PAHKAKOSKEN ENERGIA OY

Iso Pihlajasuon tuulivoimahanke, Oulu

Melu- ja varjostusmallinnukset

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Iso Pihlajasuon tuulivoimahanke, Oulu

1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Suunnitteilla olevan Yli-Iin kunnan alueelle sijoittuvan Iso Pihlajasuon 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 läheiselle asutukselle.

Tuulivoimaloiden aiheuttamat melu- ja varjostusvaikutukset on mallinnettu WindPro-ohjelmalla voimaloiden sijoitussuunnitelman mukaisesti. Melu- ja varjostusmallinnukset on laatinut Ins. Miikka Saranpää FCG Finnish Consulting Group Oy:stä. Laaduntarkistuksen on tehnyt Johanna Harju 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 mukaisesti tuulen nopeutena käytettiin 8 m/s, ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisena kosteutena 70 % ja maanpinnan kovuutena arvoa 0,4. Hankealuetta lähimpien vesistöjen kovuutena on käytetty arvoa 0. Laskenta on tehty 4,0 m maapinta-tasosta.

Iso Pihlajasuon tuulivoimahanke käsittää yhdeksän tuulivoimalaa ja näiden osalta äänenpainetasot on mallinnettu käyttäen napakorkeuksiltaan 225 m korkeita voimaloita. Lähtötietona eli referenssivoimalana on käytetty tuulivoimalaitosvalmistaja Vestaksen V150-6.0 voimalaa. Laskelmissa tuulivoimalan äänitehotasona (LWA) on käytetty 107,7 dB. Tuulivoimalaitoksen V150-6.0 melupäästötiedot on saatu voimalavalmistajalta.

Mallinnuksessa on huomioitu Iso Pihlajasuon yhdeksän voimalan lisäksi rakenteilla oleva Pahkakosken tuulivoimapuisto, joka käsittää 30 tuulivoimalaa. Näiden voimaloiden osalta äänenpainetasot on mallinnettu käyttäen napakorkeuksiltaan 177 m korkeita voimaloita. Lähtötietona eli referenssivoimalana on käytetty tuulivoimalaitosvalmistaja Vestaksen V136-3.45 voimalaa. Laskelmissa tuulivoimalan äänitehotasona (LWA) on käytetty 108,2 dB. Tuulivoimalaitoksen V136-3.45 melupäästötiedot on saatu voimalavalmistajalta.

Valmistajan ilmoittamat tuulivoimaloiden tuottamat äänitehotasot perustuvat todellisiin mittaustuloksiin ja vastaavat ylempää luottamusväliä 95%. Lähtömelutaso on arvioitu valmistajan antamien tietojen pohjalta, laskemalla ensin napakorkeudessa vallitseva tuulen nopeus ympäristöministeriön ohjeen 4/2014 kaavan 5.3.1 mukaisesti. Maan karheutena on käytetty arvoa 0,3.

Melumallinnuksen laskentatuloksia on havainnollistettu ns. keskiäänitasokarttojen avulla. Keskiäänitasokartassa on melun keskiäänitaso- eli ekvivalenttiäänitasokäyrät (LAeq) 5 dB välein. Tulokset on esitetty liitteessä 1.

2.1.2 Matalataajuisen melun mallinnus

Matalataajuinen melu laskettiin Ympäristöministeriön ohjeen 2/2014 mukaisin menetelmin, käyttäen voimalavalmistajilta saatuja arvioita voimaloiden 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, 2019) julkistamien Anojanssi- projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

Taulukko 1. 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

Matalataajuisen melun laskelmassa huomioitiin maanpinnan muodon vaikutus ohjeen 4/2014 mukaisesti. Tulokset on esitetty taajuuskohtaisena taulukkona hankealuetta ympäröiville taloille. Kohdekohtaiset tulokset on liitetty raporttiin (Liite 2).

Taulukko 2. Pahkakosken 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: Vestas				Tyyppi: V136-3.45 MW		Sarjanumero/t:-	
Nimellisteho:3,45 MW		Napakorkeus:177 m		Roottorin halkaisija:136		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä: Blades without serrated trailing edge			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:		Kyllä	
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso		-	

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot perustuvat dokumenttiin ”DMS 0055-9919_V00 V136-mk3-3.45 MW Third octave noise emission, 2015-11-23” NO STE Tuulivoima-alueen tuulivoimaloiden melumallinnuksen lähtöarvoina käytetään ensisijaisesti valmistajan standardin IEC TS 61400–14 mukaisesti ilmoittamia tuulivoimaloiden melupäästön (äänitehotaso) takuuarvoja (”declared value” tai ”warranted level”). Valmistajan ilmoittama tuulivoimalan tuottaman äänitehotaso perustuu todellisiin mittaustuloksiin ja vastaa ylempää luottamusväliä 95%, ”The stated values are expected to be representing an upper 95% confidence limit for the turbine performance”.							
Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	73,0	200	89,9	1600	100,2
63	86,7	25	73,6	250	91,9	2000	96,3
125	95,0	31,5	73,5	315	93,7	2500	92,9
250	96,9	40	77,0	400	95,4	3150	88,6
500	101,0	50	81,0	500	95,8	4000	86,4
1000	104,3	63	81,1	630	97,3	5000	76,3
2000	102,2	80	83,3	800	98,8	6300	67,7
4000	90,8	100	86,3	1000	99,6	8000	58,3
8000	68,6	125	91,9	1250	100,0	10000	57,9
108,2 dB(A)		160	90,8				

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

Taulukko 3. Iso Pihlajasuon 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: Vestas				Tyyppi: V150-6.0MW PO1-0S,		Sarjanumero/t:-	
Nimellisteho: 6,0 MW		Napakorkeus: 225 m		Roottorin halkaisija:150		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä: Blades without serrated trailing edge			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:		Kyllä	
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso		-	

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Melupäästötiedot perustuvat dokumenttiin ”DMS 0095-3747_V01 - V150-6_0MW Third Octaves noise emission” Blades with serrated trailing edge. Tuulivoimalan tai tuulivoima-alueen tuulivoimaloiden melumallinnuksen lähtöarvoina käytetään ensisijaisesti valmistajan standardin IEC TS 61400–14 mukaisesti ilmoittamia tuulivoimaloiden melupäästön (äänitehotaso) takuuarvoja (”declared value” tai ”warranted level”). Valmistajan ilmoittama tuulivoimalan tuottaman äänitehotaso perustuu todellisiin mittaustuloksiin ja vastaa ylempää luottamusväliä 95%, *”The stated values are expected to be representing an upper 95% confidence limit for the turbine performance*”.							
Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	57,7	200	93,9	1600	95,3
62,5	85,9	25	62,8	250	95,5	2000	93,6
125	94,7	31,5	67,7	315	96,7	2500	91,7
250	100,3	40	72,4	400	97,7	3150	89,3
500	102,8	50	76,4	500	98,2	4000	86,4
1000	102,3	63	80,3	630	98,3	5000	83,4
2000	98,5	80	83,8	800	98,1	6300	79,9
4000	91,8	100	86,8	1000	97,6	8000	75,9
8000	81,8	125	89,5	1250	96,7	10000	71,8
107,7 dB(A)		160	92				

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

Taulukko 4. Käytetyt mallinnusparametrit ISO 9613-2 laskelmissa sekä melulle altistuvat kohteet.

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskenta korkeus		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:1,0
Maan- ja vedenpinnan absorption ja heijastuksen huomioiminen, käytetyt kertoimet			
ISO 9613-2	maa-alueet = 0,4 Vesialue = 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°		Tuulennopeus: 8 m/s 10 m korkeudessa	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä		Muu, mikä, miksi:	

2.2 Varjostusmallinnus

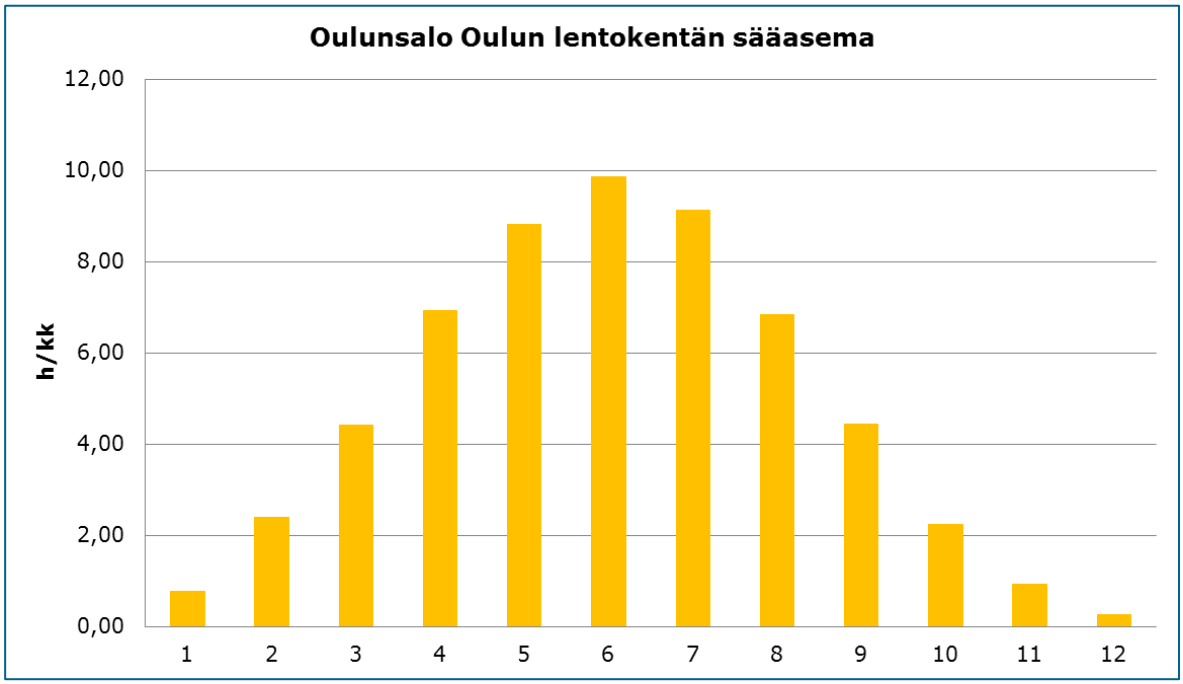
Tuulivoimaloiden varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Varjostuslaskennassa käytettiin Iso-Pihlajasuon tuulivoimaloiden osalta voimalaa, jonka roottorin halkaisija on 200 metriä ja napakorkeus 200 metriä, jolloin kokonaiskorkeudeksi muodostuu 300 metriä. Pahkakosken rakenteilla olevan tuulivoimapuiston osalta käytettiin voimalavalmista Vestaksen V136 voimalaa, jonka roottorin halkaisija on 136 metriä ja napakorkeus 177 metriä.

Mallinnus tehtiin niin sanotulle todelliselle tilanteelle (real case). Mallinnuksissa tehtiin kaksi eri laskentatilannetta molemmille vaihtoehdoille:

A. Todellinen tilanne, jossa puuston suojaavaa vaikutusta ei huomioitu (real case, no forest). Tämä kuvaa spekulatiivista tilannetta, jossa alueella ei kasvaisi lainkaan puustoa.

B. Todellinen tilanne, jossa puuston suojaavaa vaikutusta on huomioitu (real case, luke forest). Puuston korkeustiedot perustuvat Luonnonvarakeskus (Luke) vuoden 2019 monilähteisestä valtakunnan metsien inventoinnista (MVMI), jossa käytetään Valtakunnan metsien inventoinnin (VMI) maastomittausten lisäksi satelliittikuvia ja muita tietolähteitä, kuten Maanmittauslaitoksen numeerista maastotietokantaa ja korkeusmallia. Vuoden 2019 metsävarakartoissa karttateemojen maastoelementin koko on nyt 16 × 16 metriä, (Kuva 2).

Auringon keskimääräiset paistetunnit perustuvat Oulun lentokentän sääaseman pitkäaikaisiin mitattuihin säätietoihin 1981–2010 (Kuva 1). Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-datatietoa hankealueen läheisyydeltä (E26.002_N65.500).



Kuva 1. Oulunsalon Oulun lentokentän sääaseman kuukauden keskimääräiset päivittäiset auringonpaistetunnit vuosina 1981–2010

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 sekä kuukausittainen pilvisyys (ts. kuinka paljon aurinko paistaa ollessaan horisontin yläpuolella).

Laskennoissa varjot huomioidaan, jos aurinko on yli 3 astetta horisontin yläpuolella ja varjoksi lasketaan, kun siipi peittää vähintään 20 % auringosta.

Varjostuksen tarkastelukorkeutena lähialueen asuin- tai lomarakennusten pihapiirissä käytettiin 2,0 metriä ja laskenta-alueen kokoa 5,0 x 5,0 metriä.

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

2.3 Raja- ja ohjearvot

Suomessa ei ole viranomaisten antamia yleisiä määräyksiä tuulivoimaloiden muodostaman varjostuksen enimmäiskestoista eikä varjonmuodostuksen arviointiperusteista. Ympäristöministeriön tuulivoimarakentamisen suunnittelu-ohjeistuksessa esitetään käytettäväksi muiden maiden suosituksia välkkeen rajoittamisesta (Ympäristöministeriö 2012).

Useissa maissa on annettu raja-arvoja tai suosituksia hyväksyttävän välkevaikutuksen määrästä. Esimerkiksi Tanskassa sovelletaan todellisen tilanteen raja-arvona enintään kymmenen tuntia vuodessa. Ruotsissa vastaava suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä.

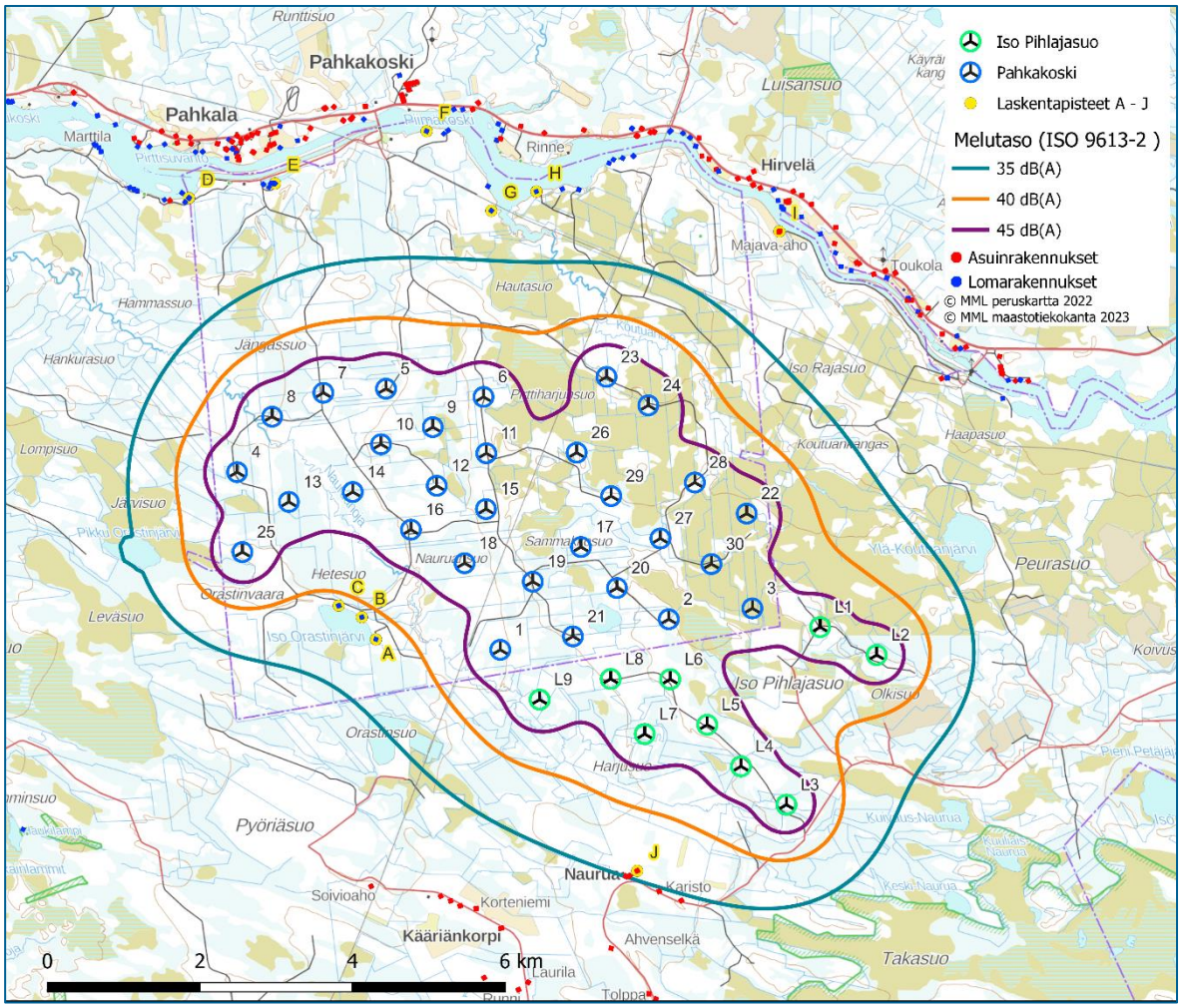
Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa (”real case”) esiintyy vähintään kahdeksan tuntia vuodessa.

3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

3.1 Melun laskentatulokset ISO 9613-2

3.1.1 Iso-Pihlajasuon tuulivoimapuisto

Iso Pihlajasuon tuulivoimapuiston mukainen laskennallinen melutaso on esitetty alla olevassa kuvassa, (Kuva 2). Lähimpien asuin- ja lomarakennusten pihapiirissä laskennalliset melutasot ovat alle 40 dB (A).



Kuva 2. Iso Pihlajasuon tuulivoimahankkeen laskennalliset melutasot, kun rakenteilla olevan Pahkakosken tuulivoimapuiston voimalat huomioidaan, yhteensä 39 tuulivoimalaa.

Taulukko 4. Laskennalliset melutasot standardin ISO 9613-2 ja YM 2/2014 ohjeen mukaisesti, kun huomioidaan Iso Pihlajasuon ja Pahkakosken voimalat.

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-korkeus (m)	Melutaso dB(A)
A Lomarakennus (Orastintie)	455 224	7 241 949	85	4	38,4
B Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85	4	39,1
C Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	4	39,2
D Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	4	28,6
E Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66	4	29,7
F Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	4	28,7
G Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	4	32,2
H Lomarakennus (Turpontie 34)	457 328	7 247 817	80	4	31,2
I Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	4	29,6
J Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	4	35,6

Matalataajuinen melu

Sisätilojen laskennallisia tuloksia on verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella. Taulukkoon 5 on koottu matalataajuisen melun laskentatuloksia ja verrattu niitä STM:n toimenpiderajoihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella. Taulukossa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo).

Taulukko 5. Matalataajuisen melun mallinnustulokset herkissä kohteissa verrattuna Sosiaali- ja terveysministeriön toimenpiderajaan.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asumisterveys-ohje sisällä	Hz	L eq,1h – Asumisterveys-ohje sisällä	Hz
A Lomarakennus (Orastintie)	8,5	125	-4,2	50
B Lomarakennus (Orastinjärventie 700)	9,0	125	-3,8	50
C Lomarakennus (Orastinjärventie 728)	9,0	125	-3,7	50
D Asuinrakennus (Kottarantie 311)	1,7	125	-10,3	50
E Lomarakennus (Orastinjärventie 14d)	2,5	125	-9,5	50
F Lomarakennus (Piimäkoskentie 382b)	2,0	125	-9,9	50
G Lomarakennus (Hautasaarentie)	4,5	125	-7,8	50
H Lomarakennus (Turpontie 34)	3,8	125	-8,4	50
I Asuinrakennus (Majava-ahontie 391)	2,5	125	-9,6	50
J Asuinrakennus (Kaistontie 30)	4,8	125	-8,4	50

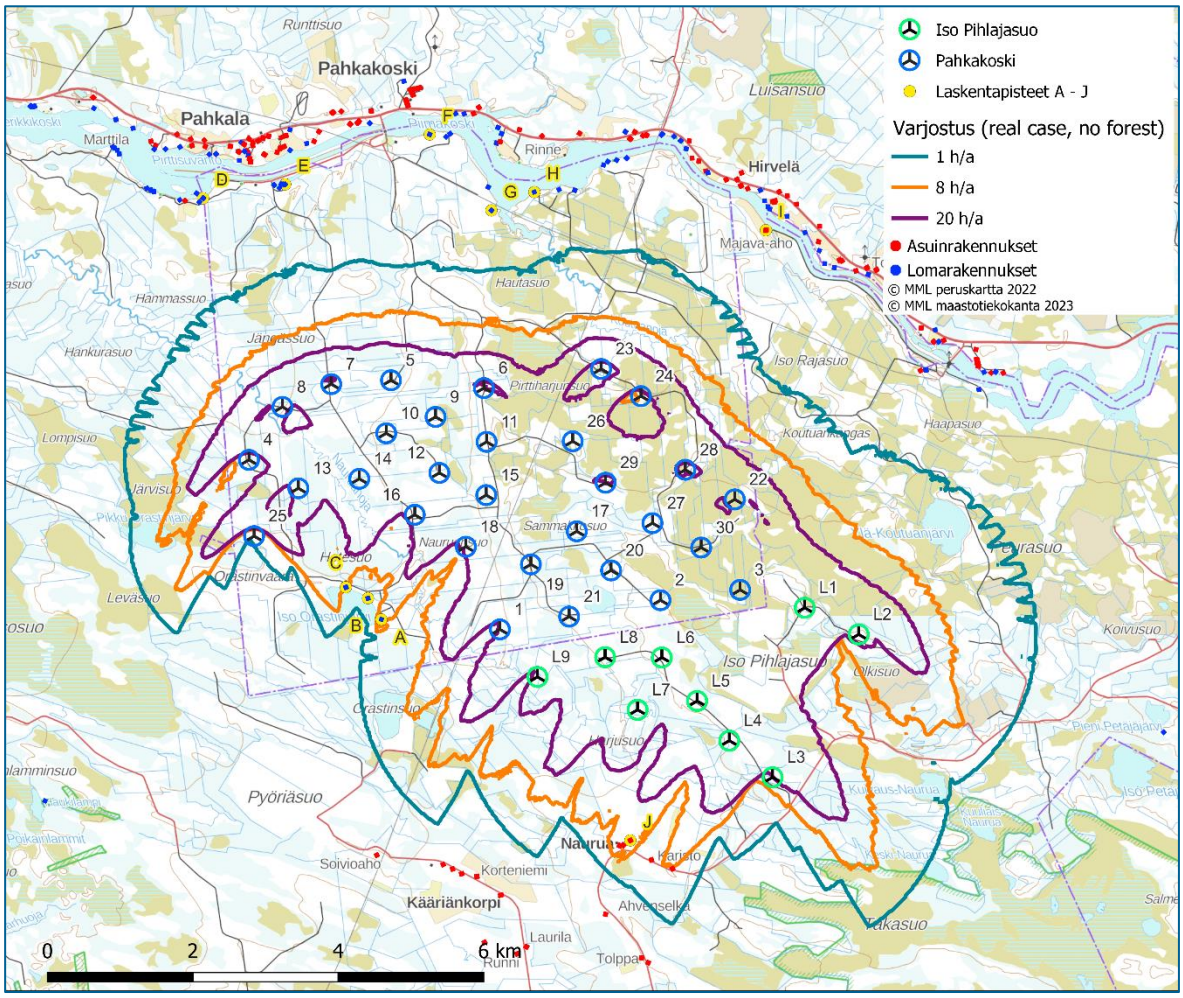
Matalataajuiset äänitasot jäävät kaikkien rakennusten sisällä alle toimenpiderajan, kun rakenteiden ääneneristävyys huomioidaan.

Rakennuskohtaiset matalataajuiset äänitasot lähimpien rakennusten osalta on esitetty liitteessä 2. Rakennusten kirjaintunnukset ovat samat kuin ISO 9613-2 mallinnuksessa (Liite 1).

