	02.55	03.27	05.03	06.35	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.46	23.24	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.57	04.14	02.54	03.30	05.06	06.38	08.05	08.42	10.05
	15.09	16.49	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.25
15	09.49	08.19	06.43	05.53	04.10	02.53	03.33	05.09	06.41	08.08	08.46	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.47	08.16	06.39	05.50	04.07	02.52	03.36	05.12	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.54	22.30	23.51	23.16	21.36	19.46	18.01	15.21	14.24
17	09.44	08.12	06.36	05.46	04.04	02.51	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.57	22.33	23.52	23.13	21.32	19.43	17.58	15.18	14.24
18	09.42	08.09	06.32	05.42	04.01	02.51	03.42	05.19	06.49	08.17	08.55	10.10
	15.21	17.02	18.28	21.00	22.36	23.53	23.10	21.29	19.39	17.54	15.16	14.24
19	09.39	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.52	08.20	08.58	10.11
	15.24	17.05	18.31	21.03	22.39	23.53	23.07	21.25	19.36	17.51	15.13	14.24
20	09.37	08.02	06.25	05.35	03.55	02.51	03.48	05.25	06.55	08.23	09.02	10.12
	15.27	17.08	18.34	21.07	22.42	23.54	23.04	21.22	19.32	17.47	15.10	14.24
21	09.34	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.30	17.12	18.37	21.10	22.46	23.54	23.01	21.18	19.29	17.44	15.07	14.24
22	09.32	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.54	22.58	21.15	19.25	17.41	15.05	14.24
23	09.29	07.52	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.54	22.55	21.11	19.22	17.37	15.02	14.25
24	09.26	07.49	06.11	05.21	03.42	02.52	04.00	05.37	07.07	08.35	09.14	10.15
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.45	06.07	05.18	03.40	02.53	04.03	05.40	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.15
	15.47	17.27	18.51	21.25	23.01	23.53	22.46	21.01	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.45	09.23	10.15
	15.50	17.30	18.54	21.28	23.04	23.53	22.43	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.26	10.14
	15.53	17.33	18.57	21.32	23.07	23.52	22.40	20.54	19.04	16.21	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.52	07.21	07.51	09.29	10.14
	15.56		20.00	21.35	23.10	23.51	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.32	10.13
	16.00		20.03	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.58		07.57		10.13
	16.03		20.06		23.16		22.30	20.43		16.11		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
FCG Finnish Consulting Group Oy
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FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: B - Lomarakennus B (Sarjankyläntie 1093)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.36	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.43
2	10.10	09.00	07.28	06.39	04.53	03.17	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.41
3	10.09	08.57	07.24	06.35	04.50	03.15	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.09	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.43	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.24	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.22	17.51	20.24	21.57	23.32	23.39	22.09	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.06	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.32
8	10.02	08.41	07.07	06.17	04.33	03.04	03.13	04.47	06.20	07.47	08.22	09.52
	14.52	16.29	17.57	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.30	03.02	03.16	04.50	06.23	07.49	08.26	09.55
	14.54	16.32	18.00	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.36	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.39	14.28
11	09.57	08.31	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	15.00	16.39	18.06	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.27
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.02	16.42	18.09	20.42	22.16	23.44	23.26	21.49	20.00	18.14	15.33	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.27	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.04
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.24	14.24
16	09.46	08.15	06.39	05.49	04.07	02.52	03.35	05.12	06.43	08.10	08.48	10.07
	15.14	16.55	18.21	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.45	04.04	02.51	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.32	23.51	23.12	21.32	19.42	17.57	15.18	14.23
18	09.41	08.08	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.02	18.27	21.00	22.36	23.52	23.09	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.36	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.25	09.04	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.04	14.24
23	09.29	07.52	06.14	05.24	03.45	02.51	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.24
24	09.26	07.48	06.10	05.21	03.42	02.52	04.00	05.36	07.06	08.35	09.14	10.14
	15.39	17.21	18.45	21.18	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.03	05.39	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.49	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.10	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.56	04.12	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.03	16.20	14.50	14.29
29	09.12		06.53	05.04	03.28	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.47	14.31
30	09.09		06.49	05.00	03.25	02.59	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.37	23.13	23.49	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.22	05.57		07.57		10.12
	16.03		20.06		23.16		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Vasama_22_11_2022

Licensed user:
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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: C - Lomarakennnus C (Kurunoja)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.04	07.32	06.42	04.57	03.19	03.00	04.25	06.00	07.27	08.01	09.35
	14.36	16.06	17.36	20.09	21.41	23.20	23.49	22.27	20.40	18.53	16.07	14.43
2	10.11	09.01	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.30	08.04	09.38
	14.38	16.09	17.39	20.12	21.45	23.22	23.48	22.24	20.36	18.50	16.04	14.41
3	10.10	08.57	07.25	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.07	09.41
	14.40	16.13	17.42	20.15	21.48	23.25	23.46	22.20	20.33	18.46	16.01	14.39
4	10.09	08.54	07.21	06.32	04.47	03.12	03.04	04.34	06.09	07.35	08.10	09.44
	14.42	16.16	17.46	20.18	21.51	23.28	23.44	22.17	20.29	18.43	15.57	14.37
5	10.08	08.51	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.46
	14.44	16.19	17.49	20.21	21.54	23.30	23.42	22.14	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.25	04.40	03.08	03.08	04.41	06.15	07.41	08.17	09.49
	14.47	16.23	17.52	20.24	21.57	23.33	23.41	22.10	20.22	18.36	15.51	14.34
7	10.05	08.45	07.11	06.21	04.36	03.05	03.11	04.44	06.18	07.44	08.20	09.51
	14.49	16.26	17.55	20.27	22.01	23.35	23.38	22.07	20.18	18.32	15.48	14.32
8	10.03	08.42	07.07	06.18	04.33	03.03	03.13	04.47	06.21	07.47	08.23	09.53
	14.52	16.29	17.58	20.30	22.04	23.38	23.36	22.03	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.15	04.50	06.24	07.50	08.26	09.56
	14.54	16.32	18.01	20.33	22.07	23.40	23.34	22.00	20.11	18.25	15.42	14.29
10	10.00	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.10	23.42	23.32	21.57	20.08	18.22	15.39	14.28
11	09.58	08.32	06.57	06.07	04.23	02.56	03.21	04.57	06.29	07.56	08.33	10.00
	15.00	16.39	18.07	20.39	22.14	23.44	23.29	21.53	20.04	18.18	15.36	14.27
12	09.56	08.29	06.53	06.03	04.20	02.55	03.23	05.00	06.32	07.59	08.36	10.02
	15.02	16.42	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.26
13	09.54	08.26	06.50	06.00	04.16	02.54	03.26	05.03	06.35	08.02	08.39	10.04
	15.05	16.46	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.11	15.30	14.25
14	09.52	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.05	08.43	10.05
	15.08	16.49	18.16	20.48	22.23	23.49	23.22	21.43	19.53	18.08	15.27	14.24
15	09.49	08.19	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08	08.46	10.07
	15.11	16.52	18.19	20.51	22.27	23.50	23.19	21.39	19.50	18.04	15.24	14.24
16	09.47	08.16	06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11	08.49	10.08
	15.14	16.55	18.22	20.54	22.30	23.52	23.16	21.36	19.46	18.01	15.21	14.23
17	09.45	08.12	06.36	05.46	04.03	02.50	03.38	05.15	06.46	08.14	08.52	10.10
	15.17	16.59	18.25	20.57	22.33	23.53	23.13	21.32	19.43	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.17	08.56	10.11
	15.20	17.02	18.28	21.00	22.36	23.54	23.10	21.29	19.39	17.54	15.15	14.23
19	09.40	08.06	06.29	05.39	03.57	02.50	03.44	05.21	06.52	08.20	08.59	10.12
	15.23	17.05	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.23	09.02	10.13
	15.27	17.08	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47	15.10	14.23
21	09.35	07.59	06.21	05.32	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.14
	15.30	17.11	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.23
22	09.32	07.56	06.18	05.28	03.48	02.50	03.53	05.30	07.01	08.29	09.08	10.14
	15.33	17.14	18.40	21.13	22.49	23.55	22.59	21.15	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.25	03.45	02.50	03.56	05.33	07.04	08.32	09.11	10.15
	15.36	17.18	18.43	21.16	22.52	23.55	22.56	21.11	19.21	17.37	15.02	14.24
24	09.27	07.49	06.11	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.15	10.15
	15.39	17.21	18.45	21.19	22.56	23.55	22.53	21.08	19.18	17.34	14.59	14.25
25	09.24	07.45	06.07	05.18	03.39	02.52	04.03	05.39	07.09	07.38	09.18	10.15
	15.43	17.24	18.48	21.22	22.59	23.55	22.49	21.04	19.14	16.30	14.57	14.26
26	09.21	07.42	06.04	05.14	03.36	02.53	04.06	05.42	07.12	07.42	09.21	10.15
	15.46	17.27	18.51	21.25	23.02	23.54	22.46	21.01	19.11	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.45	09.24	10.15
	15.49	17.30	18.54	21.29	23.05	23.54	22.43	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.57	05.07	03.30	02.55	04.12	05.48	07.18	07.48	09.27	10.15
	15.53	17.33	18.57	21.32	23.08	23.53	22.40	20.54	19.04	16.20	14.50	14.29
29	09.12		06.53	05.04	03.27	02.57	04.15	05.51	07.21	07.51	09.30	10.15
	15.56		20.00	21.35	23.11	23.52	22.37	20.50	19.00	16.17	14.47	14.30
30	09.10		06.50	05.00	03.25	02.58	04.18	05.54	07.24	07.54	09.33	10.14
	15.59		20.03	21.38	23.14	23.50	22.33	20.47	18.57	16.14	14.45	14.32
31	09.07		06.46		03.22		04.22	05.57		07.57		10.13
	16.03		20.06		23.17		22.30	20.43		16.10		14.34
Potential sun hours	171	238	363	451	569	624	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Calculated:

23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: D - Asuinrakennus D (Haapavesitie 1404)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January		February			March	April	May	June	July	August	September	October			November			December
1	10.13		09.04		10.31 (14)	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27			08.01		10.08 (18)	09.36
	14.36		16.06	30	11.01 (18)	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53			16.07	19	10.27 (18)	14.43
2	10.12		09.01		10.32 (14)	07.28	06.39	04.54	03.17	03.00	04.28	06.03	07.30			08.04		10.06 (18)	09.38
	14.38		16.09	29	11.01 (18)	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50			16.04	22	10.28 (18)	14.41
3	10.11		08.58		10.33 (14)	07.25	06.36	04.50	03.15	03.02	04.31	06.06	07.33			08.07		10.05 (18)	09.41
	14.40		16.13	28	11.01 (18)	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46			16.01	24	10.29 (18)	14.39
4	10.09		08.55		10.34 (18)	07.21	06.32	04.47	03.12	03.04	04.35	06.09	07.36			08.10		10.05 (18)	09.44
	14.42		16.16	27	11.01 (18)	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	25	10.30 (18)	14.37
5	10.08		08.52		10.34 (18)	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38			08.14		10.05 (18)	09.46
	14.44		16.19	26	11.00 (18)	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39			15.54	25	10.30 (18)	14.36
6	10.07		08.48		10.34 (18)	07.15	06.25	04.40	03.08	03.08	04.41	06.15	07.41			08.17		10.04 (18)	09.49
	14.47		16.23	26	11.00 (18)	17.52	20.24	21.58	23.33	23.41	22.10	20.22	18.36			15.51	27	10.31 (18)	14.34
7	10.05		08.45		10.36 (18)	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44			08.20		10.04 (18)	09.51
	14.49		16.26	24	11.00 (18)	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32			15.48	27	10.31 (18)	14.32
8	10.04		08.42		10.36 (18)	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47			08.23		10.03 (14)	09.54
	14.52		16.29	23	10.59 (18)	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29			15.45	28	10.31 (18)	14.31
9	10.02		08.39		10.37 (18)	07.04	06.14	04.30	03.02	03.16	04.50	06.24	07.50			08.27		10.03 (14)	09.56
	14.54		16.33	21	10.58 (18)	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25			15.42	28	10.31 (18)	14.30
10	10.00		08.36		10.38 (18)	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53			08.30		10.02 (14)	09.58
	14.57		16.36	19	10.57 (18)	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	29	10.31 (18)	14.28
11	09.58		08.32		10.41 (18)	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56			08.33		10.01 (14)	10.00
	15.00		16.39	15	10.56 (18)	18.07	20.39	22.14	23.44	23.30	21.53	20.04	18.18			15.36	30	10.31 (18)	14.27
12	09.56		08.29		10.43 (18)	06.54	06.04	04.20	02.55	03.24	05.00	06.32	07.59			08.36		10.01 (14)	10.02
	15.03		16.43	9	10.52 (18)	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15			15.33	30	10.31 (18)	14.26
13	09.54		08.26			06.50	06.00	04.17	02.54	03.26	05.03	06.35	08.02			08.40		10.01 (14)	10.04
	15.05		16.46			18.13	20.45	22.20	23.48	23.25	21.47	19.57	18.11			15.30	30	10.31 (18)	14.25
14	09.52		08.23			06.46	05.57	04.13	02.53	03.29	05.06	06.38	08.05			08.43		10.01 (14)	10.06
	15.08		16.49			18.16	20.48	22.24	23.49	23.22	21.43	19.54	18.08			15.27	29	10.30 (18)	14.25
15	09.50		08.19			06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08			08.46		10.02 (14)	10.07
	15.11		16.52			18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05			15.24	28	10.30 (18)	14.24
16	09.47		08.16			06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11			08.49		10.02 (14)	10.09
	15.14		16.56			18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01			15.21	28	10.30 (18)	14.24
17	09.45		08.13			06.36	05.46	04.04	02.51	03.38	05.15	06.47	08.14			08.53		10.02 (14)	10.10
	15.17		16.59			18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58			15.18	27	10.29 (18)	14.23
18	09.43		08.09			06.32	05.42	04.00	02.50	03.41	05.18	06.50	08.17			08.56		10.03 (14)	10.11
	15.21		17.02			18.28	21.01	22.37	23.54	23.11	21.29	19.39	17.54			15.15	25	10.28 (18)	14.23
19	09.40		08.06			06.29	05.39	03.57	02.50	03.44	05.22	06.52	08.20			08.59		10.03 (14)	10.12
	15.24		17.05			18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51			15.13	24	10.27 (18)	14.23
20	09.38		08.03		10.38 (14)	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23			09.02		10.05 (14)	10.13
	15.27	5	17.08		10.43 (14)	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47			15.10	21	10.26 (18)	14.23
21	09.35		07.59		10.34 (14)	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26			09.05		10.09 (14)	10.14
	15.30	14	17.12		10.48 (18)	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44			15.07	14	10.23 (18)	14.23
22	09.32		07.56		10.30 (14)	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29			09.09		10.14 (14)	10.15
	15.33	21	17.15		10.51 (18)	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41			15.04	5	10.19 (14)	14.24
23	09.30		07.52		10.29 (14)	06.15	05.25	03.45	02.51	03.56	05.34	07.04	08.32			09.12			10.15
	15.36	24	17.18		10.53 (18)	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37			15.02			14.24
24	09.27		07.49		10.29 (14)	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36			09.15			10.15
	15.40	25	17.21		10.54 (18)	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34			14.59			14.25
25	09.24		07.46		10.29 (14)	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39			09.18			10.16
	15.43	27	17.24		10.56 (18)	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.30			14.57			14.26
26	09.21		07.42		10.29 (14)	06.04	05.14	03.36	02.53	04.06	05.43	07.12	07.42			09.21			10.16
	15.46	28	17.27		10.57 (18)	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27			14.54			14.27
27	09.19		07.39		10.29 (14)	06.00	05.11	03.33	02.54	04.09	05.46	07.15	07.45			09.24			10.16
	15.50	29	17.30		10.58 (18)	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24			14.52			14.28
28	09.16		07.35		10.29 (14)	05.57	05.07	03.30	02.55	04.12	05.49	07.18	07.48			09.27			10.15
	15.53	29	17.33		10.58 (18)	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.20			14.50			14.29
29	09.13				10.29 (14)	06.53	05.04	03.28	02.57	04.15	05.52	07.21	07.51			09.30			10.15
	15.56	30			10.59 (18)	20.01	21.35	23.11	23.52	22.37	20.51	19.00	16.17			14.47			14.31
30	09.10				10.29 (14)	06.50	05.01	03.25	02.58	04.19	05.55	07.24	07.54		10.12 (18)	09.33			10.14
	16.00	30			10.59 (18)	20.03	21.38	23.14	23.51	22.34	20.47	18.57	16.14	10	10.22 (18)	14.45			14.32
31	09.07				10.30 (14)	06.46		03.22		04.22	05.58		07.58		10.09 (18)				10.14
	16.03	30			11.00 (18)	20.06		23.17		22.30	20.44		16.11	16	10.25 (18)				14.34
Potential sun hours	171		238			363	451	569	624	608	508	393	305			198			137
Total, worst case		292		277										26			545		
Sun reduction		0,18		0,33										0,35			0,24		
Oper. time red.		0,99		0,99										0,99			0,99		
Wind dir. red.		0,67		0,67										0,67			0,67		
Total reduction		0,12		0,22										0,23			0,16		
Total, real		36		61										6			86		

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

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

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.13	09.04	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27	08.01	09.36
	14.36	16.06	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53	16.07	14.43
2	10.12	09.01	07.28	06.39	04.54	03.17	03.00	04.28	06.04	07.30	08.04	09.38
	14.38	16.10	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50	16.04	14.41
3	10.11	08.58	07.25	06.36	04.50	03.15	03.02	04.32	06.06	07.33	08.07	09.41
	14.40	16.13	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46	16.01	14.39
4	10.09	08.55	07.22	06.32	04.47	03.12	03.04	04.35	06.09	07.36	08.10	09.44
	14.42	16.16	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43	15.58	14.38
5	10.08	08.52	07.18	06.29	04.43	03.10	03.06	04.38	06.12	07.39	08.14	09.46
	14.45	16.20	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39	15.55	14.36
6	10.07	08.48	07.15	06.25	04.40	03.08	03.09	04.41	06.15	07.41	08.17	09.49
	14.47	16.23	17.52	20.24	21.58	23.33	23.41	22.11	20.22	18.36	15.51	14.34
7	10.05	08.45	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44	08.20	09.51
	14.49	16.26	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32	15.48	14.33
8	10.04	08.42	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47	08.23	09.54
	14.52	16.30	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.16	04.51	06.24	07.50	08.27	09.56
	14.54	16.33	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25	15.42	14.30
10	10.00	08.36	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22	15.39	14.28
11	09.58	08.32	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56	08.33	10.00
	15.00	16.39	18.07	20.39	22.14	23.44	23.30	21.54	20.04	18.18	15.36	14.27
12	09.56	08.29	06.54	06.04	04.20	02.55	03.24	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.26
13	09.54	08.26	06.50	06.00	04.17	02.54	03.27	05.03	06.35	08.02	08.40	10.04
	15.06	16.46	18.13	20.46	22.20	23.48	23.24	21.47	19.57	18.12	15.30	14.25
14	09.52	08.23	06.47	05.57	04.13	02.53	03.29	05.06	06.38	08.05	08.43	10.06
	15.09	16.49	18.16	20.49	22.24	23.49	23.22	21.43	19.54	18.08	15.27	14.25
15	09.50	08.19	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08	08.46	10.07
	15.11	16.52	18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05	15.24	14.24
16	09.47	08.16	06.39	05.50	04.07	02.51	03.35	05.12	06.44	08.11	08.49	10.09
	15.14	16.56	18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01	15.21	14.24
17	09.45	08.13	06.36	05.46	04.04	02.51	03.38	05.16	06.47	08.14	08.53	10.10
	15.18	16.59	18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58	15.18	14.23
18	09.43	08.09	06.32	05.43	04.01	02.50	03.41	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.37	23.54	23.11	21.29	19.40	17.54	15.15	14.23
19	09.40	08.06	06.29	05.39	03.57	02.50	03.44	05.22	06.53	08.20	08.59	10.12
	15.24	17.05	18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51	15.13	14.23
20	09.38	08.03	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23	09.02	10.13
	15.27	17.08	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47	15.10	14.23
21	09.35	07.59	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26	09.05	10.14
	15.30	17.12	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.23
22	09.32	07.56	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29	09.09	10.15
	15.33	17.15	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41	15.05	14.24
23	09.30	07.52	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.32	09.12	10.15
	15.37	17.18	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37	15.02	14.24
24	09.27	07.49	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36	09.15	10.15
	15.40	17.21	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34	14.59	14.25
25	09.24	07.46	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39	09.18	10.16
	15.43	17.24	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.14	03.36	02.53	04.06	05.43	07.13	07.42	09.21	10.16
	15.46	17.27	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27	14.55	14.27
27	09.19	07.39	06.01	05.11	03.33	02.54	04.09	05.46	07.15	07.45	09.24	10.16
	15.50	17.30	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24	14.52	14.28
28	09.16	07.35	05.57	05.08	03.31	02.56	04.12	05.49	07.18	07.48	09.27	10.15
	15.53	17.34	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.21	14.50	14.29
29	09.13		06.53	05.04	03.28	02.57	04.16	05.52	07.21	07.51	09.30	10.15
	15.56		20.01	21.35	23.11	23.52	22.37	20.51	19.01	16.17	14.48	14.31
30	09.10		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.33	10.14
	16.00		20.04	21.38	23.14	23.51	22.34	20.47	18.57	16.14	14.45	14.32
31	09.07		06.46		03.22		04.22	05.58		07.58		10.14
	16.03		20.07		23.17		22.30	20.44		16.11		14.34
Potential sun hours	171	238	363	451	569	624	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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FI-00601 Helsinki
+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: F - Asuinrakennus F (Ritamäentie 156)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.13	09.04	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.01	09.36
	14.36	16.06	17.37	20.10	21.42	23.20	23.49	22.27	20.40	18.54	16.08	14.44
2	10.12	09.01	07.29	06.39	04.54	03.18	03.01	04.29	06.04	07.30	08.04	09.38
	14.38	16.10	17.40	20.13	21.45	23.23	23.48	22.24	20.37	18.50	16.04	14.42
3	10.11	08.58	07.25	06.36	04.50	03.15	03.03	04.32	06.07	07.33	08.07	09.41
	14.40	16.13	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.47	16.01	14.40
4	10.09	08.55	07.22	06.32	04.47	03.13	03.05	04.35	06.09	07.36	08.10	09.44
	14.43	16.16	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43	15.58	14.38
5	10.08	08.52	07.18	06.29	04.44	03.10	03.07	04.38	06.12	07.39	08.14	09.46
	14.45	16.20	17.49	20.21	21.55	23.31	23.43	22.14	20.26	18.40	15.55	14.36
6	10.07	08.48	07.15	06.25	04.40	03.08	03.09	04.41	06.15	07.42	08.17	09.49
	14.47	16.23	17.52	20.24	21.58	23.33	23.41	22.11	20.22	18.36	15.52	14.34
7	10.05	08.45	07.11	06.22	04.37	03.06	03.11	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.01	23.35	23.39	22.07	20.19	18.33	15.48	14.33
8	10.04	08.42	07.08	06.18	04.34	03.04	03.14	04.48	06.21	07.47	08.23	09.54
	14.52	16.30	17.58	20.30	22.04	23.38	23.36	22.04	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.16	04.51	06.24	07.50	08.27	09.56
	14.55	16.33	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.26	15.42	14.30
10	10.00	08.36	07.01	06.11	04.27	03.00	03.19	04.54	06.27	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22	15.39	14.29
11	09.58	08.32	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56	08.33	10.00
	15.00	16.40	18.07	20.39	22.14	23.44	23.29	21.54	20.05	18.19	15.36	14.28
12	09.56	08.29	06.54	06.04	04.20	02.56	03.24	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.43	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.27
13	09.54	08.26	06.50	06.00	04.17	02.54	03.27	05.03	06.35	08.02	08.40	10.04
	15.06	16.46	18.13	20.46	22.20	23.47	23.24	21.47	19.57	18.12	15.30	14.26
14	09.52	08.23	06.47	05.57	04.14	02.53	03.30	05.06	06.38	08.05	08.43	10.06
	15.09	16.49	18.16	20.49	22.24	23.49	23.22	21.43	19.54	18.08	15.27	14.25
15	09.50	08.19	06.43	05.53	04.10	02.52	03.33	05.09	06.41	08.08	08.46	10.07
	15.12	16.53	18.19	20.52	22.27	23.50	23.19	21.40	19.50	18.05	15.24	14.24
16	09.47	08.16	06.40	05.50	04.07	02.52	03.35	05.13	06.44	08.11	08.49	10.09
	15.15	16.56	18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01	15.21	14.24
17	09.45	08.13	06.36	05.46	04.04	02.51	03.38	05.16	06.47	08.14	08.53	10.10
	15.18	16.59	18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58	15.18	14.24
18	09.43	08.09	06.32	05.43	04.01	02.51	03.41	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.37	23.54	23.11	21.29	19.40	17.54	15.16	14.23
19	09.40	08.06	06.29	05.39	03.58	02.50	03.44	05.22	06.53	08.20	08.59	10.12
	15.24	17.05	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51	15.13	14.23
20	09.38	08.03	06.25	05.36	03.55	02.50	03.47	05.25	06.55	08.23	09.02	10.13
	15.27	17.09	18.34	21.07	22.43	23.55	23.05	21.22	19.33	17.48	15.10	14.23
21	09.35	07.59	06.22	05.32	03.51	02.50	03.51	05.28	06.58	08.26	09.05	10.14
	15.30	17.12	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.24
22	09.32	07.56	06.18	05.29	03.48	02.51	03.54	05.31	07.01	08.29	09.09	10.15
	15.34	17.15	18.40	21.13	22.50	23.55	22.59	21.15	19.25	17.41	15.05	14.24
23	09.30	07.53	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.33	09.12	10.15
	15.37	17.18	18.43	21.16	22.53	23.55	22.56	21.12	19.22	17.37	15.02	14.25
24	09.27	07.49	06.11	05.22	03.42	02.52	04.00	05.37	07.07	08.36	09.15	10.15
	15.40	17.21	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34	15.00	14.25
25	09.24	07.46	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39	09.18	10.16
	15.43	17.24	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.36	02.53	04.06	05.43	07.13	07.42	09.21	10.16
	15.47	17.27	18.52	21.26	23.02	23.54	22.47	21.01	19.11	16.27	14.55	14.27
27	09.19	07.39	06.01	05.11	03.34	02.55	04.09	05.46	07.15	07.45	09.24	10.15
	15.50	17.31	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24	14.52	14.28
28	09.16	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.27	10.15
	15.53	17.34	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.21	14.50	14.30
29	09.13		06.54	05.04	03.28	02.57	04.16	05.52	07.21	07.51	09.30	10.15
	15.56		20.01	21.35	23.11	23.52	22.37	20.51	19.01	16.17	14.48	14.31
30	09.10		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.33	10.14
	16.00		20.04	21.38	23.14	23.51	22.34	20.47	18.57	16.14	14.46	14.32
31	09.07		06.46		03.23		04.22	05.58		07.58		10.14
	16.03		20.07		23.17		22.30	20.44		16.11		14.34
Potential sun hours	171	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: G - Lomarakennus G (Virtaniementie 175)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.31	06.42	04.57	03.19	03.00	04.25	06.00	07.26	08.00	09.35
	14.36	16.06	17.36	20.09	21.41	23.19	23.48	22.26	20.39	18.53	16.07	14.43
2	10.11	09.00	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.29	08.03	09.38
	14.38	16.09	17.39	20.12	21.44	23.22	23.47	22.23	20.36	18.49	16.04	14.41
3	10.10	08.57	07.24	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.20	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.10	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.44	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.37	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.24	04.40	03.08	03.08	04.41	06.15	07.41	08.16	09.48
	14.46	16.22	17.51	20.24	21.57	23.32	23.40	22.10	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.05	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.38	22.06	20.18	18.32	15.48	14.32
8	10.03	08.41	07.07	06.17	04.33	03.03	03.13	04.47	06.20	07.47	08.23	09.53
	14.51	16.29	17.57	20.30	22.03	23.37	23.36	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.29	03.02	03.15	04.50	06.23	07.50	08.26	09.55
	14.54	16.32	18.00	20.33	22.07	23.39	23.33	21.59	20.11	18.25	15.41	14.29
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.35	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.38	14.28
11	09.57	08.32	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	14.59	16.39	18.06	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.35	14.27
12	09.55	08.28	06.53	06.03	04.19	02.55	03.23	04.59	06.32	07.58	08.36	10.01
	15.02	16.42	18.09	20.42	22.16	23.45	23.26	21.49	20.00	18.14	15.32	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.26	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.20	23.46	23.23	21.46	19.57	18.11	15.29	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.05
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.26	14.24
15	09.49	08.19	06.42	05.52	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.23	14.24
16	09.46	08.15	06.39	05.49	04.06	02.51	03.35	05.12	06.43	08.10	08.48	10.08
	15.14	16.55	18.21	20.54	22.29	23.51	23.15	21.35	19.46	18.00	15.21	14.23
17	09.44	08.12	06.35	05.45	04.03	02.50	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.33	23.52	23.13	21.32	19.42	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.01	18.27	21.00	22.36	23.53	23.10	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.26	17.08	18.33	21.06	22.42	23.54	23.04	21.21	19.32	17.47	15.09	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.08	10.14
	15.33	17.14	18.39	21.12	22.49	23.54	22.58	21.14	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.24	03.45	02.50	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.52	23.54	22.55	21.11	19.21	17.37	15.01	14.24
24	09.26	07.48	06.10	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.14	10.14
	15.39	17.20	18.45	21.19	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.02	05.39	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.30	14.56	14.26
26	09.21	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.15
	15.46	17.27	18.51	21.25	23.01	23.53	22.46	21.00	19.10	16.27	14.54	14.26
27	09.18	07.38	06.00	05.10	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.53	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.55	04.12	05.48	07.18	07.47	09.26	10.14
	15.52	17.33	18.57	21.31	23.07	23.52	22.39	20.53	19.03	16.20	14.49	14.29
29	09.12		06.53	05.03	03.27	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.51	22.36	20.50	19.00	16.17	14.47	14.30
30	09.09		06.49	05.00	03.25	02.58	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.38	23.13	23.50	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.21	05.57		07.57		10.13
	16.02		20.06		23.16		22.30	20.43		16.10		14.33
Potential sun hours	172	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Vasama_22_11_2022