3.2 Varjostusmallinnusten tulokset

3.2.1 "Real case, no forest"

Lähimpien asuinrakennusten ja lomarakennusten pihapiirissä laskennalliset varjostustunnit ovat "real case, no forest"-laskentatulosten mukaan alle 8 tuntia vuodessa, luukuun ottamatta kohteita A, C ja J (Kuva 3 ja Taulukko 6). Laskentatulokset on esitetty kokonaisuudessaan liitteessä 3.



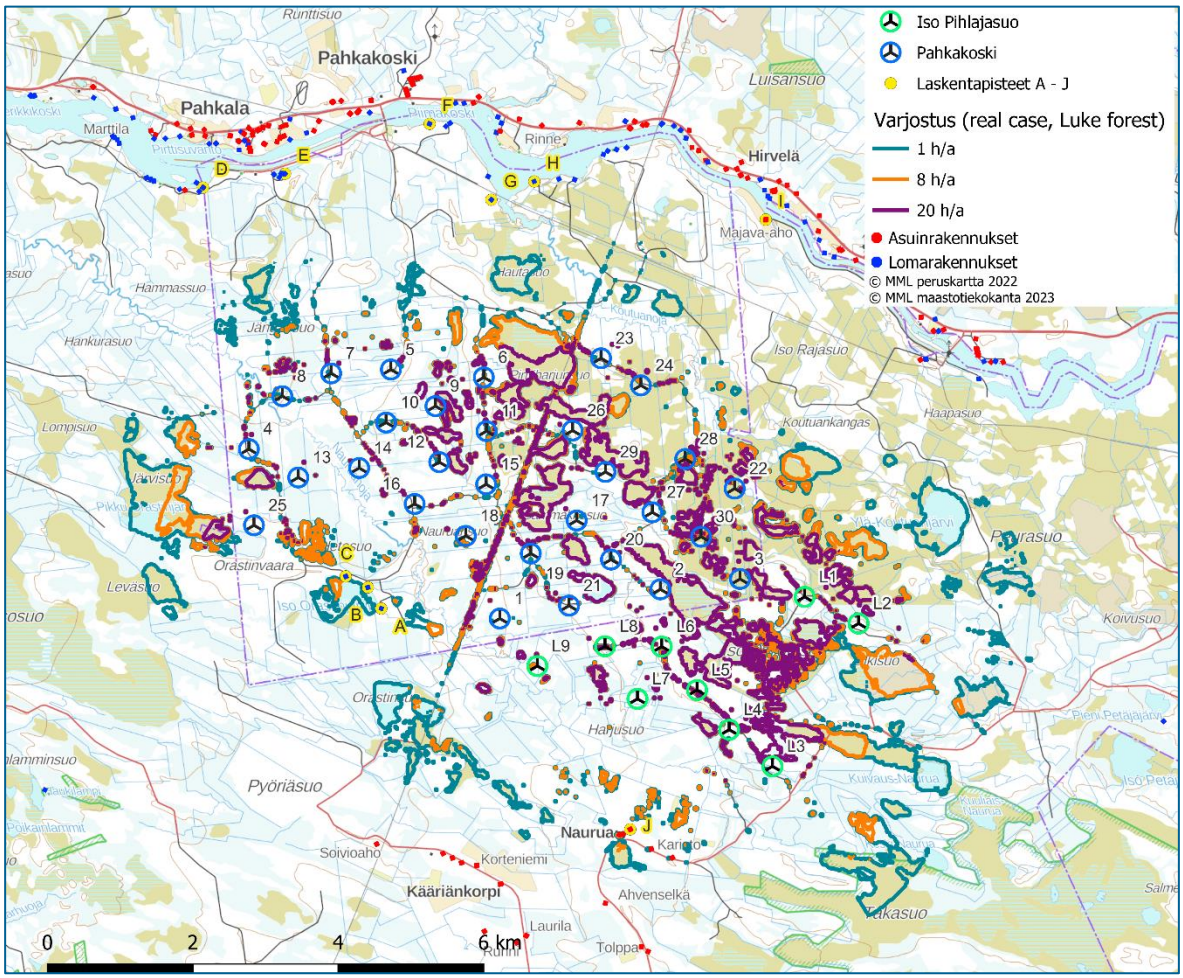
Kuva 3. Iso Pihlajasuon laskennalliset varjostustulokset, kun rakenteilla olevan Pahkakosken tuulivoimapuiston voimalat huomioidaan, yhteensä 39 tuulivoimalaa. Laskelmissa suojaavaa puustoa EI ole huomioitu.

Taulukko 6. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu ”real case, no forest” (yhteensä 39 tuulivoimalaa)

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-ikkuna (m)	Varjostus (h/a)
A Lomarakennus (Orastintie)	455 224	7 241 949	85	5 x 5	9:18
B Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85	5 x 5	3:19
C Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	5 x 5	8:05
D Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	5 x 5	0:00
E Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66	5 x 5	0:00
F Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	5 x 5	0:00
G Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	5 x 5	0:00
H Lomarakennus (Turpontie 34)	457 328	7 247 817	80	5 x 5	0:00
I Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	5 x 5	0:00
J Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	5 x 5	9:46

3.2.2 ”Real case, luke forest"

Tuulivoimaloiden läheisyydessä sijaitsevien asuinrakennusten kohdalla varjostusvaikutukset ylittää 8 tuntia vuodessa laskentapisteessä J ”real case, luke forest”-laskentatulosten perusteella, eli tilanteessa missä puuston suojaava vaikutus huomioidaan (Kuva 4, Taulukko 7). Puuston suojaavan vaikutuksen huomioivan varjostusmallinnuksen laskentatulokset on esitetty kokonaisuudessaan liitteessä 4.



Kuva 4. Iso Pihlajasuon laskennalliset varjostustulokset, kun rakenteilla olevan Pahkakosken tuulivoimapuiston voimalat huomioidaan, yhteensä 39 tuulivoimalaa. Laskelmissa suojaava puusto on huomioitu.

Taulukko 7. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaava vaikutus on huomioitu ”real case, luke forest” (yhteensä 39 tuulivoimalaa)

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta-ikkuna (m)	Varjostus (h/a)
A Lomarakennus (Orastintie)	455 224	7 241 949	85	5 x 5	0:00
B Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85	5 x 5	0:00
C Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	5 x 5	0:00
D Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	5 x 5	0:00
E Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66	5 x 5	0:00
F Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	5 x 5	0:00
G Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	5 x 5	0:00
H Lomarakennus (Turpontie 34)	457 328	7 247 817	80	5 x 5	0:00
I Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	5 x 5	0:00
J Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	5 x 5	9:46

FCG Finnish Consulting Group Oy

Miikka Saranpää
Ins. Laatija

Johanna Harju
Ins. Laaduntarkistus

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

Project:
Iso Pihlajasuo 2023

Description:
Lagerwey

Licensed user:
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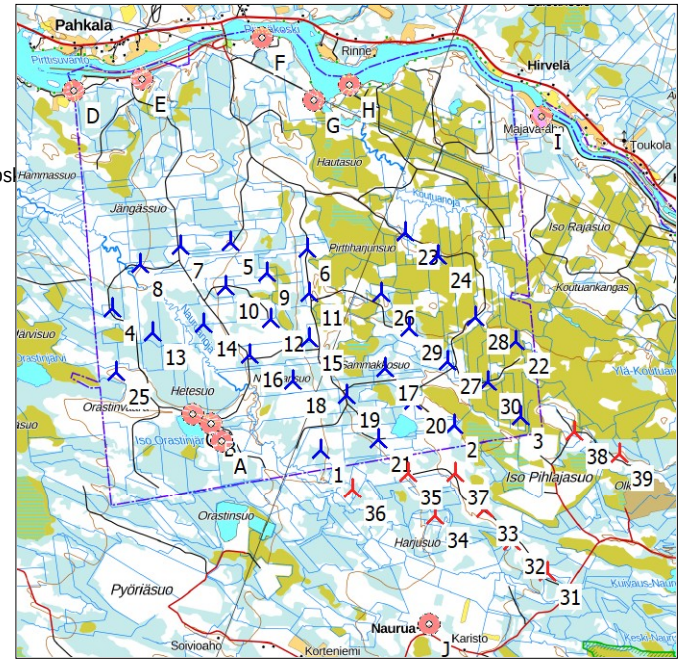
Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Main Result

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

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_Pahkakosk
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
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



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	456 854	7 241 812	88,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
2	459 062	7 242 213	110,6	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
3	460 158	7 242 355	108,3	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
4	453 403	7 244 140	74,3	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
5	455 356	7 245 233	80,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
6	456 634	7 245 126	95,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
7	454 534	7 245 180	73,5	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
8	453 863	7 244 867	69,9	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
9	455 969	7 244 730	86,8	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
10	455 290	7 244 505	85,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
11	456 671	7 244 387	96,3	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
12	456 021	7 243 961	87,6	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
13	454 082	7 243 750	74,5	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
14	454 920	7 243 880	75,7	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
15	456 666	7 243 656	93,4	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
16	455 683	7 243 386	81,8	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
17	457 911	7 243 159	105,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
18	456 386	7 242 947	84,4	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
19	457 280	7 242 705	101,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
20	458 383	7 242 622	107,6	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
21	457 806	7 241 988	101,3	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
22	460 084	7 243 597	101,4	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
23	458 246	7 245 388	89,4	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
24	458 794	7 245 015	92,2	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
25	453 473	7 243 093	82,5	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
26	457 855	7 244 395	97,2	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
27	458 952	7 243 271	108,4	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
28	459 404	7 244 004	100,0	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
29	458 307	7 243 826	102,5	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
30	459 622	7 242 936	106,5	VESTAS V136-3.45 3450 136...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	USER	Mode 0 - Clean blade 108,2	8,0	108,2
31	460 604	7 239 781	114,8	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
32	460 009	7 240 284	112,2	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
33	459 566	7 240 829	117,5	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
34	458 747	7 240 708	102,5	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
35	458 301	7 241 430	101,1	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
36	457 370	7 241 159	92,5	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
37	459 081	7 241 426	117,3	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
38	461 046	7 242 109	111,3	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7
39	461 788	7 241 743	111,4	VESTAS V150-6.0 HH225 60...	Yes	VESTAS	V150-6.0 HH225-6 000	6 000	150,0	225,0	USER	Level 0-0S - Measured - Mode 0-0S - 10-2020	8,0	107,7

Calculation Results

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Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Main Result

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

Sound level

Noise sensitive area						Demands	Sound level	
No.	Name	East	North	Z	Immission height	Noise	From WTGs	Distance to noise demand
				[m]	[m]	[dB(A)]	[dB(A)]	[m]
A	Lomarakennus (Orastintie)	455 224	7 241 949	85,0	4,0	40,0	38,4	317
B	Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85,0	4,0	40,0	39,1	178
C	Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	4,0	40,0	39,2	167
D	Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	4,0	40,0	28,6	2 165
E	Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66,0	4,0	40,0	29,7	1 926
F	Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	4,0	40,0	28,7	2 479
G	Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	4,0	40,0	32,2	1 513
H	Lomarakennus (Turpontie 34)	457 328	7 247 817	80,0	4,0	40,0	31,2	1 774
I	Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	4,0	40,0	29,6	1 982
J	Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	4,0	40,0	35,6	792

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J
1	1636	1865	2197	7192	6788	6864	5755	6024	6591	3407
2	3847	4023	4331	8369	7697	7139	5836	5866	5284	3324
3	4951	5120	5423	9137	8376	7571	6234	6152	4952	3757
4	2849	2507	2198	3648	3817	5113	4780	5378	7777	7403
5	3287	3010	2909	3595	3059	3417	2711	3251	5553	7124
6	3476	3297	3330	4660	3911	3561	2442	2779	4443	6529
7	3304	2983	2796	3102	2816	3686	3247	3842	6341	7495
8	3220	2878	2625	3067	3057	4254	3943	4551	7078	7637
9	2879	2658	2645	4386	3805	3879	2938	3373	5217	6402
10	2557	2279	2186	4094	3690	4146	3386	3889	5920	6521
11	2835	2697	2781	5138	4493	4293	3180	3492	4817	5818
12	2164	1981	2029	4978	4494	4649	3675	4072	5593	5689
13	2133	1788	1508	4193	4178	5183	4649	5204	7342	6650
14	1955	1644	1500	4411	4170	4826	4110	4615	6552	6209
15	2235	2157	2308	5638	5085	5013	3911	4213	5294	5139
16	1509	1315	1374	5232	4875	5226	4311	4727	6212	5365
17	2947	3015	3268	6880	6228	5812	4561	4694	4885	4308
18	1532	1521	1742	5997	5563	5683	4632	4960	5993	4623
19	2191	2289	2564	6753	6217	6065	4891	5112	5613	4029
20	3230	3366	3655	7590	6943	6485	5211	5301	5134	3716
21	2582	2778	3097	7638	7105	6892	5680	5849	5956	3186
22	5132	5224	5483	8401	7547	6535	5192	5040	3722	4897
23	4578	4494	4616	5955	5031	3990	2650	2597	2961	6485
24	4706	4669	4833	6607	5692	4620	3277	3162	2854	6102
25	2092	1783	1444	4693	4850	6021	5537	6097	8197	6651
26	3592	3546	3708	6081	5300	4649	3362	3462	3933	5537
27	3955	4047	4308	7622	6868	6153	4833	4827	4315	4367
28	4658	4708	4940	7608	6756	5792	4450	4341	3472	5145
29	3609	3633	3849	6775	6017	5359	4056	4109	4110	4923
30	4507	4636	4917	8363	7590	6790	5455	5393	4448	4137
31	5800	6084	6423	11161	10547	10007	8692	8678	7513	2139
32	5066	5341	5679	10385	9781	9287	7983	7995	7028	1931
33	4484	4742	5077	9686	9079	8604	7307	7338	6534	2123
34	3735	4012	4351	9222	8692	8401	7146	7249	6818	1796
35	3121	3361	3693	8384	7844	7572	6332	6461	6267	2539
36	2287	2570	2909	8022	7603	7595	6438	6658	6893	2582
37	3892	4123	4452	8921	8310	7859	6572	6627	6040	2548
38	5824	6009	6317	10004	9212	8296	6953	6812	5212	3994
39	6567	6767	7083	10824	10020	9051	7708	7536	5696	4226

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Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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 (Orastintie)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1 636	1 645	28,68	108,2	0,00	75,32	-	-	0,00	0,00	-
10	2 557	2 563	22,65	108,2	0,00	79,17	-	-	0,00	0,00	-
11	2 835	2 841	21,19	108,2	0,00	80,07	-	-	0,00	0,00	-
12	2 164	2 171	24,96	108,2	0,00	77,73	-	-	0,00	0,00	-
13	2 133	2 139	25,16	108,2	0,00	77,60	-	-	0,00	0,00	-
14	1 955	1 962	26,34	108,2	0,00	76,85	-	-	0,00	0,00	-
15	2 235	2 242	24,51	108,2	0,00	78,01	-	-	0,00	0,00	-
16	1 509	1 518	29,72	108,2	0,00	74,63	-	-	0,00	0,00	-
17	2 947	2 953	20,64	108,2	0,00	80,41	-	-	0,00	0,00	-
18	1 532	1 541	29,52	108,2	0,00	74,76	-	-	0,00	0,00	-
19	2 191	2 199	24,78	108,2	0,00	77,84	-	-	0,00	0,00	-
2	3 847	3 852	16,83	108,2	0,00	82,71	-	-	0,00	0,00	-
20	3 230	3 236	19,33	108,2	0,00	81,20	-	-	0,00	0,00	-
21	2 582	2 589	22,51	108,2	0,00	79,26	-	-	0,00	0,00	-
22	5 132	5 135	12,63	108,2	0,00	85,21	-	-	0,00	0,00	-
23	4 578	4 582	14,28	108,2	0,00	84,22	-	-	0,00	0,00	-
24	4 706	4 709	13,88	108,2	0,00	84,46	-	-	0,00	0,00	-
25	2 092	2 099	26,29	108,2	0,00	77,44	-	-	0,00	0,00	-
26	3 592	3 597	17,80	108,2	0,00	82,12	-	-	0,00	0,00	-
27	3 955	3 960	16,40	108,2	0,00	82,95	-	-	0,00	0,00	-
28	4 658	4 662	14,03	108,2	0,00	84,37	-	-	0,00	0,00	-
29	3 609	3 614	17,73	108,2	0,00	82,16	-	-	0,00	0,00	-
3	4 951	4 955	13,16	108,2	0,00	84,90	-	-	0,00	0,00	-
30	4 507	4 512	14,50	108,2	0,00	84,09	-	-	0,00	0,00	-
31	5 800	5 806	12,11	107,7	0,00	86,28	-	-	0,00	0,00	-
32	5 066	5 072	14,12	107,7	0,00	85,10	-	-	0,00	0,00	-
33	4 484	4 491	15,92	107,7	0,00	84,05	-	-	0,00	0,00	-
34	3 735	3 743	18,55	107,7	0,00	82,46	-	-	0,00	0,00	-
35	3 121	3 130	21,06	107,7	0,00	80,91	-	-	0,00	0,00	-
36	2 287	2 298	25,21	107,7	0,00	78,23	-	-	0,00	0,00	-
37	3 892	3 901	17,96	107,7	0,00	82,82	-	-	0,00	0,00	-
38	5 824	5 830	12,05	107,7	0,00	86,31	-	-	0,00	0,00	-
39	6 567	6 572	10,24	107,7	0,00	87,35	-	-	0,00	0,00	-
4	2 849	2 854	21,55	108,2	0,00	80,11	-	-	0,00	0,00	-
5	3 287	3 291	19,08	108,2	0,00	81,35	-	-	0,00	0,00	-
6	3 476	3 481	18,27	108,2	0,00	81,83	-	-	0,00	0,00	-
7	3 304	3 308	19,01	108,2	0,00	81,39	-	-	0,00	0,00	-
8	3 220	3 224	19,38	108,2	0,00	81,17	-	-	0,00	0,00	-
9	2 879	2 884	20,98	108,2	0,00	80,20	-	-	0,00	0,00	-
Sum			38,44								

- Data undefined due to calculation with octave data

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29.3.2023 16.47/3.5.584

DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise calculation model: ISO 9613-2 General 8,0 m/s

Noise sensitive area: B Lomarakennus (Orastinjärventie 700)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1 865	1 873	26,96	108,2	0,00	76,45	-	-	0,00	0,00	-
10	2 279	2 285	24,25	108,2	0,00	78,18	-	-	0,00	0,00	-
11	2 697	2 703	21,90	108,2	0,00	79,64	-	-	0,00	0,00	-
12	1 981	1 989	26,15	108,2	0,00	76,97	-	-	0,00	0,00	-
13	1 788	1 795	27,53	108,2	0,00	76,08	-	-	0,00	0,00	-
14	1 644	1 652	28,62	108,2	0,00	75,36	-	-	0,00	0,00	-
15	2 157	2 165	25,00	108,2	0,00	77,71	-	-	0,00	0,00	-
16	1 315	1 325	31,45	108,2	0,00	73,45	-	-	0,00	0,00	-
17	3 015	3 022	20,31	108,2	0,00	80,60	-	-	0,00	0,00	-
18	1 521	1 531	29,61	108,2	0,00	74,70	-	-	0,00	0,00	-
19	2 289	2 297	24,18	108,2	0,00	78,22	-	-	0,00	0,00	-
2	4 023	4 028	16,16	108,2	0,00	83,10	-	-	0,00	0,00	-
20	3 366	3 371	18,74	108,2	0,00	81,56	-	-	0,00	0,00	-
21	2 778	2 785	21,48	108,2	0,00	79,90	-	-	0,00	0,00	-
22	5 224	5 228	12,37	108,2	0,00	85,37	-	-	0,00	0,00	-
23	4 494	4 497	14,55	108,2	0,00	84,06	-	-	0,00	0,00	-
24	4 669	4 673	14,00	108,2	0,00	84,39	-	-	0,00	0,00	-
25	1 783	1 791	28,01	108,2	0,00	76,06	-	-	0,00	0,00	-
26	3 546	3 551	17,99	108,2	0,00	82,01	-	-	0,00	0,00	-
27	4 047	4 051	16,07	108,2	0,00	83,15	-	-	0,00	0,00	-
28	4 708	4 712	13,88	108,2	0,00	84,46	-	-	0,00	0,00	-
29	3 633	3 638	17,64	108,2	0,00	82,22	-	-	0,00	0,00	-
3	5 120	5 124	12,66	108,2	0,00	85,19	-	-	0,00	0,00	-
30	4 636	4 640	14,10	108,2	0,00	84,33	-	-	0,00	0,00	-
31	6 084	6 089	11,40	107,7	0,00	86,69	-	-	0,00	0,00	-
32	5 341	5 347	13,35	107,7	0,00	85,56	-	-	0,00	0,00	-
33	4 742	4 749	15,11	107,7	0,00	84,53	-	-	0,00	0,00	-
34	4 012	4 019	17,54	107,7	0,00	83,08	-	-	0,00	0,00	-
35	3 361	3 370	20,04	107,7	0,00	81,55	-	-	0,00	0,00	-
36	2 570	2 580	23,70	107,7	0,00	79,23	-	-	0,00	0,00	-
37	4 123	4 131	17,14	107,7	0,00	83,32	-	-	0,00	0,00	-
38	6 009	6 014	11,61	107,7	0,00	86,58	-	-	0,00	0,00	-
39	6 767	6 772	9,79	107,7	0,00	87,61	-	-	0,00	0,00	-
4	2 507	2 513	22,93	108,2	0,00	79,00	-	-	0,00	0,00	-
5	3 010	3 014	20,35	108,2	0,00	80,58	-	-	0,00	0,00	-
6	3 297	3 303	19,03	108,2	0,00	81,38	-	-	0,00	0,00	-
7	2 983	2 987	20,48	108,2	0,00	80,51	-	-	0,00	0,00	-
8	2 878	2 883	20,99	108,2	0,00	80,20	-	-	0,00	0,00	-
9	2 658	2 664	22,11	108,2	0,00	79,51	-	-	0,00	0,00	-
Sum			39,10								

- Data undefined due to calculation with octave data

Noise sensitive area: C Lomarakennus (Orastinjärventie 728)

Wind speed: 8,0 m/s
WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2 197	2 204	24,80	108,2	0,00	77,86	-	-	0,00	0,00	-
10	2 186	2 192	24,82	108,2	0,00	77,82	-	-	0,00	0,00	-
11	2 781	2 787	21,47	108,2	0,00	79,90	-	-	0,00	0,00	-
12	2 029	2 037	25,83	108,2	0,00	77,18	-	-	0,00	0,00	-
13	1 508	1 516	29,74	108,2	0,00	74,61	-	-	0,00	0,00	-
14	1 500	1 509	29,80	108,2	0,00	74,57	-	-	0,00	0,00	-
15	2 308	2 315	24,07	108,2	0,00	78,29	-	-	0,00	0,00	-
16	1 374	1 384	30,90	108,2	0,00	73,83	-	-	0,00	0,00	-
17	3 268	3 273	19,17	108,2	0,00	81,30	-	-	0,00	0,00	-
18	1 742	1 750	27,86	108,2	0,00	75,86	-	-	0,00	0,00	-
19	2 564	2 571	22,61	108,2	0,00	79,20	-	-	0,00	0,00	-
2	4 331	4 335	15,10	108,2	0,00	83,74	-	-	0,00	0,00	-
20	3 655	3 660	17,56	108,2	0,00	82,27	-	-	0,00	0,00	-
21	3 097	3 103	19,95	108,2	0,00	80,84	-	-	0,00	0,00	-
22	5 483	5 486	11,69	108,2	0,00	85,79	-	-	0,00	0,00	-
23	4 616	4 619	14,16	108,2	0,00	84,29	-	-	0,00	0,00	-

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29.3.2023 16.47/3.5.584

DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
24	4 833	4 837	13,50	108,2	0,00	84,69	-	-	0,00	0,00	-
25	1 444	1 454	30,28	108,2	0,00	74,25	-	-	0,00	0,00	-
26	3 708	3 713	17,34	108,2	0,00	82,39	-	-	0,00	0,00	-
27	4 308	4 312	15,17	108,2	0,00	83,69	-	-	0,00	0,00	-
28	4 940	4 943	13,19	108,2	0,00	84,88	-	-	0,00	0,00	-
29	3 849	3 854	16,80	108,2	0,00	82,72	-	-	0,00	0,00	-
3	5 423	5 427	11,84	108,2	0,00	85,69	-	-	0,00	0,00	-
30	4 917	4 921	13,26	108,2	0,00	84,84	-	-	0,00	0,00	-
31	6 423	6 428	10,61	107,7	0,00	87,16	-	-	0,00	0,00	-
32	5 679	5 684	12,46	107,7	0,00	86,09	-	-	0,00	0,00	-
33	5 077	5 084	14,13	107,7	0,00	85,12	-	-	0,00	0,00	-
34	4 351	4 357	16,41	107,7	0,00	83,78	-	-	0,00	0,00	-
35	3 693	3 701	18,75	107,7	0,00	82,37	-	-	0,00	0,00	-
36	2 909	2 918	22,10	107,7	0,00	80,30	-	-	0,00	0,00	-
37	4 452	4 459	16,05	107,7	0,00	83,98	-	-	0,00	0,00	-
38	6 317	6 322	10,85	107,7	0,00	87,02	-	-	0,00	0,00	-
39	7 083	7 087	9,16	107,7	0,00	88,01	-	-	0,00	0,00	-
4	2 198	2 204	24,75	108,2	0,00	77,87	-	-	0,00	0,00	-
5	2 909	2 914	20,83	108,2	0,00	80,29	-	-	0,00	0,00	-
6	3 330	3 334	18,89	108,2	0,00	81,46	-	-	0,00	0,00	-
7	2 796	2 801	21,40	108,2	0,00	79,95	-	-	0,00	0,00	-
8	2 625	2 630	22,29	108,2	0,00	79,40	-	-	0,00	0,00	-
9	2 645	2 650	22,18	108,2	0,00	79,47	-	-	0,00	0,00	-
Sum			39,17								

- Data undefined due to calculation with octave data

Noise sensitive area: D Asuinrakennus (Kottarantie 311)

Wind speed: 8,0 m/s

WTG No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	7 192	7 194	8,33	108,2	0,00	88,14	-	-	0,00	0,00	-
10	4 094	4 099	15,90	108,2	0,00	83,25	-	-	0,00	0,00	-
11	5 138	5 142	12,61	108,2	0,00	85,22	-	-	0,00	0,00	-
12	4 978	4 982	13,07	108,2	0,00	84,95	-	-	0,00	0,00	-
13	4 193	4 197	15,56	108,2	0,00	83,46	-	-	0,00	0,00	-
14	4 411	4 415	14,82	108,2	0,00	83,90	-	-	0,00	0,00	-
15	5 638	5 642	11,35	108,2	0,00	86,03	-	-	0,00	0,00	-
16	5 232	5 235	12,35	108,2	0,00	85,38	-	-	0,00	0,00	-
17	6 880	6 883	8,88	108,2	0,00	87,76	-	-	0,00	0,00	-
18	5 997	6 000	10,58	108,2	0,00	86,56	-	-	0,00	0,00	-
19	6 753	6 756	9,11	108,2	0,00	87,59	-	-	0,00	0,00	-
2	8 369	8 372	6,46	108,2	0,00	89,46	-	-	0,00	0,00	-
20	7 590	7 593	7,66	108,2	0,00	88,61	-	-	0,00	0,00	-
21	7 638	7 641	7,59	108,2	0,00	88,66	-	-	0,00	0,00	-
22	8 401	8 403	6,41	108,2	0,00	89,49	-	-	0,00	0,00	-
23	5 955	5 958	10,67	108,2	0,00	86,50	-	-	0,00	0,00	-
24	6 607	6 610	9,38	108,2	0,00	87,40	-	-	0,00	0,00	-
25	4 693	4 697	13,92	108,2	0,00	84,44	-	-	0,00	0,00	-
26	6 081	6 085	10,41	108,2	0,00	86,68	-	-	0,00	0,00	-
27	7 622	7 626	7,61	108,2	0,00	88,65	-	-	0,00	0,00	-
28	7 608	7 611	7,63	108,2	0,00	88,63	-	-	0,00	0,00	-
29	6 775	6 778	9,07	108,2	0,00	87,62	-	-	0,00	0,00	-
3	9 137	9 139	5,38	108,2	0,00	90,22	-	-	0,00	0,00	-
30	8 363	8 365	6,47	108,2	0,00	89,45	-	-	0,00	0,00	-
31	11 161	11 165	2,99	107,7	0,00	91,96	-	-	0,00	0,00	-
32	10 385	10 389	3,98	107,7	0,00	91,33	-	-	0,00	0,00	-
33	9 686	9 690	4,93	107,7	0,00	90,73	-	-	0,00	0,00	-
34	9 222	9 226	5,60	107,7	0,00	90,30	-	-	0,00	0,00	-
35	8 384	8 388	6,89	107,7	0,00	89,47	-	-	0,00	0,00	-
36	8 022	8 026	7,49	107,7	0,00	89,09	-	-	0,00	0,00	-
37	8 921	8 925	6,05	107,7	0,00	90,01	-	-	0,00	0,00	-
38	10 004	10 008	4,48	107,7	0,00	91,01	-	-	0,00	0,00	-
39	10 824	10 828	3,40	107,7	0,00	91,69	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
4	3 648	3 653	17,57	108,2	0,00	82,25	-	-	0,00	0,00	-
5	3 595	3 600	17,78	108,2	0,00	82,13	-	-	0,00	0,00	-
6	4 660	4 664	14,02	108,2	0,00	84,38	-	-	0,00	0,00	-
7	3 102	3 107	19,91	108,2	0,00	80,85	-	-	0,00	0,00	-
8	3 067	3 072	20,08	108,2	0,00	80,75	-	-	0,00	0,00	-
9	4 386	4 391	14,90	108,2	0,00	83,85	-	-	0,00	0,00	-
Sum			28,55								

- Data undefined due to calculation with octave data

Noise sensitive area: E Lomarakennus (Orastinjärventie 14d)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	6 788	6 791	9,05	108,2	0,00	87,64	-	-	0,00	0,00	-
10	3 690	3 695	17,41	108,2	0,00	82,35	-	-	0,00	0,00	-
11	4 493	4 497	14,55	108,2	0,00	84,06	-	-	0,00	0,00	-
12	4 494	4 499	14,55	108,2	0,00	84,06	-	-	0,00	0,00	-
13	4 178	4 182	15,61	108,2	0,00	83,43	-	-	0,00	0,00	-
14	4 170	4 174	15,63	108,2	0,00	83,41	-	-	0,00	0,00	-
15	5 085	5 089	12,76	108,2	0,00	85,13	-	-	0,00	0,00	-
16	4 875	4 879	13,37	108,2	0,00	84,77	-	-	0,00	0,00	-
17	6 228	6 231	10,11	108,2	0,00	86,89	-	-	0,00	0,00	-
18	5 563	5 566	11,52	108,2	0,00	85,91	-	-	0,00	0,00	-
19	6 217	6 221	10,13	108,2	0,00	86,88	-	-	0,00	0,00	-
2	7 697	7 701	7,49	108,2	0,00	88,73	-	-	0,00	0,00	-
20	6 943	6 946	8,77	108,2	0,00	87,83	-	-	0,00	0,00	-
21	7 105	7 108	8,48	108,2	0,00	88,04	-	-	0,00	0,00	-
22	7 547	7 550	7,74	108,2	0,00	88,56	-	-	0,00	0,00	-
23	5 031	5 035	12,91	108,2	0,00	85,04	-	-	0,00	0,00	-
24	5 692	5 696	11,23	108,2	0,00	86,11	-	-	0,00	0,00	-
25	4 850	4 854	13,44	108,2	0,00	84,72	-	-	0,00	0,00	-
26	5 300	5 304	12,16	108,2	0,00	85,49	-	-	0,00	0,00	-
27	6 868	6 871	8,90	108,2	0,00	87,74	-	-	0,00	0,00	-
28	6 756	6 760	9,10	108,2	0,00	87,60	-	-	0,00	0,00	-
29	6 017	6 021	10,54	108,2	0,00	86,59	-	-	0,00	0,00	-
3	8 376	8 379	6,45	108,2	0,00	89,46	-	-	0,00	0,00	-
30	7 590	7 593	7,66	108,2	0,00	88,61	-	-	0,00	0,00	-
31	10 547	10 550	3,76	107,7	0,00	91,47	-	-	0,00	0,00	-
32	9 781	9 785	4,79	107,7	0,00	90,81	-	-	0,00	0,00	-
33	9 079	9 083	5,81	107,7	0,00	90,16	-	-	0,00	0,00	-
34	8 692	8 696	6,40	107,7	0,00	89,79	-	-	0,00	0,00	-
35	7 844	7 848	7,79	107,7	0,00	88,90	-	-	0,00	0,00	-
36	7 603	7 607	8,21	107,7	0,00	88,62	-	-	0,00	0,00	-
37	8 310	8 314	7,01	107,7	0,00	89,40	-	-	0,00	0,00	-
38	9 212	9 216	5,61	107,7	0,00	90,29	-	-	0,00	0,00	-
39	10 020	10 024	4,46	107,7	0,00	91,02	-	-	0,00	0,00	-
4	3 817	3 821	16,92	108,2	0,00	82,64	-	-	0,00	0,00	-
5	3 059	3 065	20,11	108,2	0,00	80,73	-	-	0,00	0,00	-
6	3 911	3 916	16,56	108,2	0,00	82,86	-	-	0,00	0,00	-
7	2 816	2 822	21,29	108,2	0,00	80,01	-	-	0,00	0,00	-
8	3 057	3 062	20,12	108,2	0,00	80,72	-	-	0,00	0,00	-
9	3 805	3 810	16,96	108,2	0,00	82,62	-	-	0,00	0,00	-
Sum			29,66								

- Data undefined due to calculation with octave data

Noise sensitive area: F Lomarakennus (Piimäkoskentie 382b)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	6 864	6 866	8,91	108,2	0,00	87,73	-	-	0,00	0,00	-
10	4 146	4 150	15,72	108,2	0,00	83,36	-	-	0,00	0,00	-
11	4 293	4 297	15,21	108,2	0,00	83,66	-	-	0,00	0,00	-

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29.3.2023 16.47/3.5.584

DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
12	4 649	4 652	14,06	108,2	0,00	84,35	-	-	0,00	0,00	-
13	5 183	5 186	12,49	108,2	0,00	85,30	-	-	0,00	0,00	-
14	4 826	4 829	13,52	108,2	0,00	84,68	-	-	0,00	0,00	-
15	5 013	5 016	12,97	108,2	0,00	85,01	-	-	0,00	0,00	-
16	5 226	5 229	12,37	108,2	0,00	85,37	-	-	0,00	0,00	-
17	5 812	5 815	10,97	108,2	0,00	86,29	-	-	0,00	0,00	-
18	5 683	5 685	11,25	108,2	0,00	86,10	-	-	0,00	0,00	-
19	6 065	6 068	10,44	108,2	0,00	86,66	-	-	0,00	0,00	-
2	7 139	7 142	8,42	108,2	0,00	88,08	-	-	0,00	0,00	-
20	6 485	6 488	9,61	108,2	0,00	87,24	-	-	0,00	0,00	-
21	6 892	6 895	8,86	108,2	0,00	87,77	-	-	0,00	0,00	-
22	6 535	6 538	9,52	108,2	0,00	87,31	-	-	0,00	0,00	-
23	3 990	3 995	16,27	108,2	0,00	83,03	-	-	0,00	0,00	-
24	4 620	4 624	14,15	108,2	0,00	84,30	-	-	0,00	0,00	-
25	6 021	6 023	10,54	108,2	0,00	86,60	-	-	0,00	0,00	-
26	4 649	4 653	14,06	108,2	0,00	84,35	-	-	0,00	0,00	-
27	6 153	6 157	10,26	108,2	0,00	86,79	-	-	0,00	0,00	-
28	5 792	5 796	11,01	108,2	0,00	86,26	-	-	0,00	0,00	-
29	5 359	5 362	12,01	108,2	0,00	85,59	-	-	0,00	0,00	-
3	7 571	7 574	7,70	108,2	0,00	88,59	-	-	0,00	0,00	-
30	6 790	6 793	9,04	108,2	0,00	87,64	-	-	0,00	0,00	-
31	10 007	10 011	4,48	107,7	0,00	91,01	-	-	0,00	0,00	-
32	9 287	9 291	5,50	107,7	0,00	90,36	-	-	0,00	0,00	-
33	8 604	8 608	6,54	107,7	0,00	89,70	-	-	0,00	0,00	-
34	8 401	8 404	6,88	107,7	0,00	89,49	-	-	0,00	0,00	-
35	7 572	7 576	8,27	107,7	0,00	88,59	-	-	0,00	0,00	-
36	7 595	7 598	8,23	107,7	0,00	88,61	-	-	0,00	0,00	-
37	7 859	7 864	7,77	107,7	0,00	88,91	-	-	0,00	0,00	-
38	8 296	8 300	7,04	107,7	0,00	89,38	-	-	0,00	0,00	-
39	9 051	9 055	5,85	107,7	0,00	90,14	-	-	0,00	0,00	-
4	5 113	5 116	12,68	108,2	0,00	85,18	-	-	0,00	0,00	-
5	3 417	3 421	18,52	108,2	0,00	81,68	-	-	0,00	0,00	-
6	3 561	3 566	17,92	108,2	0,00	82,04	-	-	0,00	0,00	-
7	3 686	3 690	17,43	108,2	0,00	82,34	-	-	0,00	0,00	-
8	4 254	4 257	15,35	108,2	0,00	83,58	-	-	0,00	0,00	-
9	3 879	3 883	16,69	108,2	0,00	82,78	-	-	0,00	0,00	-
Sum			28,70								

- Data undefined due to calculation with octave data

Noise sensitive area: G Lomarakennus (Hautasaarentie)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	5 755	5 758	11,10	108,2	0,00	86,21	-	-	0,00	0,00	-
10	3 386	3 390	18,65	108,2	0,00	81,61	-	-	0,00	0,00	-
11	3 180	3 185	19,56	108,2	0,00	81,06	-	-	0,00	0,00	-
12	3 675	3 680	17,47	108,2	0,00	82,32	-	-	0,00	0,00	-
13	4 649	4 652	14,06	108,2	0,00	84,35	-	-	0,00	0,00	-
14	4 110	4 113	15,85	108,2	0,00	83,28	-	-	0,00	0,00	-
15	3 911	3 915	16,57	108,2	0,00	82,85	-	-	0,00	0,00	-
16	4 311	4 314	15,15	108,2	0,00	83,70	-	-	0,00	0,00	-
17	4 561	4 565	14,33	108,2	0,00	84,19	-	-	0,00	0,00	-
18	4 632	4 636	14,11	108,2	0,00	84,32	-	-	0,00	0,00	-
19	4 891	4 895	13,32	108,2	0,00	84,80	-	-	0,00	0,00	-
2	5 836	5 840	10,92	108,2	0,00	86,33	-	-	0,00	0,00	-
20	5 211	5 215	12,41	108,2	0,00	85,34	-	-	0,00	0,00	-
21	5 680	5 683	11,26	108,2	0,00	86,09	-	-	0,00	0,00	-
22	5 192	5 195	12,46	108,2	0,00	85,31	-	-	0,00	0,00	-
23	2 650	2 656	22,15	108,2	0,00	79,48	-	-	0,00	0,00	-
24	3 277	3 282	19,12	108,2	0,00	81,32	-	-	0,00	0,00	-
25	5 537	5 540	11,57	108,2	0,00	85,87	-	-	0,00	0,00	-
26	3 362	3 368	18,75	108,2	0,00	81,55	-	-	0,00	0,00	-
27	4 833	4 837	13,49	108,2	0,00	84,69	-	-	0,00	0,00	-

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29.3.2023 16.47/3.5.584

DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
28	4 450	4 454	14,69	108,2	0,00	83,97	-	-	0,00	0,00	-
29	4 056	4 061	16,03	108,2	0,00	83,17	-	-	0,00	0,00	-
3	6 234	6 237	10,10	108,2	0,00	86,90	-	-	0,00	0,00	-
30	5 455	5 459	11,76	108,2	0,00	85,74	-	-	0,00	0,00	-
31	8 692	8 696	6,40	107,7	0,00	89,79	-	-	0,00	0,00	-
32	7 983	7 987	7,56	107,7	0,00	89,05	-	-	0,00	0,00	-
33	7 307	7 311	8,74	107,7	0,00	88,28	-	-	0,00	0,00	-
34	7 146	7 151	9,04	107,7	0,00	88,09	-	-	0,00	0,00	-
35	6 332	6 337	10,80	107,7	0,00	87,04	-	-	0,00	0,00	-
36	6 438	6 442	10,54	107,7	0,00	87,18	-	-	0,00	0,00	-
37	6 572	6 577	10,23	107,7	0,00	87,36	-	-	0,00	0,00	-
38	6 953	6 958	9,40	107,7	0,00	87,85	-	-	0,00	0,00	-
39	7 708	7 713	8,03	107,7	0,00	88,74	-	-	0,00	0,00	-
4	4 780	4 783	13,66	108,2	0,00	84,59	-	-	0,00	0,00	-
5	2 711	2 717	21,83	108,2	0,00	79,68	-	-	0,00	0,00	-
6	2 442	2 449	23,29	108,2	0,00	78,78	-	-	0,00	0,00	-
7	3 247	3 252	19,26	108,2	0,00	81,24	-	-	0,00	0,00	-
8	3 943	3 946	16,45	108,2	0,00	82,92	-	-	0,00	0,00	-
9	2 938	2 944	20,69	108,2	0,00	80,38	-	-	0,00	0,00	-
Sum			32,23								

- Data undefined due to calculation with octave data

Noise sensitive area: H Lomarakennus (Turpontie 34)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	6 024	6 026	10,53	108,2	0,00	86,60	-	-	0,00	0,00	-
10	3 889	3 893	16,65	108,2	0,00	82,81	-	-	0,00	0,00	-
11	3 492	3 497	18,20	108,2	0,00	81,88	-	-	0,00	0,00	-
12	4 072	4 076	15,98	108,2	0,00	83,20	-	-	0,00	0,00	-
13	5 204	5 206	12,43	108,2	0,00	85,33	-	-	0,00	0,00	-
14	4 615	4 618	14,17	108,2	0,00	84,29	-	-	0,00	0,00	-
15	4 213	4 217	15,48	108,2	0,00	83,50	-	-	0,00	0,00	-
16	4 727	4 730	13,82	108,2	0,00	84,50	-	-	0,00	0,00	-
17	4 694	4 699	13,91	108,2	0,00	84,44	-	-	0,00	0,00	-
18	4 960	4 963	13,12	108,2	0,00	84,92	-	-	0,00	0,00	-
19	5 112	5 116	12,68	108,2	0,00	85,18	-	-	0,00	0,00	-
2	5 866	5 870	10,86	108,2	0,00	86,37	-	-	0,00	0,00	-
20	5 301	5 305	12,16	108,2	0,00	85,49	-	-	0,00	0,00	-
21	5 849	5 852	10,89	108,2	0,00	86,35	-	-	0,00	0,00	-
22	5 040	5 044	12,89	108,2	0,00	85,06	-	-	0,00	0,00	-
23	2 597	2 603	22,43	108,2	0,00	79,31	-	-	0,00	0,00	-
24	3 162	3 168	19,63	108,2	0,00	81,01	-	-	0,00	0,00	-
25	6 097	6 100	10,38	108,2	0,00	86,71	-	-	0,00	0,00	-
26	3 462	3 468	18,33	108,2	0,00	81,80	-	-	0,00	0,00	-
27	4 827	4 832	13,51	108,2	0,00	84,68	-	-	0,00	0,00	-
28	4 341	4 346	15,05	108,2	0,00	83,76	-	-	0,00	0,00	-
29	4 109	4 114	15,85	108,2	0,00	83,29	-	-	0,00	0,00	-
3	6 152	6 155	10,27	108,2	0,00	86,78	-	-	0,00	0,00	-
30	5 393	5 397	11,91	108,2	0,00	85,64	-	-	0,00	0,00	-
31	8 678	8 682	6,43	107,7	0,00	89,77	-	-	0,00	0,00	-
32	7 995	7 999	7,53	107,7	0,00	89,06	-	-	0,00	0,00	-
33	7 338	7 342	8,69	107,7	0,00	88,32	-	-	0,00	0,00	-
34	7 249	7 253	8,85	107,7	0,00	88,21	-	-	0,00	0,00	-
35	6 461	6 465	10,50	107,7	0,00	87,21	-	-	0,00	0,00	-
36	6 658	6 662	10,03	107,7	0,00	87,47	-	-	0,00	0,00	-
37	6 627	6 632	10,10	107,7	0,00	87,43	-	-	0,00	0,00	-
38	6 812	6 817	9,69	107,7	0,00	87,67	-	-	0,00	0,00	-
39	7 536	7 540	8,33	107,7	0,00	88,55	-	-	0,00	0,00	-
4	5 378	5 381	11,95	108,2	0,00	85,62	-	-	0,00	0,00	-
5	3 251	3 255	19,24	108,2	0,00	81,25	-	-	0,00	0,00	-
6	2 779	2 785	21,47	108,2	0,00	79,90	-	-	0,00	0,00	-
7	3 842	3 846	16,83	108,2	0,00	82,70	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
8	4 551	4 554	14,37	108,2	0,00	84,17	-	-	0,00	0,00	-
9	3 373	3 378	18,71	108,2	0,00	81,57	-	-	0,00	0,00	-
Sum			31,20								

- Data undefined due to calculation with octave data

Noise sensitive area: I Asuinrakennus (Majava-ahontie 391)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	6 591	6 593	9,41	108,2	0,00	87,38	-	-	0,00	0,00	-
10	5 920	5 923	10,75	108,2	0,00	86,45	-	-	0,00	0,00	-
11	4 817	4 821	13,54	108,2	0,00	84,66	-	-	0,00	0,00	-
12	5 593	5 596	11,45	108,2	0,00	85,96	-	-	0,00	0,00	-
13	7 342	7 344	8,08	108,2	0,00	88,32	-	-	0,00	0,00	-
14	6 552	6 554	9,49	108,2	0,00	87,33	-	-	0,00	0,00	-
15	5 294	5 297	12,18	108,2	0,00	85,48	-	-	0,00	0,00	-
16	6 212	6 215	10,15	108,2	0,00	86,87	-	-	0,00	0,00	-
17	4 885	4 889	13,34	108,2	0,00	84,78	-	-	0,00	0,00	-
18	5 993	5 996	10,59	108,2	0,00	86,56	-	-	0,00	0,00	-
19	5 613	5 616	11,40	108,2	0,00	85,99	-	-	0,00	0,00	-
2	5 284	5 288	12,21	108,2	0,00	85,47	-	-	0,00	0,00	-
20	5 134	5 138	12,62	108,2	0,00	85,22	-	-	0,00	0,00	-
21	5 956	5 959	10,67	108,2	0,00	86,50	-	-	0,00	0,00	-
22	3 722	3 726	17,28	108,2	0,00	82,43	-	-	0,00	0,00	-
23	2 961	2 966	20,58	108,2	0,00	80,44	-	-	0,00	0,00	-
24	2 854	2 860	21,10	108,2	0,00	80,13	-	-	0,00	0,00	-
25	8 197	8 199	6,72	108,2	0,00	89,28	-	-	0,00	0,00	-
26	3 933	3 937	16,49	108,2	0,00	82,90	-	-	0,00	0,00	-
27	4 315	4 319	15,14	108,2	0,00	83,71	-	-	0,00	0,00	-
28	3 472	3 477	18,29	108,2	0,00	81,82	-	-	0,00	0,00	-
29	4 110	4 114	15,85	108,2	0,00	83,29	-	-	0,00	0,00	-
3	4 952	4 955	13,14	108,2	0,00	84,90	-	-	0,00	0,00	-
30	4 448	4 452	14,70	108,2	0,00	83,97	-	-	0,00	0,00	-
31	7 513	7 518	8,37	107,7	0,00	88,52	-	-	0,00	0,00	-
32	7 028	7 032	9,26	107,7	0,00	87,94	-	-	0,00	0,00	-
33	6 534	6 539	10,32	107,7	0,00	87,31	-	-	0,00	0,00	-
34	6 818	6 822	9,67	107,7	0,00	87,68	-	-	0,00	0,00	-
35	6 267	6 271	10,95	107,7	0,00	86,95	-	-	0,00	0,00	-
36	6 893	6 896	9,52	107,7	0,00	87,77	-	-	0,00	0,00	-
37	6 040	6 045	11,50	107,7	0,00	86,63	-	-	0,00	0,00	-
38	5 212	5 218	13,70	107,7	0,00	85,35	-	-	0,00	0,00	-
39	5 696	5 701	12,38	107,7	0,00	86,12	-	-	0,00	0,00	-
4	7 777	7 779	7,37	108,2	0,00	88,82	-	-	0,00	0,00	-
5	5 553	5 555	11,54	108,2	0,00	85,89	-	-	0,00	0,00	-
6	4 443	4 447	14,71	108,2	0,00	83,96	-	-	0,00	0,00	-
7	6 341	6 343	9,89	108,2	0,00	87,05	-	-	0,00	0,00	-
8	7 078	7 080	8,53	108,2	0,00	88,00	-	-	0,00	0,00	-
9	5 217	5 220	12,39	108,2	0,00	85,35	-	-	0,00	0,00	-
Sum			29,65								