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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: H - Asuinrakennus H (Purotie 55)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.37	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.44
2	10.10	09.00	07.28	06.39	04.54	03.18	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.42
3	10.09	08.57	07.24	06.35	04.50	03.15	03.03	04.32	06.06	07.32	08.06	09.40
	14.41	16.13	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.01	14.40
4	10.08	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.45	20.18	21.50	23.26	23.43	22.16	20.29	18.42	15.58	14.38
5	10.07	08.51	07.17	06.28	04.43	03.11	03.07	04.38	06.12	07.38	08.13	09.45
	14.45	16.19	17.49	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.31	23.39	22.09	20.22	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.19	09.50
	14.50	16.26	17.55	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.33
8	10.02	08.41	07.07	06.18	04.33	03.04	03.14	04.47	06.21	07.47	08.22	09.52
	14.52	16.29	17.58	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.00	08.38	07.03	06.14	04.30	03.03	03.16	04.51	06.23	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.27	03.01	03.19	04.54	06.26	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.40	23.30	21.56	20.07	18.22	15.39	14.29
11	09.57	08.32	06.56	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.32	09.59
	15.00	16.39	18.07	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.28
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.03	16.42	18.10	20.42	22.16	23.44	23.26	21.49	20.00	18.15	15.33	14.27
13	09.53	08.25	06.49	06.00	04.17	02.55	03.27	05.03	06.35	08.01	08.39	10.02
	15.06	16.46	18.13	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.56	04.14	02.54	03.30	05.06	06.38	08.04	08.42	10.04
	15.09	16.49	18.16	20.48	22.23	23.47	23.20	21.42	19.53	18.08	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.53	03.33	05.09	06.41	08.07	08.45	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.46	08.15	06.39	05.49	04.07	02.52	03.36	05.12	06.43	08.10	08.48	10.07
	15.15	16.55	18.22	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.46	04.04	02.52	03.39	05.15	06.46	08.13	08.52	10.09
	15.18	16.59	18.25	20.57	22.32	23.51	23.12	21.32	19.43	17.57	15.18	14.24
18	09.41	08.09	06.32	05.42	04.01	02.51	03.42	05.18	06.49	08.16	08.55	10.10
	15.21	17.02	18.27	21.00	22.35	23.52	23.09	21.28	19.39	17.54	15.15	14.24
19	09.39	08.05	06.28	05.39	03.58	02.51	03.45	05.21	06.52	08.19	08.58	10.11
	15.24	17.05	18.30	21.03	22.39	23.53	23.06	21.25	19.35	17.51	15.13	14.24
20	09.36	08.02	06.25	05.35	03.54	02.51	03.48	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.24
21	09.34	07.58	06.21	05.32	03.51	02.51	03.51	05.28	06.58	08.26	09.04	10.12
	15.30	17.11	18.36	21.09	22.45	23.53	23.01	21.18	19.28	17.44	15.07	14.24
22	09.31	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.05	14.24
23	09.29	07.52	06.14	05.25	03.45	02.52	03.57	05.34	07.03	08.32	09.11	10.14
	15.37	17.18	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.25
24	09.26	07.48	06.11	05.21	03.42	02.52	04.00	05.37	07.06	08.35	09.14	10.14
	15.40	17.21	18.45	21.19	22.54	23.53	22.52	21.07	19.18	17.34	15.00	14.26
25	09.23	07.45	06.07	05.18	03.39	02.53	04.03	05.40	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.48	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.04	05.14	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.44	09.23	10.14
	15.50	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.56	05.07	03.31	02.56	04.13	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.04	16.20	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.51	07.21	07.50	09.29	10.13
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.49	05.00	03.25	02.59	04.19	05.54	07.23	07.54	09.32	10.13
	16.00		20.03	21.37	23.13	23.49	22.33	20.46	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.57		07.57		10.12
	16.03		20.06		23.15		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.04	07.32	06.43	04.58	03.21	03.00	04.26	06.01	07.27	08.01	09.35
	14.37	16.07	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.54	16.08	14.44
2	10.11	09.01	07.28	06.39	04.54	03.18	03.02	04.29	06.04	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.45	23.22	23.47	22.24	20.36	18.50	16.05	14.42
3	10.10	08.58	07.25	06.36	04.51	03.16	03.03	04.32	06.07	07.33	08.07	09.41
	14.41	16.13	17.43	20.15	21.48	23.25	23.45	22.20	20.33	18.47	16.01	14.40
4	10.09	08.54	07.22	06.32	04.47	03.13	03.05	04.35	06.10	07.36	08.10	09.43
	14.43	16.17	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.08	08.51	07.18	06.29	04.44	03.11	03.07	04.38	06.13	07.39	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.14	20.26	18.40	15.55	14.37
6	10.06	08.48	07.15	06.25	04.41	03.09	03.10	04.42	06.15	07.42	08.17	09.48
	14.48	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.52	14.35
7	10.05	08.45	07.11	06.22	04.37	03.07	03.12	04.45	06.18	07.44	08.20	09.51
	14.50	16.27	17.55	20.27	22.01	23.35	23.38	22.07	20.19	18.33	15.49	14.33
8	10.03	08.42	07.08	06.18	04.34	03.05	03.14	04.48	06.21	07.47	08.23	09.53
	14.53	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.46	14.32
9	10.01	08.39	07.04	06.15	04.31	03.03	03.17	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.34	22.00	20.12	18.26	15.43	14.31
10	09.59	08.35	07.01	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.30	09.58
	14.58	16.36	18.04	20.36	22.10	23.41	23.31	21.57	20.08	18.22	15.39	14.29
11	09.58	08.32	06.57	06.08	04.24	03.00	03.22	04.57	06.30	07.56	08.33	10.00
	15.01	16.40	18.07	20.39	22.14	23.43	23.29	21.53	20.04	18.19	15.36	14.28
12	09.56	08.29	06.54	06.04	04.21	02.57	03.25	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.54	08.26	06.50	06.00	04.17	02.55	03.28	05.04	06.36	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.12	15.30	14.26
14	09.51	08.22	06.47	05.57	04.14	02.54	03.30	05.07	06.38	08.05	08.43	10.05
	15.09	16.50	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.26
15	09.49	08.19	06.43	05.53	04.11	02.53	03.33	05.10	06.41	08.08	08.46	10.07
	15.12	16.53	18.19	20.52	22.27	23.50	23.19	21.40	19.50	18.05	15.25	14.25
16	09.47	08.16	06.40	05.50	04.08	02.53	03.36	05.13	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.55	22.30	23.51	23.16	21.36	19.47	18.01	15.22	14.25
17	09.45	08.13	06.36	05.46	04.04	02.52	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.58	22.33	23.52	23.13	21.33	19.43	17.58	15.19	14.24
18	09.42	08.09	06.33	05.43	04.01	02.52	03.42	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.36	23.53	23.10	21.29	19.40	17.55	15.16	14.24
19	09.40	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.53	08.20	08.59	10.12
	15.24	17.06	18.31	21.04	22.39	23.53	23.07	21.26	19.36	17.51	15.13	14.24
20	09.37	08.03	06.25	05.36	03.55	02.51	03.48	05.25	06.56	08.23	09.02	10.13
	15.28	17.09	18.34	21.07	22.43	23.54	23.04	21.22	19.33	17.48	15.11	14.24
21	09.35	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.31	17.12	18.37	21.10	22.46	23.54	23.01	21.19	19.29	17.44	15.08	14.24
22	09.32	07.56	06.18	05.29	03.49	02.52	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.55	22.58	21.15	19.25	17.41	15.05	14.25
23	09.29	07.52	06.15	05.25	03.46	02.52	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.55	22.55	21.12	19.22	17.38	15.03	14.25
24	09.27	07.49	06.11	05.22	03.43	02.53	04.00	05.37	07.07	08.36	09.14	10.15
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.46	06.08	05.18	03.40	02.53	04.04	05.40	07.10	07.39	09.18	10.15
	15.44	17.25	18.49	21.22	22.58	23.54	22.49	21.05	19.15	16.31	14.58	14.27
26	09.21	07.42	06.04	05.15	03.37	02.54	04.07	05.43	07.13	07.42	09.21	10.15
	15.47	17.28	18.52	21.26	23.01	23.54	22.46	21.01	19.11	16.28	14.55	14.28
27	09.18	07.39	06.01	05.11	03.34	02.56	04.10	05.46	07.16	07.45	09.24	10.15
	15.50	17.31	18.55	21.29	23.05	23.53	22.43	20.58	19.08	16.24	14.53	14.29
28	09.15	07.35	05.57	05.08	03.31	02.57	04.13	05.49	07.18	07.48	09.27	10.15
	15.54	17.34	18.58	21.32	23.08	23.52	22.40	20.54	19.04	16.21	14.51	14.30
29	09.12		06.54	05.05	03.29	02.58	04.16	05.52	07.21	07.51	09.30	10.14
	15.57		20.01	21.35	23.11	23.51	22.37	20.51	19.01	16.18	14.48	14.32
30	09.10		06.50	05.01	03.26	03.00	04.19	05.55	07.24	07.54	09.32	10.14
	16.00		20.04	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.07		06.46		03.23		04.23	05.58		07.57		10.13
	16.03		20.07		23.16		22.30	20.43		16.11		14.35
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Vasama_22_11_2022

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Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Calendar

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: J - Lomaasunto J (Pyssyniemen metsätie 2)

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
550	413	384	423	625	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.00	09.35
	14.37	16.06	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.53	16.07	14.44
2	10.11	09.00	07.28	06.39	04.54	03.18	03.01	04.29	06.03	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.44	23.22	23.47	22.23	20.36	18.50	16.04	14.42
3	10.10	08.57	07.25	06.36	04.50	03.15	03.03	04.32	06.06	07.32	08.07	09.40
	14.41	16.13	17.43	20.15	21.48	23.24	23.45	22.20	20.33	18.46	16.01	14.40
4	10.09	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.07	08.51	07.18	06.28	04.44	03.11	03.07	04.38	06.12	07.38	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.55	14.36
6	10.06	08.48	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.52	14.35
7	10.04	08.45	07.11	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.00	23.34	23.38	22.07	20.18	18.32	15.48	14.33
8	10.03	08.42	07.07	06.18	04.34	03.04	03.14	04.48	06.21	07.47	08.23	09.53
	14.52	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.45	14.32
9	10.01	08.38	07.04	06.14	04.30	03.03	03.16	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.33	22.00	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.29	09.57
	14.58	16.36	18.04	20.36	22.10	23.41	23.31	21.56	20.08	18.22	15.39	14.29
11	09.57	08.32	06.57	06.07	04.24	02.58	03.22	04.57	06.30	07.56	08.33	09.59
	15.00	16.39	18.07	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.36	14.28
12	09.55	08.29	06.53	06.04	04.20	02.56	03.24	05.00	06.32	07.59	08.36	10.01
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.53	08.25	06.50	06.00	04.17	02.55	03.27	05.03	06.35	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.46	23.24	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.57	04.14	02.54	03.30	05.06	06.38	08.05	08.42	10.05
	15.09	16.49	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.25
15	09.49	08.19	06.43	05.53	04.10	02.53	03.33	05.09	06.41	08.08	08.46	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.05	15.24	14.25
16	09.47	08.16	06.39	05.50	04.07	02.52	03.36	05.13	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.54	22.30	23.51	23.16	21.36	19.46	18.01	15.21	14.24
17	09.44	08.12	06.36	05.46	04.04	02.52	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.57	22.33	23.52	23.13	21.32	19.43	17.58	15.18	14.24
18	09.42	08.09	06.32	05.43	04.01	02.51	03.42	05.19	06.50	08.17	08.55	10.10
	15.21	17.02	18.28	21.00	22.36	23.53	23.10	21.29	19.39	17.54	15.16	14.24
19	09.39	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.52	08.20	08.58	10.11
	15.24	17.05	18.31	21.03	22.39	23.53	23.07	21.25	19.36	17.51	15.13	14.24
20	09.37	08.02	06.25	05.35	03.55	02.51	03.48	05.25	06.55	08.23	09.02	10.12
	15.27	17.08	18.34	21.07	22.42	23.54	23.04	21.22	19.32	17.47	15.10	14.24
21	09.34	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.30	17.12	18.37	21.10	22.46	23.54	23.01	21.18	19.29	17.44	15.07	14.24
22	09.32	07.56	06.18	05.28	03.49	02.51	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.54	22.58	21.15	19.25	17.41	15.05	14.24
23	09.29	07.52	06.15	05.25	03.45	02.52	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.54	22.55	21.11	19.22	17.37	15.02	14.25
24	09.26	07.49	06.11	05.21	03.43	02.52	04.00	05.37	07.07	08.35	09.14	10.14
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.45	06.07	05.18	03.40	02.53	04.03	05.40	07.09	07.38	09.17	10.15
	15.43	17.24	18.49	21.22	22.58	23.54	22.49	21.04	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.15
	15.47	17.27	18.51	21.25	23.01	23.53	22.46	21.01	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.10	05.46	07.15	07.45	09.23	10.15
	15.50	17.30	18.54	21.28	23.04	23.53	22.43	20.57	19.07	16.24	14.52	14.29
28	09.15	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.26	10.14
	15.53	17.33	18.57	21.32	23.07	23.52	22.40	20.54	19.04	16.21	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.52	07.21	07.51	09.29	10.14
	15.56		20.00	21.35	23.10	23.51	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.50	05.01	03.26	02.59	04.19	05.55	07.24	07.54	09.32	10.13
	16.00		20.03	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.58		07.57		10.13
	16.03		20.06		23.16		22.30	20.43		16.11		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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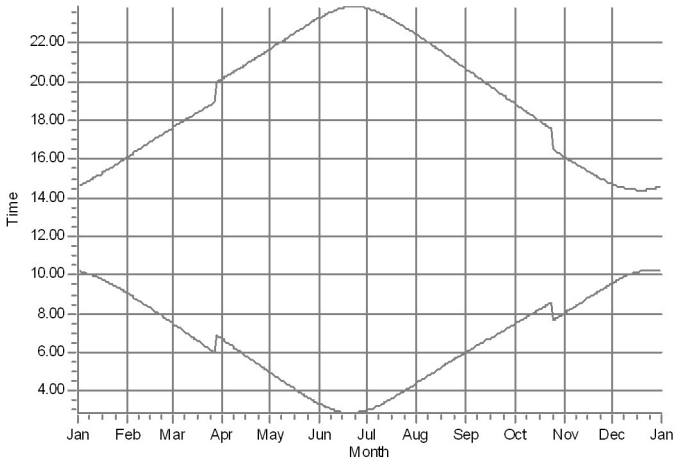
Calculated:
23.11.2022 10.55/3.5.584

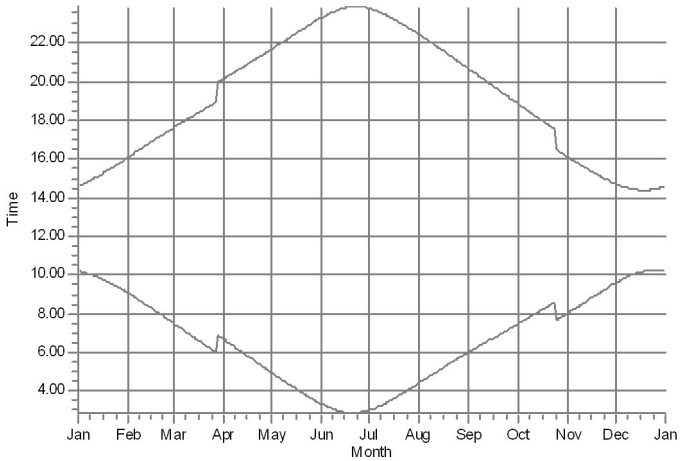
SHADOW - Calendar, graphical

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

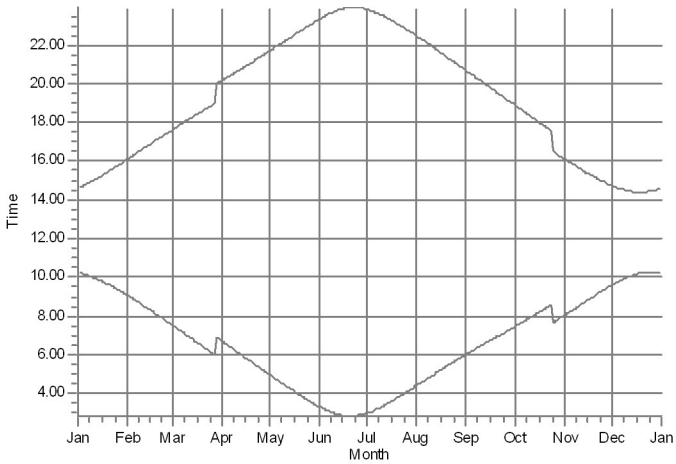
A: Lomarakennus A (Pyssynienen metsätie 156)



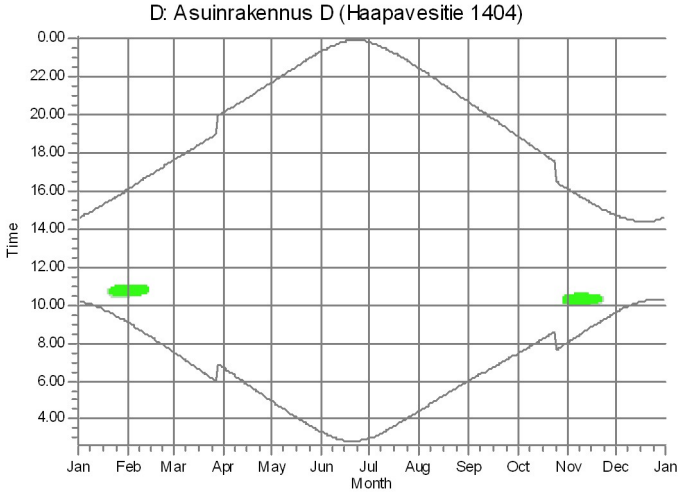
B: Lomarakennus B (Sarjankyläntie 1093)



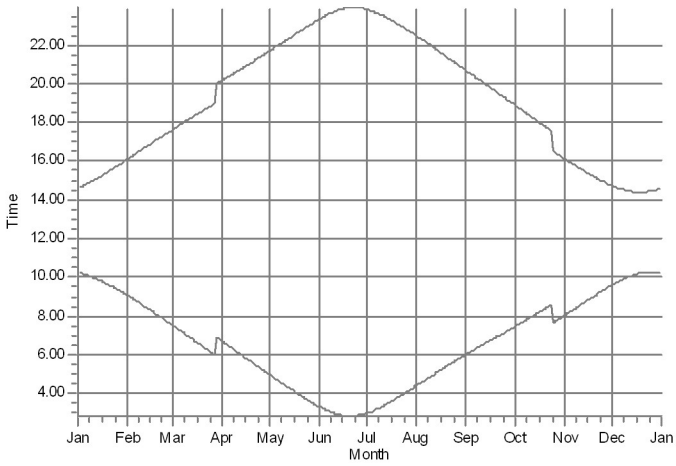
C: Lomarakennnus C (Kurunoja)



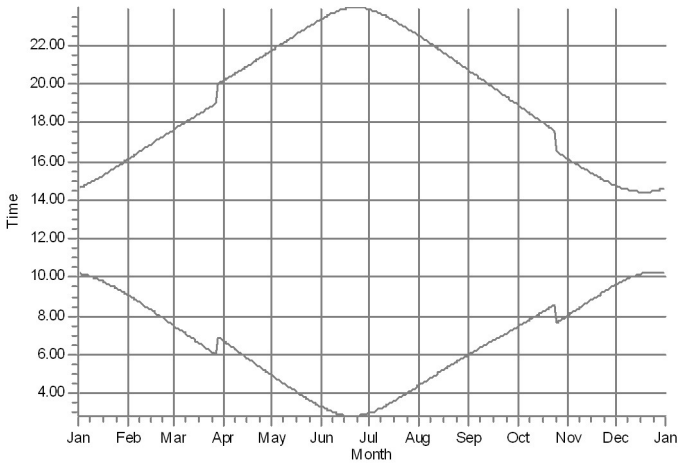
D: Asuinrakennus D (Haapavesitie 1404)



E: Asuinrakennus E (Säilynkankaantie 34)



F: Asuinrakennus F (Ritamäentie 156)



WTGs
14: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (33)
18: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (37)

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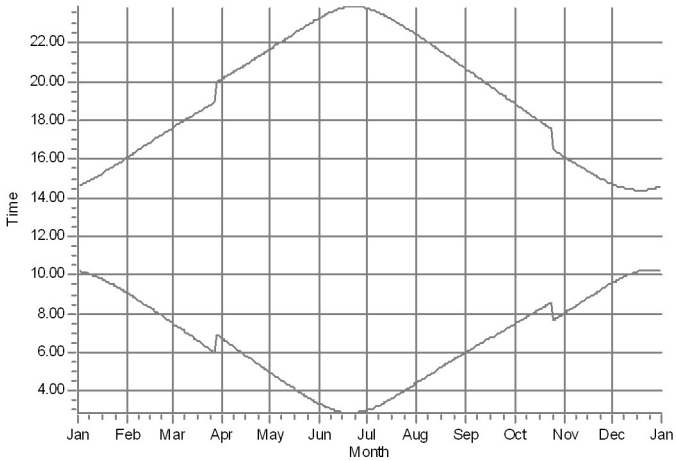
Calculated:
23.11.2022 10.55/3.5.584

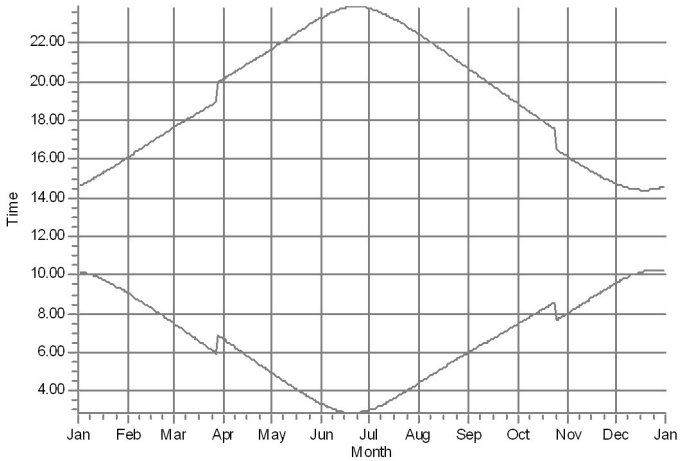
SHADOW - Calendar, graphical

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

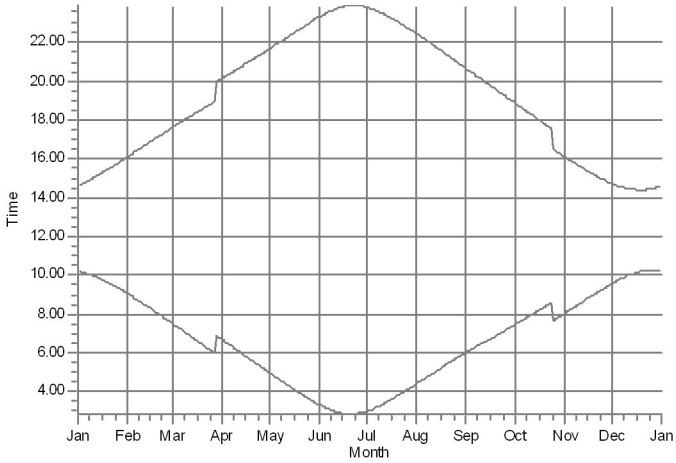
G: Lomarakennus G (Virtaniementie 175)



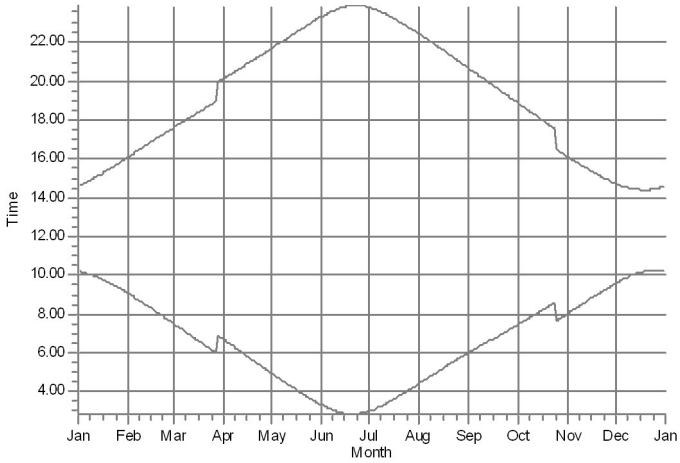
H: Asuinrakennus H (Purotie 55)



I: Lomarakennus I (Hirvinevan haara 147)



J: Lomaasunto J (Pyssyniemen metsätie 2)



WTG:

Project:
Vasama_22_11_2022

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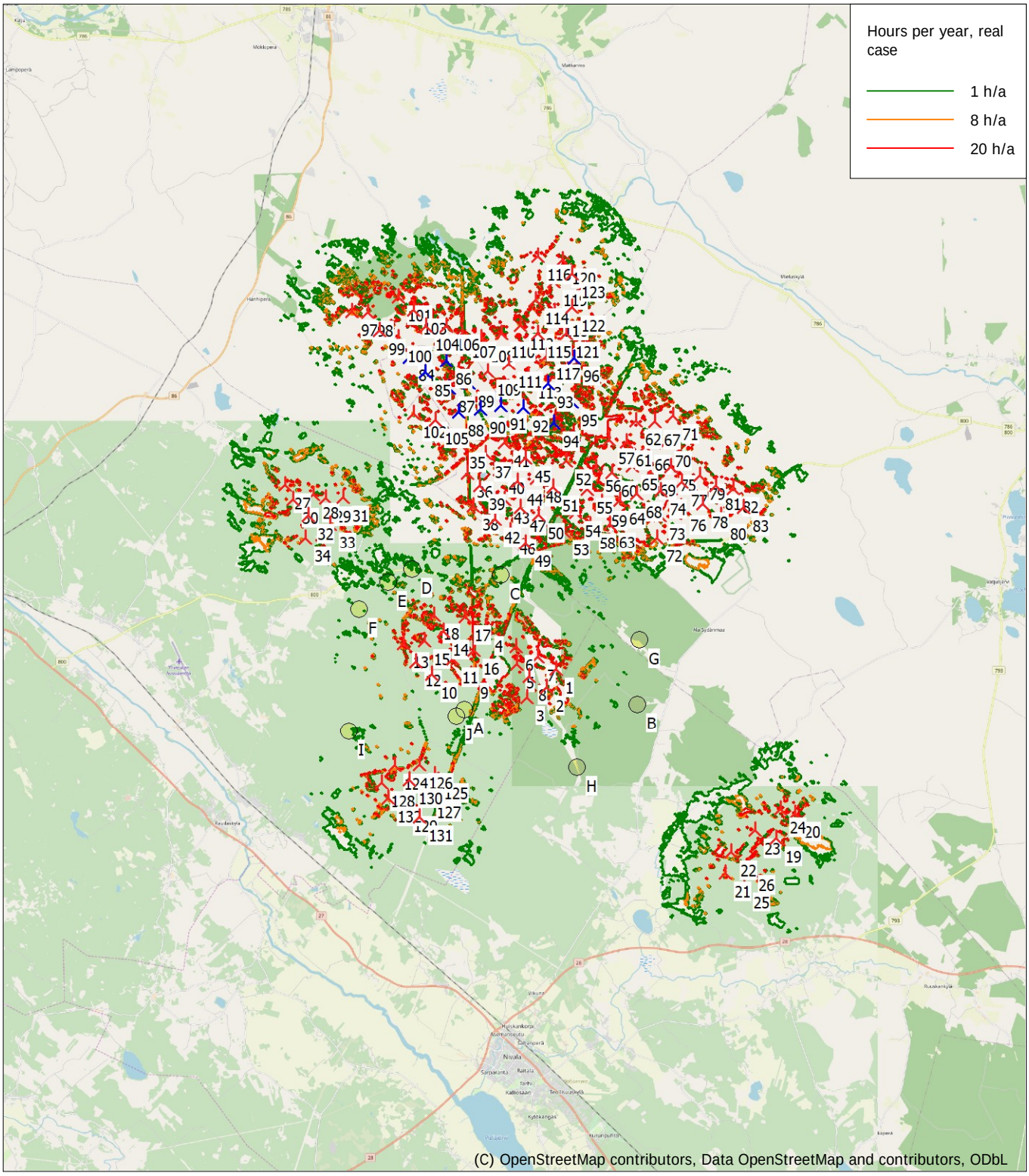
Calculated:
23.11.2022 10.55/3.5.584

SHADOW - Map

Calculation: Vasama VE1_RD200 x 18 x HH200 + Yhteisvaikutus_real case Luke forest_20221122



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 340 North: 7 107 810

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Vasama_5_5_2022_0.wpo (1)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Liite 7. Vasaman tuulivoimahanke VE2 – varjostusmallinnuksen tulokset ”Real Case, no forest”

Project:
Vasama_22_11_2022

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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

Assumptions for shadow calculations

Maximum distance for influence	2 500	m
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-2_N64,00_E025,00 (5)

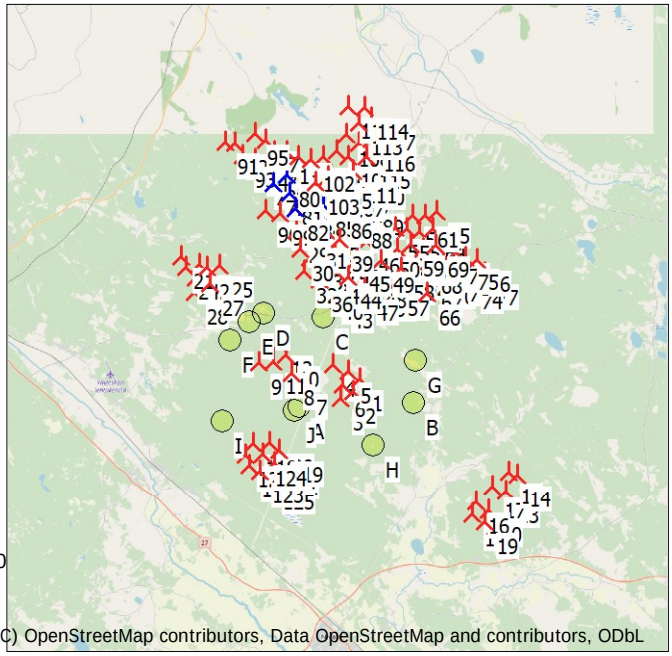
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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_Vasama_5_5_2022_0
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:400 000
New WTG
Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	402 014	7 104 309	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
2	401 637	7 103 661	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
3	400 968	7 103 344	104,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
4	400 636	7 105 142	105,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
5	401 395	7 104 737	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
6	401 057	7 104 087	103,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
7	399 017	7 104 219	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
8	398 397	7 104 778	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
9	396 683	7 105 368	98,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
10	398 090	7 105 743	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
11	397 412	7 105 444	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
12	397 770	7 106 329	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
13	409 573	7 098 129	122,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
14	410 264	7 098 972	122,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
15	407 742	7 096 948	109,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
16	407 993	7 097 672	109,3	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
17	408 857	7 098 427	115,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
18	409 752	7 099 120	115,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
19	408 404	7 096 567	110,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
20	408 619	7 097 160	117,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
21	392 697	7 111 104	82,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
22	393 696	7 110 723	85,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
23	394 124	7 110 573	88,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
24	392 964	7 110 572	83,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
25	394 736	7 110 600	89,8	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
26	393 462	7 109 982	84,9	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
27	394 233	7 109 674	87,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
28	393 349	7 109 200	84,2	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
29	398 896	7 112 332	92,5	PUU01	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
30	399 097	7 111 286	95,0	PUU02	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
31	399 784	7 111 972	97,5	PUU03	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
32	399 264	7 110 151	97,2	PUU04	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
33	399 536	7 110 832	95,4	PUU05	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
34	400 239	7 111 382	97,5	PUU06	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

To be continued on next page...