- Data undefined due to calculation with octave data

Noise sensitive area: J Asuinrakennus (Kaistontie 30)

Wind speed: 8,0 m/s

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3 407	3 411	18,57	108,2	0,00	81,66	-	-	0,00	0,00	-
10	6 521	6 523	9,55	108,2	0,00	87,29	-	-	0,00	0,00	-
11	5 818	5 821	10,96	108,2	0,00	86,30	-	-	0,00	0,00	-
12	5 689	5 691	11,24	108,2	0,00	86,10	-	-	0,00	0,00	-
13	6 650	6 652	9,30	108,2	0,00	87,46	-	-	0,00	0,00	-
14	6 209	6 210	10,16	108,2	0,00	86,86	-	-	0,00	0,00	-
15	5 139	5 141	12,61	108,2	0,00	85,22	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225 Noise 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)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
16	5 365	5 367	11,99	108,2	0,00	85,59	-	-	0,00	0,00	-
17	4 308	4 311	15,17	108,2	0,00	83,69	-	-	0,00	0,00	-
18	4 623	4 626	14,14	108,2	0,00	84,30	-	-	0,00	0,00	-
19	4 029	4 033	16,14	108,2	0,00	83,11	-	-	0,00	0,00	-
2	3 324	3 329	18,92	108,2	0,00	81,45	-	-	0,00	0,00	-
20	3 716	3 721	17,31	108,2	0,00	82,41	-	-	0,00	0,00	-
21	3 186	3 191	19,53	108,2	0,00	81,08	-	-	0,00	0,00	-
22	4 897	4 900	13,31	108,2	0,00	84,80	-	-	0,00	0,00	-
23	6 485	6 487	9,61	108,2	0,00	87,24	-	-	0,00	0,00	-
24	6 102	6 104	10,37	108,2	0,00	86,71	-	-	0,00	0,00	-
25	6 651	6 653	9,36	108,2	0,00	87,46	-	-	0,00	0,00	-
26	5 537	5 540	11,59	108,2	0,00	85,87	-	-	0,00	0,00	-
27	4 367	4 370	14,97	108,2	0,00	83,81	-	-	0,00	0,00	-
28	5 145	5 148	12,59	108,2	0,00	85,23	-	-	0,00	0,00	-
29	4 923	4 926	13,23	108,2	0,00	84,85	-	-	0,00	0,00	-
3	3 757	3 761	17,15	108,2	0,00	82,51	-	-	0,00	0,00	-
30	4 137	4 141	15,75	108,2	0,00	83,34	-	-	0,00	0,00	-
31	2 139	2 152	26,07	107,7	0,00	77,66	-	-	0,00	0,00	-
32	1 931	1 944	27,36	107,7	0,00	76,77	-	-	0,00	0,00	-
33	2 123	2 136	26,16	107,7	0,00	77,59	-	-	0,00	0,00	-
34	1 796	1 809	28,27	107,7	0,00	76,15	-	-	0,00	0,00	-
35	2 539	2 548	23,85	107,7	0,00	79,12	-	-	0,00	0,00	-
36	2 582	2 591	23,63	107,7	0,00	79,27	-	-	0,00	0,00	-
37	2 548	2 559	23,80	107,7	0,00	79,16	-	-	0,00	0,00	-
38	3 994	4 001	17,59	107,7	0,00	83,04	-	-	0,00	0,00	-
39	4 226	4 232	16,78	107,7	0,00	83,53	-	-	0,00	0,00	-
4	7 403	7 405	7,98	108,2	0,00	88,39	-	-	0,00	0,00	-
5	7 124	7 126	8,45	108,2	0,00	88,06	-	-	0,00	0,00	-
6	6 529	6 531	9,53	108,2	0,00	87,30	-	-	0,00	0,00	-
7	7 495	7 496	7,82	108,2	0,00	88,50	-	-	0,00	0,00	-
8	7 637	7 638	7,59	108,2	0,00	88,66	-	-	0,00	0,00	-
9	6 402	6 404	9,77	108,2	0,00	87,13	-	-	0,00	0,00	-
Sum			35,56								

- Data undefined due to calculation with octave data

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Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Assumptions for noise calculation

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

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_Pahkakoski_Laajennus 2023_0.w2r (21)
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
Model: 5,0 dB(A)
Height above ground level, when no value in NSA object:
4,0 m; Don't allow override of model height with height from NSA object
Uncertainty margin:
0,0 dB; Uncertainty margin in NSA has priority
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0,0 dB(A)
Octave data required
Frequency dependent air absorption

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

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V136-3.45 3450 136.0 !O!
Noise: Mode 0 - Clean blade 108,2

Source	Source/Date	Creator	Edited
Manufacturer	23.11.2015	USER	23.1.2020 11.05

Based on Document no.: DMS 0055-9919_V00

					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	177,0	8,0	108,2	No	86,7	95,0	96,9	101,0	104,3	102,2	90,8	68,6

WTG: VESTAS V150-6.0 HH225 6000 150.0 !O!
Noise: Level 0-0S - Measured - Mode 0-0S - 10-2020

Source	Source/Date	Creator	Edited
Manufacturer	13.10.2020	USER	29.3.2023 14.27

Blades without serrated trailing edge.
Document no. 0098-0749 V01.

					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	225,0	8,0	107,7	No	85,9	94,7	100,3	102,8	102,3	98,5	91,8	81,8

Noise sensitive area: A Lomarakennus (Orastintie)

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

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

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Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Assumptions for noise calculation

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

Noise sensitive area: B Lomarakennus (Orastinjärventie 700)

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

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

Noise sensitive area: C Lomarakennus (Orastinjärventie 728)

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 (Kottarantie 311)

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

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

Noise sensitive area: E Lomarakennus (Orastinjärventie 14d)

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 Lomarakennus (Piimäkoskentie 382b)

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 (Hautasaarentie)

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

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

Noise sensitive area: H Lomarakennus (Turpontie 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: I Asuinrakennus (Majava-ahontie 391)

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

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

Noise sensitive area: J Asuinrakennus (Kaistontie 30)

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

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Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Assumptions for noise calculation

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

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

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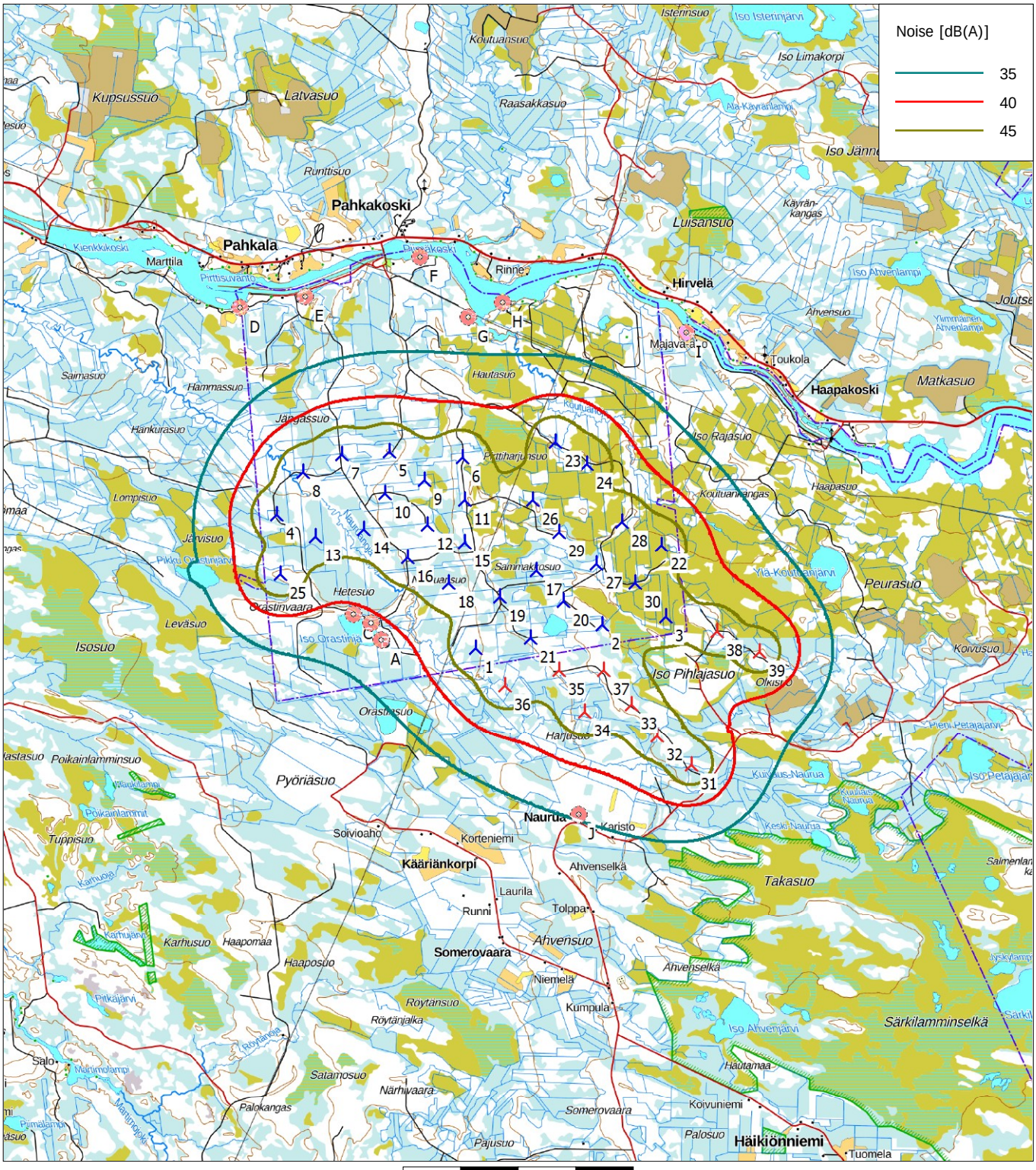
Calculated:
29.3.2023 16.47/3.5.584

DECIBEL - Map 8,0 m/s

Calculation: Pahkakoski V136 x 30 x H177 x V150 x 9 x HH225

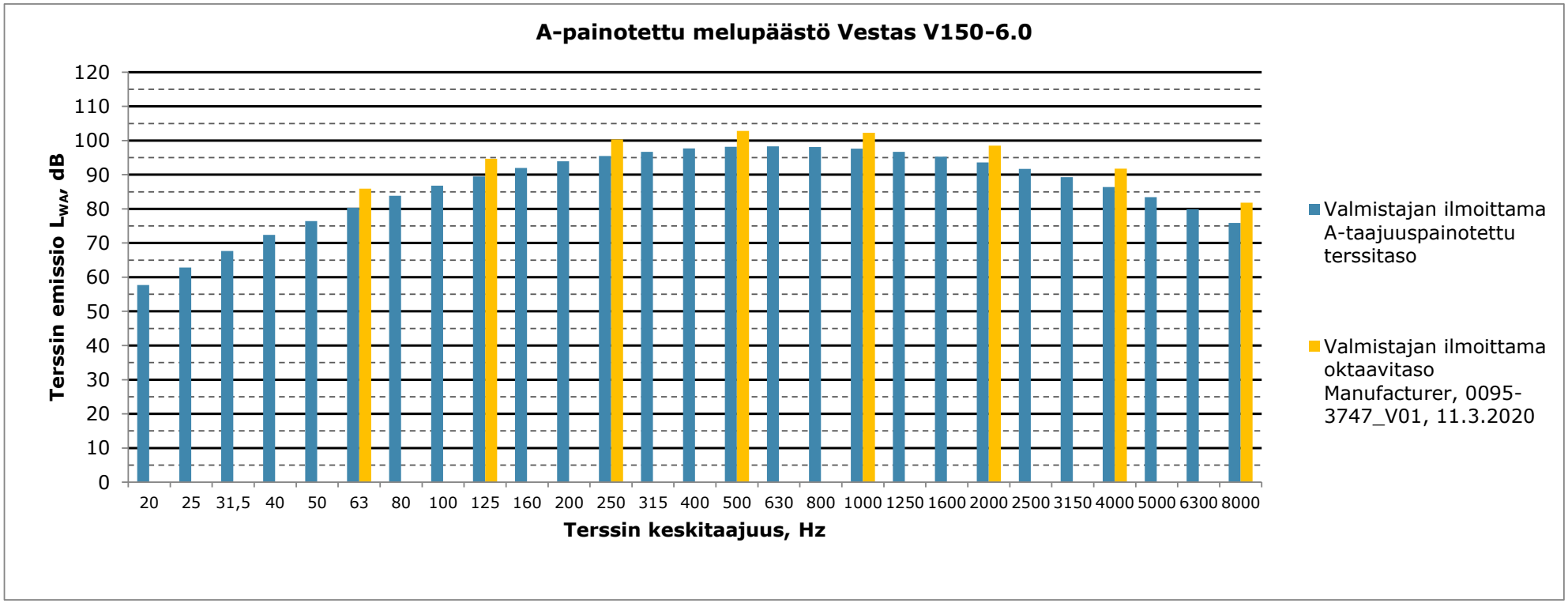


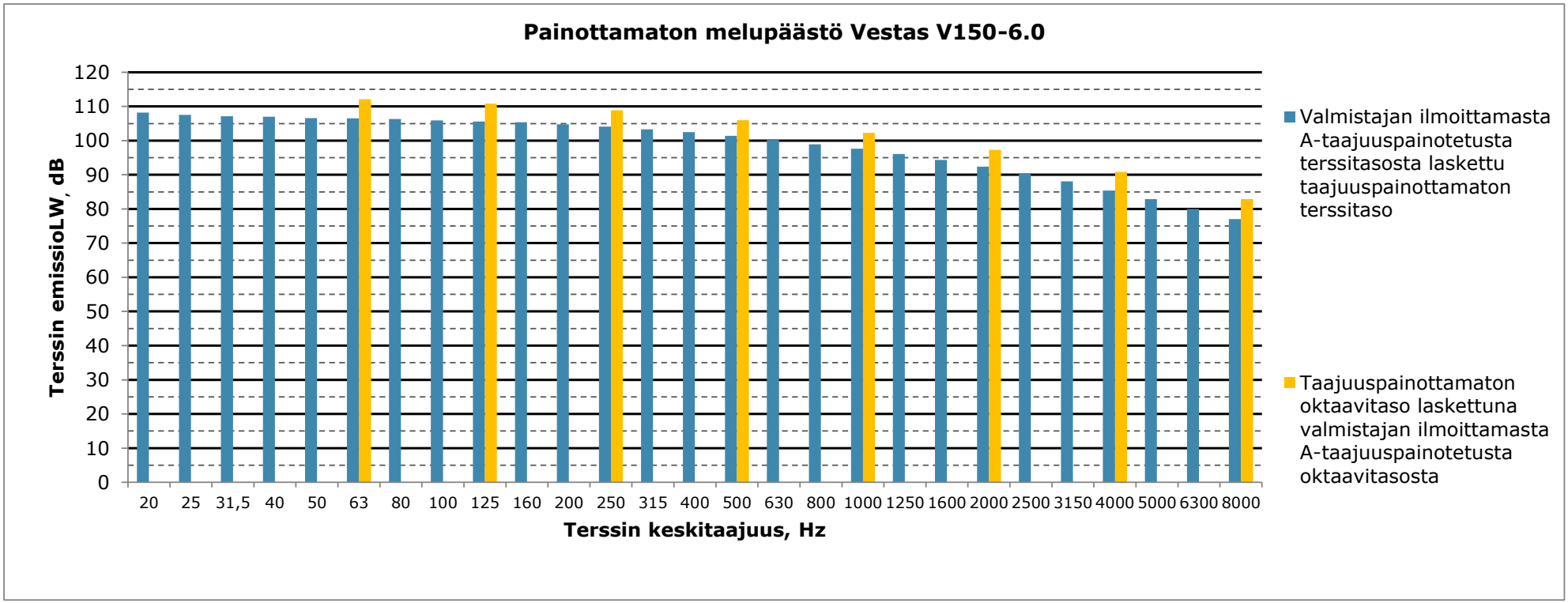
Map: Maastorasteri 100k , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 457 595 North: 7 242 944

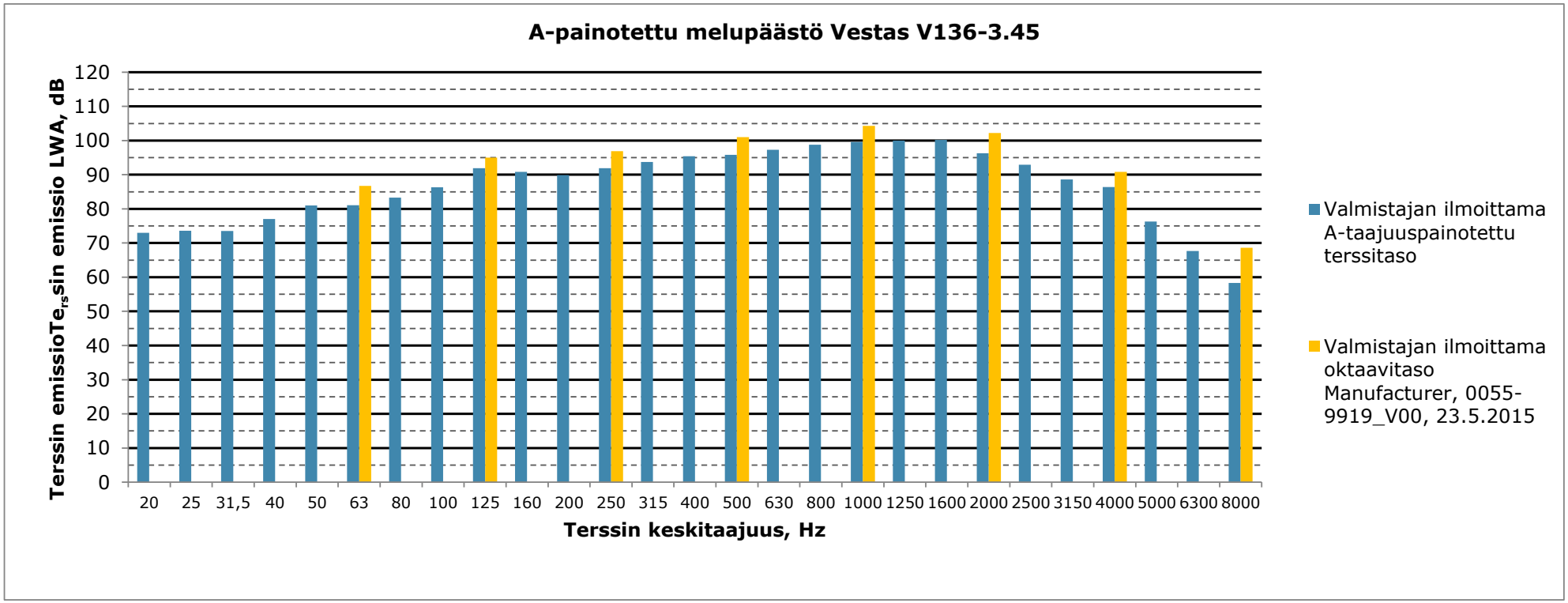
New WTG Noise sensitive area

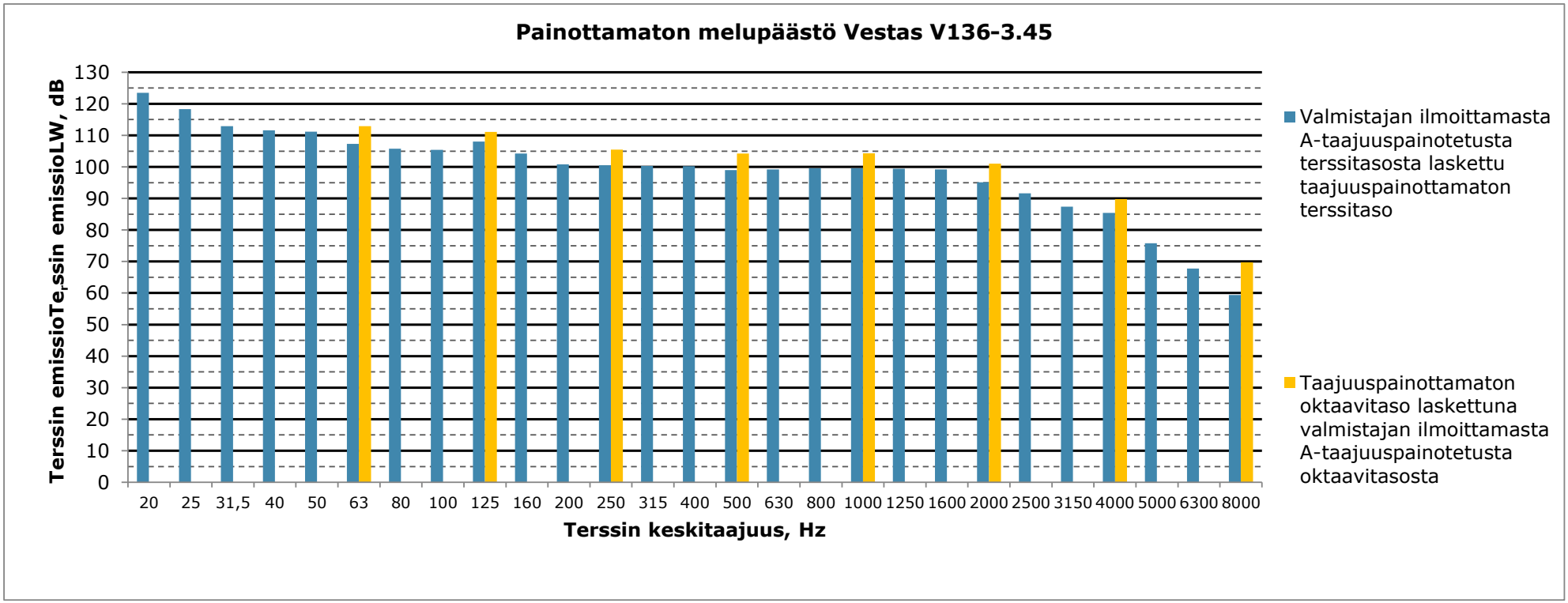
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

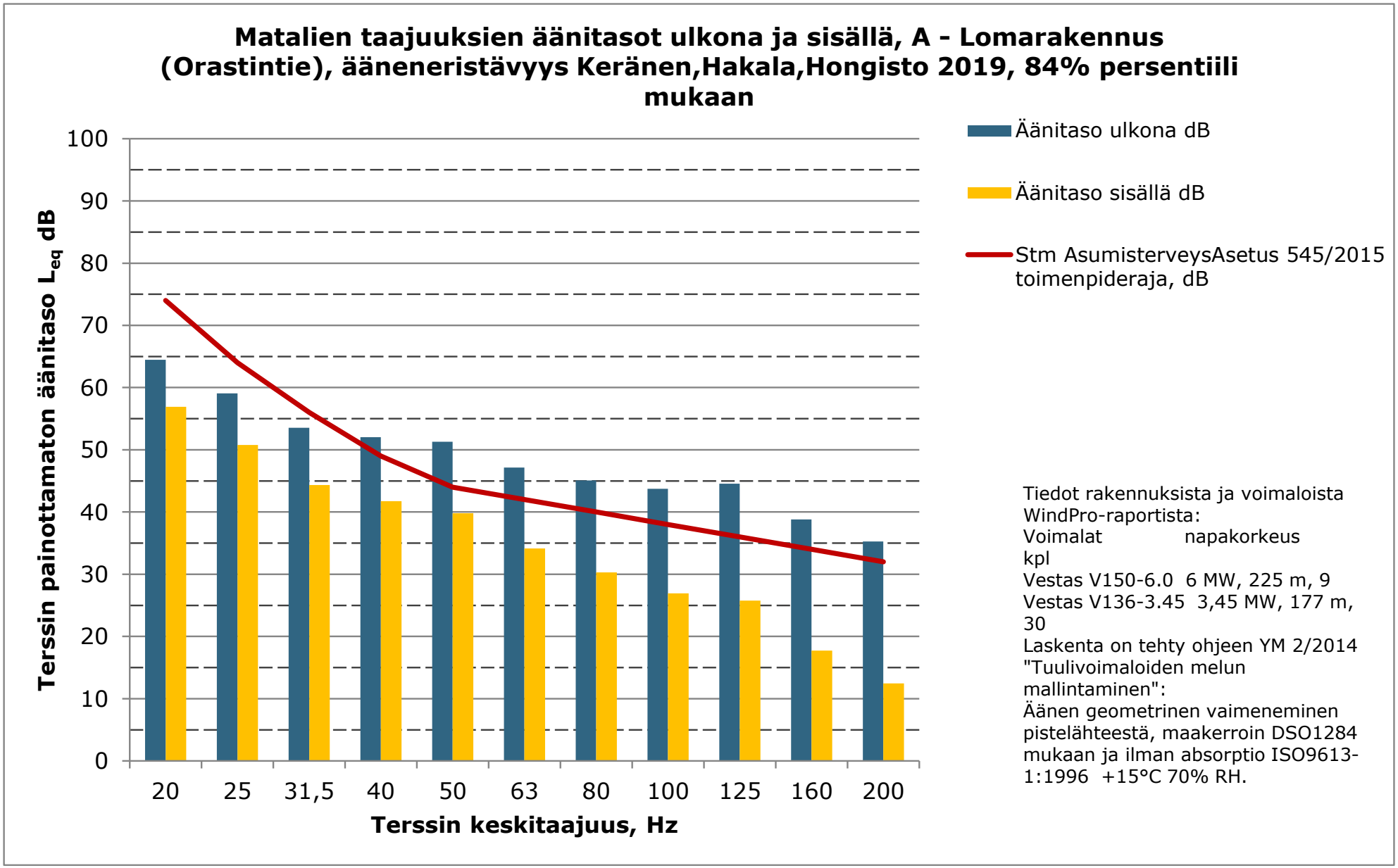
Liite 2: Matalataajuisen melun rakennuskohtaiset arvot


A-painotettu melupäästö Vestas V150-6.0
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, 0095-3747_V01, 11.3.2020

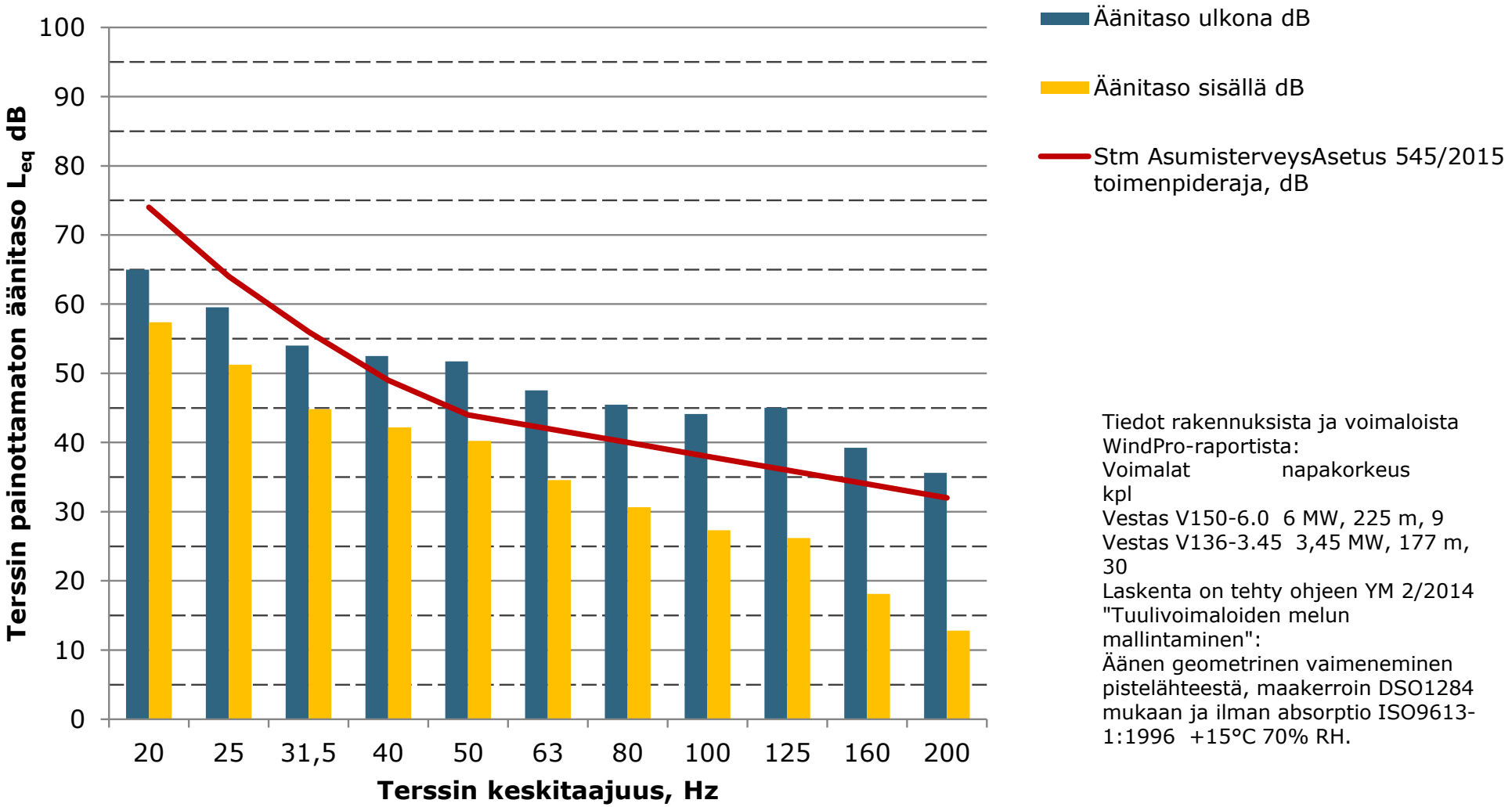

Painottamaton melupäästö Vestas V150-6.0
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta


A-painotettu melupäästö Vestas V136-3.45
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, 0055-9919_V00, 23.5.2015


Painottamaton melupäästö Vestas V136-3.45
Terssin emissioTe,ssin emissioLW, dB
0
10
20
30
40
50
60
70
80
90
100
110
120
130
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

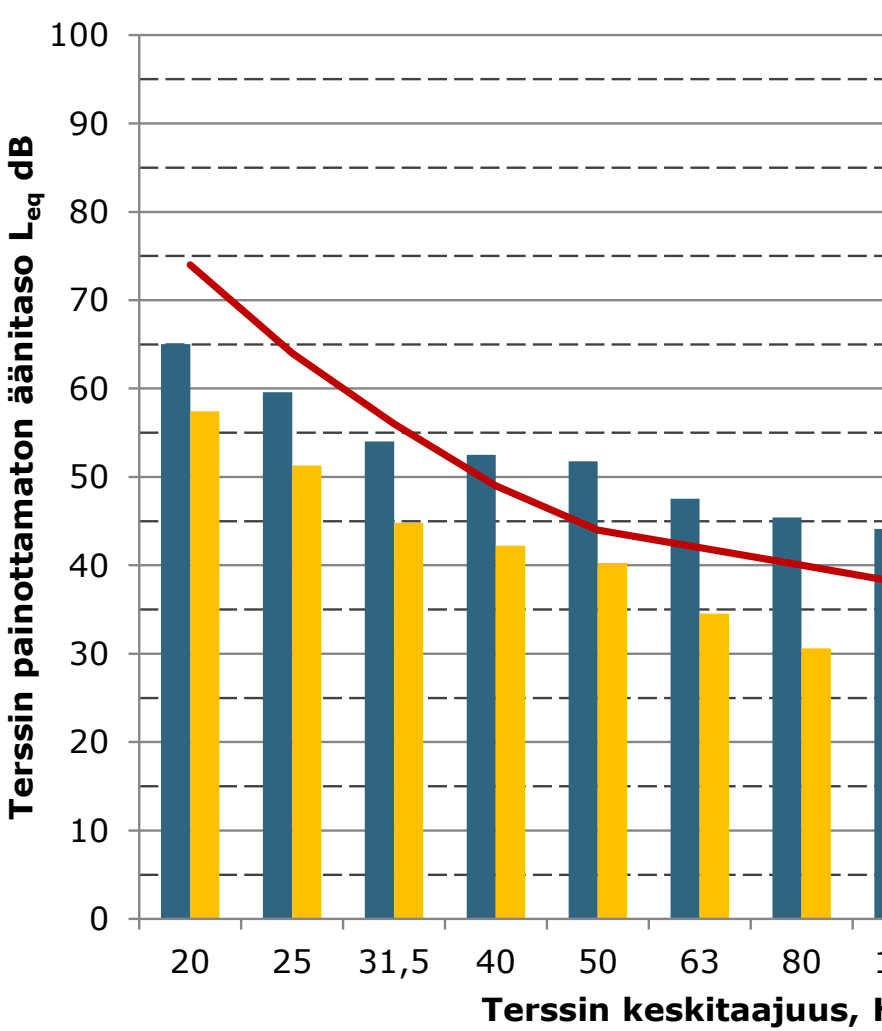

Matalien taajuuksien äänitasot ulkona ja sisällä, A - Lomarakennus (Orastintie), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan
Terssin painottamaton äänitaso L_{eq} dB
100
90
80
70
60
50
40
30
20
10
0
20
25
31,5
40
50
63
80
100
125
160
200
Terssin keskitaajuus, Hz
Äänitaso ulkona dB
Äänitaso sisällä dB
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

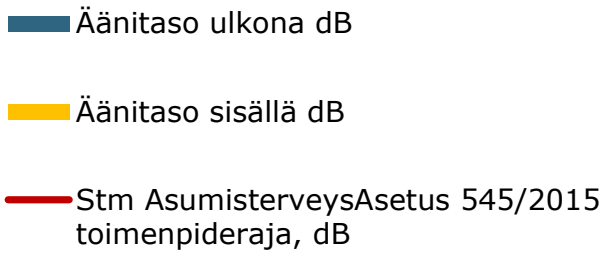
Matalien taajuuksien äänitasot ulkona ja sisällä, B - Lomarakennus (Orastinjärventie 700), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

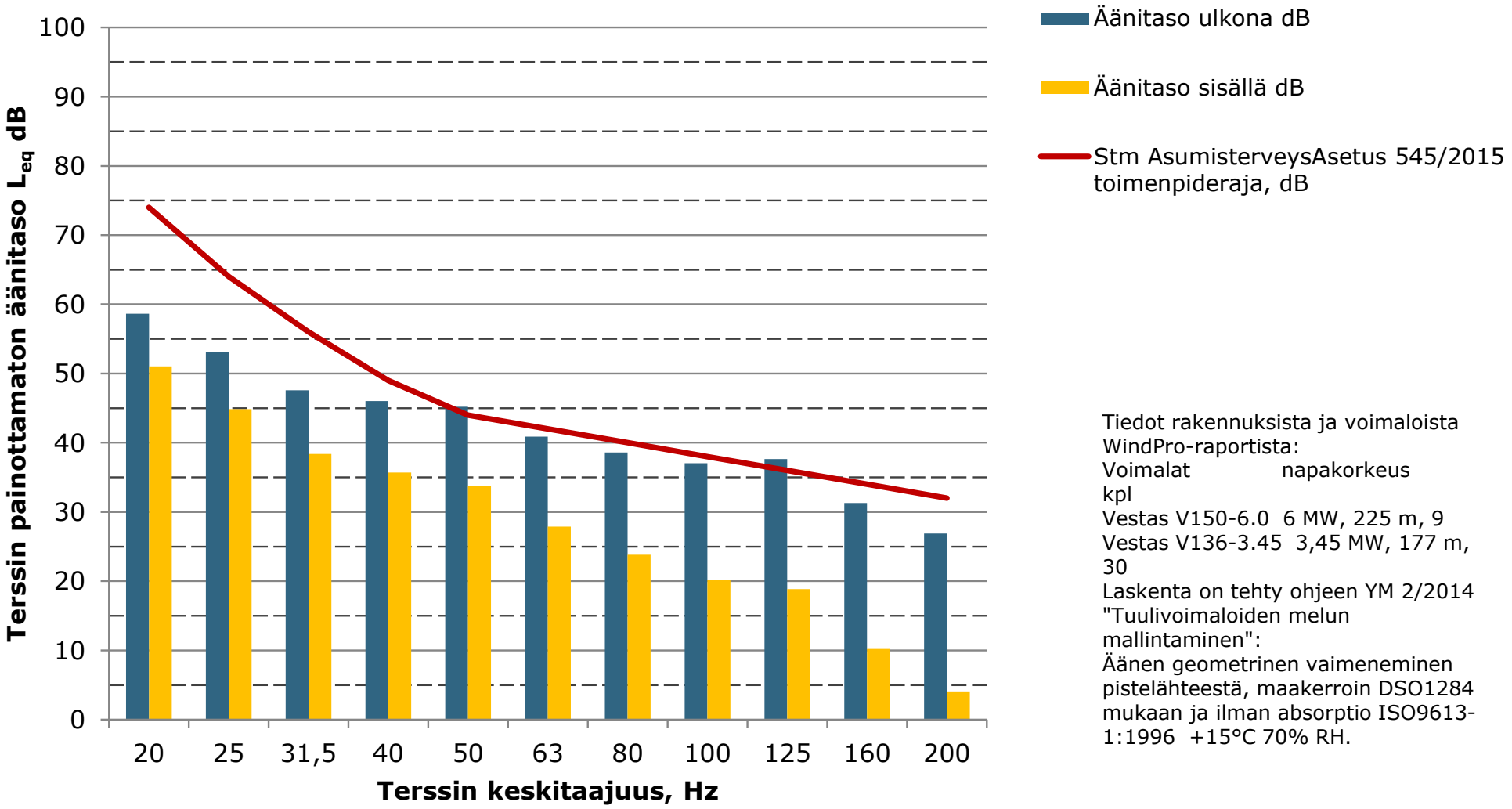
Matalien taajuuksien äänitasot ulkona ja sisällä, C - Lomarakennus (Orastinjärventie 728), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan





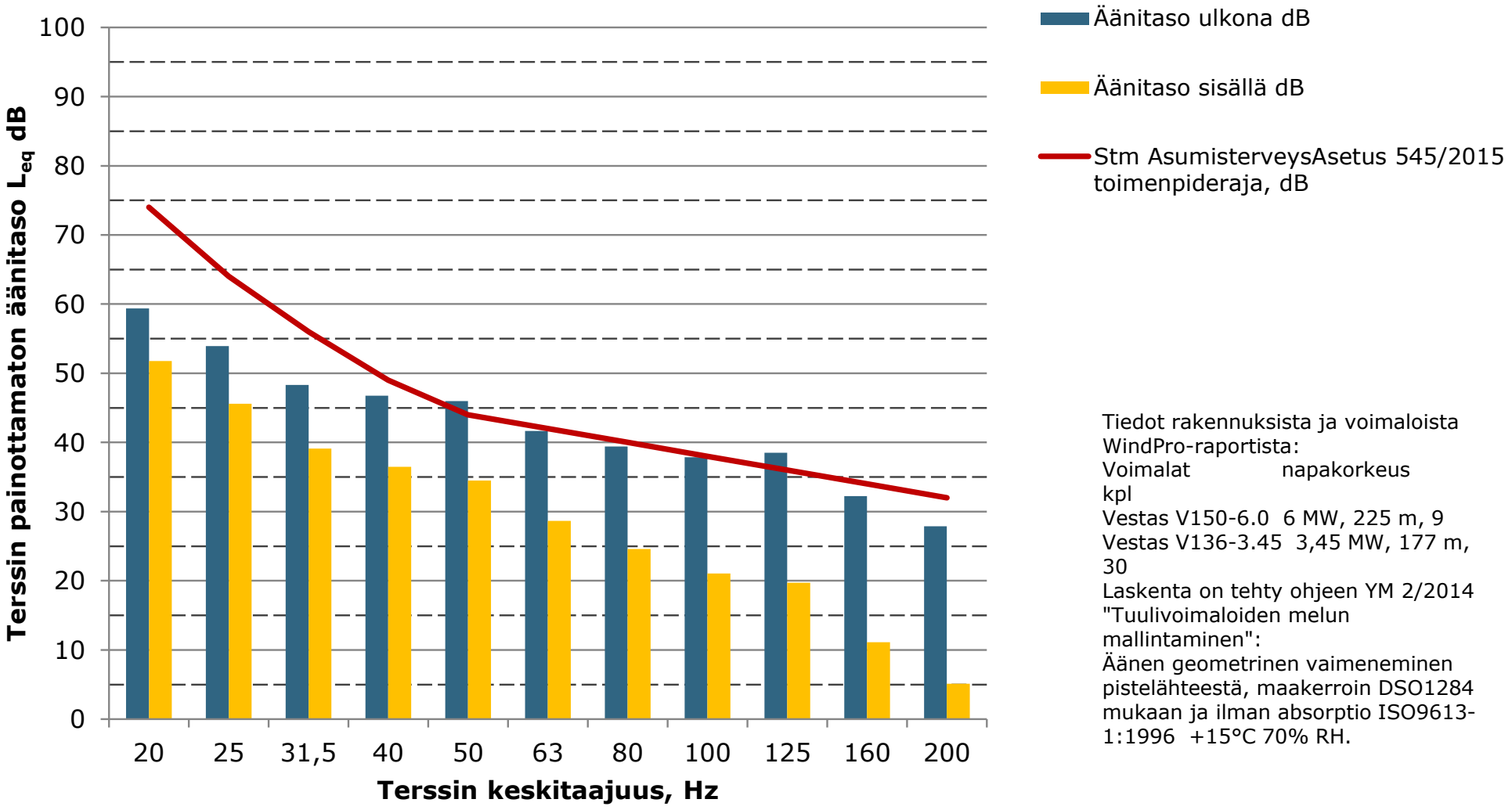
Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, D - Asuinrakennus (Kottarantie 311), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

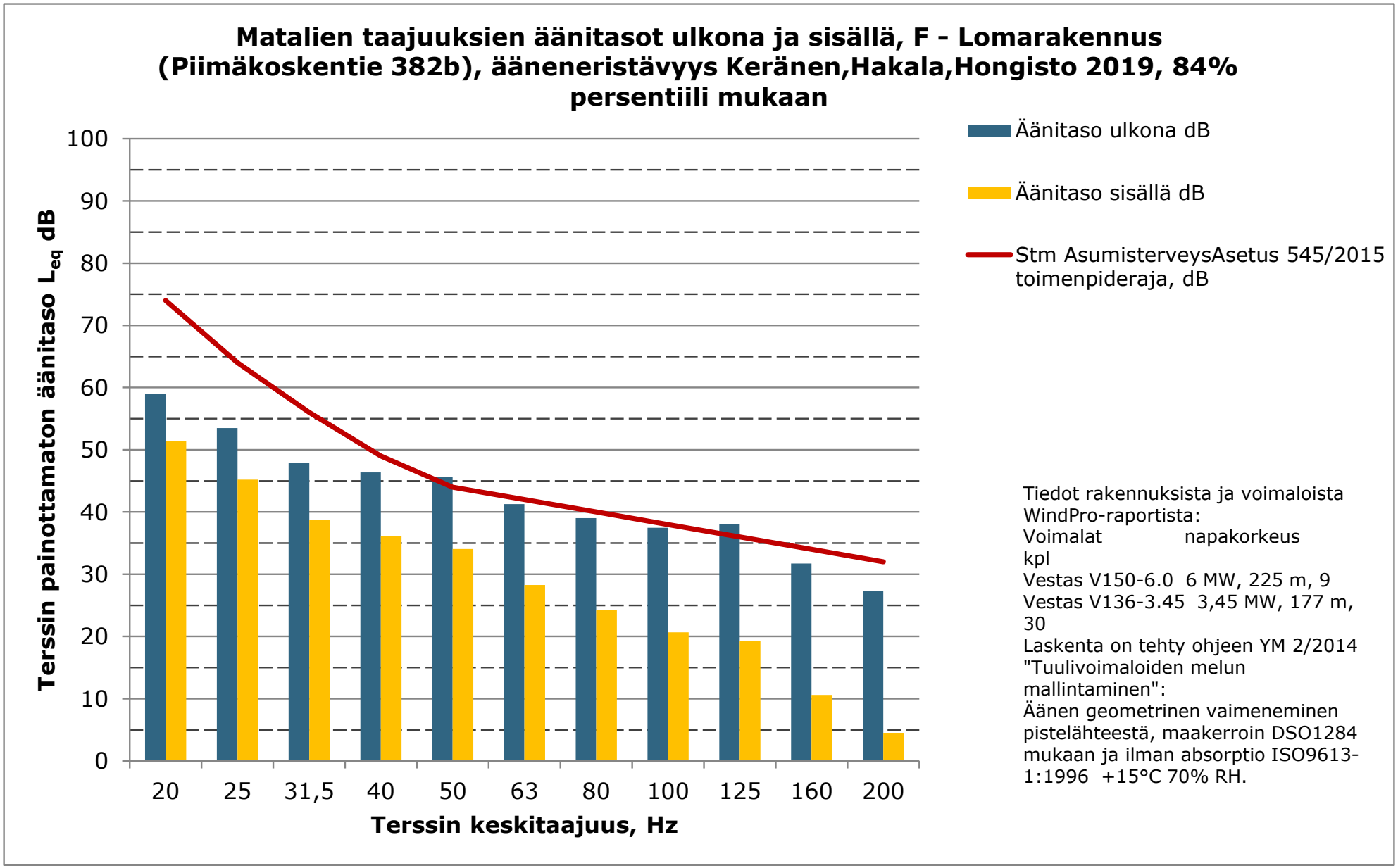


Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

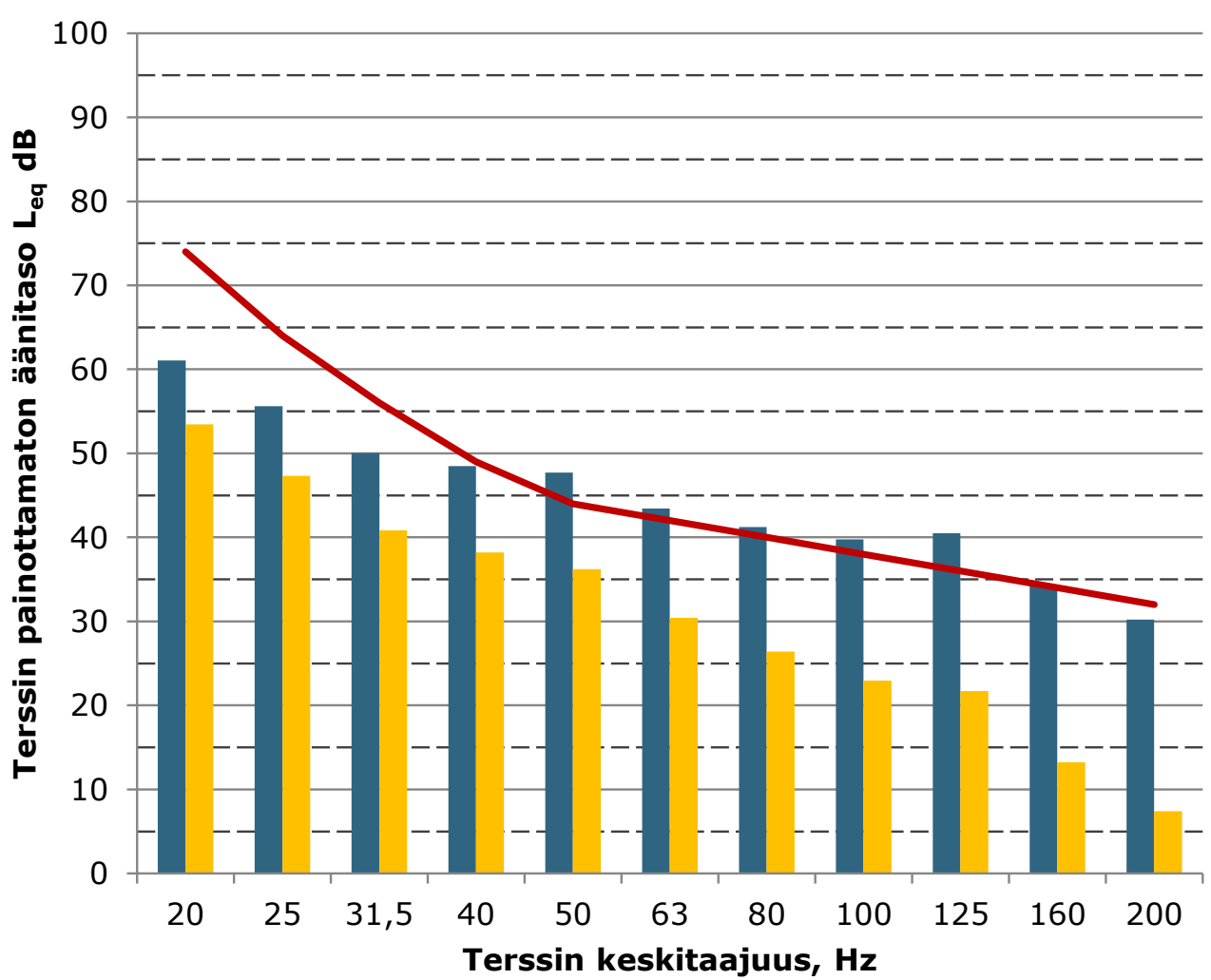
Matalien taajuuksien äänitasot ulkona ja sisällä, E - Lomarakennus (Orastinjärventie 14d), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.