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23.11.2022 10.28/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

	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]
35	400 444	7 112 292	97,3	PUU07	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
36	400 019	7 109 649	100,0	PUU08	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
37	400 380	7 110 348	100,0	PUU09	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
38	400 876	7 110 966	99,4	PUU10	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
39	401 152	7 111 752	100,0	PUU11	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
40	400 549	7 109 232	102,5	PUU12	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
41	400 953	7 110 020	102,5	PUU13	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
42	401 537	7 111 046	104,5	PUU14	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
43	401 068	7 108 792	105,0	PUU15	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
44	401 564	7 109 758	104,1	PUU16	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
45	402 089	7 110 702	107,5	PUU17	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
46	402 589	7 111 603	106,9	PUU18	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
47	402 455	7 109 148	112,5	PUU19	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
48	402 889	7 109 778	110,0	PUU20	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
49	403 318	7 110 593	107,5	PUU21	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
50	403 622	7 111 352	106,3	PUU22	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
51	404 117	7 112 276	103,7	PUU23	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
52	403 379	7 109 327	115,0	PUU24	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
53	403 790	7 110 129	108,2	PUU25	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
54	404 210	7 111 152	105,6	PUU26	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
55	404 739	7 112 199	105,0	PUU27	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
56	405 100	7 112 943	100,6	PUU28	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
57	404 061	7 109 351	110,0	PUU29	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
58	404 420	7 110 174	106,8	PUU30	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
59	404 900	7 111 381	105,0	PUU31	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
60	405 395	7 112 030	102,5	PUU32	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
61	405 740	7 112 891	100,2	PUU33	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
62	405 042	7 110 380	105,9	PUU34	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
63	405 532	7 111 130	103,8	PUU35	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
64	406 114	7 112 133	103,1	PUU36	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
65	406 380	7 113 067	107,2	PUU37	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
66	405 707	7 108 791	111,2	PUU38	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
67	405 822	7 109 587	108,6	PUU39	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
68	405 893	7 110 455	104,7	PUU40	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
69	406 257	7 111 298	104,1	PUU41	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
70	406 558	7 109 872	106,5	PUU42	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
71	406 638	7 110 744	106,0	PUU43	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
72	407 324	7 109 954	108,3	PUU44	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
73	407 269	7 110 957	112,5	PUU45	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
74	407 963	7 109 542	113,5	PUU46	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
75	407 809	7 110 582	116,0	PUU47	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
76	408 414	7 110 457	120,0	PUU48	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
77	408 786	7 109 772	117,5	PUU49	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
78	397 208	7 115 412	88,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
79	397 754	7 114 856	87,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
80	398 503	7 115 243	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
81	398 570	7 114 265	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
82	398 871	7 113 427	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
83	399 272	7 114 459	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
84	399 647	7 113 488	95,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
85	400 360	7 113 628	100,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
86	401 168	7 113 504	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
87	402 041	7 114 329	106,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
88	402 216	7 112 963	108,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
89	402 852	7 113 666	105,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
90	402 975	7 115 189	106,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
91	395 254	7 117 093	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
92	395 819	7 117 022	83,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
93	396 195	7 116 379	82,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
94	396 858	7 116 145	85,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
95	396 894	7 117 531	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
96	397 303	7 113 442	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
97	397 417	7 117 093	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
98	397 854	7 116 507	90,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

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SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

	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]
99	398 058	7 113 189	92,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
100	398 529	7 116 484	94,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
101	399 116	7 116 184	97,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
102	399 762	7 116 032	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
103	399 974	7 114 812	98,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
104	400 456	7 116 139	99,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
105	400 698	7 115 062	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
106	401 155	7 116 430	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
107	401 348	7 114 680	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
108	401 706	7 117 283	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
109	401 754	7 116 113	103,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
110	401 837	7 118 791	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
111	402 023	7 115 337	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
112	402 362	7 116 825	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
113	402 365	7 117 878	100,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
114	402 692	7 118 655	95,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
115	402 733	7 116 070	109,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
116	402 975	7 117 005	104,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
117	403 021	7 118 167	96,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
118	396 213	7 101 101	92,7	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
119	397 616	7 100 723	97,6	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
120	397 086	7 101 114	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
121	397 318	7 100 046	97,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
122	395 741	7 100 512	93,4	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
123	396 517	7 099 615	95,1	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
124	396 717	7 100 560	95,3	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
125	397 043	7 099 258	95,9	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
126	395 944	7 099 965	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Pyssynienen metsätie 156)	2:37
B	Lomarakennus B (Sarjankyläntie 1093)	0:00
C	Lomarakennnus C (Kurunoja)	0:00
D	Asuinrakennus D (Haapavesitie 1404)	3:09
E	Asuinrakennus E (Säilynkankaantie 34)	5:39
F	Asuinrakennus F (Ritamäentie 156)	2:17
G	Lomarakennus G (Virtaniementie 175)	0:00
H	Asuinrakennus H (Purotie 55)	0:00
I	Lomarakennus I (Hirvinevan haara 147)	3:17
J	Lomaasunto J (Pyssyniemen metsätie 2)	2:54

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23.11.2022 10.28/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (38)	0:00
2	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (39)	0:00
3	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (40)	1:39
4	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (41)	0:00
5	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (42)	0:00
6	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (43)	0:00
7	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (44)	0:00
8	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (45)	0:00
9	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (46)	4:15
10	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (47)	1:23
11	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (48)	1:28
12	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (49)	4:59
13	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (276)	0:00
14	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (277)	0:00
15	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (278)	0:00
16	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (279)	0:00
17	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (280)	0:00
18	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (281)	0:00
19	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (282)	0:00
20	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (283)	0:00
21	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (284)	0:00
22	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (285)	0:00
23	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (286)	0:00
24	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (287)	0:00
25	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (288)	0:00
26	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (289)	0:00
27	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (290)	0:00
28	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (291)	0:00
29	PUU01	0:00
30	PUU02	0:00
31	PUU03	0:00
32	PUU04	0:00
33	PUU05	0:00
34	PUU06	0:00
35	PUU07	0:00
36	PUU08	0:00
37	PUU09	0:00
38	PUU10	0:00
39	PUU11	0:00
40	PUU12	0:00
41	PUU13	0:00
42	PUU14	0:00
43	PUU15	0:00
44	PUU16	0:00
45	PUU17	0:00
46	PUU18	0:00
47	PUU19	0:00
48	PUU20	0:00
49	PUU21	0:00
50	PUU22	0:00
51	PUU23	0:00
52	PUU24	0:00
53	PUU25	0:00
54	PUU26	0:00
55	PUU27	0:00
56	PUU28	0:00
57	PUU29	0:00
58	PUU30	0:00
59	PUU31	0:00
60	PUU32	0:00
61	PUU33	0:00
62	PUU34	0:00
63	PUU35	0:00
64	PUU36	0:00
65	PUU37	0:00

To be continued on next page...

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23.11.2022 10.28/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

...continued from previous page

No.	Name	Expected [h/year]
66	PUU38	0:00
67	PUU39	0:00
68	PUU40	0:00
69	PUU41	0:00
70	PUU42	0:00
71	PUU43	0:00
72	PUU44	0:00
73	PUU45	0:00
74	PUU46	0:00
75	PUU47	0:00
76	PUU48	0:00
77	PUU49	0:00
78	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (350)	0:00
79	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (351)	0:00
80	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (352)	0:00
81	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (353)	0:00
82	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (354)	0:00
83	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (355)	0:00
84	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (356)	0:00
85	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (357)	0:00
86	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (358)	0:00
87	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (359)	0:00
88	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (360)	0:00
89	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (361)	0:00
90	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (362)	0:00
91	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (363)	0:00
92	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (364)	0:00
93	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (365)	0:00
94	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (366)	0:00
95	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (367)	0:00
96	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (368)	0:00
97	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (369)	0:00
98	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (370)	0:00
99	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (371)	0:00
100	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (372)	0:00
101	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (373)	0:00
102	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (374)	0:00
103	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (375)	0:00
104	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (376)	0:00
105	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (377)	0:00
106	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (378)	0:00
107	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (379)	0:00
108	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (380)	0:00
109	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (381)	0:00
110	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (382)	0:00
111	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (383)	0:00
112	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (384)	0:00
113	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (385)	0:00
114	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (386)	0:00
115	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (387)	0:00
116	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (388)	0:00
117	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (389)	0:00
118	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (470)	1:45
119	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (471)	1:25
120	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (472)	1:42
121	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (473)	0:00
122	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (474)	1:31
123	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (475)	0:00
124	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (476)	0:00
125	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (477)	0:00
126	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (478)	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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

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23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February			March	April			May	June
1	10.12	09.03		15.11 (120)	07.32	06.43			04.57	03.20
	14.37	16.06	5	15.16 (120)	17.37	20.09			21.41	23.19
2	10.11	09.00		15.10 (120)	07.28	06.39			04.54	03.18
	14.39	16.10	10	15.20 (120)	17.40	20.12			21.44	23.22
3	10.10	08.57		15.09 (120)	07.25	06.36			04.50	03.15
	14.41	16.13	15	15.24 (120)	17.43	20.15			21.48	23.24
4	10.09	08.54		15.09 (120)	07.21	06.32			04.47	03.13
	14.43	16.16	17	15.26 (120)	17.46	20.18			21.51	23.27
5	10.07	08.51		15.10 (120)	07.18	06.28			04.44	03.11
	14.45	16.20	17	15.27 (120)	17.49	20.21			21.54	23.30
6	10.06	08.48		15.09 (120)	07.14	06.25			04.40	03.08
	14.47	16.23	18	15.27 (120)	17.52	20.24			21.57	23.32
7	10.04	08.45		15.09 (120)	07.11	06.21			04.37	03.06
	14.50	16.26	18	15.27 (120)	17.55	20.27			22.00	23.34
8	10.03	08.42		15.10 (120)	07.07	06.18		06.50 (3)	04.33	03.04
	14.52	16.30	16	15.26 (120)	17.58	20.30	7	06.57 (3)	22.04	23.37
9	10.01	08.38		15.11 (120)	07.04	06.14		06.47 (3)	04.30	03.03
	14.55	16.33	15	15.26 (120)	18.01	20.33	12	06.59 (3)	22.07	23.39
10	09.59	08.35		15.12 (120)	07.00	06.11		06.43 (3)	04.27	03.01
	14.57	16.36	13	15.25 (120)	18.04	20.36	16	06.59 (3)	22.10	23.41
11	09.57	08.32		15.13 (120)	06.57	06.07		06.41 (3)	04.23	02.58
	15.00	16.39	11	15.24 (120)	18.07	20.39	19	07.00 (3)	22.13	23.43
12	09.55	08.29		15.16 (120)	06.53	06.04		06.41 (3)	04.20	02.56
	15.03	16.43	5	15.21 (120)	18.10	20.42	20	07.01 (3)	22.17	23.45
13	09.53	08.25			06.50	06.00		06.40 (3)	04.17	02.55
	15.06	16.46			18.13	20.45	20	07.00 (3)	22.20	23.46
14	09.51	08.22			06.46	05.57		06.40 (3)	04.14	02.54
	15.09	16.49			18.16	20.48	21	07.01 (3)	22.23	23.48
15	09.49	08.19			06.43	05.53		06.39 (3)	04.10	02.53
	15.12	16.52			18.19	20.51	21	07.00 (3)	22.26	23.49
16	09.47	08.16			06.39	05.50		06.39 (3)	04.07	02.52
	15.15	16.56			18.22	20.54	20	06.59 (3)	22.30	23.51
17	09.44	08.12			06.36	05.46		06.40 (3)	04.04	02.51
	15.18	16.59			18.25	20.57	19	06.59 (3)	22.33	23.52
18	09.42	08.09			06.32	05.42		06.40 (3)	04.01	02.51
	15.21	17.02			18.28	21.00	17	06.57 (3)	22.36	23.53
19	09.39	08.06			06.29	05.39		06.41 (3)	03.58	02.51
	15.24	17.05			18.31	21.03	15	06.56 (3)	22.39	23.53
20	09.37	08.02			06.25	05.35		06.42 (3)	03.55	02.51
	15.27	17.08			18.34	21.07	12	06.54 (3)	22.42	23.54
21	09.34	07.59			06.22	05.32		06.45 (3)	03.52	02.51
	15.30	17.12			18.37	21.10	7	06.52 (3)	22.46	23.54
22	09.32	07.55			06.18	05.28			03.48	02.51
	15.34	17.15			18.40	21.13			22.49	23.54
23	09.29	07.52			06.15	05.25			03.45	02.51
	15.37	17.18			18.43	21.16			22.52	23.54
24	09.26	07.49			06.11	05.21			03.42	02.52
	15.40	17.21			18.46	21.19			22.55	23.54
25	09.24	07.45			06.07	05.18			03.40	02.53
	15.43	17.24			18.48	21.22			22.58	23.54
26	09.21	07.42			06.04	05.15			03.37	02.54
	15.47	17.27			18.51	21.25			23.01	23.53
27	09.18	07.38			06.00	05.11			03.34	02.55
	15.50	17.30			18.54	21.28			23.04	23.53
28	09.15	07.35			05.57	05.08			03.31	02.56
	15.53	17.33			18.57	21.32			23.07	23.52
29	09.12				06.53	05.04			03.28	02.58
	15.56				20.00	21.35			23.10	23.51
30	09.09				06.50	05.01			03.25	02.59
	16.00				20.03	21.38			23.13	23.50
31	09.06				06.46				03.23	
	16.03				20.06				23.16	
Potential sun hours	172	238			363	451			569	623
Total, worst case			160				226			
Sun reduction			0,33				0,41			
Oper. time red.			0,99				0,99			
Wind dir. red.			0,62				0,61			
Total reduction			0,21				0,25			
Total, real			33				55			

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

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

Project:

Vasama_22_11_2022

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SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	July	August		September			October			November			December
1	03.01	04.25		06.01		06.40 (3)	07.27			08.00		14.41 (120)	09.35
	23.48	22.27		20.40	19	06.59 (3)	18.53			16.07	14	14.55 (120)	14.44
2	03.01	04.29		06.03		06.42 (3)	07.30			08.04		14.40 (120)	09.38
	23.47	22.23		20.36	16	06.58 (3)	18.50			16.04	16	14.56 (120)	14.42
3	03.03	04.32		06.06		06.45 (3)	07.32			08.07		14.40 (120)	09.40
	23.45	22.20		20.33	12	06.57 (3)	18.46			16.01	17	14.57 (120)	14.40
4	03.05	04.35		06.09		06.47 (3)	07.35			08.10		14.39 (120)	09.43
	23.44	22.17		20.29	7	06.54 (3)	18.43			15.58	17	14.56 (120)	14.38
5	03.07	04.38		06.12			07.38			08.13		14.39 (120)	09.46
	23.42	22.13		20.25			18.39			15.55	18	14.57 (120)	14.36
6	03.09	04.41		06.15			07.41			08.16		14.39 (120)	09.48
	23.40	22.10		20.22			18.36			15.51	18	14.57 (120)	14.34
7	03.12	04.44		06.18			07.44			08.20		14.39 (120)	09.51
	23.38	22.07		20.18			18.32			15.48	18	14.57 (120)	14.33
8	03.14	04.48		06.21			07.47			08.23		14.40 (120)	09.53
	23.36	22.03		20.15			18.29			15.45	14	14.54 (120)	14.31
9	03.16	04.51		06.24			07.50			08.26		14.41 (120)	09.55
	23.33	22.00		20.11			18.25			15.42	9	14.50 (120)	14.30
10	03.19	04.54		06.27			07.53			08.29		14.42 (120)	09.57
	23.31	21.56		20.08			18.22			15.39	4	14.46 (120)	14.29
11	03.22	04.57		06.29			07.56			08.33			09.59
	23.29	21.53		20.04			18.18			15.36			14.28
12	03.24	05.00		06.32			07.59			08.36			10.01
	23.26	21.50		20.01			18.15			15.33			14.27
13	03.27	05.03		06.35			08.02			08.39			10.03
	23.24	21.46		19.57			18.11			15.30			14.26
14	03.30	05.06		06.38			08.05			08.42			10.05
	23.21	21.43		19.54			18.08			15.27			14.25
15	03.33	05.09		06.41			08.08			08.46			10.06
	23.18	21.39		19.50			18.04			15.24			14.25
16	03.36	05.12		06.44			08.11			08.49			10.08
	23.16	21.36		19.46			18.01			15.21			14.24
17	03.39	05.16		06.47			08.14			08.52			10.09
	23.13	21.32		19.43			17.58			15.18			14.24
18	03.42	05.19		06.49			08.17			08.55			10.10
	23.10	21.29		19.39			17.54			15.16			14.24
19	03.45	05.22		06.52			08.20			08.58			10.11
	23.07	21.25		19.36			17.51			15.13			14.24
20	03.48	05.25		06.55			08.23			09.02			10.12
	23.04	21.22		19.32			17.47			15.10			14.24
21	03.51	05.28		06.58			08.26			09.05			10.13
	23.01	21.18		19.29			17.44			15.07			14.24
22	03.54	05.31		06.49 (3)	07.01		08.29			09.08			10.14
	22.58	21.15	8	06.57 (3)	19.25		17.41			15.05			14.24
23	03.57	05.34		06.46 (3)	07.04		08.32			09.11			10.14
	22.55	21.11	12	06.58 (3)	19.22		17.37			15.02			14.25
24	04.00	05.37		06.44 (3)	07.07		08.35			09.14			10.15
	22.52	21.08	16	07.00 (3)	19.18		17.34			15.00			14.26
25	04.03	05.40		06.43 (3)	07.09		07.38			09.17			10.15
	22.49	21.04	18	07.01 (3)	19.14		16.31			14.57			14.26
26	04.06	05.43		06.42 (3)	07.12		07.41			09.20			10.15
	22.46	21.01	20	07.02 (3)	19.11		16.27			14.55			14.27
27	04.09	05.46		06.41 (3)	07.15		07.45			09.23			10.15
	22.43	20.57	20	07.01 (3)	19.07		16.24			14.52			14.28
28	04.13	05.49		06.40 (3)	07.18		07.48			09.26			10.14
	22.40	20.54	21	07.01 (3)	19.04		16.21			14.50			14.30
29	04.16	05.52		06.40 (3)	07.21		07.51			09.29			10.14
	22.36	20.50	21	07.01 (3)	19.00		16.17			14.48			14.31
30	04.19	05.55		06.40 (3)	07.24		07.54		14.45 (120)	09.32			10.13
	22.33	20.47	21	07.01 (3)	18.57		16.14	7	14.52 (120)	14.46			14.33
31	04.22	05.58		06.40 (3)			07.57		14.42 (120)				10.13
	22.30	20.43	20	07.00 (3)			16.11	11	14.53 (120)				14.34
Potential sun hours	608	508			393		305			199			138
Total, worst case			177			54		18			145		
Sun reduction			0,31			0,33		0,35			0,24		
Oper. time red.			0,99			0,99		0,99			0,99		
Wind dir. red.			0,61			0,61		0,62			0,62		
Total reduction			0,19			0,20		0,21			0,15		
Total, real			33			11		4			21		

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

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

Project:
Vasama_22_11_2022

Licensed user:
FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: B - Lomarakennus B (Sarjankyläntie 1093)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.36	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.43
2	10.10	09.00	07.28	06.39	04.53	03.17	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.41
3	10.09	08.57	07.24	06.35	04.50	03.15	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.09	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.43	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.24	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.22	17.51	20.24	21.57	23.32	23.39	22.09	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.06	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.32
8	10.02	08.41	07.07	06.17	04.33	03.04	03.13	04.47	06.20	07.47	08.22	09.52
	14.52	16.29	17.57	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.30	03.02	03.16	04.50	06.23	07.49	08.26	09.55
	14.54	16.32	18.00	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.36	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.39	14.28
11	09.57	08.31	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	15.00	16.39	18.06	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.27
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.02	16.42	18.09	20.42	22.16	23.44	23.26	21.49	20.00	18.14	15.33	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.27	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.04
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.24	14.24
16	09.46	08.15	06.39	05.49	04.07	02.52	03.35	05.12	06.43	08.10	08.48	10.07
	15.14	16.55	18.21	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.45	04.04	02.51	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.32	23.51	23.12	21.32	19.42	17.57	15.18	14.23
18	09.41	08.08	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.02	18.27	21.00	22.36	23.52	23.09	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.36	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.25	09.04	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.04	14.24
23	09.29	07.52	06.14	05.24	03.45	02.51	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.24
24	09.26	07.48	06.10	05.21	03.42	02.52	04.00	05.36	07.06	08.35	09.14	10.14
	15.39	17.21	18.45	21.18	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.03	05.39	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.49	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.10	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.56	04.12	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.03	16.20	14.50	14.29
29	09.12		06.53	05.04	03.28	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.47	14.31
30	09.09		06.49	05.00	03.25	02.59	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.37	23.13	23.49	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.22	05.57		07.57		10.12
	16.03		20.06		23.16		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

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Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: C - Lomarakennnus C (Kurunoja)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.04	07.32	06.42	04.57	03.19	03.00	04.25	06.00	07.27	08.01	09.35
	14.36	16.06	17.36	20.09	21.41	23.20	23.49	22.27	20.40	18.53	16.07	14.43
2	10.11	09.01	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.30	08.04	09.38
	14.38	16.09	17.39	20.12	21.45	23.22	23.48	22.24	20.36	18.50	16.04	14.41
3	10.10	08.57	07.25	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.07	09.41
	14.40	16.13	17.42	20.15	21.48	23.25	23.46	22.20	20.33	18.46	16.01	14.39
4	10.09	08.54	07.21	06.32	04.47	03.12	03.04	04.34	06.09	07.35	08.10	09.44
	14.42	16.16	17.46	20.18	21.51	23.28	23.44	22.17	20.29	18.43	15.57	14.37
5	10.08	08.51	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.46
	14.44	16.19	17.49	20.21	21.54	23.30	23.42	22.14	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.25	04.40	03.08	03.08	04.41	06.15	07.41	08.17	09.49
	14.47	16.23	17.52	20.24	21.57	23.33	23.41	22.10	20.22	18.36	15.51	14.34
7	10.05	08.45	07.11	06.21	04.36	03.05	03.11	04.44	06.18	07.44	08.20	09.51
	14.49	16.26	17.55	20.27	22.01	23.35	23.38	22.07	20.18	18.32	15.48	14.32
8	10.03	08.42	07.07	06.18	04.33	03.03	03.13	04.47	06.21	07.47	08.23	09.53
	14.52	16.29	17.58	20.30	22.04	23.38	23.36	22.03	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.15	04.50	06.24	07.50	08.26	09.56
	14.54	16.32	18.01	20.33	22.07	23.40	23.34	22.00	20.11	18.25	15.42	14.29
10	10.00	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.10	23.42	23.32	21.57	20.08	18.22	15.39	14.28
11	09.58	08.32	06.57	06.07	04.23	02.56	03.21	04.57	06.29	07.56	08.33	10.00
	15.00	16.39	18.07	20.39	22.14	23.44	23.29	21.53	20.04	18.18	15.36	14.27
12	09.56	08.29	06.53	06.03	04.20	02.55	03.23	05.00	06.32	07.59	08.36	10.02
	15.02	16.42	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.26
13	09.54	08.26	06.50	06.00	04.16	02.54	03.26	05.03	06.35	08.02	08.39	10.04
	15.05	16.46	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.11	15.30	14.25
14	09.52	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.05	08.43	10.05
	15.08	16.49	18.16	20.48	22.23	23.49	23.22	21.43	19.53	18.08	15.27	14.24
15	09.49	08.19	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08	08.46	10.07
	15.11	16.52	18.19	20.51	22.27	23.50	23.19	21.39	19.50	18.04	15.24	14.24
16	09.47	08.16	06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11	08.49	10.08
	15.14	16.55	18.22	20.54	22.30	23.52	23.16	21.36	19.46	18.01	15.21	14.23
17	09.45	08.12	06.36	05.46	04.03	02.50	03.38	05.15	06.46	08.14	08.52	10.10
	15.17	16.59	18.25	20.57	22.33	23.53	23.13	21.32	19.43	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.17	08.56	10.11
	15.20	17.02	18.28	21.00	22.36	23.54	23.10	21.29	19.39	17.54	15.15	14.23
19	09.40	08.06	06.29	05.39	03.57	02.50	03.44	05.21	06.52	08.20	08.59	10.12
	15.23	17.05	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.23	09.02	10.13
	15.27	17.08	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47	15.10	14.23
21	09.35	07.59	06.21	05.32	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.14
	15.30	17.11	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.23
22	09.32	07.56	06.18	05.28	03.48	02.50	03.53	05.30	07.01	08.29	09.08	10.14
	15.33	17.14	18.40	21.13	22.49	23.55	22.59	21.15	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.25	03.45	02.50	03.56	05.33	07.04	08.32	09.11	10.15
	15.36	17.18	18.43	21.16	22.52	23.55	22.56	21.11	19.21	17.37	15.02	14.24
24	09.27	07.49	06.11	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.15	10.15
	15.39	17.21	18.45	21.19	22.56	23.55	22.53	21.08	19.18	17.34	14.59	14.25
25	09.24	07.45	06.07	05.18	03.39	02.52	04.03	05.39	07.09	07.38	09.18	10.15
	15.43	17.24	18.48	21.22	22.59	23.55	22.49	21.04	19.14	16.30	14.57	14.26
26	09.21	07.42	06.04	05.14	03.36	02.53	04.06	05.42	07.12	07.42	09.21	10.15
	15.46	17.27	18.51	21.25	23.02	23.54	22.46	21.01	19.11	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.45	09.24	10.15
	15.49	17.30	18.54	21.29	23.05	23.54	22.43	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.57	05.07	03.30	02.55	04.12	05.48	07.18	07.48	09.27	10.15
	15.53	17.33	18.57	21.32	23.08	23.53	22.40	20.54	19.04	16.20	14.50	14.29
29	09.12		06.53	05.04	03.27	02.57	04.15	05.51	07.21	07.51	09.30	10.15
	15.56		20.00	21.35	23.11	23.52	22.37	20.50	19.00	16.17	14.47	14.30
30	09.10		06.50	05.00	03.25	02.58	04.18	05.54	07.24	07.54	09.33	10.14
	15.59		20.03	21.38	23.14	23.50	22.33	20.47	18.57	16.14	14.45	14.32
31	09.07		06.46		03.22		04.22	05.57		07.57		10.13
	16.03		20.06		23.17		22.30	20.43		16.10		14.34
Potential sun hours	171	238	363	451	569	624	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:

23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: D - Asuinrakennus D (Haapavesitie 1404)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January		February			March	April	May	June	July	August	September	October			November			December
1	10.13		09.04		10.31 (10)	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27			08.01		10.08 (12)	09.36
	14.36		16.06	30	11.01 (12)	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53			16.07	19	10.27 (12)	14.43
2	10.12		09.01		10.32 (10)	07.28	06.39	04.54	03.17	03.00	04.28	06.03	07.30			08.04		10.06 (12)	09.38
	14.38		16.09	29	11.01 (12)	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50			16.04	22	10.28 (12)	14.41
3	10.11		08.58		10.33 (10)	07.25	06.36	04.50	03.15	03.02	04.31	06.06	07.33			08.07		10.05 (12)	09.41
	14.40		16.13	28	11.01 (12)	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46			16.01	24	10.29 (12)	14.39
4	10.09		08.55		10.34 (10)	07.21	06.32	04.47	03.12	03.04	04.35	06.09	07.36			08.10		10.05 (12)	09.44
	14.42		16.16	27	11.01 (12)	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	25	10.30 (12)	14.37
5	10.08		08.52		10.34 (12)	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38			08.14		10.05 (12)	09.46
	14.44		16.19	26	11.00 (12)	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39			15.54	25	10.30 (12)	14.36
6	10.07		08.48		10.34 (12)	07.15	06.25	04.40	03.08	03.08	04.41	06.15	07.41			08.17		10.04 (12)	09.49
	14.47		16.23	26	11.00 (12)	17.52	20.24	21.58	23.33	23.41	22.10	20.22	18.36			15.51	27	10.31 (12)	14.34
7	10.05		08.45		10.36 (12)	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44			08.20		10.04 (12)	09.51
	14.49		16.26	24	11.00 (12)	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32			15.48	27	10.31 (12)	14.32
8	10.04		08.42		10.36 (12)	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47			08.23		10.03 (10)	09.54
	14.52		16.29	23	10.59 (12)	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29			15.45	28	10.31 (12)	14.31
9	10.02		08.39		10.37 (12)	07.04	06.14	04.30	03.02	03.16	04.50	06.24	07.50			08.27		10.03 (10)	09.56
	14.54		16.33	21	10.58 (12)	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25			15.42	28	10.31 (12)	14.30
10	10.00		08.36		10.38 (12)	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53			08.30		10.02 (10)	09.58
	14.57		16.36	19	10.57 (12)	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	29	10.31 (12)	14.28
11	09.58		08.32		10.41 (12)	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56			08.33		10.01 (10)	10.00
	15.00		16.39	15	10.56 (12)	18.07	20.39	22.14	23.44	23.30	21.53	20.04	18.18			15.36	30	10.31 (12)	14.27
12	09.56		08.29		10.43 (12)	06.54	06.04	04.20	02.55	03.24	05.00	06.32	07.59			08.36		10.01 (10)	10.02
	15.03		16.43	9	10.52 (12)	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15			15.33	30	10.31 (12)	14.26
13	09.54		08.26			06.50	06.00	04.17	02.54	03.26	05.03	06.35	08.02			08.40		10.01 (10)	10.04
	15.05		16.46			18.13	20.45	22.20	23.48	23.25	21.47	19.57	18.11			15.30	30	10.31 (12)	14.25
14	09.52		08.23			06.46	05.57	04.13	02.53	03.29	05.06	06.38	08.05			08.43		10.01 (10)	10.06
	15.08		16.49			18.16	20.48	22.24	23.49	23.22	21.43	19.54	18.08			15.27	29	10.30 (12)	14.25
15	09.50		08.19			06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08			08.46		10.02 (10)	10.07
	15.11		16.52			18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05			15.24	28	10.30 (12)	14.24
16	09.47		08.16			06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11			08.49		10.02 (10)	10.09
	15.14		16.56			18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01			15.21	28	10.30 (12)	14.24
17	09.45		08.13			06.36	05.46	04.04	02.51	03.38	05.15	06.47	08.14			08.53		10.02 (10)	10.10
	15.17		16.59			18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58			15.18	27	10.29 (12)	14.23
18	09.43		08.09			06.32	05.42	04.00	02.50	03.41	05.18	06.50	08.17			08.56		10.03 (10)	10.11
	15.21		17.02			18.28	21.01	22.37	23.54	23.11	21.29	19.39	17.54			15.15	25	10.28 (12)	14.23
19	09.40		08.06			06.29	05.39	03.57	02.50	03.44	05.22	06.52	08.20			08.59		10.03 (10)	10.12
	15.24		17.05			18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51			15.13	24	10.27 (12)	14.23
20	09.38		08.03		10.38 (10)	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23			09.02		10.05 (10)	10.13
	15.27	5	17.08		10.43 (10)	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47			15.10	21	10.26 (12)	14.23
21	09.35		07.59		10.34 (10)	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26			09.05		10.09 (10)	10.14
	15.30	14	17.12		10.48 (12)	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44			15.07	14	10.23 (12)	14.23
22	09.32		07.56		10.30 (10)	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29			09.09		10.14 (10)	10.15
	15.33	21	17.15		10.51 (12)	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41			15.04	5	10.19 (10)	14.24
23	09.30		07.52		10.29 (10)	06.15	05.25	03.45	02.51	03.56	05.34	07.04	08.32			09.12			10.15
	15.36	24	17.18		10.53 (12)	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37			15.02			14.24
24	09.27		07.49		10.29 (10)	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36			09.15			10.15
	15.40	25	17.21		10.54 (12)	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34			14.59			14.25
25	09.24		07.46		10.29 (10)	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39			09.18			10.16
	15.43	27	17.24		10.56 (12)	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.30			14.57			14.26
26	09.21		07.42		10.29 (10)	06.04	05.14	03.36	02.53	04.06	05.43	07.12	07.42			09.21			10.16
	15.46	28	17.27		10.57 (12)	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27			14.54			14.27
27	09.19		07.39		10.29 (10)	06.00	05.11	03.33	02.54	04.09	05.46	07.15	07.45			09.24			10.16
	15.50	29	17.30		10.58 (12)	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24			14.52			14.28
28	09.16		07.35		10.29 (10)	05.57	05.07	03.30	02.55	04.12	05.49	07.18	07.48			09.27			10.15
	15.53	29	17.33		10.58 (12)	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.20			14.50			14.29
29	09.13				10.29 (10)	06.53	05.04	03.28	02.57	04.15	05.52	07.21	07.51			09.30			10.15
	15.56	30			10.59 (12)	20.01	21.35	23.11	23.52	22.37	20.51	19.00	16.17			14.47			14.31
30	09.10				10.29 (10)	06.50	05.01	03.25	02.58	04.19	05.55	07.24	07.54		10.12 (12)	09.33			10.14
	16.00	30			10.59 (12)	20.03	21.38	23.14	23.51	22.34	20.47	18.57	16.14	10	10.22 (12)	14.45			14.32
31	09.07				10.30 (10)	06.46		03.22		04.22	05.58		07.58		10.09 (12)				10.14
	16.03	30			11.00 (12)	20.06		23.17		22.30	20.44		16.11	16	10.25 (12)				14.34
Potential sun hours	171		238			363	451	569	624	608	508	393	305			198			137
Total, worst case		292		277										26			545		
Sun reduction		0,18		0,33										0,35			0,24		
Oper. time red.		0,99		0,99										0,99			0,99		
Wind dir. red.		0,67		0,67										0,67			0,67		
Total reduction		0,12		0,22										0,23			0,16		
Total, real		36		61										6			86		

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

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

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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March			April	May	June
1	10.13			09.04		10.09 (11)	07.32		08.42 (12)	06.43	04.57	03.20
	14.36			16.06	23	11.33 (9)	17.37	21	09.03 (12)	20.09	21.42	23.20
2	10.12			09.01		10.09 (11)	07.28		08.42 (12)	06.39	04.54	03.17
	14.38			16.10	21	10.30 (11)	17.40	19	09.01 (12)	20.12	21.45	23.23
3	10.11			08.58		10.09 (11)	07.25		08.44 (12)	06.36	04.50	03.15
	14.40			16.13	20	10.29 (11)	17.43	16	09.00 (12)	20.15	21.48	23.25
4	10.09			08.55		10.10 (11)	07.22		08.46 (12)	06.32	04.47	03.12
	14.42			16.16	19	10.29 (11)	17.46	11	08.57 (12)	20.18	21.51	23.28
5	10.08			08.52		10.10 (11)	07.18			06.29	04.43	03.10
	14.45			16.20	19	10.29 (11)	17.49			20.21	21.54	23.31
6	10.07			08.48		10.10 (11)	07.15			06.25	04.40	03.08
	14.47			16.23	18	10.28 (11)	17.52			20.24	21.58	23.33
7	10.05			08.45		10.12 (11)	07.11			06.21	04.37	03.06
	14.49			16.26	16	10.28 (11)	17.55			20.27	22.01	23.36
8	10.04			08.42		10.14 (11)	07.08			06.18	04.33	03.04
	14.52			16.30	12	10.26 (11)	17.58			20.30	22.04	23.38
9	10.02		11.25 (9)	08.39		10.16 (11)	07.04			06.14	04.30	03.02
	14.54	5	11.30 (9)	16.33	7	10.23 (11)	18.01			20.33	22.07	23.40
10	10.00		11.21 (9)	08.36			07.01			06.11	04.27	03.00
	14.57	11	11.32 (9)	16.36			18.04			20.36	22.11	23.42
11	09.58		11.19 (9)	08.32			06.57			06.07	04.23	02.57
	15.00	14	11.33 (9)	16.39			18.07			20.39	22.14	23.44
12	09.56		11.18 (9)	08.29			06.54			06.04	04.20	02.55
	15.03	16	11.34 (9)	16.43			18.10			20.42	22.17	23.46
13	09.54		11.18 (9)	08.26			06.50			06.00	04.17	02.54
	15.06	17	11.35 (9)	16.46			18.13			20.46	22.20	23.48
14	09.52		11.18 (9)	08.23			06.47			05.57	04.13	02.53
	15.09	19	11.37 (9)	16.49			18.16			20.49	22.24	23.49
15	09.50		11.17 (9)	08.19			06.43			05.53	04.10	02.52
	15.11	20	11.37 (9)	16.52			18.19			20.52	22.27	23.51
16	09.47		11.18 (9)	08.16			06.39			05.50	04.07	02.51
	15.14	20	11.38 (9)	16.56			18.22			20.55	22.30	23.52
17	09.45		11.18 (9)	08.13		08.52 (12)	06.36			05.46	04.04	02.51
	15.18	21	11.39 (9)	16.59	3	08.55 (12)	18.25			20.58	22.33	23.53
18	09.43		11.18 (9)	08.09		08.48 (12)	06.32			05.43	04.01	02.50
	15.21	21	11.39 (9)	17.02	12	09.00 (12)	18.28			21.01	22.37	23.54
19	09.40		11.18 (9)	08.06		08.46 (12)	06.29			05.39	03.57	02.50
	15.24	22	11.40 (9)	17.05	16	09.02 (12)	18.31			21.04	22.40	23.55
20	09.38		11.18 (9)	08.03		08.44 (12)	06.25			05.35	03.54	02.50
	15.27	23	11.41 (9)	17.08	19	09.03 (12)	18.34			21.07	22.43	23.55
21	09.35		11.19 (9)	07.59		08.43 (12)	06.22			05.32	03.51	02.50
	15.30	22	11.41 (9)	17.12	20	09.03 (12)	18.37			21.10	22.46	23.55
22	09.32		11.19 (9)	07.56		08.42 (12)	06.18			05.28	03.48	02.50
	15.33	22	11.41 (9)	17.15	23	09.05 (12)	18.40			21.13	22.50	23.56
23	09.30		11.19 (9)	07.52		08.41 (12)	06.15			05.25	03.45	02.51
	15.37	23	11.42 (9)	17.18	24	09.05 (12)	18.43			21.16	22.53	23.56
24	09.27		11.20 (9)	07.49		08.41 (12)	06.11			05.21	03.42	02.51
	15.40	22	11.42 (9)	17.21	24	09.05 (12)	18.46			21.19	22.56	23.55
25	09.24		10.18 (11)	07.46		08.41 (12)	06.08			05.18	03.39	02.52
	15.43	28	11.42 (9)	17.24	24	09.05 (12)	18.49			21.23	22.59	23.55
26	09.21		10.14 (11)	07.42		08.41 (12)	06.04			05.14	03.36	02.53
	15.46	31	11.41 (9)	17.27	24	09.05 (12)	18.52			21.26	23.02	23.55
27	09.19		10.10 (11)	07.39		08.41 (12)	06.01			05.11	03.33	02.54
	15.50	36	11.41 (9)	17.30	23	09.04 (12)	18.55			21.29	23.05	23.54
28	09.16		10.09 (11)	07.35		08.42 (12)	05.57			05.08	03.31	02.56
	15.53	37	11.41 (9)	17.34	22	09.04 (12)	18.58			21.32	23.08	23.53
29	09.13		10.09 (11)				06.53			05.04	03.28	02.57
	15.56	36	11.40 (9)				20.01			21.35	23.11	23.52
30	09.10		10.09 (11)				06.50			05.01	03.25	02.59
	16.00	34	11.39 (9)				20.04			21.38	23.14	23.51
31	09.07		10.08 (11)				06.46				03.22	
	16.03	31	11.37 (9)				20.07				23.17	
Potential sun hours	171			238			363			451	569	624
Total, worst case		531			389			67				
Sun reduction		0,18			0,33			0,32				
Oper. time red.		0,99			0,99			0,99				
Wind dir. red.		0,66			0,65			0,64				
Total reduction		0,12			0,22			0,21				
Total, real		65			84			14				

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	July	August	September	October			November			December		
1	03.00	04.25	06.01	07.27			08.01			09.36		11.01 (9)
	23.49	22.27	20.40	18.53			16.07			14.43	14	11.15 (9)
2	03.00	04.28	06.04	07.30			08.04		09.45 (11)	09.38		11.03 (9)
	23.48	22.24	20.36	18.50			16.04	8	09.53 (11)	14.41	12	11.15 (9)
3	03.02	04.32	06.06	07.33			08.07		09.43 (11)	09.41		11.09 (9)
	23.46	22.21	20.33	18.46			16.01	13	09.56 (11)	14.39	5	11.14 (9)
4	03.04	04.35	06.09	07.36			08.10		09.42 (11)	09.44		
	23.45	22.17	20.29	18.43			15.58	15	09.57 (11)	14.38		
5	03.06	04.38	06.12	07.39			08.14		09.41 (11)	09.46		
	23.43	22.14	20.26	18.39			15.55	17	09.58 (11)	14.36		
6	03.09	04.41	06.15	07.41			08.17		09.40 (11)	09.49		
	23.41	22.11	20.22	18.36			15.51	19	09.59 (11)	14.34		
7	03.11	04.44	06.18	07.44			08.20		09.40 (11)	09.51		
	23.39	22.07	20.19	18.32			15.48	20	10.00 (11)	14.33		
8	03.13	04.47	06.21	07.47			08.23		09.40 (11)	09.54		
	23.37	22.04	20.15	18.29			15.45	20	10.00 (11)	14.31		
9	03.16	04.51	06.24	07.50		09.22 (12)	08.27		09.40 (11)	09.56		
	23.34	22.00	20.12	18.25	8	09.30 (12)	15.42	20	10.00 (11)	14.30		
10	03.18	04.54	06.27	07.53		09.19 (12)	08.30		09.40 (11)	09.58		
	23.32	21.57	20.08	18.22	14	09.33 (12)	15.39	24	11.05 (9)	14.28		
11	03.21	04.57	06.30	07.56		09.17 (12)	08.33		09.40 (11)	10.00		
	23.30	21.54	20.04	18.18	17	09.34 (12)	15.36	31	11.09 (9)	14.27		
12	03.24	05.00	06.33	07.59		09.15 (12)	08.36		09.40 (11)	10.02		
	23.27	21.50	20.01	18.15	20	09.35 (12)	15.33	34	11.10 (9)	14.26		
13	03.27	05.03	06.35	08.02		09.15 (12)	08.40		09.41 (11)	10.04		
	23.24	21.47	19.57	18.12	22	09.37 (12)	15.30	35	11.12 (9)	14.25		
14	03.29	05.06	06.38	08.05		09.14 (12)	08.43		09.41 (11)	10.06		
	23.22	21.43	19.54	18.08	23	09.37 (12)	15.27	36	11.12 (9)	14.25		
15	03.32	05.09	06.41	08.08		09.13 (12)	08.46		09.43 (11)	10.07		
	23.19	21.40	19.50	18.05	24	09.37 (12)	15.24	36	11.14 (9)	14.24		
16	03.35	05.12	06.44	08.11		09.12 (12)	08.49		09.47 (11)	10.09		
	23.16	21.36	19.47	18.01	25	09.37 (12)	15.21	32	11.14 (9)	14.24		
17	03.38	05.16	06.47	08.14		09.13 (12)	08.53		09.51 (11)	10.10		
	23.14	21.33	19.43	17.58	24	09.37 (12)	15.18	27	11.15 (9)	14.23		
18	03.41	05.19	06.50	08.17		09.13 (12)	08.56		10.54 (9)	10.11		
	23.11	21.29	19.40	17.54	23	09.36 (12)	15.15	22	11.16 (9)	14.23		
19	03.44	05.22	06.53	08.20		09.12 (12)	08.59		10.53 (9)	10.12		
	23.08	21.26	19.36	17.51	23	09.35 (12)	15.13	23	11.16 (9)	14.23		
20	03.47	05.25	06.55	08.23		09.13 (12)	09.02		10.54 (9)	10.13		
	23.05	21.22	19.32	17.47	22	09.35 (12)	15.10	22	11.16 (9)	14.23		
21	03.50	05.28	06.58	08.26		09.14 (12)	09.05		10.54 (9)	10.14		
	23.02	21.19	19.29	17.44	20	09.34 (12)	15.07	22	11.16 (9)	14.23		
22	03.53	05.31	07.01	08.29		09.15 (12)	09.09		10.54 (9)	10.15		
	22.59	21.15	19.25	17.41	18	09.33 (12)	15.05	23	11.17 (9)	14.24		
23	03.57	05.34	07.04	08.32		09.16 (12)	09.12		10.54 (9)	10.15		
	22.56	21.12	19.22	17.37	15	09.31 (12)	15.02	22	11.16 (9)	14.24		
24	04.00	05.37	07.07	08.36		09.19 (12)	09.15		10.55 (9)	10.15		
	22.53	21.08	19.18	17.34	10	09.29 (12)	14.59	22	11.17 (9)	14.25		
25	04.03	05.40	07.10	07.39			09.18		10.56 (9)	10.16		
	22.50	21.05	19.15	16.31			14.57	21	11.17 (9)	14.26		
26	04.06	05.43	07.13	07.42			09.21		10.56 (9)	10.16		
	22.47	21.01	19.11	16.27			14.55	20	11.16 (9)	14.27		
27	04.09	05.46	07.15	07.45			09.24		10.57 (9)	10.16		
	22.43	20.58	19.08	16.24			14.52	19	11.16 (9)	14.28		
28	04.12	05.49	07.18	07.48			09.27		10.57 (9)	10.15		
	22.40	20.54	19.04	16.21			14.50	19	11.16 (9)	14.29		
29	04.16	05.52	07.21	07.51			09.30		10.58 (9)	10.15		
	22.37	20.51	19.01	16.17			14.48	18	11.16 (9)	14.31		
30	04.19	05.55	07.24	07.54			09.33		10.59 (9)	10.14		
	22.34	20.47	18.57	16.14			14.45	16	11.15 (9)	14.32		
31	04.22	05.58		07.58						10.14		
	22.30	20.44		16.11						14.34		
Potential sun hours	608	508	393	305			198			137		
Total, worst case					308			656			31	
Sun reduction					0,35			0,24			0,22	
Oper. time red.					0,99			0,99			0,99	
Wind dir. red.					0,64			0,66			0,66	
Total reduction					0,22			0,16			0,14	
Total, real					69			104			4	

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: F - Asuinrakennus F (Ritamäentie 156)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February			March			April	May	June	July	August	September	October			November	December
1	10.13	09.04			07.32		08.54 (9)	06.43	04.57	03.20	03.01	04.25	06.01	07.27			08.01	09.36
	14.36	16.06			17.37	16	09.10 (9)	20.10	21.42	23.20	23.49	22.27	20.40	18.54			16.08	14.44
2	10.12	09.01			07.29		08.56 (9)	06.39	04.54	03.18	03.01	04.29	06.04	07.30			08.04	09.38
	14.38	16.10			17.40	11	09.07 (9)	20.13	21.45	23.23	23.48	22.24	20.37	18.50			16.04	14.42
3	10.11	08.58			07.25			06.36	04.50	03.15	03.03	04.32	06.07	07.33			08.07	09.41
	14.40	16.13			17.43			20.15	21.48	23.25	23.46	22.21	20.33	18.47			16.01	14.40
4	10.09	08.55			07.22			06.32	04.47	03.13	03.05	04.35	06.09	07.36			08.10	09.44
	14.43	16.16			17.46			20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	14.38
5	10.08	08.52			07.18			06.29	04.44	03.10	03.07	04.38	06.12	07.39			08.14	09.46
	14.45	16.20			17.49			20.21	21.55	23.31	23.43	22.14	20.26	18.40			15.55	14.36
6	10.07	08.48			07.15			06.25	04.40	03.08	03.09	04.41	06.15	07.42			08.17	09.49
	14.47	16.23			17.52			20.24	21.58	23.33	23.41	22.11	20.22	18.36			15.52	14.34
7	10.05	08.45			07.11			06.22	04.37	03.06	03.11	04.44	06.18	07.44			08.20	09.51
	14.50	16.26			17.55			20.27	22.01	23.35	23.39	22.07	20.19	18.33			15.48	14.33
8	10.04	08.42			07.08			06.18	04.34	03.04	03.14	04.48	06.21	07.47			08.23	09.54
	14.52	16.30			17.58			20.30	22.04	23.38	23.36	22.04	20.15	18.29			15.45	14.31
9	10.02	08.39			07.04			06.14	04.30	03.02	03.16	04.51	06.24	07.50			08.27	09.56
	14.55	16.33			18.01			20.33	22.07	23.40	23.34	22.00	20.12	18.26			15.42	14.30
10	10.00	08.36			07.01			06.11	04.27	03.00	03.19	04.54	06.27	07.53			08.30	09.58
	14.57	16.36			18.04			20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	14.29
11	09.58	08.32			06.57			06.07	04.23	02.57	03.21	04.57	06.30	07.56		09.33 (9)	08.33	10.00
	15.00	16.40			18.07			20.39	22.14	23.44	23.29	21.54	20.05	18.19	5	09.38 (9)	15.36	14.28
12	09.56	08.29			06.54			06.04	04.20	02.56	03.24	05.00	06.33	07.59		09.30 (9)	08.36	10.02
	15.03	16.43			18.10			20.43	22.17	23.46	23.27	21.50	20.01	18.15	12	09.42 (9)	15.33	14.27
13	09.54	08.26			06.50			06.00	04.17	02.54	03.27	05.03	06.35	08.02		09.27 (9)	08.40	10.04
	15.06	16.46			18.13			20.46	22.20	23.47	23.24	21.47	19.57	18.12	17	09.44 (9)	15.30	14.26
14	09.52	08.23			06.47			05.57	04.14	02.53	03.30	05.06	06.38	08.05		09.25 (9)	08.43	10.06
	15.09	16.49			18.16			20.49	22.24	23.49	23.22	21.43	19.54	18.08	20	09.45 (9)	15.27	14.25
15	09.50	08.19		08.59 (9)	06.43			05.53	04.10	02.52	03.33	05.09	06.41	08.08		09.24 (9)	08.46	10.07
	15.12	16.53	10	09.09 (9)	18.19			20.52	22.27	23.50	23.19	21.40	19.50	18.05	21	09.45 (9)	15.24	14.24
16	09.47	08.16		08.56 (9)	06.40			05.50	04.07	02.52	03.35	05.13	06.44	08.11		09.23 (9)	08.49	10.09
	15.15	16.56	15	09.11 (9)	18.22			20.55	22.30	23.52	23.16	21.36	19.47	18.01	23	09.46 (9)	15.21	14.24
17	09.45	08.13		08.54 (9)	06.36			05.46	04.04	02.51	03.38	05.16	06.47	08.14		09.23 (9)	08.53	10.10
	15.18	16.59	18	09.12 (9)	18.25			20.58	22.33	23.53	23.14	21.33	19.43	17.58	24	09.47 (9)	15.18	14.24
18	09.43	08.09		08.54 (9)	06.32			05.43	04.01	02.51	03.41	05.19	06.50	08.17		09.22 (9)	08.56	10.11
	15.21	17.02	20	09.14 (9)	18.28			21.01	22.37	23.54	23.11	21.29	19.40	17.54	24	09.46 (9)	15.16	14.23
19	09.40	08.06		08.53 (9)	06.29			05.39	03.58	02.50	03.44	05.22	06.53	08.20		09.22 (9)	08.59	10.12
	15.24	17.05	21	09.14 (9)	18.31			21.04	22.40	23.54	23.08	21.26	19.36	17.51	24	09.46 (9)	15.13	14.23
20	09.38	08.03		08.52 (9)	06.25			05.36	03.55	02.50	03.47	05.25	06.55	08.23		09.22 (9)	09.02	10.13
	15.27	17.09	23	09.15 (9)	18.34			21.07	22.43	23.55	23.05	21.22	19.33	17.48	24	09.46 (9)	15.10	14.23
21	09.35	07.59		08.52 (9)	06.22			05.32	03.51	02.50	03.51	05.28	06.58	08.26		09.22 (9)	09.05	10.14
	15.30	17.12	24	09.16 (9)	18.37			21.10	22.46	23.55	23.02	21.19	19.29	17.44	23	09.45 (9)	15.07	14.24
22	09.32	07.56		08.51 (9)	06.18			05.29	03.48	02.51	03.54	05.31	07.01	08.29		09.23 (9)	09.09	10.15
	15.34	17.15	24	09.15 (9)	18.40			21.13	22.50	23.55	22.59	21.15	19.25	17.41	22	09.45 (9)	15.05	14.24
23	09.30	07.53		08.51 (9)	06.15			05.25	03.45	02.51	03.57	05.34	07.04	08.33		09.23 (9)	09.12	10.15
	15.37	17.18	24	09.15 (9)	18.43			21.16	22.53	23.55	22.56	21.12	19.22	17.37	21	09.44 (9)	15.02	14.25
24	09.27	07.49		08.50 (9)	06.11			05.22	03.42	02.52	04.00	05.37	07.07	08.36		09.24 (9)	09.15	10.15
	15.40	17.21	25	09.15 (9)	18.46			21.19	22.56	23.55	22.53	21.08	19.18	17.34	20	09.44 (9)	15.00	14.25
25	09.24	07.46		08.51 (9)	06.08			05.18	03.39	02.52	04.03	05.40	07.10	07.39		08.25 (9)	09.18	10.16
	15.43	17.24	24	09.15 (9)	18.49			21.23	22.59	23.55	22.50	21.05	19.15	16.31	17	08.42 (9)	14.57	14.26
26	09.21	07.42		08.51 (9)	06.04			05.15	03.36	02.53	04.06	05.43	07.13	07.42		08.27 (9)	09.21	10.16
	15.47	17.27	23	09.14 (9)	18.52			21.26	23.02	23.54	22.47	21.01	19.11	16.27	13	08.40 (9)	14.55	14.27
27	09.19	07.39		08.52 (9)	06.01			05.11	03.34	02.55	04.09	05.46	07.15	07.45		08.29 (9)	09.24	10.15
	15.50	17.31	20	09.12 (9)	18.55			21.29	23.05	23.54	22.43	20.58	19.08	16.24	8	08.37 (9)	14.52	14.28
28	09.16	07.35		08.53 (9)	05.57			05.08	03.31	02.56	04.13	05.49	07.18	07.48			09.27	10.15
	15.53	17.34	19	09.12 (9)	18.58			21.32	23.08	23.53	22.40	20.54	19.04	16.21			14.50	14.30
29	09.13				06.54			05.04	03.28	02.57	04.16	05.52	07.21	07.51			09.30	10.15
	15.56				20.01			21.35	23.11	23.52	22.37	20.51	19.01	16.17			14.48	14.31
30	09.10				06.50			05.01	03.25	02.59	04.19	05.55	07.24	07.54			09.33	10.14
	16.00				20.04			21.38	23.14	23.51	22.34	20.47	18.57	16.14			14.46	14.32
31	09.07				06.46				03.23		04.22	05.58		07.58				10.14
	16.03				20.07				23.17		22.30	20.44		16.11				14.34
Potential sun hours	171	238			363			451	569	623	608	508	393	305			198	137
Total, worst case			290			27									318			
Sun reduction			0,33			0,32									0,35			
Oper. time red.			0,99			0,99									0,99			
Wind dir. red.			0,64			0,64									0,64			
Total reduction			0,21			0,21									0,22			
Total, real			62			6									71			

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: G - Lomarakennus G (Virtaniementie 175)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.31	06.42	04.57	03.19	03.00	04.25	06.00	07.26	08.00	09.35
	14.36	16.06	17.36	20.09	21.41	23.19	23.48	22.26	20.39	18.53	16.07	14.43
2	10.11	09.00	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.29	08.03	09.38
	14.38	16.09	17.39	20.12	21.44	23.22	23.47	22.23	20.36	18.49	16.04	14.41
3	10.10	08.57	07.24	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.20	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.10	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.44	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.37	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.24	04.40	03.08	03.08	04.41	06.15	07.41	08.16	09.48
	14.46	16.22	17.51	20.24	21.57	23.32	23.40	22.10	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.05	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.38	22.06	20.18	18.32	15.48	14.32
8	10.03	08.41	07.07	06.17	04.33	03.03	03.13	04.47	06.20	07.47	08.23	09.53
	14.51	16.29	17.57	20.30	22.03	23.37	23.36	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.29	03.02	03.15	04.50	06.23	07.50	08.26	09.55
	14.54	16.32	18.00	20.33	22.07	23.39	23.33	21.59	20.11	18.25	15.41	14.29
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.35	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.38	14.28
11	09.57	08.32	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	14.59	16.39	18.06	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.35	14.27
12	09.55	08.28	06.53	06.03	04.19	02.55	03.23	04.59	06.32	07.58	08.36	10.01
	15.02	16.42	18.09	20.42	22.16	23.45	23.26	21.49	20.00	18.14	15.32	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.26	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.20	23.46	23.23	21.46	19.57	18.11	15.29	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.05
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.26	14.24
15	09.49	08.19	06.42	05.52	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.23	14.24
16	09.46	08.15	06.39	05.49	04.06	02.51	03.35	05.12	06.43	08.10	08.48	10.08
	15.14	16.55	18.21	20.54	22.29	23.51	23.15	21.35	19.46	18.00	15.21	14.23
17	09.44	08.12	06.35	05.45	04.03	02.50	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.33	23.52	23.13	21.32	19.42	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.01	18.27	21.00	22.36	23.53	23.10	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.26	17.08	18.33	21.06	22.42	23.54	23.04	21.21	19.32	17.47	15.09	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.08	10.14
	15.33	17.14	18.39	21.12	22.49	23.54	22.58	21.14	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.24	03.45	02.50	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.52	23.54	22.55	21.11	19.21	17.37	15.01	14.24
24	09.26	07.48	06.10	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.14	10.14
	15.39	17.20	18.45	21.19	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.02	05.39	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.30	14.56	14.26
26	09.21	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.15
	15.46	17.27	18.51	21.25	23.01	23.53	22.46	21.00	19.10	16.27	14.54	14.26
27	09.18	07.38	06.00	05.10	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.53	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.55	04.12	05.48	07.18	07.47	09.26	10.14
	15.52	17.33	18.57	21.31	23.07	23.52	22.39	20.53	19.03	16.20	14.49	14.29
29	09.12		06.53	05.03	03.27	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.51	22.36	20.50	19.00	16.17	14.47	14.30
30	09.09		06.49	05.00	03.25	02.58	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.38	23.13	23.50	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.21	05.57		07.57		10.13
	16.02		20.06		23.16		22.30	20.43		16.10		14.33
Potential sun hours	172	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Vasama_22_11_2022