Matalien taajuuksien äänitasot ulkona ja sisällä, F - Lomarakennus (Piimäkoskentie 382b), 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
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, G - Lomarakennus (Hautasaarentie), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



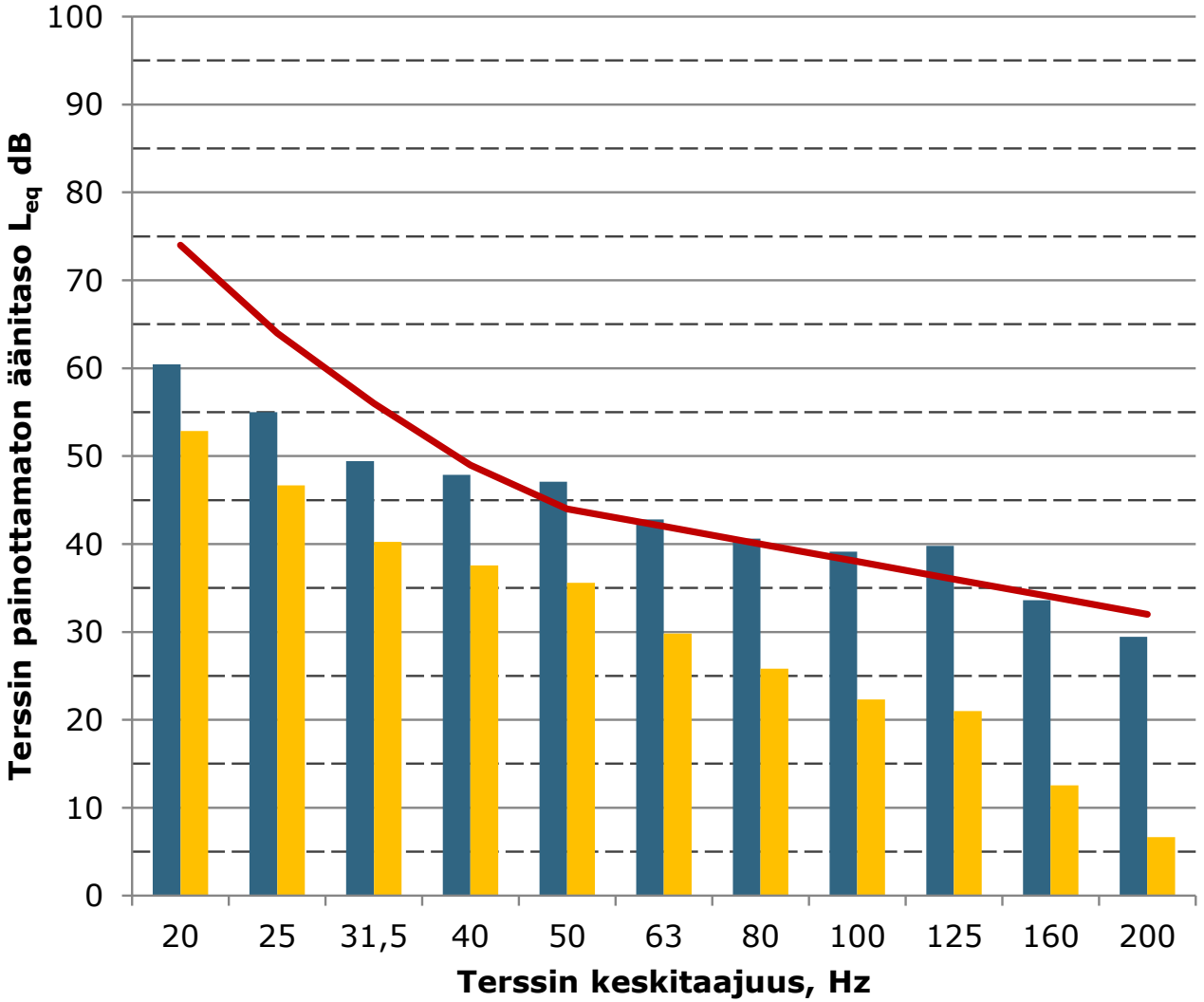
Äänitaso ulkona dB

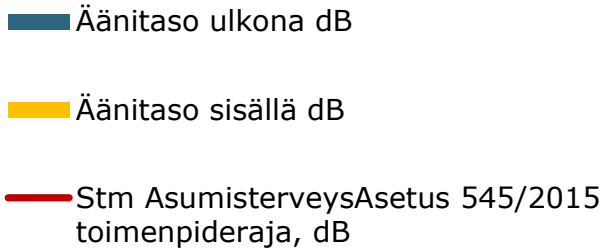
Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

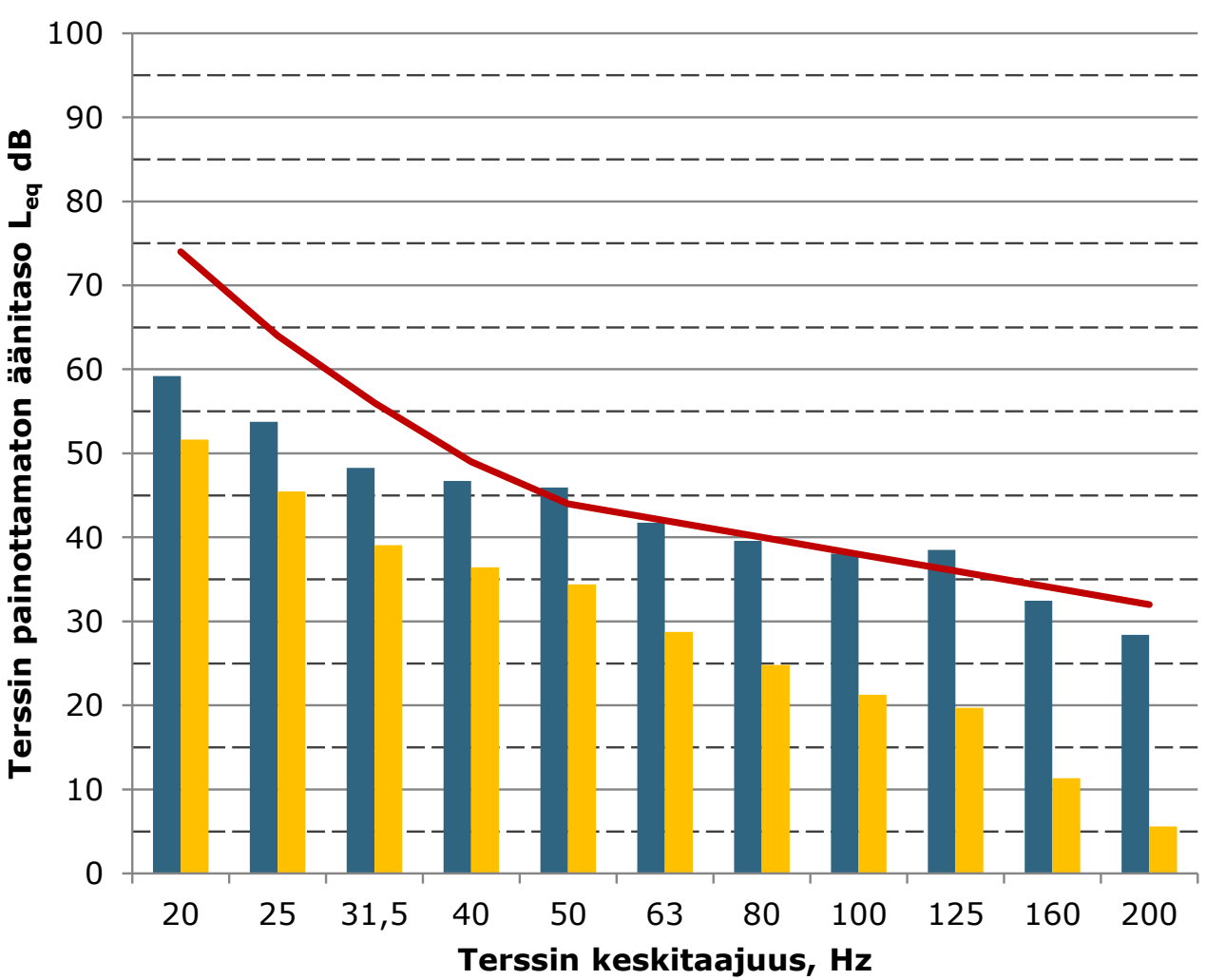
Matalien taajuuksien äänitasot ulkona ja sisällä, H - Lomarakennus (Turpontie 34), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan





Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, I - Asuinrakennus (Majava-ahontie 391), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



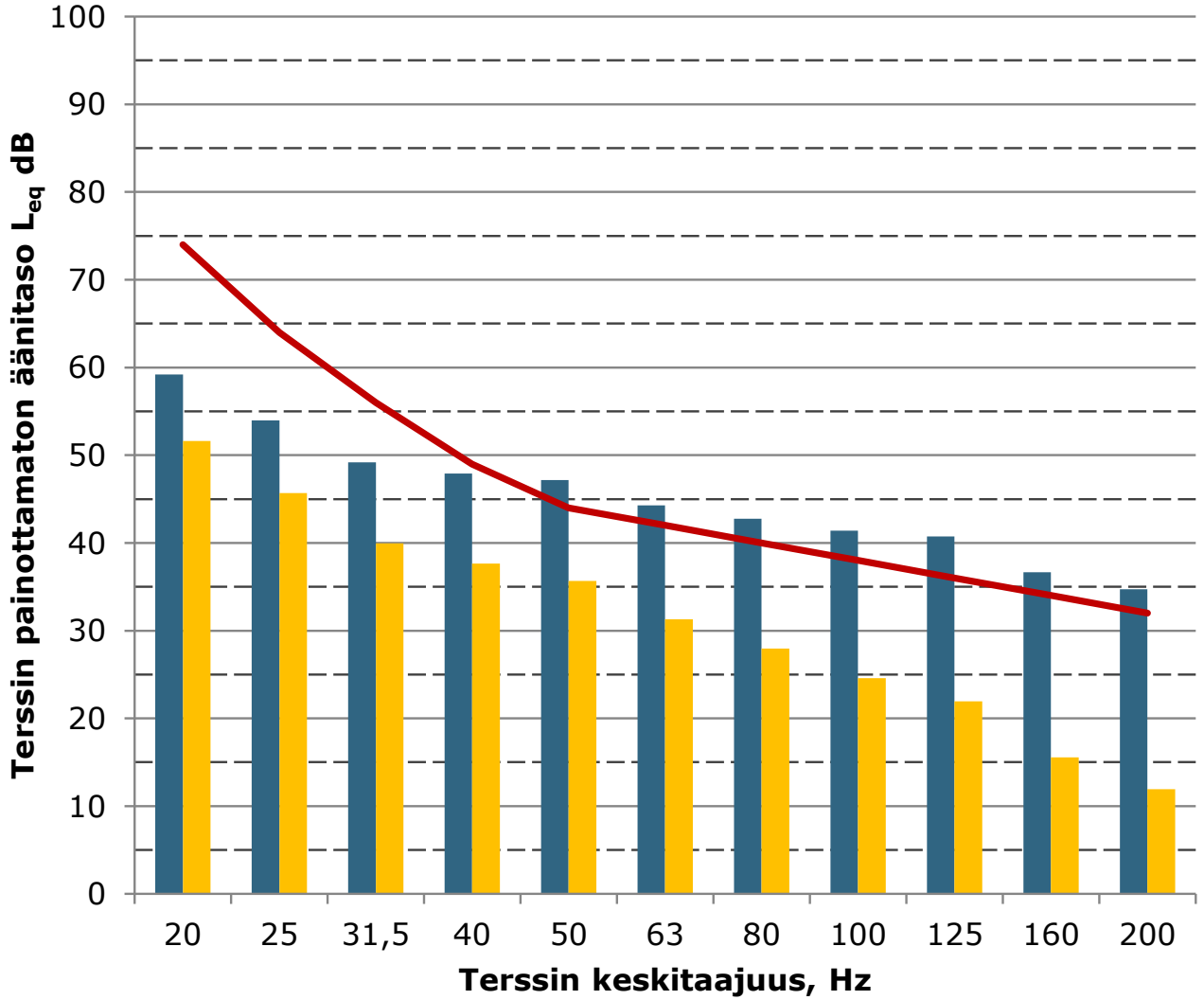
Äänitaso ulkona dB

Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, J - Asuinrakennus (Kaistontie 30), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl
Vestas V150-6.0 6 MW, 225 m, 9
Vestas V136-3.45 3,45 MW, 177 m, 30
Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Liite 3: Varjostusmallinnusten tulokset ”real case, no forest”

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Assumptions for shadow calculations

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

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

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N65,50_E026,25 (33)

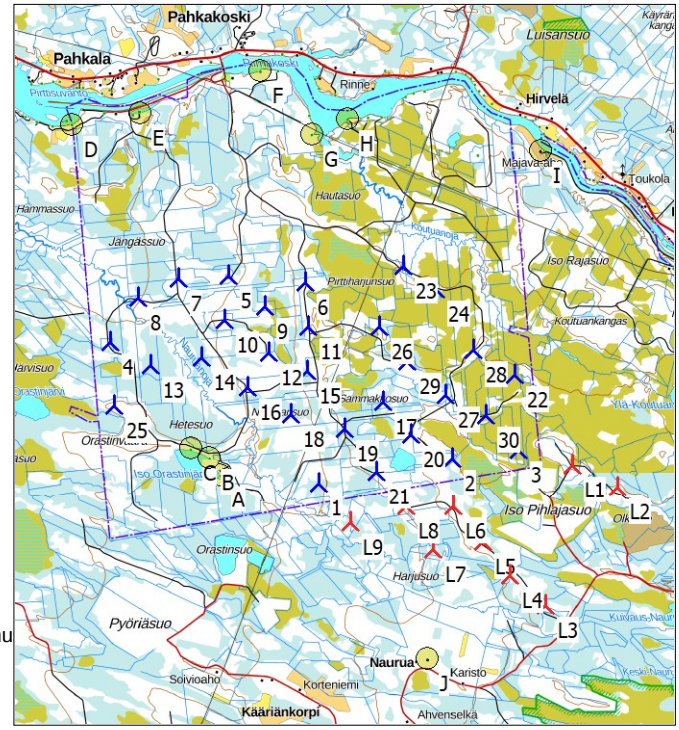
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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_Pahkakoski_Laajennu
Obstacles used in calculation
Receptor grid resolution: 10,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:125 000

New WTG Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	456 854	7 241 812	88,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
10	455 290	7 244 505	85,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
11	456 671	7 244 387	96,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
12	456 021	7 243 961	87,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
13	454 082	7 243 750	74,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
14	454 920	7 243 880	75,7	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
15	456 666	7 243 656	93,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
16	455 683	7 243 386	81,8	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
17	457 911	7 243 159	105,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
18	456 386	7 242 947	84,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
19	457 280	7 242 705	101,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
2	459 062	7 242 213	110,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
20	458 383	7 242 622	107,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
21	457 806	7 241 988	101,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
22	460 084	7 243 597	101,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
23	458 246	7 245 388	89,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
24	458 794	7 245 015	92,2	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
25	453 473	7 243 093	82,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
26	457 855	7 244 395	97,2	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
27	458 952	7 243 271	108,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
28	459 404	7 244 004	100,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
29	458 307	7 243 826	102,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
3	460 158	7 242 355	108,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
30	459 622	7 242 936	106,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
4	453 403	7 244 140	74,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
5	455 356	7 245 233	80,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
6	456 634	7 245 126	95,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
7	454 534	7 245 180	73,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
8	453 863	7 244 867	69,9	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
9	455 969	7 244 730	86,8	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
L1	461 046	7 242 109	111,3	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4

To be continued on next page...

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

...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]
L2	461 788	7 241 743	111,4	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L3	460 604	7 239 781	114,8	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L4	460 009	7 240 284	112,2	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L5	459 566	7 240 829	117,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L6	459 081	7 241 426	117,3	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L7	458 747	7 240 708	102,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L8	458 301	7 241 430	101,1	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L9	457 370	7 241 159	92,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	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 (Orastintie)	455 224	7 241 949	85,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
B	Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
C	Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
D	Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
E	Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
F	Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	5,0	5,0	2,0	90,0	"Green house mode"	7,0
G	Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	5,0	5,0	2,0	90,0	"Green house mode"	7,0
H	Lomarakennus (Turpontie 34)	457 328	7 247 817	80,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
I	Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
J	Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	5,0	5,0	2,0	90,0	"Green house mode"	7,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus (Orastintie)	9:18
B	Lomarakennus (Orastinjärventie 700)	3:19
C	Lomarakennus (Orastinjärventie 728)	8:05
D	Asuinrakennus (Kottarantie 311)	0:00
E	Lomarakennus (Orastinjärventie 14d)	0:00
F	Lomarakennus (Piimäkoskentie 382b)	0:00
G	Lomarakennus (Hautasaarentie)	0:00
H	Lomarakennus (Turpontie 34)	0:00
I	Asuinrakennus (Majava-ahontie 391)	0:00
J	Asuinrakennus (Kaistontie 30)	9:46

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

No.	Name	Expected [h/year]
1	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (127)	1:28
10	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (136)	0:00
11	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (137)	0:00
12	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (138)	0:00
13	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (139)	0:00
14	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (140)	0:00
15	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (141)	0:00
16	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (142)	4:26
17	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (143)	0:00
18	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (144)	9:50
19	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (145)	0:00
2	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (128)	0:00
20	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (146)	0:00
21	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (147)	0:00
22	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (148)	0:00
23	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (149)	0:00

To be continued on next page...

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

...continued from previous page

No.	Name	Expected [h/year]
24	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (150)	0:00
25	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (151)	3:38
26	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (152)	0:00
27	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (153)	0:00
28	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (154)	0:00
29	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (155)	0:00
3	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (129)	0:00
30	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (156)	0:00
4	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (130)	0:00
5	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (131)	0:00
6	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (132)	0:00
7	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (133)	0:00
8	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (134)	0:00
9	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (135)	0:00
L1	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
L2	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
L3	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	2:55
L4	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	6:50
L5	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
L6	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
L7	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
L8	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
L9	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	1:20

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: A - Lomarakennus (Orastintie)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March		April		May		June	
1	10.30	09.09	07.31		06.36		07.35 (1)	04.43	02.48	04.35 (18)
	14.10	15.51	17.29		20.07	19	07.54 (1)	21.46	23.40	23 04.58 (18)
2	10.29	09.06	07.27		06.32		07.35 (1)	04.40	02.44	04.35 (18)
	14.12	15.55	17.32		20.10	18	07.53 (1)	21.50	23.44	23 04.58 (18)
3	10.27	09.03	07.23		06.28		07.36 (1)	04.36	02.41	04.35 (18)
	14.14	15.59	17.35		20.14	16	07.52 (1)	21.53	23.47	23 04.58 (18)
4	10.26	08.59	07.20		06.25		07.36 (1)	04.32	02.38	04.36 (18)
	14.17	16.02	17.38		20.17	14	07.50 (1)	21.57	23.51	23 04.59 (18)
5	10.24	08.56	07.16		06.21		07.38 (1)	04.28	02.35	04.36 (18)
	14.20	16.06	17.42		20.20	9	07.47 (1)	22.01	23.55	22 04.58 (18)
6	10.22	08.52	07.12	07.47 (L9)	06.17			04.25	02.32	04.36 (18)
	14.22	16.10	17.45	3 07.50 (L9)	20.23			22.04	23.58	23 04.59 (18)
7	10.20	08.49	07.09	07.43 (L9)	06.13			04.21	02.28	04.36 (18)
	14.25	16.13	17.48	9 07.52 (L9)	20.26			22.08	00.01	22 04.58 (18)
8	10.18	08.46	07.05	07.40 (L9)	06.10			04.17	02.26	04.37 (18)
	14.28	16.17	17.51	14 07.54 (L9)	20.30			22.11	00.05	22 04.59 (18)
9	10.16	08.42	07.01	07.37 (L9)	06.06			04.14	02.23	04.37 (18)
	14.31	16.20	17.55	18 07.55 (L9)	20.33			22.15	00.08	22 04.59 (18)
10	10.14	08.39	06.58	07.35 (L9)	06.02			04.10	02.20	04.38 (18)
	14.34	16.24	17.58	20 07.55 (L9)	20.36			22.19	00.11	21 04.59 (18)
11	10.11	08.35	06.54	07.35 (L9)	05.58			04.06	02.17	04.38 (18)
	14.37	16.27	18.01	20 07.55 (L9)	20.39			22.22	00.14	21 04.59 (18)
12	10.09	08.32	06.50	07.34 (L9)	05.55			04.02	02.15	04.38 (18)
	14.41	16.31	18.04	21 07.55 (L9)	20.42			22.26	00.17	21 04.59 (18)
13	10.06	08.28	06.47	07.34 (L9)	05.51			03.59	02.13	04.38 (18)
	14.44	16.34	18.07	20 07.54 (L9)	20.46			22.29	00.20	21 04.59 (18)
14	10.04	08.25	06.43	07.35 (L9)	05.47			03.55	02.11	04.38 (18)
	14.47	16.38	18.11	19 07.54 (L9)	20.49			22.33	00.22	21 04.59 (18)
15	10.01	08.21	06.39	07.35 (L9)	05.43			03.51	02.09	04.39 (18)
	14.51	16.41	18.14	18 07.53 (L9)	20.52			22.37	00.25	21 05.00 (18)
16	09.58	08.18	06.35	07.35 (L9)	05.40			03.48	02.07	04.39 (18)
	14.54	16.45	18.17	17 07.52 (L9)	20.56			22.41	00.27	20 04.59 (18)
17	09.56	08.14	06.32	07.36 (L9)	05.36			03.44	02.06	04.40 (18)
	14.58	16.48	18.20	14 07.50 (L9)	20.59			22.44	00.29	20 05.00 (18)
18	09.53	08.10	06.28	07.38 (L9)	05.32			03.40	04.43 (18)	02.05 04.40 (18)
	15.01	16.52	18.23	9 07.47 (L9)	21.02			22.48	5 04.48 (18)	00.30 20 05.00 (18)
19	09.50	08.07	06.24		05.28			03.37	04.40 (18)	02.04 04.40 (18)
	15.05	16.55	18.26		21.05			22.52	10 04.50 (18)	00.31 20 05.00 (18)
20	09.47	08.03	06.21		05.25			03.33	04.38 (18)	02.03 04.41 (18)
	15.08	16.59	18.29		21.09			22.55	14 04.52 (18)	00.32 19 05.00 (18)
21	09.44	08.00	06.17		05.21			03.30	04.38 (18)	02.03 04.41 (18)
	15.12	17.02	18.33		21.12			22.59	15 04.53 (18)	00.33 20 05.01 (18)
22	09.41	07.56	06.13		05.17			03.26	04.37 (18)	02.04 04.41 (18)
	15.15	17.05	18.36		21.15			23.03	17 04.54 (18)	00.33 19 05.00 (18)
23	09.38	07.52	06.09		05.13			03.22	04.37 (18)	02.04 04.40 (18)
	15.19	17.09	18.39		21.19			23.07	18 04.55 (18)	00.33 20 05.00 (18)
24	09.35	07.49	06.06		05.10			03.19	04.36 (18)	02.05 04.41 (18)
	15.22	17.12	18.42		21.22			23.10	19 04.55 (18)	00.32 20 05.01 (18)
25	09.32	07.45	06.02	06.41 (1)	05.06			03.15	04.36 (18)	02.07 04.41 (18)
	15.26	17.15	18.45	11 06.52 (1)	21.26			23.14	20 04.56 (18)	00.31 20 05.01 (18)
26	09.29	07.42	05.58	06.39 (1)	05.02			03.12	04.36 (18)	02.08 04.41 (18)
	15.30	17.19	18.48	14 06.53 (1)	21.29			23.18	21 04.57 (18)	00.30 20 05.01 (18)
27	09.26	07.38	05.54	06.38 (1)	04.58			03.08	04.35 (18)	02.10 04.41 (18)
	15.33	17.22	18.51	17 06.55 (1)	21.32			23.22	21 04.56 (18)	00.28 21 05.02 (18)
28	09.22	07.34	05.51	06.36 (1)	04.55			03.05	04.35 (18)	02.12 04.42 (18)
	15.37	17.25	18.55	19 06.55 (1)	21.36			23.25	22 04.57 (18)	00.27 20 05.02 (18)
29	09.19		06.47	07.35 (1)	04.51			03.01	04.35 (18)	02.15 04.42 (18)
	15.41		19.58	20 07.55 (1)	21.39			23.29	22 04.57 (18)	00.25 20 05.02 (18)
30	09.16		06.43	07.35 (1)	04.47			02.54	04.35 (18)	02.18 04.42 (18)
	15.44		20.01	19 07.54 (1)	21.43			23.33	23 04.58 (18)	00.23 21 05.03 (18)
31	09.13		06.39	07.35 (1)				02.51	04.35 (18)	
	15.48		20.04	20 07.55 (1)				23.37	23 04.58 (18)	
Potential sun hours	155	232	362		456		585		660	
Total, worst case				322		76		250		629
Sun reduction				0,38		0,46		0,47		0,45
Oper. time red.				0,99		0,99		0,99		0,99
Wind dir. red.				0,61		0,61		0,63		0,63
Total reduction				0,23		0,27		0,29		0,28
Total, real				73		21		73		176