Licensed user:
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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: H - Asuinrakennus H (Purotie 55)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.37	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.44
2	10.10	09.00	07.28	06.39	04.54	03.18	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.42
3	10.09	08.57	07.24	06.35	04.50	03.15	03.03	04.32	06.06	07.32	08.06	09.40
	14.41	16.13	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.01	14.40
4	10.08	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.45	20.18	21.50	23.26	23.43	22.16	20.29	18.42	15.58	14.38
5	10.07	08.51	07.17	06.28	04.43	03.11	03.07	04.38	06.12	07.38	08.13	09.45
	14.45	16.19	17.49	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.31	23.39	22.09	20.22	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.19	09.50
	14.50	16.26	17.55	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.33
8	10.02	08.41	07.07	06.18	04.33	03.04	03.14	04.47	06.21	07.47	08.22	09.52
	14.52	16.29	17.58	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.00	08.38	07.03	06.14	04.30	03.03	03.16	04.51	06.23	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.27	03.01	03.19	04.54	06.26	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.40	23.30	21.56	20.07	18.22	15.39	14.29
11	09.57	08.32	06.56	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.32	09.59
	15.00	16.39	18.07	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.28
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.03	16.42	18.10	20.42	22.16	23.44	23.26	21.49	20.00	18.15	15.33	14.27
13	09.53	08.25	06.49	06.00	04.17	02.55	03.27	05.03	06.35	08.01	08.39	10.02
	15.06	16.46	18.13	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.56	04.14	02.54	03.30	05.06	06.38	08.04	08.42	10.04
	15.09	16.49	18.16	20.48	22.23	23.47	23.20	21.42	19.53	18.08	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.53	03.33	05.09	06.41	08.07	08.45	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.46	08.15	06.39	05.49	04.07	02.52	03.36	05.12	06.43	08.10	08.48	10.07
	15.15	16.55	18.22	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.46	04.04	02.52	03.39	05.15	06.46	08.13	08.52	10.09
	15.18	16.59	18.25	20.57	22.32	23.51	23.12	21.32	19.43	17.57	15.18	14.24
18	09.41	08.09	06.32	05.42	04.01	02.51	03.42	05.18	06.49	08.16	08.55	10.10
	15.21	17.02	18.27	21.00	22.35	23.52	23.09	21.28	19.39	17.54	15.15	14.24
19	09.39	08.05	06.28	05.39	03.58	02.51	03.45	05.21	06.52	08.19	08.58	10.11
	15.24	17.05	18.30	21.03	22.39	23.53	23.06	21.25	19.35	17.51	15.13	14.24
20	09.36	08.02	06.25	05.35	03.54	02.51	03.48	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.24
21	09.34	07.58	06.21	05.32	03.51	02.51	03.51	05.28	06.58	08.26	09.04	10.12
	15.30	17.11	18.36	21.09	22.45	23.53	23.01	21.18	19.28	17.44	15.07	14.24
22	09.31	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.05	14.24
23	09.29	07.52	06.14	05.25	03.45	02.52	03.57	05.34	07.03	08.32	09.11	10.14
	15.37	17.18	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.25
24	09.26	07.48	06.11	05.21	03.42	02.52	04.00	05.37	07.06	08.35	09.14	10.14
	15.40	17.21	18.45	21.19	22.54	23.53	22.52	21.07	19.18	17.34	15.00	14.26
25	09.23	07.45	06.07	05.18	03.39	02.53	04.03	05.40	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.48	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.04	05.14	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.44	09.23	10.14
	15.50	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.56	05.07	03.31	02.56	04.13	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.04	16.20	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.51	07.21	07.50	09.29	10.13
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.49	05.00	03.25	02.59	04.19	05.54	07.23	07.54	09.32	10.13
	16.00		20.03	21.37	23.13	23.49	22.33	20.46	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.57		07.57		10.12
	16.03		20.06		23.15		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January			February			March			April	May	June
1	10.12			09.04		10.06 (122)	07.32		08.52 (118)	06.43	04.58	03.21
	14.37			16.07	21	10.27 (122)	17.37	7	08.59 (118)	20.09	21.41	23.19
2	10.11			09.01		10.06 (122)	07.28			06.39	04.54	03.18
	14.39			16.10	21	10.27 (122)	17.40			20.12	21.45	23.22
3	10.10			08.58		10.06 (122)	07.25			06.36	04.51	03.16
	14.41			16.13	21	10.27 (122)	17.43			20.15	21.48	23.25
4	10.09			08.54		10.07 (122)	07.22			06.32	04.47	03.13
	14.43			16.17	20	10.27 (122)	17.46			20.18	21.51	23.27
5	10.08			08.51		10.07 (122)	07.18			06.29	04.44	03.11
	14.45			16.20	20	10.27 (122)	17.49			20.21	21.54	23.30
6	10.06			08.48		10.08 (122)	07.15			06.25	04.41	03.09
	14.48			16.23	18	10.26 (122)	17.52			20.24	21.57	23.32
7	10.05			08.45		10.08 (122)	07.11			06.22	04.37	03.07
	14.50			16.27	17	10.25 (122)	17.55			20.27	22.01	23.35
8	10.03			08.42		10.10 (122)	07.08			06.18	04.34	03.05
	14.53			16.30	15	10.25 (122)	17.58			20.30	22.04	23.37
9	10.01			08.39		10.12 (122)	07.04			06.15	04.31	03.03
	14.55			16.33	11	10.23 (122)	18.01			20.33	22.07	23.39
10	09.59			08.35		10.14 (122)	07.01			06.11	04.27	03.01
	14.58			16.36	6	10.20 (122)	18.04			20.36	22.10	23.41
11	09.58			08.32			06.57			06.08	04.24	03.00
	15.01			16.40			18.07			20.39	22.14	23.43
12	09.56			08.29			06.54			06.04	04.21	02.57
	15.03			16.43			18.10			20.42	22.17	23.45
13	09.54			08.26			06.50			06.00	04.17	02.55
	15.06			16.46			18.13			20.45	22.20	23.47
14	09.51			08.22			06.47			05.57	04.14	02.54
	15.09			16.50			18.16			20.48	22.23	23.48
15	09.49			08.19		08.58 (118)	06.43			05.53	04.11	02.53
	15.12			16.53	2	09.00 (118)	18.19			20.52	22.27	23.50
16	09.47			08.16		08.54 (118)	06.40			05.50	04.08	02.53
	15.15			16.56	9	09.03 (118)	18.22			20.55	22.30	23.51
17	09.45			08.13		08.50 (118)	06.36			05.46	04.04	02.52
	15.18			16.59	15	09.05 (118)	18.25			20.58	22.33	23.52
18	09.42			08.09		08.48 (118)	06.33			05.43	04.01	02.52
	15.21			17.02	18	09.06 (118)	18.28			21.01	22.36	23.53
19	09.40			08.06		08.48 (118)	06.29			05.39	03.58	02.51
	15.24			17.06	19	09.07 (118)	18.31			21.04	22.39	23.53
20	09.37			08.03		08.47 (118)	06.25			05.36	03.55	02.51
	15.28			17.09	20	09.07 (118)	18.34			21.07	22.43	23.54
21	09.35			07.59		08.46 (118)	06.22			05.32	03.52	02.51
	15.31			17.12	21	09.07 (118)	18.37			21.10	22.46	23.54
22	09.32			07.56		08.46 (118)	06.18			05.29	03.49	02.52
	15.34			17.15	22	09.08 (118)	18.40			21.13	22.49	23.55
23	09.29			07.52		08.46 (118)	06.15			05.25	03.46	02.52
	15.37			17.18	22	09.08 (118)	18.43			21.16	22.52	23.55
24	09.27			07.49		08.46 (118)	06.11			05.22	03.43	02.53
	15.40			17.21	21	09.07 (118)	18.46			21.19	22.55	23.54
25	09.24		10.17 (122)	07.46		08.47 (118)	06.08			05.18	03.40	02.53
	15.44	2	10.19 (122)	17.25	20	09.07 (118)	18.49			21.22	22.58	23.54
26	09.21		10.13 (122)	07.42		08.47 (118)	06.04			05.15	03.37	02.54
	15.47	8	10.21 (122)	17.28	19	09.06 (118)	18.52			21.26	23.01	23.54
27	09.18		10.09 (122)	07.39		08.48 (118)	06.01			05.11	03.34	02.56
	15.50	14	10.23 (122)	17.31	16	09.04 (118)	18.55			21.29	23.05	23.53
28	09.15		10.07 (122)	07.35		08.50 (118)	05.57			05.08	03.31	02.57
	15.54	17	10.24 (122)	17.34	13	09.03 (118)	18.58			21.32	23.08	23.52
29	09.12		10.07 (122)				06.54			05.05	03.29	02.58
	15.57	18	10.25 (122)				20.01			21.35	23.11	23.51
30	09.10		10.07 (122)				06.50			05.01	03.26	03.00
	16.00	19	10.26 (122)				20.04			21.38	23.13	23.50
31	09.07		10.06 (122)				06.46				03.23	
	16.03	20	10.26 (122)				20.07				23.16	
Potential sun hours	172			238			363			451	569	622
Total, worst case		98			407			7				
Sun reduction		0,18			0,33			0,32				
Oper. time red.		0,99			0,99			0,99				
Wind dir. red.		0,67			0,65			0,64				
Total reduction		0,12			0,22			0,21				
Total, real		12			88			1				

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

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

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Calculated:
23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	July	August	September	October			November			December
1	03.00	04.26	06.01	07.27			08.01		09.43 (122)	09.35
	23.48	22.27	20.40	18.54			16.08	7	09.50 (122)	14.44
2	03.02	04.29	06.04	07.30			08.04		09.41 (122)	09.38
	23.47	22.24	20.36	18.50			16.05	12	09.53 (122)	14.42
3	03.03	04.32	06.07	07.33			08.07		09.39 (122)	09.41
	23.45	22.20	20.33	18.47			16.01	16	09.55 (122)	14.40
4	03.05	04.35	06.10	07.36			08.10		09.39 (122)	09.43
	23.44	22.17	20.29	18.43			15.58	17	09.56 (122)	14.38
5	03.07	04.38	06.13	07.39			08.13		09.38 (122)	09.46
	23.42	22.14	20.26	18.40			15.55	19	09.57 (122)	14.37
6	03.10	04.42	06.15	07.42			08.17		09.37 (122)	09.48
	23.40	22.10	20.22	18.36			15.52	20	09.57 (122)	14.35
7	03.12	04.45	06.18	07.44			08.20		09.37 (122)	09.51
	23.38	22.07	20.19	18.33			15.49	20	09.57 (122)	14.33
8	03.14	04.48	06.21	07.47			08.23		09.37 (122)	09.53
	23.36	22.03	20.15	18.29			15.46	20	09.57 (122)	14.32
9	03.17	04.51	06.24	07.50			08.26		09.37 (122)	09.55
	23.34	22.00	20.12	18.26			15.43	20	09.57 (122)	14.31
10	03.19	04.54	06.27	07.53			08.30		09.37 (122)	09.58
	23.31	21.57	20.08	18.22			15.39	20	09.57 (122)	14.29
11	03.22	04.57	06.30	07.56			08.33		09.37 (122)	10.00
	23.29	21.53	20.04	18.19			15.36	20	09.57 (122)	14.28
12	03.25	05.00	06.33	07.59			08.36		09.38 (122)	10.02
	23.26	21.50	20.01	18.15			15.33	20	09.58 (122)	14.27
13	03.28	05.04	06.36	08.02		09.24 (118)	08.39		09.39 (122)	10.03
	23.24	21.46	19.57	18.12	10	09.34 (118)	15.30	18	09.57 (122)	14.26
14	03.30	05.07	06.38	08.05		09.22 (118)	08.43		09.40 (122)	10.05
	23.21	21.43	19.54	18.08	14	09.36 (118)	15.27	16	09.56 (122)	14.26
15	03.33	05.10	06.41	08.08		09.20 (118)	08.46		09.42 (122)	10.07
	23.19	21.40	19.50	18.05	17	09.37 (118)	15.25	13	09.55 (122)	14.25
16	03.36	05.13	06.44	08.11		09.19 (118)	08.49		09.46 (122)	10.08
	23.16	21.36	19.47	18.01	19	09.38 (118)	15.22	8	09.54 (122)	14.25
17	03.39	05.16	06.47	08.14		09.19 (118)	08.52		09.51 (122)	10.09
	23.13	21.33	19.43	17.58	20	09.39 (118)	15.19	2	09.53 (122)	14.24
18	03.42	05.19	06.50	08.17		09.18 (118)	08.56			10.11
	23.10	21.29	19.40	17.55	21	09.39 (118)	15.16			14.24
19	03.45	05.22	06.53	08.20		09.17 (118)	08.59			10.12
	23.07	21.26	19.36	17.51	21	09.38 (118)	15.13			14.24
20	03.48	05.25	06.56	08.23		09.17 (118)	09.02			10.13
	23.04	21.22	19.33	17.48	22	09.39 (118)	15.11			14.24
21	03.51	05.28	06.58	08.26		09.17 (118)	09.05			10.13
	23.01	21.19	19.29	17.44	21	09.38 (118)	15.08			14.24
22	03.54	05.31	07.01	08.29		09.17 (118)	09.08			10.14
	22.58	21.15	19.25	17.41	20	09.37 (118)	15.05			14.25
23	03.57	05.34	07.04	08.32		09.18 (118)	09.11			10.14
	22.55	21.12	19.22	17.38	19	09.37 (118)	15.03			14.25
24	04.00	05.37	07.07	08.36		09.18 (118)	09.14			10.15
	22.52	21.08	19.18	17.34	17	09.35 (118)	15.00			14.26
25	04.04	05.40	07.10	07.39		08.21 (118)	09.18			10.15
	22.49	21.05	19.15	16.31	13	08.34 (118)	14.58			14.27
26	04.07	05.43	07.13	07.42		08.24 (118)	09.21			10.15
	22.46	21.01	19.11	16.28	8	08.32 (118)	14.55			14.28
27	04.10	05.46	07.16	07.45			09.24			10.15
	22.43	20.58	19.08	16.24			14.53			14.29
28	04.13	05.49	07.18	07.48			09.27			10.15
	22.40	20.54	19.04	16.21			14.51			14.30
29	04.16	05.52	07.21	07.51			09.30			10.14
	22.37	20.51	19.01	16.18			14.48			14.32
30	04.19	05.55	07.24	07.54			09.32			10.14
	22.33	20.47	18.57	16.14			14.46			14.33
31	04.23	05.58		07.57						10.13
	22.30	20.43		16.11						14.35
Potential sun hours	607	508	393	305			199			138
Total, worst case					242			268		
Sun reduction					0,35			0,24		
Oper. time red.					0,99			0,99		
Wind dir. red.					0,64			0,67		
Total reduction					0,22			0,16		
Total, real					54			42		

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 10.28/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122 Shadow receptor: J - Lomaasunto J (Pyssyniemen metsätie 2)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January		February		March	April	May	June	July	August	September	October		November		December
1	10.12		09.03	13.58 (119)	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27		08.00	14.33 (120)	09.35
	14.37		16.06 18	15.16 (120)	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.53		16.07 18	14.51 (120)	14.44
2	10.11		09.00	15.03 (120)	07.28	06.39	04.54	03.18	03.01	04.29	06.03	07.30		08.04	14.32 (120)	09.38
	14.39		16.10 17	15.20 (120)	17.40	20.12	21.44	23.22	23.47	22.23	20.36	18.50		16.04 20	14.52 (120)	14.42
3	10.10		08.57	15.02 (120)	07.25	06.36	04.50	03.15	03.03	04.32	06.06	07.32		08.07	14.32 (120)	09.40
	14.41		16.13 19	15.21 (120)	17.43	20.15	21.48	23.24	23.45	22.20	20.33	18.46		16.01 21	14.53 (120)	14.40
4	10.09		08.54	15.02 (120)	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35		08.10	14.31 (120)	09.43
	14.43		16.16 19	15.21 (120)	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43		15.58 21	14.52 (120)	14.38
5	10.07		08.51	15.02 (120)	07.18	06.28	04.44	03.11	03.07	04.38	06.12	07.38		08.13	14.32 (120)	09.46
	14.45		16.20 21	15.23 (120)	17.49	20.21	21.54	23.30	23.42	22.13	20.25	18.39		15.55 20	14.52 (120)	14.36
6	10.06		08.48	15.02 (120)	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41		08.16	14.32 (120)	09.48
	14.47		16.23 21	15.23 (120)	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36		15.52 20	14.52 (120)	14.35
7	10.04		08.45	15.02 (120)	07.11	06.21	04.37	03.06	03.12	04.44	06.18	07.44		08.20	14.32 (120)	09.51
	14.50		16.26 21	15.23 (120)	17.55	20.27	22.00	23.34	23.38	22.07	20.18	18.32		15.48 20	14.52 (120)	14.33
8	10.03		08.42	15.02 (120)	07.07	06.18	04.34	03.04	03.14	04.48	06.21	07.47		08.23	14.33 (120)	09.53
	14.52		16.30 20	15.22 (120)	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29		15.45 19	14.52 (120)	14.32
9	10.01		08.38	15.03 (120)	07.04	06.14	04.30	03.03	03.16	04.51	06.24	07.50		08.26	14.34 (120)	09.55
	14.55		16.33 20	15.23 (120)	18.01	20.33	22.07	23.39	23.33	22.00	20.11	18.25		15.42 16	14.50 (120)	14.30
10	09.59		08.35	15.03 (120)	07.00	06.11	04.27	03.01	03.19	04.54	06.27	07.53		08.29	13.28 (119)	09.57
	14.58		16.36 19	15.22 (120)	18.04	20.36	22.10	23.41	23.31	21.56	20.08	18.22		15.39 18	14.46 (120)	14.29
11	09.57		08.32	15.04 (120)	06.57	06.07	04.24	02.58	03.22	04.57	06.30	07.56		08.33	13.26 (119)	09.59
	15.00		16.39 17	15.21 (120)	18.07	20.39	22.13	23.43	23.29	21.53	20.04	18.18		15.36 18	14.42 (120)	14.28
12	09.55		08.29	15.05 (120)	06.53	06.04	04.20	02.56	03.24	05.00	06.32	07.59		08.36	13.24 (119)	10.01
	15.03		16.43 15	15.20 (120)	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15		15.33 15	13.39 (119)	14.27
13	09.53		08.25	15.07 (120)	06.50	06.00	04.17	02.55	03.27	05.03	06.35	08.02		08.39	13.23 (119)	10.03
	15.06		16.46 12	15.19 (120)	18.13	20.45	22.20	23.46	23.24	21.46	19.57	18.11		15.30 17	13.40 (119)	14.26
14	09.51	13.49 (119)	08.22	15.11 (120)	06.46	05.57	04.14	02.54	03.30	05.06	06.38	08.05		08.42	13.24 (119)	10.05
	15.09 5	13.54 (119)	16.49 4	15.15 (120)	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08		15.27 18	13.42 (119)	14.25
15	09.49	13.49 (119)	08.19		06.43	05.53	04.10	02.53	03.33	05.09	06.41	08.08		08.46	13.23 (119)	10.06
	15.12 10	13.59 (119)	16.52		18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.05		15.24 19	13.42 (119)	14.25
16	09.47	13.49 (119)	08.16		06.39	05.50	04.07	02.52	03.36	05.13	06.44	08.11		08.49	13.23 (119)	10.08
	15.15 15	14.04 (119)	16.56		18.22	20.54	22.30	23.51	23.16	21.36	19.46	18.01		15.21 19	13.42 (119)	14.24
17	09.44	13.49 (119)	08.12		06.36	05.46	04.04	02.52	03.39	05.16	06.47	08.14		08.52	13.22 (119)	10.09
	15.18 17	14.06 (119)	16.59		18.25	20.57	22.33	23.52	23.13	21.32	19.43	17.58		15.18 20	13.42 (119)	14.24
18	09.42	13.49 (119)	08.09		06.32	05.43	04.01	02.51	03.42	05.19	06.50	08.17		08.55	13.23 (119)	10.10
	15.21 18	14.07 (119)	17.02		18.28	21.00	22.36	23.53	23.10	21.29	19.39	17.54		15.16 20	13.43 (119)	14.24
19	09.39	13.49 (119)	08.06		06.29	05.39	03.58	02.51	03.45	05.22	06.52	08.20		08.58	13.23 (119)	10.11
	15.24 18	14.07 (119)	17.05		18.31	21.03	22.39	23.53	23.07	21.25	19.36	17.51		15.13 20	13.43 (119)	14.24
20	09.37	13.49 (119)	08.02		06.25	05.35	03.55	02.51	03.48	05.25	06.55	08.23		09.02	13.24 (119)	10.12
	15.27 19	14.08 (119)	17.08		18.34	21.07	22.42	23.54	23.04	21.22	19.32	17.47		15.10 20	13.44 (119)	14.24
21	09.34	13.49 (119)	07.59		06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26		09.05	13.24 (119)	10.13
	15.30 20	14.09 (119)	17.12		18.37	21.10	22.46	23.54	23.01	21.18	19.29	17.44		15.07 20	13.44 (119)	14.24
22	09.32	13.49 (119)	07.56		06.18	05.28	03.49	02.51	03.54	05.31	07.01	08.29		09.08	13.25 (119)	10.14
	15.34 20	14.09 (119)	17.15		18.40	21.13	22.49	23.54	22.58	21.15	19.25	17.41		15.05 19	13.44 (119)	14.24
23	09.29	13.49 (119)	07.52		06.15	05.25	03.45	02.52	03.57	05.34	07.04	08.32		09.11	13.25 (119)	10.14
	15.37 20	14.09 (119)	17.18		18.43	21.16	22.52	23.54	22.55	21.11	19.22	17.37		15.02 19	13.44 (119)	14.25
24	09.26	13.49 (119)	07.49		06.11	05.21	03.43	02.52	04.00	05.37	07.07	08.35		09.14	13.26 (119)	10.14
	15.40 21	14.10 (119)	17.21		18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34		15.00 18	13.44 (119)	14.26
25	09.24	13.49 (119)	07.45		06.07	05.18	03.40	02.53	04.03	05.40	07.09	07.38		09.17	13.27 (119)	10.15
	15.43 21	14.10 (119)	17.24		18.49	21.22	22.58	23.54	22.49	21.04	19.15	16.31		14.57 17	13.44 (119)	14.26
26	09.21	13.50 (119)	07.42		06.04	05.15	03.37	02.54	04.06	05.43	07.12	07.41		09.20	13.27 (119)	10.15
	15.47 19	14.09 (119)	17.27		18.51	21.25	23.01	23.53	22.46	21.01	19.11	16.27		14.55 16	13.43 (119)	14.27
27	09.18	13.50 (119)	07.38		06.00	05.11	03.34	02.55	04.10	05.46	07.15	07.45		09.23	13.28 (119)	10.15
	15.50 19	14.09 (119)	17.30		18.54	21.28	23.04	23.53	22.43	20.57	19.07	16.24		14.52 11	13.39 (119)	14.29
28	09.15	13.51 (119)	07.35		05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	14.39 (120)	09.26	13.29 (119)	10.14
	15.53 18	14.09 (119)	17.33		18.57	21.32	23.07	23.52	22.40	20.54	19.04	16.21 7	14.46 (120)	14.50 5	13.34 (119)	14.30
29	09.12	13.52 (119)			06.53	05.04	03.28	02.58	04.16	05.52	07.21	07.51	14.36 (120)	09.29		10.14
	15.56 16	14.08 (119)			20.00	21.35	23.10	23.51	22.36	20.50	19.00	16.17 12	14.48 (120)	14.48		14.31
30	09.09	13.53 (119)			06.50	05.01	03.26	02.59	04.19	05.55	07.24	07.54	14.35 (120)	09.32		10.13
	16.00 15	15.07 (120)			20.03	21.38	23.13	23.50	22.33	20.47	18.57	16.14 15	14.50 (120)	14.46		14.33
31	09.06	13.55 (119)			06.46		03.23		04.22	05.58		07.57	14.33 (120)			10.13
	16.03 19	15.12 (120)			20.06		23.16		22.30	20.43		16.11 17	14.50 (120)			14.34
Potential sun hours	172		238		363	451	569	623	608	508	393	305		199		138
Total, worst case	310		243									51		504		
Sun reduction	0,18		0,33									0,35		0,24		
Oper. time red.	0,99		0,99									0,99		0,99		
Wind dir. red.	0,65		0,62									0,62		0,64		
Total reduction	0,12		0,21									0,22		0,15		
Total, real	37		50									11		77		

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

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

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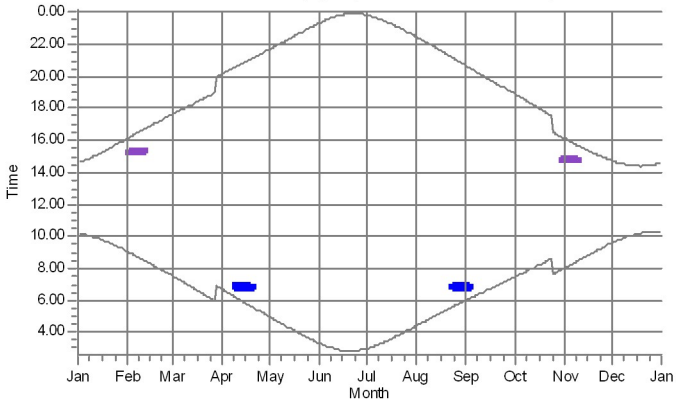
23.11.2022 10.28/3.5.584

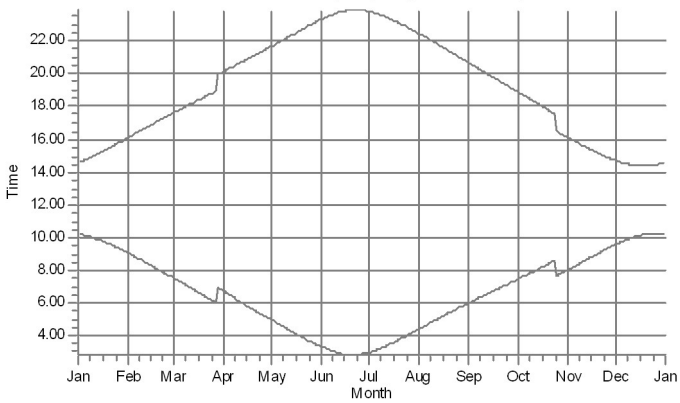
SHADOW - Calendar, graphical

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

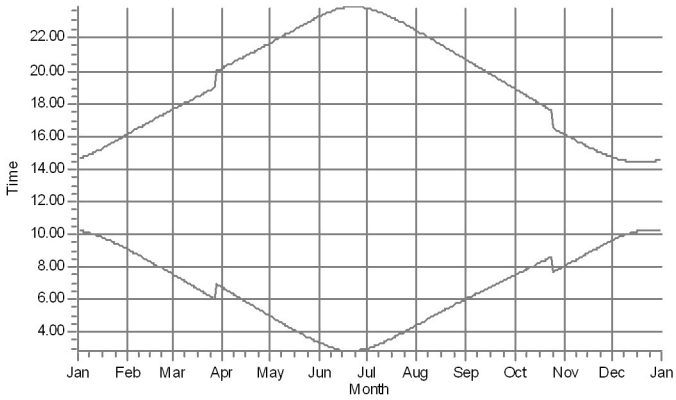
A: Lomarakennus A (Pyssynienen metsätie 156)



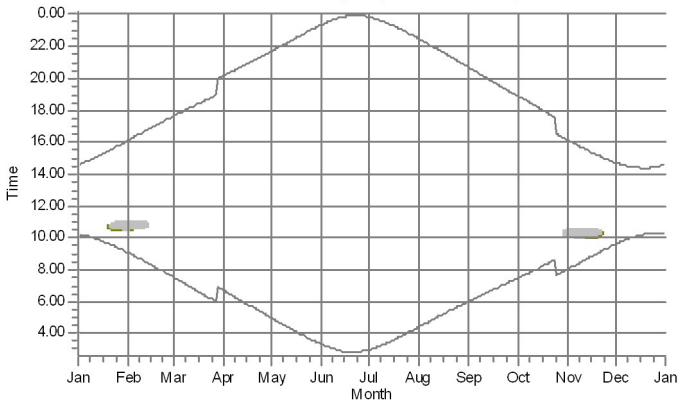
B: Lomarakennus B (Sarjankyläntie 1093)



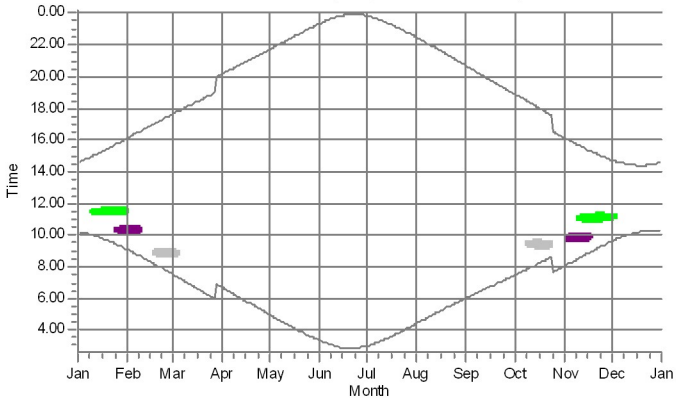
C: Lomarakennnus C (Kurunoja)



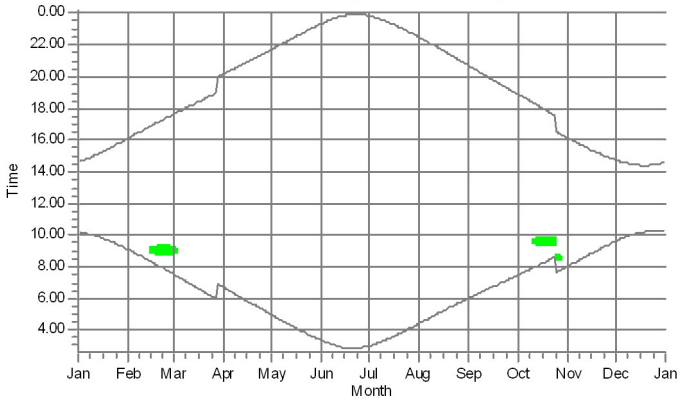
D: Asuinrakennus D (Haapavesitie 1404)



E: Asuinrakennus E (Säilynkankaantie 34)



F: Asuinrakennus F (Ritamäentie 156)



WTGs

3: Generic RD200 HH200 7700 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (40)
9: Generic RD200 HH200 7700 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (46)
10: Generic RD200 HH200 7700 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (47)
11: Generic RD200 HH200 7700 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (48)
12: Generic RD200 HH200 7700 200.0 IO! hub: 200,0 m (TOT: 300,0 m) (49)
120: VESTAS V162-5.6 5600 180.0 IO! hub: 190,0 m (TOT: 280,0 m) (472)

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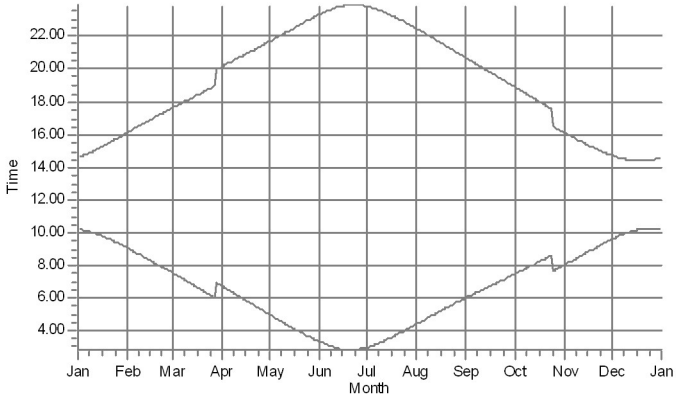
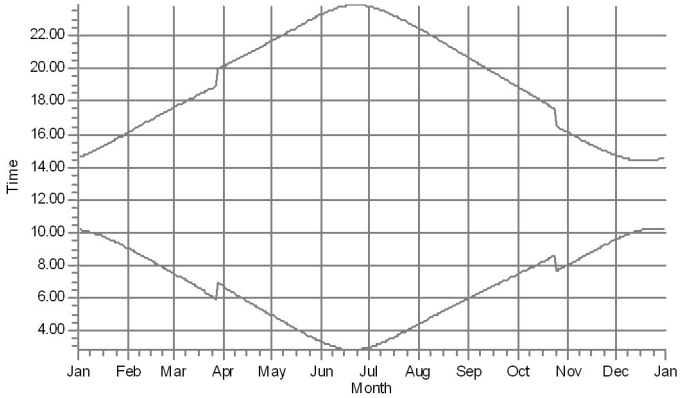
SHADOW - Calendar, graphical

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122

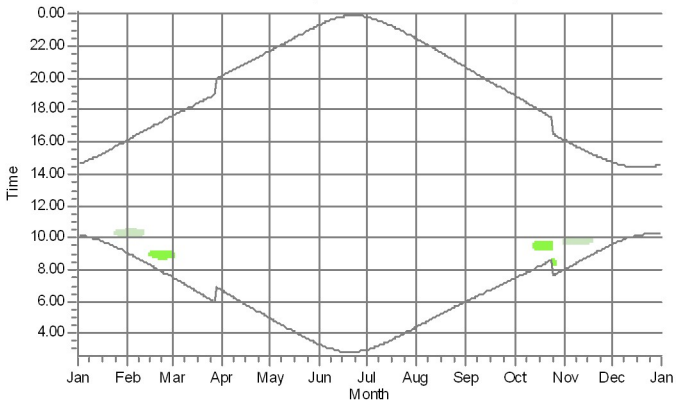
G: Lomarakennus G (Virtaniementie 175)



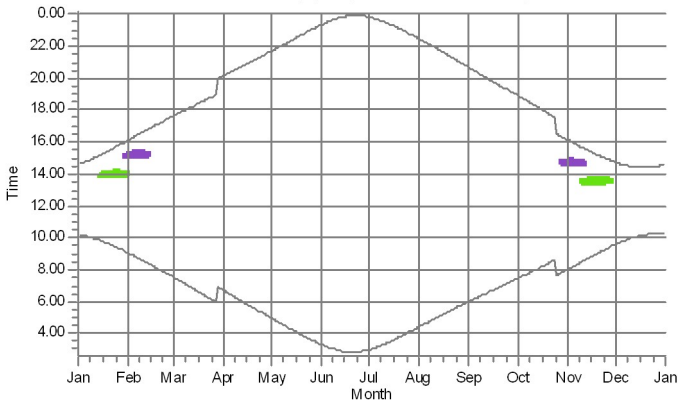
H: Asuinrakennus H (Purotie 55)



I: Lomarakennus I (Hirvinevan haara 147)



J: Lomaasunto J (Pyssyniemen metsätie 2)



WTGs

118: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (470)
119: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (471)
120: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (472)
122: VESTAS V162-5.6 5600 180.0 IOI hub: 190,0 m (TOT: 280,0 m) (474)

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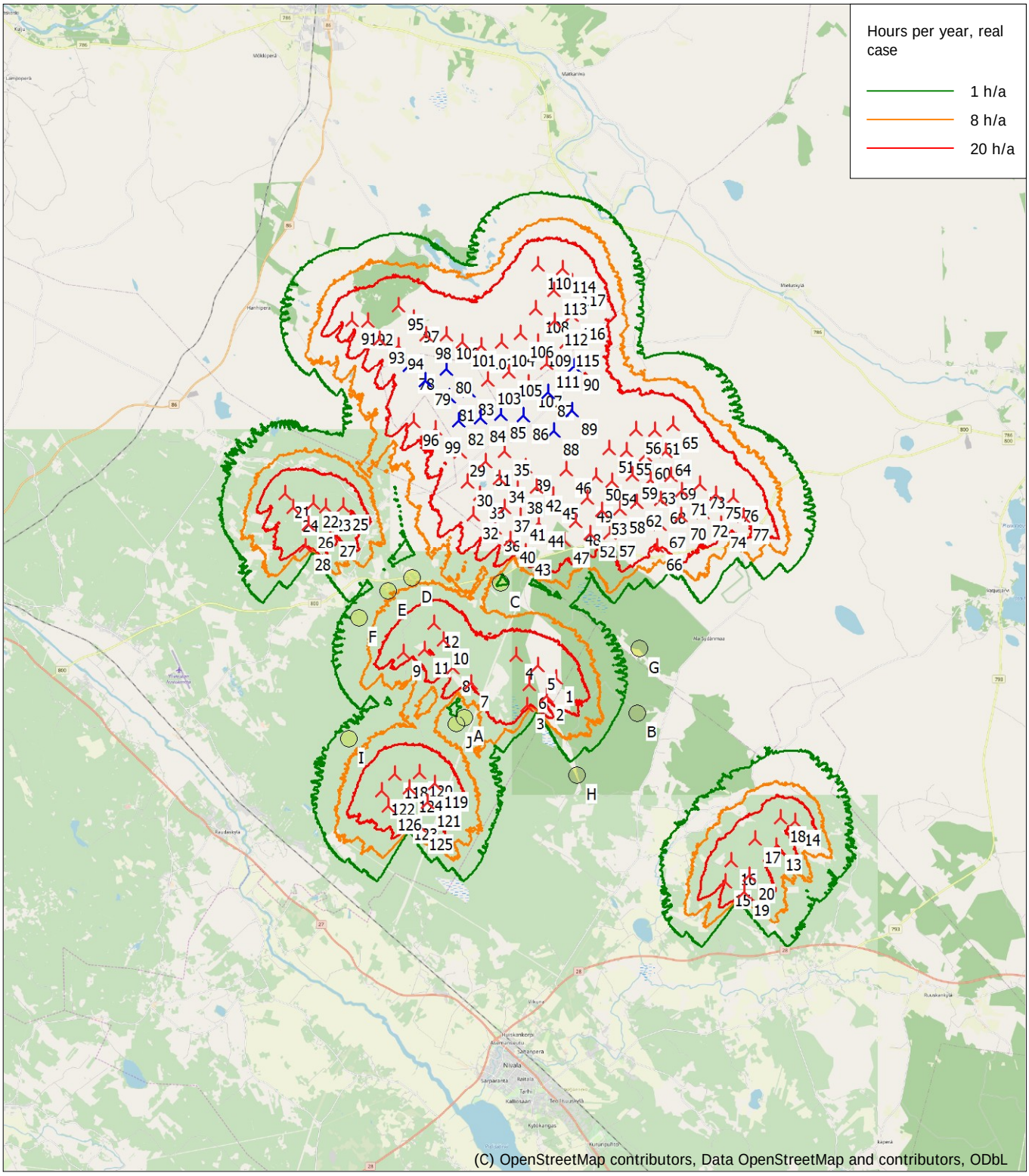
SHADOW - Map

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case no forest_20221122



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 340 North: 7 108 110

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Vasama_5_5_2022_0.wpo (1)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Liite 8. Vasaman tuulivoimahanke VE2 – varjostusmallinnuksen tulokset ”Real Case, Luke forest”

Project:
Vasama_22_11_2022

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23.11.2022 9.50/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

Assumptions for shadow calculations

Maximum distance for influence	2 500	m
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-2_N64,00_E025,00 (5)

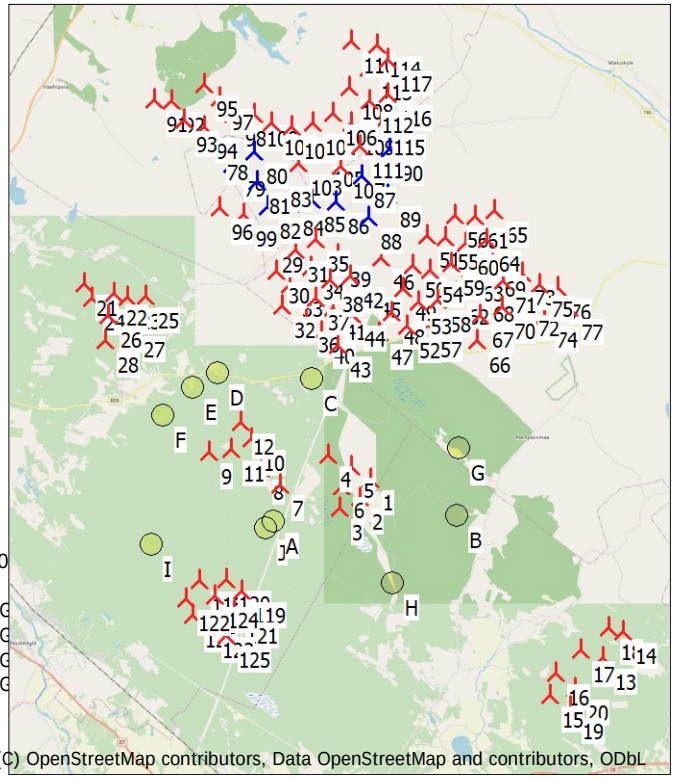
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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_Vasama_5_5_2022_0
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REG
Obstacles used in calculation
Receptor grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:250 000
New WTG
Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	402 014	7 104 309	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
2	401 637	7 103 661	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
3	400 968	7 103 344	104,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
4	400 636	7 105 142	105,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
5	401 395	7 104 737	107,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
6	401 057	7 104 087	103,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
7	399 017	7 104 219	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
8	398 397	7 104 778	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
9	396 683	7 105 368	98,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
10	398 090	7 105 743	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
11	397 412	7 105 444	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
12	397 770	7 106 329	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
13	409 573	7 098 129	122,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
14	410 264	7 098 972	122,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
15	407 742	7 096 948	109,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
16	407 993	7 097 672	109,3	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
17	408 857	7 098 427	115,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
18	409 752	7 099 120	115,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
19	408 404	7 096 567	110,0	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
20	408 619	7 097 160	117,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.5-158 RD175-5 500	5 500	175,0	122,5	2 500	0,0
21	392 697	7 111 104	82,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
22	393 696	7 110 723	85,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
23	394 124	7 110 573	88,4	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
24	392 964	7 110 572	83,1	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
25	394 736	7 110 600	89,8	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
26	393 462	7 109 982	84,9	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
27	394 233	7 109 674	87,5	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
28	393 349	7 109 200	84,2	GE WIND ENERGY 5....	Yes	GE WIND ENERGY	5.3-158 RD175-5 300	5 300	175,0	152,5	2 500	10,4
29	398 896	7 112 332	92,5	PUU01	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

To be continued on next page...

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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

	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]
30	399 097	7 111 286	95,0	PUU02	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
31	399 784	7 111 972	97,5	PUU03	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
32	399 264	7 110 151	97,2	PUU04	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
33	399 536	7 110 832	95,4	PUU05	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
34	400 239	7 111 382	97,5	PUU06	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
35	400 444	7 112 292	97,3	PUU07	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
36	400 019	7 109 649	100,0	PUU08	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
37	400 380	7 110 348	100,0	PUU09	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
38	400 876	7 110 966	99,4	PUU10	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
39	401 152	7 111 752	100,0	PUU11	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
40	400 549	7 109 232	102,5	PUU12	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
41	400 953	7 110 020	102,5	PUU13	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
42	401 537	7 111 046	104,5	PUU14	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
43	401 068	7 108 792	105,0	PUU15	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
44	401 564	7 109 758	104,1	PUU16	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
45	402 089	7 110 702	107,5	PUU17	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
46	402 589	7 111 603	106,9	PUU18	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
47	402 455	7 109 148	112,5	PUU19	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
48	402 889	7 109 778	110,0	PUU20	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
49	403 318	7 110 593	107,5	PUU21	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
50	403 622	7 111 352	106,3	PUU22	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
51	404 117	7 112 276	103,7	PUU23	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
52	403 379	7 109 327	115,0	PUU24	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
53	403 790	7 110 129	108,2	PUU25	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
54	404 210	7 111 152	105,6	PUU26	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
55	404 739	7 112 199	105,0	PUU27	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
56	405 100	7 112 943	100,6	PUU28	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
57	404 061	7 109 351	110,0	PUU29	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
58	404 420	7 110 174	106,8	PUU30	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
59	404 900	7 111 381	105,0	PUU31	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
60	405 395	7 112 030	102,5	PUU32	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
61	405 740	7 112 891	100,2	PUU33	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
62	405 042	7 110 380	105,9	PUU34	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
63	405 532	7 111 130	103,8	PUU35	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
64	406 114	7 112 133	103,1	PUU36	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
65	406 380	7 113 067	107,2	PUU37	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
66	405 707	7 108 791	111,2	PUU38	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
67	405 822	7 109 587	108,6	PUU39	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
68	405 893	7 110 455	104,7	PUU40	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
69	406 257	7 111 298	104,1	PUU41	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
70	406 558	7 109 872	106,5	PUU42	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
71	406 638	7 110 744	106,0	PUU43	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
72	407 324	7 109 954	108,3	PUU44	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
73	407 269	7 110 957	112,5	PUU45	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
74	407 963	7 109 542	113,5	PUU46	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
75	407 809	7 110 582	116,0	PUU47	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
76	408 414	7 110 457	120,0	PUU48	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
77	408 786	7 109 772	117,5	PUU49	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
78	397 208	7 115 412	88,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
79	397 754	7 114 856	87,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
80	398 503	7 115 243	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
81	398 570	7 114 265	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
82	398 871	7 113 427	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
83	399 272	7 114 459	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
84	399 647	7 113 488	95,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
85	400 360	7 113 628	100,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
86	401 168	7 113 504	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
87	402 041	7 114 329	106,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
88	402 216	7 112 963	108,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
89	402 852	7 113 666	105,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
90	402 975	7 115 189	106,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
91	395 254	7 117 093	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
92	395 819	7 117 022	83,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
93	396 195	7 116 379	82,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4

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SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

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	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]
94	396 858	7 116 145	85,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
95	396 894	7 117 531	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
96	397 303	7 113 442	87,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
97	397 417	7 117 093	90,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
98	397 854	7 116 507	90,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
99	398 058	7 113 189	92,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
100	398 529	7 116 484	94,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
101	399 116	7 116 184	97,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
102	399 762	7 116 032	97,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
103	399 974	7 114 812	98,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
104	400 456	7 116 139	99,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
105	400 698	7 115 062	102,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
106	401 155	7 116 430	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
107	401 348	7 114 680	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
108	401 706	7 117 283	100,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
109	401 754	7 116 113	103,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
110	401 837	7 118 791	95,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
111	402 023	7 115 337	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
112	402 362	7 116 825	105,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
113	402 365	7 117 878	100,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
114	402 692	7 118 655	95,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
115	402 733	7 116 070	109,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
116	402 975	7 117 005	104,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
117	403 021	7 118 167	96,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 700	7 700	200,0	200,0	2 500	10,4
118	396 213	7 101 101	92,7	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
119	397 616	7 100 723	97,6	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
120	397 086	7 101 114	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
121	397 318	7 100 046	97,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
122	395 741	7 100 512	93,4	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
123	396 517	7 099 615	95,1	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
124	396 717	7 100 560	95,3	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
125	397 043	7 099 258	95,9	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4
126	395 944	7 099 965	95,0	VESTAS V162-5.6 56...	Yes	VESTAS	V162-5.6-5 600	5 600	180,0	190,0	2 500	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Lomarakennus A (Pyssynienen metsätie 156)	398 729	7 102 986	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus B (Sarjankyläntie 1093)	404 834	7 102 972	111,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Lomarakennnus C (Kurunoja)	400 153	7 107 682	102,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Haapavesitie 1404)	397 049	7 107 973	88,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Säilynkankaantie 34)	396 203	7 107 524	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Ritamäentie 156)	395 182	7 106 624	85,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Virtaniementie 175)	404 969	7 105 246	112,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Purotie 55)	402 643	7 100 823	113,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus I (Hirvinevan haara 147)	394 648	7 102 347	90,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomaasunto J (Pyssyniemen metsätie 2)	398 461	7 102 753	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus A (Pyssynienen metsätie 156)	0:00
B	Lomarakennus B (Sarjankyläntie 1093)	0:00
C	Lomarakennnus C (Kurunoja)	0:00
D	Asuinrakennus D (Haapavesitie 1404)	3:09
E	Asuinrakennus E (Säilynkankaantie 34)	0:00
F	Asuinrakennus F (Ritamäentie 156)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

...continued from previous page

No.	Name	Shadow, expected values Shadow hours per year [h/year]
G	Lomarakennus G (Virtaniementie 175)	0:00
H	Asuinrakennus H (Purotie 55)	0:00
I	Lomarakennus I (Hirvinevan haara 147)	0:00
J	Lomaasunto J (Pyssyniemen metsätie 2)	0:00

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

No.	Name	Expected [h/year]
1	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (38)	0:00
2	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (39)	0:00
3	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (40)	0:00
4	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (41)	0:00
5	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (42)	0:00
6	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (43)	0:00
7	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (44)	0:00
8	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (45)	0:00
9	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (46)	0:00
10	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (47)	1:23
11	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (48)	0:00
12	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (49)	2:47
13	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (276)	0:00
14	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (277)	0:00
15	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (278)	0:00
16	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (279)	0:00
17	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (280)	0:00
18	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (281)	0:00
19	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (282)	0:00
20	GE WIND ENERGY 5.5-158 RD175 5500 175.0 !O! hub: 122,5 m (TOT: 210,0 m) (283)	0:00
21	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (284)	0:00
22	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (285)	0:00
23	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (286)	0:00
24	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (287)	0:00
25	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (288)	0:00
26	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (289)	0:00
27	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (290)	0:00
28	GE WIND ENERGY 5.3-158 RD175 5300 175.0 !O! hub: 152,5 m (TOT: 240,0 m) (291)	0:00
29	PUU01	0:00
30	PUU02	0:00
31	PUU03	0:00
32	PUU04	0:00
33	PUU05	0:00
34	PUU06	0:00
35	PUU07	0:00
36	PUU08	0:00
37	PUU09	0:00
38	PUU10	0:00
39	PUU11	0:00
40	PUU12	0:00
41	PUU13	0:00
42	PUU14	0:00
43	PUU15	0:00
44	PUU16	0:00
45	PUU17	0:00
46	PUU18	0:00
47	PUU19	0:00
48	PUU20	0:00
49	PUU21	0:00
50	PUU22	0:00
51	PUU23	0:00
52	PUU24	0:00
53	PUU25	0:00
54	PUU26	0:00

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SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

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No.	Name	Expected [h/year]
55	PUU27	0:00
56	PUU28	0:00
57	PUU29	0:00
58	PUU30	0:00
59	PUU31	0:00
60	PUU32	0:00
61	PUU33	0:00
62	PUU34	0:00
63	PUU35	0:00
64	PUU36	0:00
65	PUU37	0:00
66	PUU38	0:00
67	PUU39	0:00
68	PUU40	0:00
69	PUU41	0:00
70	PUU42	0:00
71	PUU43	0:00
72	PUU44	0:00
73	PUU45	0:00
74	PUU46	0:00
75	PUU47	0:00
76	PUU48	0:00
77	PUU49	0:00
78	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (350)	0:00
79	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (351)	0:00
80	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (352)	0:00
81	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (353)	0:00
82	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (354)	0:00
83	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (355)	0:00
84	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (356)	0:00
85	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (357)	0:00
86	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (358)	0:00
87	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (359)	0:00
88	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (360)	0:00
89	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (361)	0:00
90	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (362)	0:00
91	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (363)	0:00
92	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (364)	0:00
93	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (365)	0:00
94	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (366)	0:00
95	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (367)	0:00
96	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (368)	0:00
97	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (369)	0:00
98	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (370)	0:00
99	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (371)	0:00
100	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (372)	0:00
101	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (373)	0:00
102	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (374)	0:00
103	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (375)	0:00
104	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (376)	0:00
105	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (377)	0:00
106	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (378)	0:00
107	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (379)	0:00
108	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (380)	0:00
109	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (381)	0:00
110	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (382)	0:00
111	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (383)	0:00
112	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (384)	0:00
113	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (385)	0:00
114	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (386)	0:00
115	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (387)	0:00
116	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (388)	0:00
117	Generic RD200 HH200 7700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (389)	0:00
118	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (470)	0:00
119	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (471)	0:00

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SHADOW - Main Result

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

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No.	Name	Expected [h/year]
120	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (472)	0:00
121	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (473)	0:00
122	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (474)	0:00
123	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (475)	0:00
124	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (476)	0:00
125	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (477)	0:00
126	VESTAS V162-5.6 5600 180.0 !O! hub: 190,0 m (TOT: 280,0 m) (478)	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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122Shadow receptor: A - Lomarakennus A (Pyssynienen metsätie 156)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.00	09.35
	14.37	16.06	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.53	16.07	14.44
2	10.11	09.00	07.28	06.39	04.54	03.18	03.01	04.29	06.03	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.44	23.22	23.47	22.23	20.36	18.50	16.04	14.42
3	10.10	08.57	07.25	06.36	04.50	03.15	03.03	04.32	06.06	07.32	08.07	09.40
	14.41	16.13	17.43	20.15	21.48	23.24	23.45	22.20	20.33	18.46	16.01	14.40
4	10.09	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.07	08.51	07.18	06.28	04.44	03.11	03.07	04.38	06.12	07.38	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.55	14.36
6	10.06	08.48	07.14	06.25	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.51	14.34
7	10.04	08.45	07.11	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.00	23.34	23.38	22.07	20.18	18.32	15.48	14.33
8	10.03	08.42	07.07	06.18	04.33	03.04	03.14	04.48	06.21	07.47	08.23	09.53
	14.52	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.45	14.31
9	10.01	08.38	07.04	06.14	04.30	03.03	03.16	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.33	22.00	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.41	23.31	21.56	20.08	18.22	15.39	14.29
11	09.57	08.32	06.57	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.33	09.59
	15.00	16.39	18.07	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.36	14.28
12	09.55	08.29	06.53	06.04	04.20	02.56	03.24	05.00	06.32	07.59	08.36	10.01
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.53	08.25	06.50	06.00	04.17	02.55	03.27	05.03	06.35	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.46	23.24	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.57	04.14	02.54	03.30	05.06	06.38	08.05	08.42	10.05
	15.09	16.49	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.25
15	09.49	08.19	06.43	05.53	04.10	02.53	03.33	05.09	06.41	08.08	08.46	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.47	08.16	06.39	05.50	04.07	02.52	03.36	05.12	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.54	22.30	23.51	23.16	21.36	19.46	18.01	15.21	14.24
17	09.44	08.12	06.36	05.46	04.04	02.51	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.57	22.33	23.52	23.13	21.32	19.43	17.58	15.18	14.24
18	09.42	08.09	06.32	05.42	04.01	02.51	03.42	05.19	06.49	08.17	08.55	10.10
	15.21	17.02	18.28	21.00	22.36	23.53	23.10	21.29	19.39	17.54	15.16	14.24
19	09.39	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.52	08.20	08.58	10.11
	15.24	17.05	18.31	21.03	22.39	23.53	23.07	21.25	19.36	17.51	15.13	14.24
20	09.37	08.02	06.25	05.35	03.55	02.51	03.48	05.25	06.55	08.23	09.02	10.12
	15.27	17.08	18.34	21.07	22.42	23.54	23.04	21.22	19.32	17.47	15.10	14.24
21	09.34	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.30	17.12	18.37	21.10	22.46	23.54	23.01	21.18	19.29	17.44	15.07	14.24
22	09.32	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.54	22.58	21.15	19.25	17.41	15.05	14.24
23	09.29	07.52	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.54	22.55	21.11	19.22	17.37	15.02	14.25
24	09.26	07.49	06.11	05.21	03.42	02.52	04.00	05.37	07.07	08.35	09.14	10.15
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.45	06.07	05.18	03.40	02.53	04.03	05.40	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.15
	15.47	17.27	18.51	21.25	23.01	23.53	22.46	21.01	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.45	09.23	10.15
	15.50	17.30	18.54	21.28	23.04	23.53	22.43	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.26	10.14
	15.53	17.33	18.57	21.32	23.07	23.52	22.40	20.54	19.04	16.21	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.52	07.21	07.51	09.29	10.14
	15.56		20.00	21.35	23.10	23.51	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.32	10.13
	16.00		20.03	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.58		07.57		10.13
	16.03		20.06		23.16		22.30	20.43		16.11		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: B - Lomarakennus B (Sarjankyläntie 1093)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.36	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.43
2	10.10	09.00	07.28	06.39	04.53	03.17	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.41
3	10.09	08.57	07.24	06.35	04.50	03.15	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.09	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.43	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.24	04.40	03.08	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.22	17.51	20.24	21.57	23.32	23.39	22.09	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.06	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.32
8	10.02	08.41	07.07	06.17	04.33	03.04	03.13	04.47	06.20	07.47	08.22	09.52
	14.52	16.29	17.57	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.30	03.02	03.16	04.50	06.23	07.49	08.26	09.55
	14.54	16.32	18.00	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.36	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.39	14.28
11	09.57	08.31	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	15.00	16.39	18.06	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.27
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.02	16.42	18.09	20.42	22.16	23.44	23.26	21.49	20.00	18.14	15.33	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.27	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.04
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.24	14.24
16	09.46	08.15	06.39	05.49	04.07	02.52	03.35	05.12	06.43	08.10	08.48	10.07
	15.14	16.55	18.21	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.45	04.04	02.51	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.32	23.51	23.12	21.32	19.42	17.57	15.18	14.23
18	09.41	08.08	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.02	18.27	21.00	22.36	23.52	23.09	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.36	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.25	09.04	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.04	14.24
23	09.29	07.52	06.14	05.24	03.45	02.51	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.24
24	09.26	07.48	06.10	05.21	03.42	02.52	04.00	05.36	07.06	08.35	09.14	10.14
	15.39	17.21	18.45	21.18	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.03	05.39	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.49	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.10	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.56	04.12	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.03	16.20	14.50	14.29
29	09.12		06.53	05.04	03.28	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.47	14.31
30	09.09		06.49	05.00	03.25	02.59	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.37	23.13	23.49	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.22	05.57		07.57		10.12
	16.03		20.06		23.16		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Vasama_22_11_2022

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Miikka Saranpää / miikka.saranpaa@fcg.fi
Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: C - Lomarakennnus C (Kurunoja)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.04	07.32	06.42	04.57	03.19	03.00	04.25	06.00	07.27	08.01	09.35
	14.36	16.06	17.36	20.09	21.41	23.20	23.49	22.27	20.40	18.53	16.07	14.43
2	10.11	09.01	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.30	08.04	09.38
	14.38	16.09	17.39	20.12	21.45	23.22	23.48	22.24	20.36	18.50	16.04	14.41
3	10.10	08.57	07.25	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.07	09.41
	14.40	16.13	17.42	20.15	21.48	23.25	23.46	22.20	20.33	18.46	16.01	14.39
4	10.09	08.54	07.21	06.32	04.47	03.12	03.04	04.34	06.09	07.35	08.10	09.44
	14.42	16.16	17.46	20.18	21.51	23.28	23.44	22.17	20.29	18.43	15.57	14.37
5	10.08	08.51	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38	08.13	09.46
	14.44	16.19	17.49	20.21	21.54	23.30	23.42	22.14	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.25	04.40	03.08	03.08	04.41	06.15	07.41	08.17	09.49
	14.47	16.23	17.52	20.24	21.57	23.33	23.41	22.10	20.22	18.36	15.51	14.34
7	10.05	08.45	07.11	06.21	04.36	03.05	03.11	04.44	06.18	07.44	08.20	09.51
	14.49	16.26	17.55	20.27	22.01	23.35	23.38	22.07	20.18	18.32	15.48	14.32
8	10.03	08.42	07.07	06.18	04.33	03.03	03.13	04.47	06.21	07.47	08.23	09.53
	14.52	16.29	17.58	20.30	22.04	23.38	23.36	22.03	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.15	04.50	06.24	07.50	08.26	09.56
	14.54	16.32	18.01	20.33	22.07	23.40	23.34	22.00	20.11	18.25	15.42	14.29
10	10.00	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.10	23.42	23.32	21.57	20.08	18.22	15.39	14.28
11	09.58	08.32	06.57	06.07	04.23	02.56	03.21	04.57	06.29	07.56	08.33	10.00
	15.00	16.39	18.07	20.39	22.14	23.44	23.29	21.53	20.04	18.18	15.36	14.27
12	09.56	08.29	06.53	06.03	04.20	02.55	03.23	05.00	06.32	07.59	08.36	10.02
	15.02	16.42	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.26
13	09.54	08.26	06.50	06.00	04.16	02.54	03.26	05.03	06.35	08.02	08.39	10.04
	15.05	16.46	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.11	15.30	14.25
14	09.52	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.05	08.43	10.05
	15.08	16.49	18.16	20.48	22.23	23.49	23.22	21.43	19.53	18.08	15.27	14.24
15	09.49	08.19	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08	08.46	10.07
	15.11	16.52	18.19	20.51	22.27	23.50	23.19	21.39	19.50	18.04	15.24	14.24
16	09.47	08.16	06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11	08.49	10.08
	15.14	16.55	18.22	20.54	22.30	23.52	23.16	21.36	19.46	18.01	15.21	14.23
17	09.45	08.12	06.36	05.46	04.03	02.50	03.38	05.15	06.46	08.14	08.52	10.10
	15.17	16.59	18.25	20.57	22.33	23.53	23.13	21.32	19.43	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.17	08.56	10.11
	15.20	17.02	18.28	21.00	22.36	23.54	23.10	21.29	19.39	17.54	15.15	14.23
19	09.40	08.06	06.29	05.39	03.57	02.50	03.44	05.21	06.52	08.20	08.59	10.12
	15.23	17.05	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.23	09.02	10.13
	15.27	17.08	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47	15.10	14.23
21	09.35	07.59	06.21	05.32	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.14
	15.30	17.11	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.23
22	09.32	07.56	06.18	05.28	03.48	02.50	03.53	05.30	07.01	08.29	09.08	10.14
	15.33	17.14	18.40	21.13	22.49	23.55	22.59	21.15	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.25	03.45	02.50	03.56	05.33	07.04	08.32	09.11	10.15
	15.36	17.18	18.43	21.16	22.52	23.55	22.56	21.11	19.21	17.37	15.02	14.24
24	09.27	07.49	06.11	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.15	10.15
	15.39	17.21	18.45	21.19	22.56	23.55	22.53	21.08	19.18	17.34	14.59	14.25
25	09.24	07.45	06.07	05.18	03.39	02.52	04.03	05.39	07.09	07.38	09.18	10.15
	15.43	17.24	18.48	21.22	22.59	23.55	22.49	21.04	19.14	16.30	14.57	14.26
26	09.21	07.42	06.04	05.14	03.36	02.53	04.06	05.42	07.12	07.42	09.21	10.15
	15.46	17.27	18.51	21.25	23.02	23.54	22.46	21.01	19.11	16.27	14.54	14.27
27	09.18	07.38	06.00	05.11	03.33	02.54	04.09	05.45	07.15	07.45	09.24	10.15
	15.49	17.30	18.54	21.29	23.05	23.54	22.43	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.57	05.07	03.30	02.55	04.12	05.48	07.18	07.48	09.27	10.15
	15.53	17.33	18.57	21.32	23.08	23.53	22.40	20.54	19.04	16.20	14.50	14.29
29	09.12		06.53	05.04	03.27	02.57	04.15	05.51	07.21	07.51	09.30	10.15
	15.56		20.00	21.35	23.11	23.52	22.37	20.50	19.00	16.17	14.47	14.30
30	09.10		06.50	05.00	03.25	02.58	04.18	05.54	07.24	07.54	09.33	10.14
	15.59		20.03	21.38	23.14	23.50	22.33	20.47	18.57	16.14	14.45	14.32
31	09.07		06.46		03.22		04.22	05.57		07.57		10.13
	16.03		20.06		23.17		22.30	20.43		16.10		14.34
Potential sun hours	171	238	363	451	569	624	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