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: A - Lomarakennus (Orastintie)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	July		August		September		October		November	December
1	02.20		04.42 (18)	04.07	05.51		07.23	08.14 (L9)	08.04	09.48
	00.20	21	05.03 (18)	22.36	20.40		18.48	20 08.34 (L9)	15.55	14.21
2	02.23		04.42 (18)	04.11	05.54		07.26	08.13 (L9)	08.07	09.52
	00.18	22	05.04 (18)	22.32	20.36		18.44	21 08.34 (L9)	15.52	14.19
3	02.26		04.42 (18)	04.14	05.57		07.29	08.13 (L9)	08.10	09.55
	00.15	22	05.04 (18)	22.28	20.32		18.40	20 08.33 (L9)	15.48	14.17
4	02.29		04.42 (18)	04.18	06.01		07.32	08.13 (L9)	08.14	09.58
	00.12	22	05.04 (18)	22.25	20.29		18.37	19 08.32 (L9)	15.45	14.14
5	02.33		04.42 (18)	04.21	06.04		07.36	08.15 (L9)	08.17	10.01
	00.09	22	05.04 (18)	22.21	20.25		18.33	16 08.31 (L9)	15.41	14.12
6	02.36		04.42 (18)	04.25	06.07		07.39	08.18 (L9)	08.21	10.04
	00.06	23	05.05 (18)	22.17	20.21		18.29	12 08.30 (L9)	15.38	14.10
7	02.39		04.43 (18)	04.28	06.10	07.33 (1)	07.42	08.21 (L9)	08.24	10.07
	00.03	22	05.05 (18)	22.13	20.17	9 07.42 (1)	18.26	6 08.27 (L9)	15.35	14.08
8	02.43		04.43 (18)	04.32	06.13	07.31 (1)	07.45		08.28	10.09
	00.00	22	05.05 (18)	22.10	20.14	13 07.44 (1)	18.22		15.31	14.06
9	02.46		04.43 (18)	04.35	06.16	07.29 (1)	07.48		08.31	10.12
	23.57	23	05.06 (18)	22.06	20.10	16 07.45 (1)	18.18		15.28	14.04
10	02.50		04.43 (18)	04.39	06.19	07.28 (1)	07.51		08.35	10.14
	23.54	23	05.06 (18)	22.02	20.06	18 07.46 (1)	18.15		15.24	14.03
11	02.54		04.43 (18)	04.42	06.22	07.27 (1)	07.54		08.39	10.17
	23.50	23	05.06 (18)	21.59	20.02	19 07.46 (1)	18.11		15.21	14.01
12	02.57		04.43 (18)	04.46	06.25	07.26 (1)	07.58		08.42	10.19
	23.47	23	05.06 (18)	21.55	19.59	20 07.46 (1)	18.07		15.18	14.00
13	03.01		04.43 (18)	04.49	06.28	07.26 (1)	08.01		08.46	10.21
	23.44	23	05.06 (18)	21.51	19.55	20 07.46 (1)	18.04		15.15	13.59
14	03.01		04.44 (18)	04.52	06.31	07.26 (1)	08.04		08.49	10.23
	23.40	22	05.06 (18)	21.47	19.51	19 07.45 (1)	18.00		15.11	13.58
15	03.05		04.44 (18)	04.56	06.34	07.26 (1)	08.07		08.53	10.25
	23.37	22	05.06 (18)	21.44	19.47	18 07.44 (1)	17.56		15.08	13.57
16	03.08		04.44 (18)	04.59	06.38	07.26 (1)	08.10		08.56	10.27
	23.33	22	05.06 (18)	21.40	19.44	17 07.43 (1)	17.53		15.05	13.56
17	03.12		04.45 (18)	05.03	06.41	07.27 (1)	08.13		09.00	10.29
	23.30	21	05.06 (18)	21.36	19.40	15 07.42 (1)	17.49		15.02	13.56
18	03.16		04.45 (18)	05.06	06.44	07.29 (1)	08.17		09.03	10.30
	23.26	20	05.05 (18)	21.32	19.36	11 07.40 (1)	17.45		14.58	13.55
19	03.19		04.46 (18)	05.09	06.47	07.32 (1)	08.20		09.07	10.31
	23.23	19	05.05 (18)	21.29	19.32	4 07.36 (1)	17.42		14.55	13.55
20	03.23		04.46 (18)	05.13	06.50		08.23		09.11	10.32
	23.19	19	05.05 (18)	21.25	19.29		17.38		14.52	13.55
21	03.27		04.47 (18)	05.16	06.53		08.27		09.14	10.33
	23.16	17	05.04 (18)	21.21	19.25		17.34		14.49	13.55
22	03.30		04.47 (18)	05.19	06.56		08.30		09.18	10.34
	23.12	16	05.03 (18)	21.17	19.21		17.31		14.46	13.55
23	03.34		04.48 (18)	05.22	06.59		08.33		09.21	10.34
	23.09	15	05.03 (18)	21.14	19.18		17.27		14.43	13.56
24	03.38		04.50 (18)	05.26	07.02		08.36		09.25	10.34
	23.05	12	05.02 (18)	21.10	19.14		17.24		14.40	13.57
25	03.41		04.52 (18)	05.29	07.05	08.23 (L9)	07.40		09.28	10.34
	23.01	8	05.00 (18)	21.06	19.10	5 08.28 (L9)	16.20		14.37	13.58
26	03.45			05.32	07.08	08.19 (L9)	07.43		09.32	10.34
	22.58			21.02	19.06	12 08.31 (L9)	16.17		14.35	13.59
27	03.49			05.35	07.11	08.17 (L9)	07.46		09.35	10.34
	22.54			20.59	19.03	16 08.33 (L9)	16.13		14.32	14.00
28	03.52			05.39	07.14	08.15 (L9)	07.50		09.38	10.34
	22.50			20.55	18.59	18 08.33 (L9)	16.09		14.29	14.02
29	03.56			05.42	07.17	08.15 (L9)	07.53		09.42	10.33
	22.47			20.51	18.55	20 08.35 (L9)	16.06		14.26	14.03
30	04.00			05.45	07.20	08.14 (L9)	07.57		09.45	10.32
	22.43			20.47	18.51	21 08.35 (L9)	16.02		14.24	14.05
31	04.03			05.48			08.00			10.31
	22.39			20.44			15.59			14.07
Potential sun hours	631			517	395		301		187	115
Total, worst case		504				291		114		
Sun reduction		0,45				0,34		0,23		
Oper. time red.		0,99				0,99		0,99		
Wind dir. red.		0,63				0,61		0,61		
Total reduction		0,28				0,20		0,14		
Total, real		141				59		16		

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: B - Lomarakennus (Orastinjärventie 700)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May		June	July		August		September	October	November	December
1	10.30	09.09	07.31	06.36	04.43		05.33 (18)	02.48	02.20	04.07		05.36 (18)	05.51	07.23	08.04	09.48
	14.10	15.51	17.29	20.07	21.46	9	05.42 (18)	23.40	00.20	22.36	21	05.57 (18)	20.40	18.48	15.55	14.21
2	10.29	09.06	07.27	06.32	04.40		05.31 (18)	02.44	02.23	04.11		05.35 (18)	05.54	07.26	08.07	09.52
	14.12	15.55	17.32	20.10	21.50	13	05.44 (18)	23.44	00.18	22.32	23	05.58 (18)	20.36	18.44	15.52	14.19
3	10.27	09.03	07.23	06.28	04.36		05.28 (18)	02.41	02.26	04.14		05.35 (18)	05.57	07.29	08.10	09.55
	14.14	15.59	17.35	20.14	21.53	17	05.45 (18)	23.48	00.15	22.28	23	05.58 (18)	20.32	18.40	15.48	14.17
4	10.26	08.59	07.20	06.25	04.32		05.27 (18)	02.38	02.29	04.18		05.36 (18)	06.01	07.33	08.14	09.58
	14.17	16.02	17.38	20.17	21.57	19	05.46 (18)	23.51	00.12	22.25	22	05.58 (18)	20.29	18.37	15.45	14.14
5	10.24	08.56	07.16	06.21	04.28		05.27 (18)	02.35	02.33	04.21		05.36 (18)	06.04	07.36	08.17	10.01
	14.20	16.06	17.42	20.20	22.01	19	05.46 (18)	23.55	00.09	22.21	22	05.58 (18)	20.25	18.33	15.41	14.12
6	10.22	08.53	07.12	06.17	04.25		05.26 (18)	02.31	02.36	04.25		05.36 (18)	06.07	07.39	08.21	10.04
	14.22	16.10	17.45	20.23	22.04	21	05.47 (18)	23.58	00.06	22.17	21	05.57 (18)	20.21	18.29	15.38	14.10
7	10.20	08.49	07.09	06.13	04.21		05.26 (18)	02.28	02.39	04.28		05.36 (18)	06.10	07.42	08.24	10.07
	14.25	16.13	17.48	20.26	22.08	21	05.47 (18)	00.02	00.03	22.14	21	05.57 (18)	20.17	18.26	15.35	14.08
8	10.18	08.46	07.05	06.10	04.17		05.26 (18)	02.25	02.43	04.32		05.37 (18)	06.13	07.45	08.28	10.09
	14.28	16.17	17.51	20.30	22.11	22	05.48 (18)	00.05	00.00	22.10	19	05.56 (18)	20.14	18.22	15.31	14.06
9	10.16	08.42	07.01	06.06	04.14		05.26 (18)	02.23	02.46	04.35		05.37 (18)	06.16	07.48	08.32	10.12
	14.31	16.20	17.55	20.33	22.15	22	05.48 (18)	00.08	23.57	22.06	17	05.54 (18)	20.10	18.18	15.28	14.04
10	10.14	08.39	06.58	06.02	04.10		05.26 (18)	02.20	02.50	04.39		05.38 (18)	06.19	07.51	08.35	10.15
	14.34	16.24	17.58	20.36	22.19	22	05.48 (18)	00.11	23.54	22.02	15	05.53 (18)	20.06	18.15	15.24	14.03
11	10.11	08.35	06.54	05.58	04.06		05.26 (18)	02.17	02.54	04.42		05.39 (18)	06.22	07.54	08.39	10.17
	14.37	16.27	18.01	20.39	22.22	22	05.48 (18)	00.14	23.51	21.59	13	05.52 (18)	20.02	18.11	15.21	14.01
12	10.09	08.32	06.50	05.55	04.02		05.26 (18)	02.15	02.57	04.46		05.42 (18)	06.25	07.58	08.42	10.19
	14.41	16.31	18.04	20.43	22.26	22	05.48 (18)	00.17	23.47	21.55	7	05.49 (18)	19.59	18.07	15.18	14.00
13	10.06	08.28	06.47	05.51	03.59		05.26 (18)	02.13	03.01	04.49			06.28	08.01	08.46	10.21
	14.44	16.34	18.07	20.46	22.30	21	05.47 (18)	00.20	23.44	21.51			19.55	18.04	15.15	13.59
14	10.04	08.25	06.43	05.47	03.55		05.26 (18)	02.10	03.01	04.52			06.31	08.04	08.49	10.23
	14.47	16.38	18.11	20.49	22.33	21	05.47 (18)	00.22	23.40	21.47			19.51	18.00	15.11	13.58
15	10.01	08.21	06.39	05.43	03.51		05.27 (18)	02.09	03.04	04.56			06.34	08.07	08.53	10.25
	14.51	16.41	18.14	20.52	22.37	19	05.46 (18)	00.25	23.37	21.44			19.47	17.56	15.08	13.57
16	09.59	08.18	06.35	05.40	03.48		05.27 (18)	02.07	03.08	04.59			06.38	08.10	08.56	10.27
	14.54	16.45	18.17	20.56	22.41	18	05.45 (18)	00.27	23.33	21.40			19.44	17.53	15.05	13.56
17	09.56	08.14	06.32	05.36	03.44		05.28 (18)	02.06	03.12	05.03			06.41	08.14	09.00	10.29
	14.58	16.48	18.20	20.59	22.44	16	05.44 (18)	00.29	23.30	21.36			19.40	17.49	15.02	13.55
18	09.53	08.10	06.28	05.32	03.40		05.29 (18)	02.04	03.16	05.06			06.44	08.17	09.04	10.30
	15.01	16.52	18.23	21.02	22.48	15	05.44 (18)	00.30	23.26	21.32			19.36	17.45	14.58	13.55
19	09.50	08.07	06.24	05.28	03.37		05.30 (18)	02.04	03.19	05.09			06.47	08.20	09.07	10.31
	15.05	16.55	18.26	21.05	22.52	12	05.42 (18)	00.31	23.23	21.29			19.32	17.42	14.55	13.55
20	09.47	08.03	06.21	05.25	03.33		05.32 (18)	02.03	03.23	05.13			06.50	08.23	09.11	10.32
	15.08	16.59	18.29	21.09	22.55	8	05.40 (18)	00.32	23.19	21.25			19.29	17.38	14.52	13.55
21	09.44	08.00	06.17	05.21	03.30			02.03	03.27	05.16			06.53	08.27	09.14	10.33
	15.12	17.02	18.33	21.12	22.59			00.33	23.16	21.21			19.25	17.34	14.49	13.55
22	09.41	07.56	06.13	05.17	03.26			02.04	03.30	05.19			06.56	08.30	09.18	10.34
	15.15	17.05	18.36	21.16	23.03			00.33	23.12	21.17			19.21	17.31	14.46	13.55
23	09.38	07.53	06.09	05.13	03.22			02.04	03.34	05.44 (18)		05.22	06.59	08.33	09.21	10.34
	15.19	17.09	18.39	21.19	23.07			00.33	23.09	4	05.48 (18)	21.14	19.18	17.27	14.43	13.56
24	09.35	07.49	06.06	05.10	03.19			02.05	03.38	05.42 (18)		05.26	07.02	08.36	09.25	10.34
	15.22	17.12	18.42	21.22	23.10			00.32	23.05	9	05.51 (18)	21.10	19.14	17.24	14.40	13.57
25	09.32	07.45	06.02	05.06	03.15			02.07	03.41	05.41 (18)		05.29	07.05	07.40	09.28	10.35
	15.26	17.15	18.45	21.26	23.14			00.31	23.01	12	05.53 (18)	21.06	19.10	16.20	14.37	13.58
26	09.29	07.42	05.58	05.02	03.12			02.08	03.45	05.39 (18)		05.32	07.08	07.43	09.32	10.34
	15.30	17.19	18.48	21.29	23.18			00.30	22.58	15	05.54 (18)	21.02	19.06	16.17	14.35	13.59
27	09.26	07.38	05.54	04.58	03.08			02.10	03.49	05.38 (18)		05.35	07.11	07.47	09.35	10.34
	15.33	17.22	18.52	21.33	23.22			00.29	22.54	17	05.55 (18)	20.59	19.03	16.13	14.32	14.00
28	09.22	07.34	05.51	04.55	03.05			02.12	03.52	05.38 (18)		05.39	07.14	07.50	09.38	10.34
	15.37	17.25	18.55	21.36	23.25			00.27	22.50	18	05.56 (18)	20.55	18.59	16.09	14.29	14.02
29	09.19		06.47	04.51	03.01			02.15	03.56	05.37 (18)		05.42	07.17	07.53	09.42	10.33
	15.41		19.58	21.39	23.29			00.25	22.47	20	05.57 (18)	20.51	18.55	16.06	14.26	14.03
30	09.16		06.43	04.47	02.54			02.17	04.00	05.37 (18)		05.45	07.20	07.57	09.45	10.32
	15.44		20.01	21.43	23.33			00.23	22.43	21	05.58 (18)	20.47	18.51	16.02	14.24	14.05
31	09.13		06.39		02.51				04.03		05.36 (18)	05.48		08.00		10.31
	15.48		20.04		23.37				22.39	21	05.57 (18)	20.44		15.59		14.07
Potential sun hours	155	232	362	456	585			660	631			517		395	301	186	115
Total, worst case						359				137			224				
Sun reduction						0,47				0,45			0,41				
Oper. time red.						0,99				0,99			0,99				
Wind dir. red.						0,63				0,63			0,63				
Total reduction						0,29				0,28			0,26				
Total, real						104				38			57				

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

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(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:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: C - Lomarakennus (Orastinjärventie 728)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January		February		March		April			May			June		
1	10.30		09.09		07.31		06.36			04.43		20.40 (25)	02.48		04.17 (16)
	14.10		15.51		17.29		20.07			21.46	11	20.51 (25)	23.40	14	04.31 (16)
2	10.29		09.06		07.27		06.32			04.40		20.38 (25)	02.44		04.16 (16)
	14.12		15.55		17.32		20.10			21.50	16	20.54 (25)	23.44	16	04.32 (16)
3	10.27		09.03		07.23		06.28			04.36		20.36 (25)	02.41		04.15 (16)
	14.14		15.59		17.35		20.14			21.53	18	20.54 (25)	23.48	17	04.32 (16)
4	10.26		08.59		07.20		06.25			04.32		20.36 (25)	02.38		04.15 (16)
	14.17		16.02		17.38		20.17			21.57	19	20.55 (25)	23.51	19	04.34 (16)
5	10.24		08.56		07.16		06.21			04.28		20.35 (25)	02.35		04.15 (16)
	14.20		16.06		17.42		20.20			22.01	21	20.56 (25)	23.55	19	04.34 (16)
6	10.22		08.53		07.12		06.17			04.25		20.34 (25)	02.31		04.15 (16)
	14.22		16.10		17.45		20.23			22.04	22	20.56 (25)	23.58	20	04.35 (16)
7	10.20		08.49		07.09		06.13			04.21		20.34 (25)	02.28		04.14 (16)
	14.25		16.13		17.48		20.26			22.08	23	20.57 (25)	00.02	21	04.35 (16)
8	10.18		08.46		07.05		06.10			04.17		20.34 (25)	02.25		04.14 (16)
	14.28		16.17		17.51		20.30			22.11	23	20.57 (25)	00.05	22	04.36 (16)
9	10.16		08.42		07.01		06.06			04.14		20.34 (25)	02.23		04.14 (16)
	14.31		16.20		17.55		20.33			22.15	23	20.57 (25)	00.08	22	04.36 (16)
10	10.14		08.39		06.58		06.02			04.10		20.34 (25)	02.20		04.14 (16)
	14.34		16.24		17.58		20.36			22.19	23	20.57 (25)	00.11	23	04.37 (16)
11	10.11		08.35		06.54		05.58			04.06		20.34 (25)	02.17		04.14 (16)
	14.37		16.27		18.01		20.39			22.22	23	20.57 (25)	00.14	23	04.37 (16)
12	10.09		08.32		06.50		05.55			04.02		20.34 (25)	02.15		04.14 (16)
	14.41		16.31		18.04		20.43			22.26	23	20.57 (25)	00.17	23	04.37 (16)
13	10.06		08.28		06.47		05.51			03.59		20.34 (25)	02.13		04.14 (16)
	14.44		16.34		18.07		20.46			22.30	22	20.56 (25)	00.20	24	04.38 (16)
14	10.04		08.25		06.43		05.47			03.55		20.34 (25)	02.10		04.14 (16)
	14.47		16.38		18.11		20.49			22.33	22	20.56 (25)	00.23	24	04.38 (16)
15	10.01		08.21		06.39		05.43			03.51		20.35 (25)	02.09		04.15 (16)
	14.51		16.41		18.14		20.52			22.37	20	20.55 (25)	00.25	23	04.38 (16)
16	09.59		08.18		06.35		05.40			03.48		20.35 (25)	02.07		04.14 (16)
	14.54		16.45		18.17		20.56			22.41	19	20.54 (25)	00.27	24	04.38 (16)
17	09.56		08.14		06.32		05.36			03.44		20.36 (25)	02.05		04.15 (16)
	14.58		16.48		18.20		20.59			22.44	18	20.54 (25)	00.29	24	04.39 (16)
18	09.53		08.11		06.28		05.32			03.40		20.37 (25)	02.04		04.15 (16)
	15.01		16.52		18.23		21.02			22.48	16	20.53 (25)	00.30	24	04.39 (16)
19	09.50		08.07		06.24		05.28			03.37		20.38 (25)	02.04		04.15 (16)
	15.05		16.55		18.26		21.06			22.52	14	20.52 (25)	00.32	25	04.40 (16)
20	09.47		08.03		06.21		05.25			03.33		20.40 (25)	02.03		04.16 (16)
	15.08		16.59		18.30		21.09			22.56	10	20.50 (25)	00.32	24	04.40 (16)
21	09.44		08.00		06.17		05.21			03.30		20.43 (25)	02.03		04.16 (16)
	15.12		17.02		18.33		21.12			22.59	6	20.49 (25)	00.33	24	04.40 (16)
22	09.41		07.56		06.13		05.17			03.26			02.03		04.16 (16)
	15.15		17.05		18.36		21.16			23.03			00.33	24	04.40 (16)
23	09.38		07.53		06.09		05.13			03.22			02.04		04.16 (16)
	15.19		17.09		18.39		21.19			23.07			00.33	24	04.40 (16)
24	09.35		07.49		06.06		05.10			03.19			02.05		04.16 (16)
	15.22		17.12		18.42		21.22			23.11			00.32	24	04.40 (16)
25	09.32		07.45		06.02		05.06			03.15			02.07		04.16 (16)
	15.26		17.15		18.45		21.26			23.14			00.31	24	04.40 (16)
26	09.29		07.42		05.58		05.02			03.12			02.08		04.17 (16)
	15.30		17.19		18.48		21.29			23.18			00.30	23	04.40 (16)
27	09.26		07.38		05.54		04.58			03.08			02.10		04.17 (16)
	15.33		17.22		18.52		21.33			23.22			00.29	24	04.41 (16)
28	09.22		07.34		05.51		04.55			03.05			02.12		04.17 (16)
	15.37		17.25		18.55		21.36			23.26			00.27	24	04.41 (16)
29	09.19				06.47		04.51			03.01		04.21 (16)	02.15		04.18 (16)
	15.41				19.58		21.39			23.29	6	04.27 (16)	00.25	23	04.41 (16)
30	09.16				06.43		04.47		20.43 (25)	02.54		04.19 (16)	02.17		04.18 (16)
	15.44				20.01		21.43	5	20.48 (25)	23.33	10	04.29 (16)	00.23	23	04.41 (16)
31	09.13				06.40					02.51		04.17 (16)			
	15.48				20.04					23.37	13	04.30 (16)			
Potential sun hours	155		232		362		456			585			660		
Total, worst case								5			421			668	
Sun reduction								0,46			0,47			0,45	
Oper. time red.								0,99			0,99			0,99	
Wind dir. red.								0,62			0,62			0,63	
Total reduction								0,28			0,29			0,28	
Total, real								1			121			187	