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Calculated:

23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: D - Asuinrakennus D (Haapavesitie 1404)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January		February			March	April	May	June	July	August	September	October			November			December
1	10.13		09.04		10.31 (10)	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27			08.01		10.08 (12)	09.36
	14.36		16.06	30	11.01 (12)	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53			16.07	19	10.27 (12)	14.43
2	10.12		09.01		10.32 (10)	07.28	06.39	04.54	03.17	03.00	04.28	06.03	07.30			08.04		10.06 (12)	09.38
	14.38		16.09	29	11.01 (12)	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50			16.04	22	10.28 (12)	14.41
3	10.11		08.58		10.33 (10)	07.25	06.36	04.50	03.15	03.02	04.31	06.06	07.33			08.07		10.05 (12)	09.41
	14.40		16.13	28	11.01 (12)	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46			16.01	24	10.29 (12)	14.39
4	10.09		08.55		10.34 (10)	07.21	06.32	04.47	03.12	03.04	04.35	06.09	07.36			08.10		10.05 (12)	09.44
	14.42		16.16	27	11.01 (12)	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43			15.58	25	10.30 (12)	14.37
5	10.08		08.52		10.34 (12)	07.18	06.28	04.43	03.10	03.06	04.38	06.12	07.38			08.14		10.05 (12)	09.46
	14.44		16.19	26	11.00 (12)	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39			15.54	25	10.30 (12)	14.36
6	10.07		08.48		10.34 (12)	07.15	06.25	04.40	03.08	03.08	04.41	06.15	07.41			08.17		10.04 (12)	09.49
	14.47		16.23	26	11.00 (12)	17.52	20.24	21.58	23.33	23.41	22.10	20.22	18.36			15.51	27	10.31 (12)	14.34
7	10.05		08.45		10.36 (12)	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44			08.20		10.04 (12)	09.51
	14.49		16.26	24	11.00 (12)	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32			15.48	27	10.31 (12)	14.32
8	10.04		08.42		10.36 (12)	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47			08.23		10.03 (10)	09.54
	14.52		16.29	23	10.59 (12)	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29			15.45	28	10.31 (12)	14.31
9	10.02		08.39		10.37 (12)	07.04	06.14	04.30	03.02	03.16	04.50	06.24	07.50			08.27		10.03 (10)	09.56
	14.54		16.33	21	10.58 (12)	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25			15.42	28	10.31 (12)	14.30
10	10.00		08.36		10.38 (12)	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53			08.30		10.02 (10)	09.58
	14.57		16.36	19	10.57 (12)	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22			15.39	29	10.31 (12)	14.28
11	09.58		08.32		10.41 (12)	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56			08.33		10.01 (10)	10.00
	15.00		16.39	15	10.56 (12)	18.07	20.39	22.14	23.44	23.30	21.53	20.04	18.18			15.36	30	10.31 (12)	14.27
12	09.56		08.29		10.43 (12)	06.54	06.04	04.20	02.55	03.24	05.00	06.32	07.59			08.36		10.01 (10)	10.02
	15.03		16.43	9	10.52 (12)	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15			15.33	30	10.31 (12)	14.26
13	09.54		08.26			06.50	06.00	04.17	02.54	03.26	05.03	06.35	08.02			08.40		10.01 (10)	10.04
	15.05		16.46			18.13	20.45	22.20	23.48	23.25	21.47	19.57	18.11			15.30	30	10.31 (12)	14.25
14	09.52		08.23			06.46	05.57	04.13	02.53	03.29	05.06	06.38	08.05			08.43		10.01 (10)	10.06
	15.08		16.49			18.16	20.48	22.24	23.49	23.22	21.43	19.54	18.08			15.27	29	10.30 (12)	14.25
15	09.50		08.19			06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08			08.46		10.02 (10)	10.07
	15.11		16.52			18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05			15.24	28	10.30 (12)	14.24
16	09.47		08.16			06.39	05.49	04.07	02.51	03.35	05.12	06.44	08.11			08.49		10.02 (10)	10.09
	15.14		16.56			18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01			15.21	28	10.30 (12)	14.24
17	09.45		08.13			06.36	05.46	04.04	02.51	03.38	05.15	06.47	08.14			08.53		10.02 (10)	10.10
	15.17		16.59			18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58			15.18	27	10.29 (12)	14.23
18	09.43		08.09			06.32	05.42	04.00	02.50	03.41	05.18	06.50	08.17			08.56		10.03 (10)	10.11
	15.21		17.02			18.28	21.01	22.37	23.54	23.11	21.29	19.39	17.54			15.15	25	10.28 (12)	14.23
19	09.40		08.06			06.29	05.39	03.57	02.50	03.44	05.22	06.52	08.20			08.59		10.03 (10)	10.12
	15.24		17.05			18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51			15.13	24	10.27 (12)	14.23
20	09.38		08.03		10.38 (10)	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23			09.02		10.05 (10)	10.13
	15.27	5	17.08		10.43 (10)	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47			15.10	21	10.26 (12)	14.23
21	09.35		07.59		10.34 (10)	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26			09.05		10.09 (10)	10.14
	15.30	14	17.12		10.48 (12)	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44			15.07	14	10.23 (12)	14.23
22	09.32		07.56		10.30 (10)	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29			09.09		10.14 (10)	10.15
	15.33	21	17.15		10.51 (12)	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41			15.04	5	10.19 (10)	14.24
23	09.30		07.52		10.29 (10)	06.15	05.25	03.45	02.51	03.56	05.34	07.04	08.32			09.12			10.15
	15.36	24	17.18		10.53 (12)	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37			15.02			14.24
24	09.27		07.49		10.29 (10)	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36			09.15			10.15
	15.40	25	17.21		10.54 (12)	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34			14.59			14.25
25	09.24		07.46		10.29 (10)	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39			09.18			10.16
	15.43	27	17.24		10.56 (12)	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.30			14.57			14.26
26	09.21		07.42		10.29 (10)	06.04	05.14	03.36	02.53	04.06	05.43	07.12	07.42			09.21			10.16
	15.46	28	17.27		10.57 (12)	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27			14.54			14.27
27	09.19		07.39		10.29 (10)	06.00	05.11	03.33	02.54	04.09	05.46	07.15	07.45			09.24			10.16
	15.50	29	17.30		10.58 (12)	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24			14.52			14.28
28	09.16		07.35		10.29 (10)	05.57	05.07	03.30	02.55	04.12	05.49	07.18	07.48			09.27			10.15
	15.53	29	17.33		10.58 (12)	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.20			14.50			14.29
29	09.13				10.29 (10)	06.53	05.04	03.28	02.57	04.15	05.52	07.21	07.51			09.30			10.15
	15.56	30			10.59 (12)	20.01	21.35	23.11	23.52	22.37	20.51	19.00	16.17			14.47			14.31
30	09.10				10.29 (10)	06.50	05.01	03.25	02.58	04.19	05.55	07.24	07.54		10.12 (12)	09.33			10.14
	16.00	30			10.59 (12)	20.03	21.38	23.14	23.51	22.34	20.47	18.57	16.14	10	10.22 (12)	14.45			14.32
31	09.07				10.30 (10)	06.46		03.22		04.22	05.58		07.58		10.09 (12)				10.14
	16.03	30			11.00 (12)	20.06		23.17		22.30	20.44		16.11	16	10.25 (12)				14.34
Potential sun hours	171		238			363	451	569	624	608	508	393	305			198			137
Total, worst case		292		277										26			545		
Sun reduction		0,18		0,33										0,35			0,24		
Oper. time red.		0,99		0,99										0,99			0,99		
Wind dir. red.		0,67		0,67										0,67			0,67		
Total reduction		0,12		0,22										0,23			0,16		
Total, real		36		61										6			86		

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

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

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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: E - Asuinrakennus E (Säilynkankaantie 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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.13	09.04	07.32	06.43	04.57	03.20	03.00	04.25	06.01	07.27	08.01	09.36
	14.36	16.06	17.37	20.09	21.42	23.20	23.49	22.27	20.40	18.53	16.07	14.43
2	10.12	09.01	07.28	06.39	04.54	03.17	03.00	04.28	06.04	07.30	08.04	09.38
	14.38	16.10	17.40	20.12	21.45	23.23	23.48	22.24	20.36	18.50	16.04	14.41
3	10.11	08.58	07.25	06.36	04.50	03.15	03.02	04.32	06.06	07.33	08.07	09.41
	14.40	16.13	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.46	16.01	14.39
4	10.09	08.55	07.22	06.32	04.47	03.12	03.04	04.35	06.09	07.36	08.10	09.44
	14.42	16.16	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43	15.58	14.38
5	10.08	08.52	07.18	06.29	04.43	03.10	03.06	04.38	06.12	07.39	08.14	09.46
	14.45	16.20	17.49	20.21	21.54	23.31	23.43	22.14	20.26	18.39	15.55	14.36
6	10.07	08.48	07.15	06.25	04.40	03.08	03.09	04.41	06.15	07.41	08.17	09.49
	14.47	16.23	17.52	20.24	21.58	23.33	23.41	22.11	20.22	18.36	15.51	14.34
7	10.05	08.45	07.11	06.21	04.37	03.06	03.11	04.44	06.18	07.44	08.20	09.51
	14.49	16.26	17.55	20.27	22.01	23.36	23.39	22.07	20.19	18.32	15.48	14.33
8	10.04	08.42	07.08	06.18	04.33	03.04	03.13	04.47	06.21	07.47	08.23	09.54
	14.52	16.30	17.58	20.30	22.04	23.38	23.37	22.04	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.16	04.51	06.24	07.50	08.27	09.56
	14.54	16.33	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.25	15.42	14.30
10	10.00	08.36	07.01	06.11	04.27	03.00	03.18	04.54	06.27	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22	15.39	14.28
11	09.58	08.32	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56	08.33	10.00
	15.00	16.39	18.07	20.39	22.14	23.44	23.30	21.54	20.04	18.18	15.36	14.27
12	09.56	08.29	06.54	06.04	04.20	02.55	03.24	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.42	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.26
13	09.54	08.26	06.50	06.00	04.17	02.54	03.27	05.03	06.35	08.02	08.40	10.04
	15.06	16.46	18.13	20.46	22.20	23.48	23.24	21.47	19.57	18.12	15.30	14.25
14	09.52	08.23	06.47	05.57	04.13	02.53	03.29	05.06	06.38	08.05	08.43	10.06
	15.09	16.49	18.16	20.49	22.24	23.49	23.22	21.43	19.54	18.08	15.27	14.25
15	09.50	08.19	06.43	05.53	04.10	02.52	03.32	05.09	06.41	08.08	08.46	10.07
	15.11	16.52	18.19	20.52	22.27	23.51	23.19	21.40	19.50	18.05	15.24	14.24
16	09.47	08.16	06.39	05.50	04.07	02.51	03.35	05.12	06.44	08.11	08.49	10.09
	15.14	16.56	18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01	15.21	14.24
17	09.45	08.13	06.36	05.46	04.04	02.51	03.38	05.16	06.47	08.14	08.53	10.10
	15.18	16.59	18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58	15.18	14.23
18	09.43	08.09	06.32	05.43	04.01	02.50	03.41	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.37	23.54	23.11	21.29	19.40	17.54	15.15	14.23
19	09.40	08.06	06.29	05.39	03.57	02.50	03.44	05.22	06.53	08.20	08.59	10.12
	15.24	17.05	18.31	21.04	22.40	23.55	23.08	21.26	19.36	17.51	15.13	14.23
20	09.38	08.03	06.25	05.35	03.54	02.50	03.47	05.25	06.55	08.23	09.02	10.13
	15.27	17.08	18.34	21.07	22.43	23.55	23.05	21.22	19.32	17.47	15.10	14.23
21	09.35	07.59	06.22	05.32	03.51	02.50	03.50	05.28	06.58	08.26	09.05	10.14
	15.30	17.12	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.23
22	09.32	07.56	06.18	05.28	03.48	02.50	03.53	05.31	07.01	08.29	09.09	10.15
	15.33	17.15	18.40	21.13	22.50	23.56	22.59	21.15	19.25	17.41	15.05	14.24
23	09.30	07.52	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.32	09.12	10.15
	15.37	17.18	18.43	21.16	22.53	23.56	22.56	21.12	19.22	17.37	15.02	14.24
24	09.27	07.49	06.11	05.21	03.42	02.51	04.00	05.37	07.07	08.36	09.15	10.15
	15.40	17.21	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34	14.59	14.25
25	09.24	07.46	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39	09.18	10.16
	15.43	17.24	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.14	03.36	02.53	04.06	05.43	07.13	07.42	09.21	10.16
	15.46	17.27	18.52	21.26	23.02	23.55	22.47	21.01	19.11	16.27	14.55	14.27
27	09.19	07.39	06.01	05.11	03.33	02.54	04.09	05.46	07.15	07.45	09.24	10.16
	15.50	17.30	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24	14.52	14.28
28	09.16	07.35	05.57	05.08	03.31	02.56	04.12	05.49	07.18	07.48	09.27	10.15
	15.53	17.34	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.21	14.50	14.29
29	09.13		06.53	05.04	03.28	02.57	04.16	05.52	07.21	07.51	09.30	10.15
	15.56		20.01	21.35	23.11	23.52	22.37	20.51	19.01	16.17	14.48	14.31
30	09.10		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.33	10.14
	16.00		20.04	21.38	23.14	23.51	22.34	20.47	18.57	16.14	14.45	14.32
31	09.07		06.46		03.22		04.22	05.58		07.58		10.14
	16.03		20.07		23.17		22.30	20.44		16.11		14.34
Potential sun hours	171	238	363	451	569	624	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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+358104095666
Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: F - Asuinrakennus F (Ritamäentie 156)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.13	09.04	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.01	09.36
	14.36	16.06	17.37	20.10	21.42	23.20	23.49	22.27	20.40	18.54	16.08	14.44
2	10.12	09.01	07.29	06.39	04.54	03.18	03.01	04.29	06.04	07.30	08.04	09.38
	14.38	16.10	17.40	20.13	21.45	23.23	23.48	22.24	20.37	18.50	16.04	14.42
3	10.11	08.58	07.25	06.36	04.50	03.15	03.03	04.32	06.07	07.33	08.07	09.41
	14.40	16.13	17.43	20.15	21.48	23.25	23.46	22.21	20.33	18.47	16.01	14.40
4	10.09	08.55	07.22	06.32	04.47	03.13	03.05	04.35	06.09	07.36	08.10	09.44
	14.43	16.16	17.46	20.18	21.51	23.28	23.45	22.17	20.29	18.43	15.58	14.38
5	10.08	08.52	07.18	06.29	04.44	03.10	03.07	04.38	06.12	07.39	08.14	09.46
	14.45	16.20	17.49	20.21	21.55	23.31	23.43	22.14	20.26	18.40	15.55	14.36
6	10.07	08.48	07.15	06.25	04.40	03.08	03.09	04.41	06.15	07.42	08.17	09.49
	14.47	16.23	17.52	20.24	21.58	23.33	23.41	22.11	20.22	18.36	15.52	14.34
7	10.05	08.45	07.11	06.22	04.37	03.06	03.11	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.01	23.35	23.39	22.07	20.19	18.33	15.48	14.33
8	10.04	08.42	07.08	06.18	04.34	03.04	03.14	04.48	06.21	07.47	08.23	09.54
	14.52	16.30	17.58	20.30	22.04	23.38	23.36	22.04	20.15	18.29	15.45	14.31
9	10.02	08.39	07.04	06.14	04.30	03.02	03.16	04.51	06.24	07.50	08.27	09.56
	14.55	16.33	18.01	20.33	22.07	23.40	23.34	22.00	20.12	18.26	15.42	14.30
10	10.00	08.36	07.01	06.11	04.27	03.00	03.19	04.54	06.27	07.53	08.30	09.58
	14.57	16.36	18.04	20.36	22.11	23.42	23.32	21.57	20.08	18.22	15.39	14.29
11	09.58	08.32	06.57	06.07	04.23	02.57	03.21	04.57	06.30	07.56	08.33	10.00
	15.00	16.40	18.07	20.39	22.14	23.44	23.29	21.54	20.05	18.19	15.36	14.28
12	09.56	08.29	06.54	06.04	04.20	02.56	03.24	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.43	22.17	23.46	23.27	21.50	20.01	18.15	15.33	14.27
13	09.54	08.26	06.50	06.00	04.17	02.54	03.27	05.03	06.35	08.02	08.40	10.04
	15.06	16.46	18.13	20.46	22.20	23.47	23.24	21.47	19.57	18.12	15.30	14.26
14	09.52	08.23	06.47	05.57	04.14	02.53	03.30	05.06	06.38	08.05	08.43	10.06
	15.09	16.49	18.16	20.49	22.24	23.49	23.22	21.43	19.54	18.08	15.27	14.25
15	09.50	08.19	06.43	05.53	04.10	02.52	03.33	05.09	06.41	08.08	08.46	10.07
	15.12	16.53	18.19	20.52	22.27	23.50	23.19	21.40	19.50	18.05	15.24	14.24
16	09.47	08.16	06.40	05.50	04.07	02.52	03.35	05.13	06.44	08.11	08.49	10.09
	15.15	16.56	18.22	20.55	22.30	23.52	23.16	21.36	19.47	18.01	15.21	14.24
17	09.45	08.13	06.36	05.46	04.04	02.51	03.38	05.16	06.47	08.14	08.53	10.10
	15.18	16.59	18.25	20.58	22.33	23.53	23.14	21.33	19.43	17.58	15.18	14.24
18	09.43	08.09	06.32	05.43	04.01	02.51	03.41	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.37	23.54	23.11	21.29	19.40	17.54	15.16	14.23
19	09.40	08.06	06.29	05.39	03.58	02.50	03.44	05.22	06.53	08.20	08.59	10.12
	15.24	17.05	18.31	21.04	22.40	23.54	23.08	21.26	19.36	17.51	15.13	14.23
20	09.38	08.03	06.25	05.36	03.55	02.50	03.47	05.25	06.55	08.23	09.02	10.13
	15.27	17.09	18.34	21.07	22.43	23.55	23.05	21.22	19.33	17.48	15.10	14.23
21	09.35	07.59	06.22	05.32	03.51	02.50	03.51	05.28	06.58	08.26	09.05	10.14
	15.30	17.12	18.37	21.10	22.46	23.55	23.02	21.19	19.29	17.44	15.07	14.24
22	09.32	07.56	06.18	05.29	03.48	02.51	03.54	05.31	07.01	08.29	09.09	10.15
	15.34	17.15	18.40	21.13	22.50	23.55	22.59	21.15	19.25	17.41	15.05	14.24
23	09.30	07.53	06.15	05.25	03.45	02.51	03.57	05.34	07.04	08.33	09.12	10.15
	15.37	17.18	18.43	21.16	22.53	23.55	22.56	21.12	19.22	17.37	15.02	14.25
24	09.27	07.49	06.11	05.22	03.42	02.52	04.00	05.37	07.07	08.36	09.15	10.15
	15.40	17.21	18.46	21.19	22.56	23.55	22.53	21.08	19.18	17.34	15.00	14.25
25	09.24	07.46	06.08	05.18	03.39	02.52	04.03	05.40	07.10	07.39	09.18	10.16
	15.43	17.24	18.49	21.23	22.59	23.55	22.50	21.05	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.36	02.53	04.06	05.43	07.13	07.42	09.21	10.16
	15.47	17.27	18.52	21.26	23.02	23.54	22.47	21.01	19.11	16.27	14.55	14.27
27	09.19	07.39	06.01	05.11	03.34	02.55	04.09	05.46	07.15	07.45	09.24	10.15
	15.50	17.31	18.55	21.29	23.05	23.54	22.43	20.58	19.08	16.24	14.52	14.28
28	09.16	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.27	10.15
	15.53	17.34	18.58	21.32	23.08	23.53	22.40	20.54	19.04	16.21	14.50	14.30
29	09.13		06.54	05.04	03.28	02.57	04.16	05.52	07.21	07.51	09.30	10.15
	15.56		20.01	21.35	23.11	23.52	22.37	20.51	19.01	16.17	14.48	14.31
30	09.10		06.50	05.01	03.25	02.59	04.19	05.55	07.24	07.54	09.33	10.14
	16.00		20.04	21.38	23.14	23.51	22.34	20.47	18.57	16.14	14.46	14.32
31	09.07		06.46		03.23		04.22	05.58		07.58		10.14
	16.03		20.07		23.17		22.30	20.44		16.11		14.34
Potential sun hours	171	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: G - Lomarakennus G (Virtaniementie 175)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.31	06.42	04.57	03.19	03.00	04.25	06.00	07.26	08.00	09.35
	14.36	16.06	17.36	20.09	21.41	23.19	23.48	22.26	20.39	18.53	16.07	14.43
2	10.11	09.00	07.28	06.39	04.53	03.17	03.00	04.28	06.03	07.29	08.03	09.38
	14.38	16.09	17.39	20.12	21.44	23.22	23.47	22.23	20.36	18.49	16.04	14.41
3	10.10	08.57	07.24	06.35	04.50	03.14	03.02	04.31	06.06	07.32	08.06	09.40
	14.40	16.12	17.42	20.15	21.47	23.24	23.45	22.20	20.32	18.46	16.00	14.39
4	10.08	08.54	07.21	06.31	04.46	03.12	03.04	04.34	06.09	07.35	08.10	09.43
	14.42	16.16	17.45	20.18	21.50	23.27	23.44	22.16	20.29	18.42	15.57	14.37
5	10.07	08.51	07.17	06.28	04.43	03.10	03.06	04.37	06.12	07.38	08.13	09.45
	14.44	16.19	17.48	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.54	14.35
6	10.06	08.48	07.14	06.24	04.40	03.08	03.08	04.41	06.15	07.41	08.16	09.48
	14.46	16.22	17.51	20.24	21.57	23.32	23.40	22.10	20.21	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.36	03.05	03.11	04.44	06.17	07.44	08.19	09.50
	14.49	16.26	17.54	20.27	22.00	23.34	23.38	22.06	20.18	18.32	15.48	14.32
8	10.03	08.41	07.07	06.17	04.33	03.03	03.13	04.47	06.20	07.47	08.23	09.53
	14.51	16.29	17.57	20.30	22.03	23.37	23.36	22.03	20.14	18.28	15.45	14.31
9	10.01	08.38	07.03	06.14	04.29	03.02	03.15	04.50	06.23	07.50	08.26	09.55
	14.54	16.32	18.00	20.33	22.07	23.39	23.33	21.59	20.11	18.25	15.41	14.29
10	09.59	08.35	07.00	06.10	04.26	03.00	03.18	04.53	06.26	07.52	08.29	09.57
	14.57	16.35	18.03	20.36	22.10	23.41	23.31	21.56	20.07	18.21	15.38	14.28
11	09.57	08.32	06.56	06.07	04.23	02.57	03.21	04.56	06.29	07.55	08.32	09.59
	14.59	16.39	18.06	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.35	14.27
12	09.55	08.28	06.53	06.03	04.19	02.55	03.23	04.59	06.32	07.58	08.36	10.01
	15.02	16.42	18.09	20.42	22.16	23.45	23.26	21.49	20.00	18.14	15.32	14.26
13	09.53	08.25	06.49	06.00	04.16	02.54	03.26	05.03	06.35	08.01	08.39	10.03
	15.05	16.45	18.12	20.45	22.20	23.46	23.23	21.46	19.57	18.11	15.29	14.25
14	09.51	08.22	06.46	05.56	04.13	02.53	03.29	05.06	06.38	08.04	08.42	10.05
	15.08	16.49	18.15	20.48	22.23	23.48	23.21	21.42	19.53	18.07	15.26	14.24
15	09.49	08.19	06.42	05.52	04.10	02.52	03.32	05.09	06.40	08.07	08.45	10.06
	15.11	16.52	18.18	20.51	22.26	23.49	23.18	21.39	19.49	18.04	15.23	14.24
16	09.46	08.15	06.39	05.49	04.06	02.51	03.35	05.12	06.43	08.10	08.48	10.08
	15.14	16.55	18.21	20.54	22.29	23.51	23.15	21.35	19.46	18.00	15.21	14.23
17	09.44	08.12	06.35	05.45	04.03	02.50	03.38	05.15	06.46	08.13	08.52	10.09
	15.17	16.58	18.24	20.57	22.33	23.52	23.13	21.32	19.42	17.57	15.18	14.23
18	09.42	08.09	06.32	05.42	04.00	02.50	03.41	05.18	06.49	08.16	08.55	10.10
	15.20	17.01	18.27	21.00	22.36	23.53	23.10	21.28	19.39	17.54	15.15	14.23
19	09.39	08.05	06.28	05.38	03.57	02.50	03.44	05.21	06.52	08.19	08.58	10.11
	15.23	17.05	18.30	21.03	22.39	23.53	23.07	21.25	19.35	17.50	15.12	14.23
20	09.37	08.02	06.25	05.35	03.54	02.50	03.47	05.24	06.55	08.22	09.01	10.12
	15.26	17.08	18.33	21.06	22.42	23.54	23.04	21.21	19.32	17.47	15.09	14.23
21	09.34	07.58	06.21	05.31	03.51	02.50	03.50	05.27	06.58	08.26	09.05	10.13
	15.30	17.11	18.36	21.09	22.45	23.54	23.01	21.18	19.28	17.43	15.07	14.23
22	09.31	07.55	06.18	05.28	03.48	02.50	03.53	05.30	07.00	08.29	09.08	10.14
	15.33	17.14	18.39	21.12	22.49	23.54	22.58	21.14	19.25	17.40	15.04	14.23
23	09.29	07.52	06.14	05.24	03.45	02.50	03.56	05.33	07.03	08.32	09.11	10.14
	15.36	17.17	18.42	21.15	22.52	23.54	22.55	21.11	19.21	17.37	15.01	14.24
24	09.26	07.48	06.10	05.21	03.42	02.51	03.59	05.36	07.06	08.35	09.14	10.14
	15.39	17.20	18.45	21.19	22.55	23.54	22.52	21.07	19.18	17.33	14.59	14.25
25	09.23	07.45	06.07	05.17	03.39	02.52	04.02	05.39	07.09	07.38	09.17	10.15
	15.43	17.24	18.48	21.22	22.58	23.54	22.49	21.04	19.14	16.30	14.56	14.26
26	09.21	07.41	06.03	05.14	03.36	02.53	04.06	05.42	07.12	07.41	09.20	10.15
	15.46	17.27	18.51	21.25	23.01	23.53	22.46	21.00	19.10	16.27	14.54	14.26
27	09.18	07.38	06.00	05.10	03.33	02.54	04.09	05.45	07.15	07.44	09.23	10.14
	15.49	17.30	18.54	21.28	23.04	23.53	22.42	20.57	19.07	16.23	14.52	14.28
28	09.15	07.35	05.56	05.07	03.30	02.55	04.12	05.48	07.18	07.47	09.26	10.14
	15.52	17.33	18.57	21.31	23.07	23.52	22.39	20.53	19.03	16.20	14.49	14.29
29	09.12		06.53	05.03	03.27	02.57	04.15	05.51	07.20	07.50	09.29	10.14
	15.56		20.00	21.34	23.10	23.51	22.36	20.50	19.00	16.17	14.47	14.30
30	09.09		06.49	05.00	03.25	02.58	04.18	05.54	07.23	07.54	09.32	10.13
	15.59		20.03	21.38	23.13	23.50	22.33	20.46	18.56	16.13	14.45	14.32
31	09.06		06.46		03.22		04.21	05.57		07.57		10.13
	16.02		20.06		23.16		22.30	20.43		16.10		14.33
Potential sun hours	172	238	363	451	569	623	608	508	393	305	198	137
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Miikka Saranpää / miikka.saranpaa@fcg.fi

Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: H - Asuinrakennus H (Purotie 55)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.11	09.03	07.31	06.42	04.57	03.20	03.01	04.25	06.00	07.26	08.00	09.34
	14.37	16.06	17.36	20.09	21.41	23.18	23.48	22.26	20.39	18.53	16.07	14.44
2	10.10	09.00	07.28	06.39	04.54	03.18	03.01	04.28	06.03	07.29	08.03	09.37
	14.38	16.09	17.39	20.12	21.44	23.21	23.46	22.23	20.36	18.49	16.04	14.42
3	10.09	08.57	07.24	06.35	04.50	03.15	03.03	04.32	06.06	07.32	08.06	09.40
	14.41	16.13	17.42	20.15	21.47	23.24	23.45	22.19	20.32	18.46	16.01	14.40
4	10.08	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.45	20.18	21.50	23.26	23.43	22.16	20.29	18.42	15.58	14.38
5	10.07	08.51	07.17	06.28	04.43	03.11	03.07	04.38	06.12	07.38	08.13	09.45
	14.45	16.19	17.49	20.21	21.53	23.29	23.41	22.13	20.25	18.39	15.54	14.36
6	10.05	08.47	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.31	23.39	22.09	20.22	18.35	15.51	14.34
7	10.04	08.44	07.10	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.19	09.50
	14.50	16.26	17.55	20.27	22.00	23.34	23.37	22.06	20.18	18.32	15.48	14.33
8	10.02	08.41	07.07	06.18	04.33	03.04	03.14	04.47	06.21	07.47	08.22	09.52
	14.52	16.29	17.58	20.30	22.03	23.36	23.35	22.03	20.14	18.28	15.45	14.31
9	10.00	08.38	07.03	06.14	04.30	03.03	03.16	04.51	06.23	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.06	23.38	23.33	21.59	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.10	04.27	03.01	03.19	04.54	06.26	07.53	08.29	09.57
	14.57	16.36	18.04	20.36	22.10	23.40	23.30	21.56	20.07	18.22	15.39	14.29
11	09.57	08.32	06.56	06.07	04.23	02.58	03.22	04.57	06.29	07.56	08.32	09.59
	15.00	16.39	18.07	20.39	22.13	23.42	23.28	21.53	20.04	18.18	15.36	14.28
12	09.55	08.28	06.53	06.03	04.20	02.56	03.24	05.00	06.32	07.58	08.35	10.01
	15.03	16.42	18.10	20.42	22.16	23.44	23.26	21.49	20.00	18.15	15.33	14.27
13	09.53	08.25	06.49	06.00	04.17	02.55	03.27	05.03	06.35	08.01	08.39	10.02
	15.06	16.46	18.13	20.45	22.19	23.46	23.23	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.56	04.14	02.54	03.30	05.06	06.38	08.04	08.42	10.04
	15.09	16.49	18.16	20.48	22.23	23.47	23.20	21.42	19.53	18.08	15.27	14.25
15	09.48	08.18	06.42	05.53	04.10	02.53	03.33	05.09	06.41	08.07	08.45	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.04	15.24	14.25
16	09.46	08.15	06.39	05.49	04.07	02.52	03.36	05.12	06.43	08.10	08.48	10.07
	15.15	16.55	18.22	20.54	22.29	23.50	23.15	21.35	19.46	18.01	15.21	14.24
17	09.44	08.12	06.35	05.46	04.04	02.52	03.39	05.15	06.46	08.13	08.52	10.09
	15.18	16.59	18.25	20.57	22.32	23.51	23.12	21.32	19.43	17.57	15.18	14.24
18	09.41	08.09	06.32	05.42	04.01	02.51	03.42	05.18	06.49	08.16	08.55	10.10
	15.21	17.02	18.27	21.00	22.35	23.52	23.09	21.28	19.39	17.54	15.15	14.24
19	09.39	08.05	06.28	05.39	03.58	02.51	03.45	05.21	06.52	08.19	08.58	10.11
	15.24	17.05	18.30	21.03	22.39	23.53	23.06	21.25	19.35	17.51	15.13	14.24
20	09.36	08.02	06.25	05.35	03.54	02.51	03.48	05.24	06.55	08.22	09.01	10.12
	15.27	17.08	18.33	21.06	22.42	23.53	23.04	21.21	19.32	17.47	15.10	14.24
21	09.34	07.58	06.21	05.32	03.51	02.51	03.51	05.28	06.58	08.26	09.04	10.12
	15.30	17.11	18.36	21.09	22.45	23.53	23.01	21.18	19.28	17.44	15.07	14.24
22	09.31	07.55	06.18	05.28	03.48	02.51	03.54	05.31	07.01	08.29	09.07	10.13
	15.33	17.14	18.39	21.12	22.48	23.54	22.58	21.14	19.25	17.40	15.05	14.24
23	09.29	07.52	06.14	05.25	03.45	02.52	03.57	05.34	07.03	08.32	09.11	10.14
	15.37	17.18	18.42	21.15	22.51	23.54	22.55	21.11	19.21	17.37	15.02	14.25
24	09.26	07.48	06.11	05.21	03.42	02.52	04.00	05.37	07.06	08.35	09.14	10.14
	15.40	17.21	18.45	21.19	22.54	23.53	22.52	21.07	19.18	17.34	15.00	14.26
25	09.23	07.45	06.07	05.18	03.39	02.53	04.03	05.40	07.09	07.38	09.17	10.14
	15.43	17.24	18.48	21.22	22.58	23.53	22.48	21.04	19.14	16.30	14.57	14.26
26	09.20	07.41	06.04	05.14	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.14
	15.46	17.27	18.51	21.25	23.01	23.53	22.45	21.00	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.09	05.46	07.15	07.44	09.23	10.14
	15.50	17.30	18.54	21.28	23.04	23.52	22.42	20.57	19.07	16.24	14.52	14.28
28	09.15	07.35	05.56	05.07	03.31	02.56	04.13	05.48	07.18	07.47	09.26	10.14
	15.53	17.33	18.57	21.31	23.07	23.51	22.39	20.53	19.04	16.20	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.51	07.21	07.50	09.29	10.13
	15.56		20.00	21.34	23.10	23.50	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.49	05.00	03.25	02.59	04.19	05.54	07.23	07.54	09.32	10.13
	16.00		20.03	21.37	23.13	23.49	22.33	20.46	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.57		07.57		10.12
	16.03		20.06		23.15		22.29	20.43		16.10		14.34
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

Licensed user:
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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: I - Lomarakennus I (Hirvinevan haara 147)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.04	07.32	06.43	04.58	03.21	03.00	04.26	06.01	07.27	08.01	09.35
	14.37	16.07	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.54	16.08	14.44
2	10.11	09.01	07.28	06.39	04.54	03.18	03.02	04.29	06.04	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.45	23.22	23.47	22.24	20.36	18.50	16.05	14.42
3	10.10	08.58	07.25	06.36	04.51	03.16	03.03	04.32	06.07	07.33	08.07	09.41
	14.41	16.13	17.43	20.15	21.48	23.25	23.45	22.20	20.33	18.47	16.01	14.40
4	10.09	08.54	07.22	06.32	04.47	03.13	03.05	04.35	06.10	07.36	08.10	09.43
	14.43	16.17	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.08	08.51	07.18	06.29	04.44	03.11	03.07	04.38	06.13	07.39	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.14	20.26	18.40	15.55	14.37
6	10.06	08.48	07.15	06.25	04.41	03.09	03.10	04.42	06.15	07.42	08.17	09.48
	14.48	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.52	14.35
7	10.05	08.45	07.11	06.22	04.37	03.07	03.12	04.45	06.18	07.44	08.20	09.51
	14.50	16.27	17.55	20.27	22.01	23.35	23.38	22.07	20.19	18.33	15.49	14.33
8	10.03	08.42	07.08	06.18	04.34	03.05	03.14	04.48	06.21	07.47	08.23	09.53
	14.53	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.46	14.32
9	10.01	08.39	07.04	06.15	04.31	03.03	03.17	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.34	22.00	20.12	18.26	15.43	14.31
10	09.59	08.35	07.01	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.30	09.58
	14.58	16.36	18.04	20.36	22.10	23.41	23.31	21.57	20.08	18.22	15.39	14.29
11	09.58	08.32	06.57	06.08	04.24	03.00	03.22	04.57	06.30	07.56	08.33	10.00
	15.01	16.40	18.07	20.39	22.14	23.43	23.29	21.53	20.04	18.19	15.36	14.28
12	09.56	08.29	06.54	06.04	04.21	02.57	03.25	05.00	06.33	07.59	08.36	10.02
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.54	08.26	06.50	06.00	04.17	02.55	03.28	05.04	06.36	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.47	23.24	21.46	19.57	18.12	15.30	14.26
14	09.51	08.22	06.47	05.57	04.14	02.54	03.30	05.07	06.38	08.05	08.43	10.05
	15.09	16.50	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.26
15	09.49	08.19	06.43	05.53	04.11	02.53	03.33	05.10	06.41	08.08	08.46	10.07
	15.12	16.53	18.19	20.52	22.27	23.50	23.19	21.40	19.50	18.05	15.25	14.25
16	09.47	08.16	06.40	05.50	04.08	02.53	03.36	05.13	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.55	22.30	23.51	23.16	21.36	19.47	18.01	15.22	14.25
17	09.45	08.13	06.36	05.46	04.04	02.52	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.58	22.33	23.52	23.13	21.33	19.43	17.58	15.19	14.24
18	09.42	08.09	06.33	05.43	04.01	02.52	03.42	05.19	06.50	08.17	08.56	10.11
	15.21	17.02	18.28	21.01	22.36	23.53	23.10	21.29	19.40	17.55	15.16	14.24
19	09.40	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.53	08.20	08.59	10.12
	15.24	17.06	18.31	21.04	22.39	23.53	23.07	21.26	19.36	17.51	15.13	14.24
20	09.37	08.03	06.25	05.36	03.55	02.51	03.48	05.25	06.56	08.23	09.02	10.13
	15.28	17.09	18.34	21.07	22.43	23.54	23.04	21.22	19.33	17.48	15.11	14.24
21	09.35	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.31	17.12	18.37	21.10	22.46	23.54	23.01	21.19	19.29	17.44	15.08	14.24
22	09.32	07.56	06.18	05.29	03.49	02.52	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.55	22.58	21.15	19.25	17.41	15.05	14.25
23	09.29	07.52	06.15	05.25	03.46	02.52	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.55	22.55	21.12	19.22	17.38	15.03	14.25
24	09.27	07.49	06.11	05.22	03.43	02.53	04.00	05.37	07.07	08.36	09.14	10.15
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.46	06.08	05.18	03.40	02.53	04.04	05.40	07.10	07.39	09.18	10.15
	15.44	17.25	18.49	21.22	22.58	23.54	22.49	21.05	19.15	16.31	14.58	14.27
26	09.21	07.42	06.04	05.15	03.37	02.54	04.07	05.43	07.13	07.42	09.21	10.15
	15.47	17.28	18.52	21.26	23.01	23.54	22.46	21.01	19.11	16.28	14.55	14.28
27	09.18	07.39	06.01	05.11	03.34	02.56	04.10	05.46	07.16	07.45	09.24	10.15
	15.50	17.31	18.55	21.29	23.05	23.53	22.43	20.58	19.08	16.24	14.53	14.29
28	09.15	07.35	05.57	05.08	03.31	02.57	04.13	05.49	07.18	07.48	09.27	10.15
	15.54	17.34	18.58	21.32	23.08	23.52	22.40	20.54	19.04	16.21	14.51	14.30
29	09.12		06.54	05.05	03.29	02.58	04.16	05.52	07.21	07.51	09.30	10.14
	15.57		20.01	21.35	23.11	23.51	22.37	20.51	19.01	16.18	14.48	14.32
30	09.10		06.50	05.01	03.26	03.00	04.19	05.55	07.24	07.54	09.32	10.14
	16.00		20.04	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.07		06.46		03.23		04.23	05.58		07.57		10.13
	16.03		20.07		23.16		22.30	20.43		16.11		14.35
Potential sun hours	172	238	363	451	569	622	607	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Vasama_22_11_2022

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Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Calendar

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122 Shadow receptor: J - Lomaasunto J (Pyssyniemen metsätie 2)

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
550	413	384	423	624	914	1 088	1 135	1 014	797	659	680	8 682

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.12	09.03	07.32	06.43	04.57	03.20	03.01	04.25	06.01	07.27	08.00	09.35
	14.37	16.06	17.37	20.09	21.41	23.19	23.48	22.27	20.40	18.53	16.07	14.44
2	10.11	09.00	07.28	06.39	04.54	03.18	03.01	04.29	06.03	07.30	08.04	09.38
	14.39	16.10	17.40	20.12	21.44	23.22	23.47	22.23	20.36	18.50	16.04	14.42
3	10.10	08.57	07.25	06.36	04.50	03.15	03.03	04.32	06.06	07.32	08.07	09.40
	14.41	16.13	17.43	20.15	21.48	23.24	23.45	22.20	20.33	18.46	16.01	14.40
4	10.09	08.54	07.21	06.32	04.47	03.13	03.05	04.35	06.09	07.35	08.10	09.43
	14.43	16.16	17.46	20.18	21.51	23.27	23.44	22.17	20.29	18.43	15.58	14.38
5	10.07	08.51	07.18	06.28	04.44	03.11	03.07	04.38	06.12	07.38	08.13	09.46
	14.45	16.20	17.49	20.21	21.54	23.30	23.42	22.13	20.25	18.39	15.55	14.36
6	10.06	08.48	07.14	06.25	04.40	03.09	03.09	04.41	06.15	07.41	08.16	09.48
	14.47	16.23	17.52	20.24	21.57	23.32	23.40	22.10	20.22	18.36	15.52	14.35
7	10.04	08.45	07.11	06.21	04.37	03.06	03.12	04.44	06.18	07.44	08.20	09.51
	14.50	16.26	17.55	20.27	22.00	23.34	23.38	22.07	20.18	18.32	15.48	14.33
8	10.03	08.42	07.07	06.18	04.34	03.04	03.14	04.48	06.21	07.47	08.23	09.53
	14.52	16.30	17.58	20.30	22.04	23.37	23.36	22.03	20.15	18.29	15.45	14.32
9	10.01	08.38	07.04	06.14	04.30	03.03	03.16	04.51	06.24	07.50	08.26	09.55
	14.55	16.33	18.01	20.33	22.07	23.39	23.33	22.00	20.11	18.25	15.42	14.30
10	09.59	08.35	07.00	06.11	04.27	03.01	03.19	04.54	06.27	07.53	08.29	09.57
	14.58	16.36	18.04	20.36	22.10	23.41	23.31	21.56	20.08	18.22	15.39	14.29
11	09.57	08.32	06.57	06.07	04.24	02.58	03.22	04.57	06.30	07.56	08.33	09.59
	15.00	16.39	18.07	20.39	22.13	23.43	23.29	21.53	20.04	18.18	15.36	14.28
12	09.55	08.29	06.53	06.04	04.20	02.56	03.24	05.00	06.32	07.59	08.36	10.01
	15.03	16.43	18.10	20.42	22.17	23.45	23.26	21.50	20.01	18.15	15.33	14.27
13	09.53	08.25	06.50	06.00	04.17	02.55	03.27	05.03	06.35	08.02	08.39	10.03
	15.06	16.46	18.13	20.45	22.20	23.46	23.24	21.46	19.57	18.11	15.30	14.26
14	09.51	08.22	06.46	05.57	04.14	02.54	03.30	05.06	06.38	08.05	08.42	10.05
	15.09	16.49	18.16	20.48	22.23	23.48	23.21	21.43	19.54	18.08	15.27	14.25
15	09.49	08.19	06.43	05.53	04.10	02.53	03.33	05.09	06.41	08.08	08.46	10.06
	15.12	16.52	18.19	20.51	22.26	23.49	23.18	21.39	19.50	18.05	15.24	14.25
16	09.47	08.16	06.39	05.50	04.07	02.52	03.36	05.13	06.44	08.11	08.49	10.08
	15.15	16.56	18.22	20.54	22.30	23.51	23.16	21.36	19.46	18.01	15.21	14.24
17	09.44	08.12	06.36	05.46	04.04	02.52	03.39	05.16	06.47	08.14	08.52	10.09
	15.18	16.59	18.25	20.57	22.33	23.52	23.13	21.32	19.43	17.58	15.18	14.24
18	09.42	08.09	06.32	05.43	04.01	02.51	03.42	05.19	06.50	08.17	08.55	10.10
	15.21	17.02	18.28	21.00	22.36	23.53	23.10	21.29	19.39	17.54	15.16	14.24
19	09.39	08.06	06.29	05.39	03.58	02.51	03.45	05.22	06.52	08.20	08.58	10.11
	15.24	17.05	18.31	21.03	22.39	23.53	23.07	21.25	19.36	17.51	15.13	14.24
20	09.37	08.02	06.25	05.35	03.55	02.51	03.48	05.25	06.55	08.23	09.02	10.12
	15.27	17.08	18.34	21.07	22.42	23.54	23.04	21.22	19.32	17.47	15.10	14.24
21	09.34	07.59	06.22	05.32	03.52	02.51	03.51	05.28	06.58	08.26	09.05	10.13
	15.30	17.12	18.37	21.10	22.46	23.54	23.01	21.18	19.29	17.44	15.07	14.24
22	09.32	07.56	06.18	05.28	03.49	02.51	03.54	05.31	07.01	08.29	09.08	10.14
	15.34	17.15	18.40	21.13	22.49	23.54	22.58	21.15	19.25	17.41	15.05	14.24
23	09.29	07.52	06.15	05.25	03.45	02.52	03.57	05.34	07.04	08.32	09.11	10.14
	15.37	17.18	18.43	21.16	22.52	23.54	22.55	21.11	19.22	17.37	15.02	14.25
24	09.26	07.49	06.11	05.21	03.43	02.52	04.00	05.37	07.07	08.35	09.14	10.14
	15.40	17.21	18.46	21.19	22.55	23.54	22.52	21.08	19.18	17.34	15.00	14.26
25	09.24	07.45	06.07	05.18	03.40	02.53	04.03	05.40	07.09	07.38	09.17	10.15
	15.43	17.24	18.49	21.22	22.58	23.54	22.49	21.04	19.15	16.31	14.57	14.26
26	09.21	07.42	06.04	05.15	03.37	02.54	04.06	05.43	07.12	07.41	09.20	10.15
	15.47	17.27	18.51	21.25	23.01	23.53	22.46	21.01	19.11	16.27	14.55	14.27
27	09.18	07.38	06.00	05.11	03.34	02.55	04.10	05.46	07.15	07.45	09.23	10.15
	15.50	17.30	18.54	21.28	23.04	23.53	22.43	20.57	19.07	16.24	14.52	14.29
28	09.15	07.35	05.57	05.08	03.31	02.56	04.13	05.49	07.18	07.48	09.26	10.14
	15.53	17.33	18.57	21.32	23.07	23.52	22.40	20.54	19.04	16.21	14.50	14.30
29	09.12		06.53	05.04	03.28	02.58	04.16	05.52	07.21	07.51	09.29	10.14
	15.56		20.00	21.35	23.10	23.51	22.36	20.50	19.00	16.17	14.48	14.31
30	09.09		06.50	05.01	03.26	02.59	04.19	05.55	07.24	07.54	09.32	10.13
	16.00		20.03	21.38	23.13	23.50	22.33	20.47	18.57	16.14	14.46	14.33
31	09.06		06.46		03.23		04.22	05.58		07.57		10.13
	16.03		20.06		23.16		22.30	20.43		16.11		14.34
Potential sun hours	172	238	363	451	569	623	608	508	393	305	199	138
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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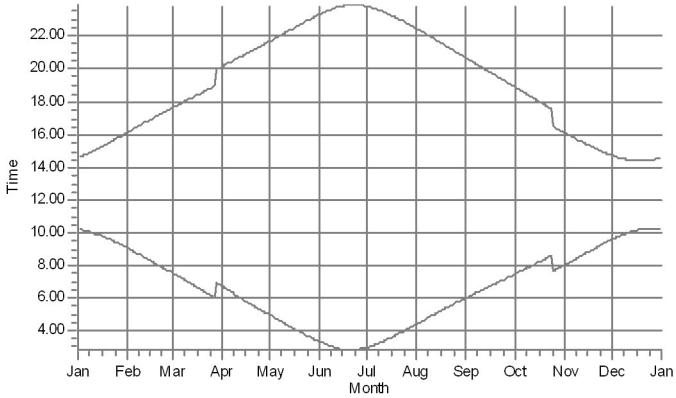
Calculated:
23.11.2022 9.50/3.5.584

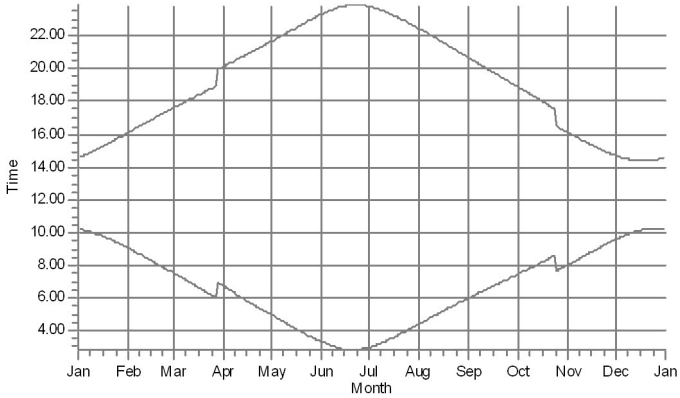
SHADOW - Calendar, graphical

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

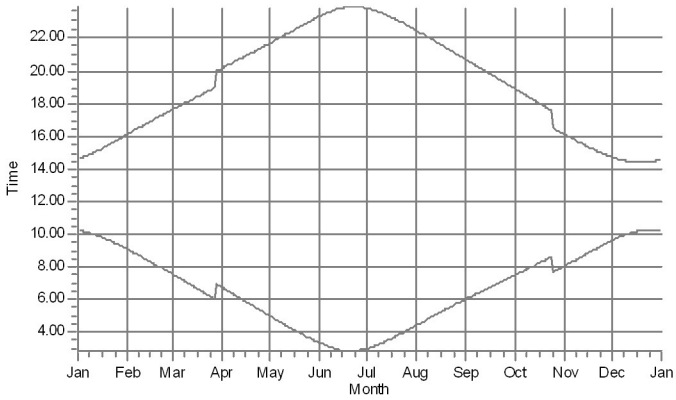
A: Lomarakennus A (Pyssynienen metsätie 156)



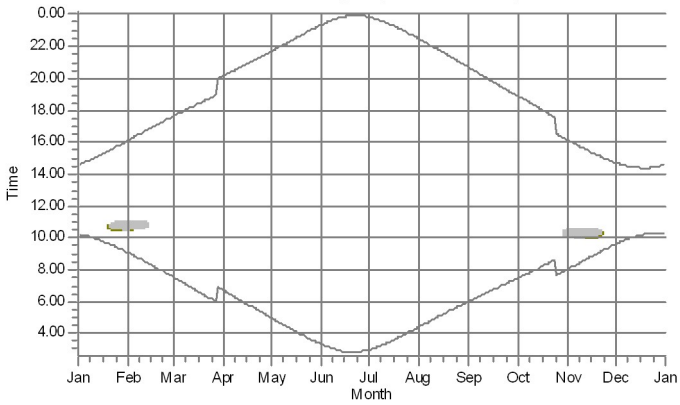
B: Lomarakennus B (Sarjankyläntie 1093)



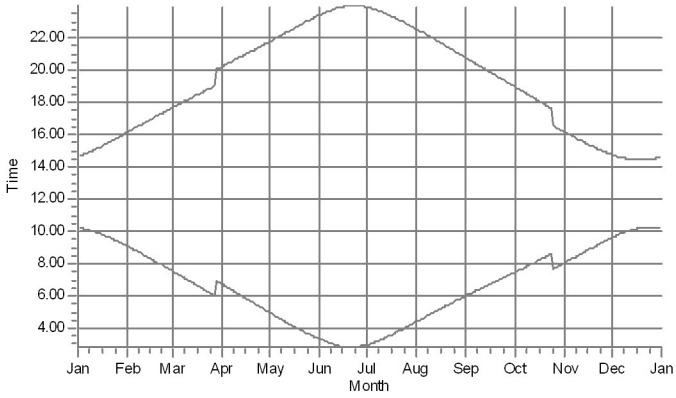
C: Lomarakennnus C (Kurunoja)



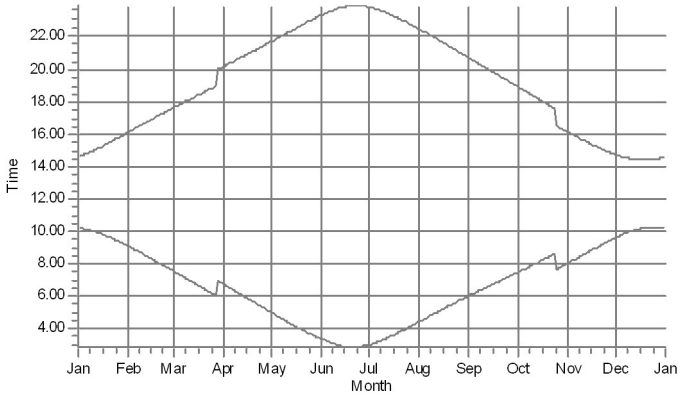
D: Asuinrakennus D (Haapavesitie 1404)



E: Asuinrakennus E (Säilynkankaantie 34)



F: Asuinrakennus F (Ritamäentie 156)



WTGs
10: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (47)
12: Generic RD200 HH200 7700 200.0 IOI hub: 200,0 m (TOT: 300,0 m) (49)

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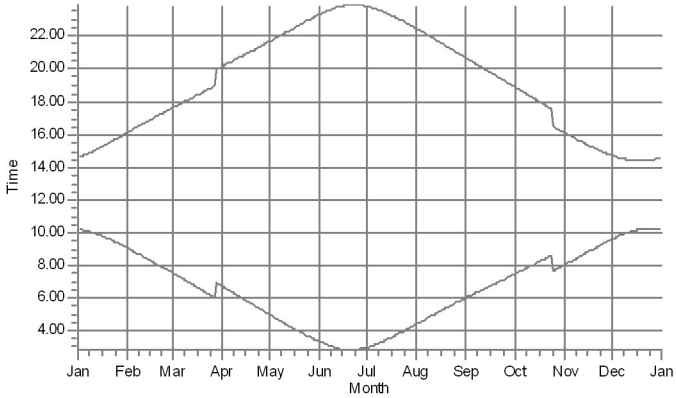
Calculated:
23.11.2022 9.50/3.5.584

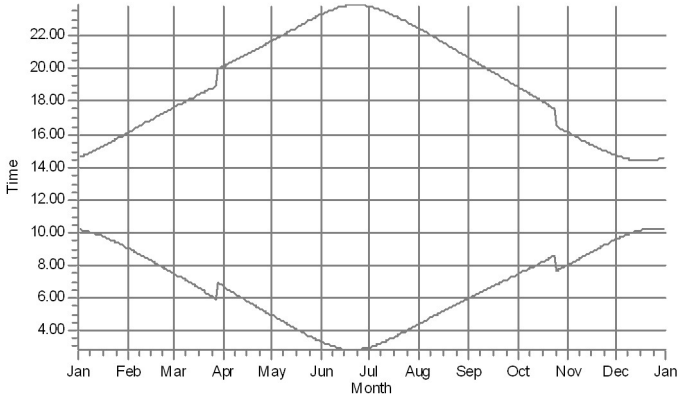
SHADOW - Calendar, graphical

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122

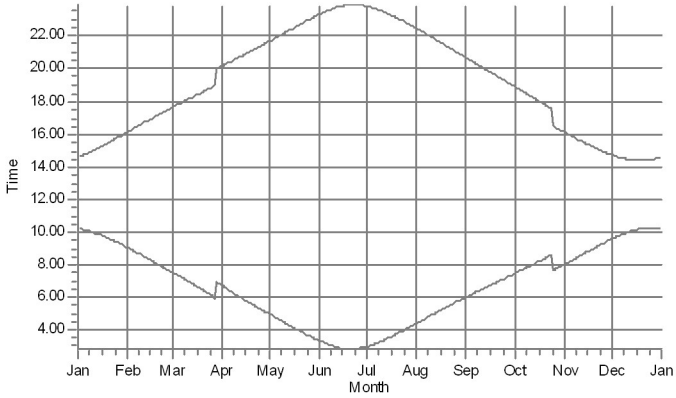
G: Lomarakennus G (Virtaniementie 175)



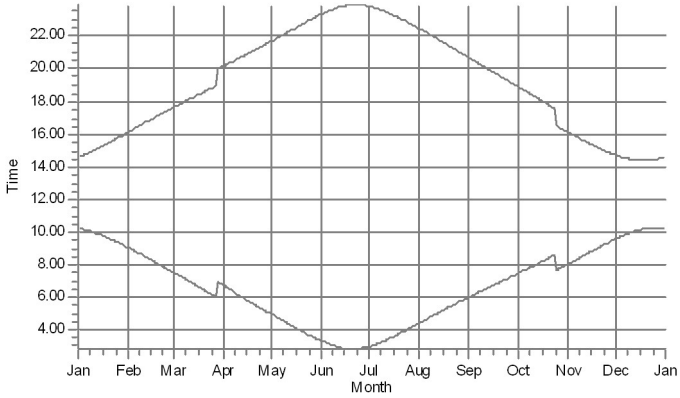
H: Asuinrakennus H (Purotie 55)



I: Lomarakennus I (Hirvinevan haara 147)



J: Lomaasunto J (Pyssyniemen metsätie 2)



WTGs

Project:
Vasama_22_11_2022

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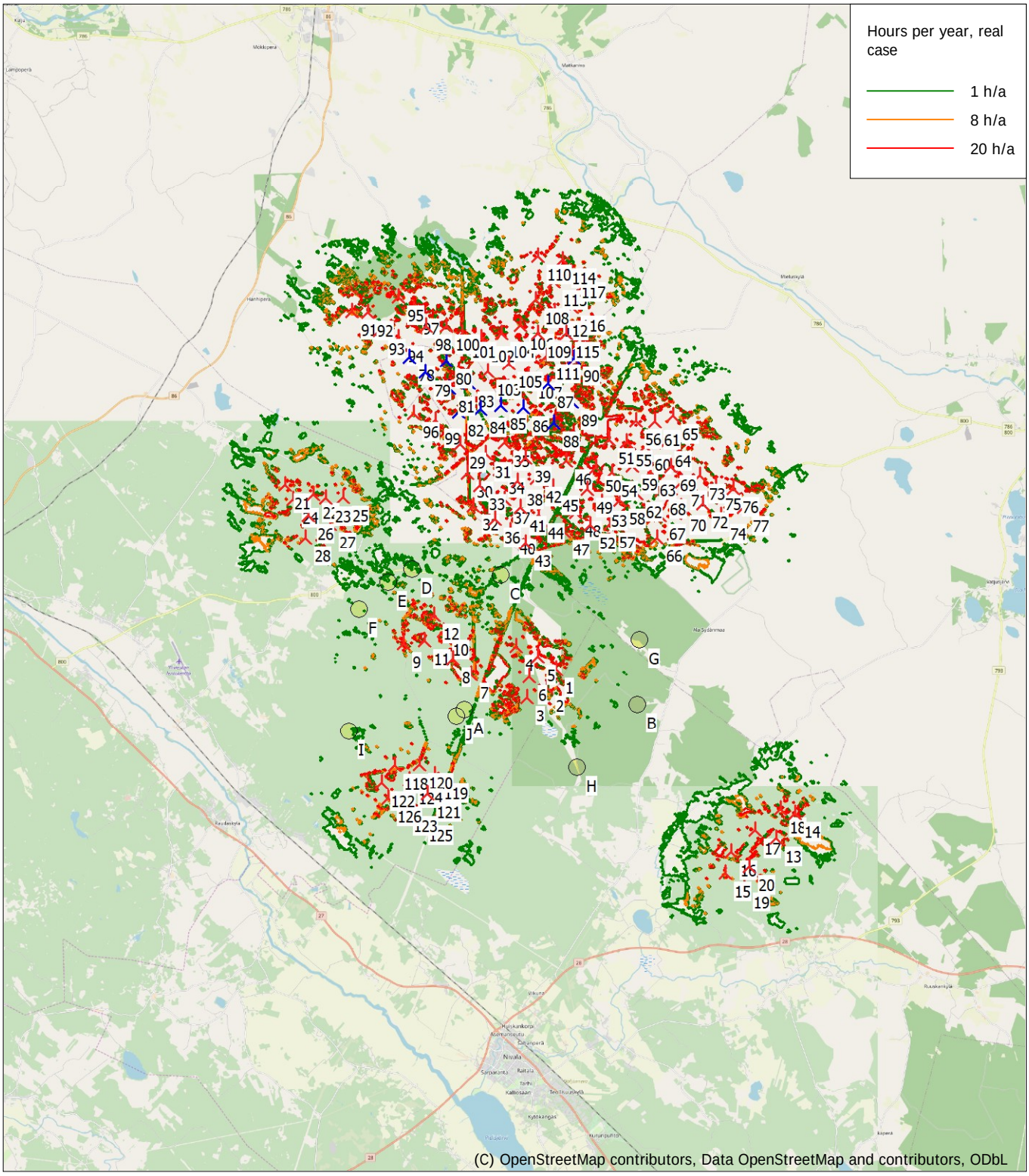
Calculated:
23.11.2022 9.50/3.5.584

SHADOW - Map

Calculation: Vasama VE2_RD200 x 12 x HH200 + Yhteisvaikutus_real case Luke forest_20221122



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 401 340 North: 7 107 810

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Vasama_5_5_2022_0.wpo (1)

Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m