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: C - Lomarakennus (Orastinjärventie 728)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	July		August		September	October	November	December
1	02.20		04.18 (16)	04.07	20.44 (25)	05.51	07.23	08.04	09.48
	00.20	23	04.41 (16)	22.36	23	21.07 (25)	20.40	18.48	15.55	14.21
2	02.23		04.19 (16)	04.11	20.44 (25)	05.54	07.26	08.07	09.52
	00.18	22	04.41 (16)	22.32	23	21.07 (25)	20.36	18.44	15.52	14.19
3	02.26		04.19 (16)	04.14	20.44 (25)	05.58	07.29	08.11	09.55
	00.15	22	04.41 (16)	22.28	23	21.07 (25)	20.32	18.40	15.48	14.17
4	02.29		04.20 (16)	04.18	20.44 (25)	06.01	07.33	08.14	09.58
	00.12	21	04.41 (16)	22.25	23	21.07 (25)	20.29	18.37	15.45	14.14
5	02.33		04.20 (16)	04.21	20.44 (25)	06.04	07.36	08.17	10.01
	00.09	21	04.41 (16)	22.21	23	21.07 (25)	20.25	18.33	15.41	14.12
6	02.36		04.20 (16)	04.25	20.44 (25)	06.07	07.39	08.21	10.04
	00.07	21	04.41 (16)	22.17	23	21.07 (25)	20.21	18.29	15.38	14.10
7	02.39		04.21 (16)	04.28	20.45 (25)	06.10	07.42	08.24	10.07
	00.03	20	04.41 (16)	22.14	21	21.06 (25)	20.17	18.26	15.35	14.08
8	02.43		04.22 (16)	04.32	20.45 (25)	06.13	07.45	08.28	10.09
	00.00	19	04.41 (16)	22.10	21	21.06 (25)	20.14	18.22	15.31	14.06
9	02.46		04.23 (16)	04.35	20.45 (25)	06.16	07.48	08.32	10.12
	23.57	18	04.41 (16)	22.06	19	21.04 (25)	20.10	18.18	15.28	14.04
10	02.50		04.23 (16)	04.39	20.46 (25)	06.19	07.51	08.35	10.15
	23.54	17	04.40 (16)	22.02	17	21.03 (25)	20.06	18.15	15.24	14.03
11	02.54		04.24 (16)	04.42	20.47 (25)	06.22	07.54	08.39	10.17
	23.51	16	04.40 (16)	21.59	14	21.01 (25)	20.02	18.11	15.21	14.01
12	02.57		04.25 (16)	04.46	20.49 (25)	06.25	07.58	08.42	10.19
	23.47	14	04.39 (16)	21.55	10	20.59 (25)	19.59	18.07	15.18	14.00
13	03.01		04.26 (16)	04.49			06.28	08.01	08.46	10.21
	23.44	12	04.38 (16)	21.51			19.55	18.04	15.15	13.59
14	03.01		04.29 (16)	04.52			06.31	08.04	08.49	10.23
	23.40	8	04.37 (16)	21.47			19.51	18.00	15.11	13.58
15	03.04		04.32 (16)	04.56			06.34	08.07	08.53	10.25
	23.37	1	04.33 (16)	21.44			19.47	17.56	15.08	13.57
16	03.08			04.59			06.38	08.10	08.56	10.27
	23.34			21.40			19.44	17.53	15.05	13.56
17	03.12			05.03			06.41	08.14	09.00	10.29
	23.30			21.36			19.40	17.49	15.02	13.55
18	03.16			05.06			06.44	08.17	09.04	10.30
	23.27			21.32			19.36	17.45	14.58	13.55
19	03.19			05.09			06.47	08.20	09.07	10.31
	23.23			21.29			19.32	17.42	14.55	13.55
20	03.23			05.13			06.50	08.23	09.11	10.32
	23.19			21.25			19.29	17.38	14.52	13.55
21	03.27			05.16			06.53	08.27	09.14	10.33
	23.16			21.21			19.25	17.34	14.49	13.55
22	03.30		20.55 (25)	05.19			06.56	08.30	09.18	10.34
	23.12	1	20.56 (25)	21.18			19.21	17.31	14.46	13.55
23	03.34		20.51 (25)	05.22			06.59	08.33	09.21	10.34
	23.09	9	21.00 (25)	21.14			19.18	17.27	14.43	13.56
24	03.38		20.50 (25)	05.26			07.02	08.36	09.25	10.34
	23.05	12	21.02 (25)	21.10			19.14	17.24	14.40	13.57
25	03.41		20.49 (25)	05.29			07.05	07.40	09.28	10.35
	23.01	14	21.03 (25)	21.06			19.10	16.20	14.37	13.58
26	03.45		20.47 (25)	05.32			07.08	07.43	09.32	10.34
	22.58	17	21.04 (25)	21.02			19.06	16.17	14.35	13.59
27	03.49		20.46 (25)	05.35			07.11	07.47	09.35	10.34
	22.54	19	21.05 (25)	20.59			19.03	16.13	14.32	14.00
28	03.52		20.46 (25)	05.39			07.14	07.50	09.39	10.34
	22.50	20	21.06 (25)	20.55			18.59	16.09	14.29	14.02
29	03.56		20.45 (25)	05.42			07.17	07.53	09.42	10.33
	22.47	21	21.06 (25)	20.51			18.55	16.06	14.26	14.03
30	04.00		20.45 (25)	05.45			07.20	07.57	09.45	10.32
	22.43	22	21.07 (25)	20.47			18.52	16.02	14.24	14.05
31	04.03		20.44 (25)	05.48				08.00		10.31
	22.39	22	21.06 (25)	20.44				15.59		14.07
Potential sun hours	631			517			395	301	186	115
Total, worst case		412			240					
Sun reduction		0,45			0,41					
Oper. time red.		0,99			0,99					
Wind dir. red.		0,63			0,62					
Total reduction		0,28			0,25					
Total, real		115			61					

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: D - Asuinrakennus (Kottarantie 311)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.47	02.18	04.07	05.51	07.24	08.04	09.49
	14.09	15.51	17.29	20.08	21.47	23.42	00.22	22.37	20.40	18.48	15.55	14.21
2	10.30	09.07	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.27	08.08	09.53
	14.11	15.55	17.32	20.11	21.51	23.45	00.20	22.33	20.37	18.44	15.52	14.18
3	10.28	09.03	07.24	06.28	04.36	02.40	02.25	04.14	05.58	07.30	08.11	09.56
	14.14	15.59	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.41	15.48	14.16
4	10.27	09.00	07.20	06.25	04.32	02.37	02.28	04.17	06.01	07.33	08.14	09.59
	14.16	16.02	17.39	20.17	21.58	23.53	00.14	22.25	20.29	18.37	15.45	14.14
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.04	07.36	08.18	10.02
	14.19	16.06	17.42	20.20	22.01	23.56	00.11	22.22	20.25	18.33	15.41	14.11
6	10.23	08.53	07.13	06.17	04.24	02.30	02.35	04.24	06.07	07.39	08.22	10.05
	14.22	16.09	17.45	20.24	22.05	00.00	00.08	22.18	20.22	18.29	15.38	14.09
7	10.21	08.50	07.09	06.13	04.21	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.27	22.08	00.03	00.05	22.14	20.18	18.26	15.34	14.07
8	10.19	08.46	07.05	06.10	04.17	02.24	02.42	04.31	06.13	07.45	08.29	10.10
	14.27	16.17	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.02	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.55	20.33	22.16	00.10	23.59	22.07	20.10	18.18	15.28	14.04
10	10.15	08.39	06.58	06.02	04.10	02.18	02.49	04.38	06.19	07.52	08.36	10.16
	14.34	16.24	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.15	15.24	14.02
11	10.12	08.36	06.54	05.58	04.06	02.16	02.53	04.42	06.22	07.55	08.39	10.18
	14.37	16.27	18.01	20.40	22.23	00.16	23.52	21.59	20.03	18.11	15.21	14.00
12	10.10	08.32	06.51	05.55	04.02	02.13	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.31	18.04	20.43	22.27	00.19	23.49	21.56	19.59	18.07	15.18	13.59
13	10.07	08.29	06.47	05.51	03.58	02.11	03.00	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.08	20.46	22.30	00.22	23.45	21.52	19.55	18.04	15.14	13.58
14	10.05	08.25	06.43	05.47	03.55	02.08	03.00	04.52	06.32	08.04	08.50	10.25
	14.47	16.38	18.11	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.57
15	10.02	08.22	06.39	05.43	03.51	02.06	03.04	04.56	06.35	08.07	08.54	10.27
	14.50	16.41	18.14	20.53	22.38	00.27	23.38	21.44	19.48	17.56	15.08	13.56
16	09.59	08.18	06.36	05.39	03.47	02.05	03.07	04.59	06.38	08.11	08.57	10.28
	14.54	16.45	18.17	20.56	22.41	00.30	23.35	21.41	19.44	17.53	15.04	13.55
17	09.57	08.14	06.32	05.36	03.44	02.03	03.11	05.02	06.41	08.14	09.01	10.30
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.37	19.40	17.49	15.01	13.55
18	09.54	08.11	06.28	05.32	03.40	02.02	03.15	05.06	06.44	08.17	09.04	10.31
	15.01	16.52	18.23	21.03	22.49	00.33	23.28	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.25	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.27	21.06	22.53	00.34	23.24	21.29	19.33	17.42	14.55	13.54
20	09.48	08.04	06.21	05.24	03.33	02.01	03.22	05.12	06.50	08.24	09.11	10.34
	15.08	16.58	18.30	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.21	03.29	02.01	03.26	05.16	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.13	23.00	00.36	23.17	21.22	19.25	17.34	14.49	13.54
22	09.42	07.57	06.13	05.17	03.25	02.01	03.30	05.19	06.56	08.30	09.19	10.35
	15.15	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.46	13.55
23	09.39	07.53	06.10	05.13	03.22	02.02	03.33	05.22	06.59	08.34	09.22	10.35
	15.18	17.09	18.39	21.19	23.08	00.36	23.10	21.14	19.18	17.27	14.43	13.55
24	09.36	07.49	06.06	05.09	03.18	02.03	03.37	05.26	07.02	08.37	09.26	10.36
	15.22	17.12	18.42	21.23	23.12	00.35	23.06	21.10	19.14	17.24	14.40	13.56
25	09.33	07.46	06.02	05.06	03.15	02.04	03.41	05.29	07.05	07.40	09.29	10.36
	15.26	17.15	18.45	21.26	23.15	00.34	23.02	21.07	19.10	16.20	14.37	13.57
26	09.30	07.42	05.58	05.02	03.11	02.06	03.45	05.32	07.08	07.44	09.33	10.36
	15.29	17.19	18.49	21.30	23.19	00.33	22.59	21.03	19.07	16.16	14.34	13.58
27	09.26	07.38	05.55	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.35	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.37	17.25	18.55	21.37	23.27	00.29	22.51	20.55	18.59	16.09	14.29	14.01
29	09.20		06.47	04.51	03.00	02.13	03.56	05.42	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.48	20.52	18.55	16.06	14.26	14.02
30	09.17		06.43	04.47	02.53	02.16	03.59	05.45	07.20	07.57	09.46	10.34
	15.44		20.01	21.44	23.34	00.25	22.44	20.48	18.52	16.02	14.23	14.04
31	09.13		06.40		02.50		04.03	05.48		08.01		10.33
	15.48		20.04		23.38		22.40	20.44		15.59		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: E - Lomarakennus (Orastinjärventie 14d)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.09	15.51	17.29	20.07	21.47	23.42	00.22	22.36	20.40	18.48	15.55	14.21
2	10.30	09.07	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.53
	14.11	15.55	17.32	20.11	21.50	23.45	00.20	22.33	20.36	18.44	15.52	14.18
3	10.28	09.03	07.24	06.28	04.36	02.40	02.24	04.14	05.57	07.30	08.11	09.56
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.40	15.48	14.16
4	10.27	09.00	07.20	06.24	04.32	02.36	02.28	04.17	06.01	07.33	08.14	09.59
	14.16	16.02	17.38	20.17	21.58	23.53	00.14	22.25	20.29	18.37	15.45	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.04	07.36	08.18	10.02
	14.19	16.06	17.42	20.20	22.01	23.56	00.11	22.22	20.25	18.33	15.41	14.11
6	10.23	08.53	07.13	06.17	04.24	02.30	02.35	04.24	06.07	07.39	08.21	10.05
	14.21	16.09	17.45	20.23	22.05	00.00	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.50	07.09	06.13	04.21	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.27	22.08	00.03	00.05	22.14	20.18	18.26	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.42	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.02	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.55	20.33	22.16	00.10	23.59	22.07	20.10	18.18	15.28	14.04
10	10.15	08.39	06.58	06.02	04.09	02.18	02.49	04.38	06.19	07.51	08.36	10.16
	14.33	16.24	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.15	15.24	14.02
11	10.12	08.36	06.54	05.58	04.06	02.15	02.52	04.42	06.22	07.55	08.39	10.18
	14.37	16.27	18.01	20.40	22.23	00.16	23.52	21.59	20.03	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.31	18.04	20.43	22.27	00.19	23.49	21.55	19.59	18.07	15.17	13.59
13	10.07	08.29	06.47	05.51	03.58	02.10	03.00	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.52	19.55	18.04	15.14	13.58
14	10.05	08.25	06.43	05.47	03.55	02.08	03.00	04.52	06.31	08.04	08.50	10.25
	14.47	16.38	18.11	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.57
15	10.02	08.22	06.39	05.43	03.51	02.06	03.03	04.56	06.34	08.07	08.53	10.27
	14.50	16.41	18.14	20.53	22.38	00.27	23.38	21.44	19.48	17.56	15.08	13.56
16	09.59	08.18	06.36	05.39	03.47	02.05	03.07	04.59	06.38	08.11	08.57	10.28
	14.53	16.45	18.17	20.56	22.41	00.29	23.35	21.40	19.44	17.53	15.04	13.55
17	09.57	08.14	06.32	05.36	03.44	02.03	03.11	05.02	06.41	08.14	09.01	10.30
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.37	19.40	17.49	15.01	13.54
18	09.54	08.11	06.28	05.32	03.40	02.02	03.15	05.06	06.44	08.17	09.04	10.31
	15.00	16.52	18.23	21.03	22.49	00.33	23.28	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.26	21.06	22.53	00.34	23.24	21.29	19.33	17.42	14.55	13.54
20	09.48	08.04	06.21	05.24	03.33	02.01	03.22	05.12	06.50	08.24	09.11	10.33
	15.08	16.58	18.30	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.21	03.29	02.01	03.26	05.16	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.13	23.00	00.36	23.17	21.22	19.25	17.34	14.49	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.30	05.19	06.56	08.30	09.18	10.35
	15.15	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.46	13.54
23	09.39	07.53	06.09	05.13	03.22	02.02	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.09	18.39	21.19	23.08	00.36	23.10	21.14	19.18	17.27	14.43	13.55
24	09.36	07.49	06.06	05.09	03.18	02.03	03.37	05.25	07.02	08.37	09.25	10.36
	15.22	17.12	18.42	21.23	23.11	00.35	23.06	21.10	19.14	17.24	14.40	13.56
25	09.33	07.46	06.02	05.06	03.14	02.04	03.41	05.29	07.05	07.40	09.29	10.36
	15.26	17.15	18.45	21.26	23.15	00.34	23.02	21.07	19.10	16.20	14.37	13.57
26	09.29	07.42	05.58	05.02	03.11	02.06	03.44	05.32	07.08	07.44	09.32	10.36
	15.29	17.19	18.49	21.30	23.19	00.33	22.59	21.03	19.06	16.16	14.34	13.58
27	09.26	07.38	05.55	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.35	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.37	17.25	18.55	21.36	23.27	00.29	22.51	20.55	18.59	16.09	14.28	14.01
29	09.20		06.47	04.51	03.00	02.13	03.55	05.42	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.48	20.52	18.55	16.06	14.26	14.02
30	09.17		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.52	16.02	14.23	14.04
31	09.13		06.40		02.50		04.03	05.48		08.01		10.32
	15.47		20.04		23.38		22.40	20.44		15.59		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: F - Lomarakennus (Piimäkoskentie 382b)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.08	15.51	17.28	20.07	21.47	23.42	00.23	22.36	20.40	18.48	15.55	14.20
2	10.30	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.55	17.32	20.11	21.50	23.45	00.20	22.33	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.11	09.56
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.40	15.48	14.16
4	10.27	09.00	07.20	06.24	04.32	02.36	02.27	04.17	06.00	07.33	08.14	09.59
	14.16	16.02	17.38	20.17	21.57	23.53	00.14	22.25	20.29	18.37	15.44	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.03	07.36	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.07	07.39	08.21	10.05
	14.21	16.09	17.45	20.23	22.05	00.00	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.18	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.23	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.01	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.59	22.07	20.10	18.18	15.27	14.03
10	10.15	08.39	06.58	06.02	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.16
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.36	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.12	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.49	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.47	05.50	03.58	02.10	02.59	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.52	19.55	18.03	15.14	13.57
14	10.05	08.25	06.43	05.47	03.54	02.08	03.03	04.52	06.31	08.04	08.50	10.25
	14.46	16.37	18.10	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.56
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.14	20.52	22.38	00.27	23.38	21.44	19.47	17.56	15.07	13.55
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.30	23.35	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.14	09.00	10.30
	14.57	16.48	18.20	20.59	22.45	00.32	23.31	21.37	19.40	17.49	15.01	13.54
18	09.54	08.11	06.28	05.32	03.40	02.01	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.26	21.06	22.53	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.04	06.21	05.24	03.32	02.00	03.22	05.12	06.50	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.12	23.00	00.36	23.17	21.22	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.00	03.29	05.19	06.56	08.30	09.18	10.35
	15.14	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.01	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.08	00.36	23.09	21.14	19.17	17.27	14.42	13.55
24	09.36	07.49	06.06	05.09	03.18	02.02	03.37	05.25	07.02	08.37	09.25	10.36
	15.22	17.12	18.42	21.23	23.11	00.35	23.06	21.10	19.14	17.23	14.39	13.55
25	09.33	07.45	06.02	05.05	03.14	02.04	03.40	05.28	07.05	07.40	09.29	10.36
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.02	03.11	02.05	03.44	05.32	07.08	07.43	09.32	10.36
	15.29	17.18	18.48	21.29	23.19	00.33	22.59	21.03	19.06	16.16	14.34	13.57
27	09.26	07.38	05.54	04.58	03.07	02.07	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.34	05.51	04.54	03.03	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.27	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.12	03.55	05.41	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.06	14.26	14.02
30	09.16		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.51	16.02	14.23	14.04
31	09.13		06.39		02.49		04.03	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	113
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: G - Lomarakennus (Hautasaarentie)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.09	15.51	17.28	20.07	21.47	23.41	00.22	22.36	20.40	18.48	15.55	14.20
2	10.29	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.55	17.32	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.40	02.24	04.13	05.57	07.29	08.11	09.55
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.32	18.40	15.48	14.16
4	10.26	09.00	07.20	06.24	04.32	02.36	02.28	04.17	06.00	07.32	08.14	09.59
	14.16	16.02	17.38	20.17	21.57	23.52	00.14	22.25	20.29	18.36	15.44	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.03	07.36	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.07	07.39	08.21	10.04
	14.21	16.09	17.45	20.23	22.04	23.59	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.07
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.17	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.06	00.01	22.10	20.14	18.22	15.31	14.05
9	10.17	08.42	07.01	06.05	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.58	06.02	04.09	02.18	02.49	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.58	08.42	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.48	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	03.00	04.49	06.28	08.01	08.46	10.22
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.51	19.55	18.03	15.14	13.58
14	10.04	08.25	06.43	05.47	03.54	02.08	03.00	04.52	06.31	08.04	08.50	10.24
	14.46	16.37	18.10	20.49	22.34	00.24	23.41	21.48	19.51	18.00	15.11	13.57
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.14	20.52	22.37	00.27	23.38	21.44	19.47	17.56	15.07	13.56
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.29	23.34	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.14	09.00	10.29
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.36	19.40	17.49	15.01	13.54
18	09.53	08.11	06.28	05.32	03.40	02.02	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.46	08.20	09.07	10.32
	15.04	16.55	18.26	21.06	22.52	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.03	06.20	05.24	03.32	02.01	03.22	05.12	06.50	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.29	05.19	06.56	08.30	09.18	10.35
	15.15	17.05	18.36	21.16	23.04	00.35	23.13	21.18	19.21	17.31	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.02	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.55
24	09.36	07.49	06.05	05.09	03.18	02.03	03.37	05.25	07.02	08.37	09.25	10.35
	15.22	17.12	18.42	21.22	23.11	00.35	23.06	21.10	19.14	17.23	14.40	13.56
25	09.32	07.45	06.02	05.05	03.14	02.04	03.41	05.28	07.05	07.40	09.29	10.35
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.02	03.11	02.06	03.44	05.32	07.08	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.19	00.32	22.58	21.03	19.06	16.16	14.34	13.58
27	09.26	07.38	05.54	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.51	21.33	23.23	00.31	22.55	20.59	19.02	16.13	14.31	13.59
28	09.23	07.34	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.26	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.13	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.05	14.26	14.02
30	09.16		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.51	16.02	14.23	14.04
31	09.13		06.39		02.50		04.03	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: H - Lomarakennus (Turpontie 34)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.35	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.08	15.51	17.28	20.07	21.47	23.41	00.22	22.36	20.40	18.48	15.55	14.20
2	10.29	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.54	17.32	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.11	09.55
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.32	18.40	15.48	14.16
4	10.26	09.00	07.20	06.24	04.32	02.36	02.27	04.17	06.00	07.32	08.14	09.58
	14.16	16.02	17.38	20.17	21.57	23.52	00.14	22.25	20.29	18.36	15.44	14.13
5	10.25	08.56	07.16	06.20	04.28	02.33	02.31	04.20	06.03	07.35	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.06	07.39	08.21	10.04
	14.21	16.09	17.45	20.23	22.04	23.59	00.08	22.18	20.21	18.29	15.37	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.07
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.17	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.06	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.42	07.01	06.05	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.58	06.02	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.57	08.42	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.48	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	02.59	04.48	06.28	08.01	08.46	10.22
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.51	19.55	18.03	15.14	13.57
14	10.04	08.25	06.43	05.47	03.54	02.08	03.03	04.52	06.31	08.04	08.50	10.24
	14.46	16.37	18.10	20.49	22.34	00.25	23.41	21.48	19.51	18.00	15.11	13.56
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.13	20.52	22.37	00.27	23.38	21.44	19.47	17.56	15.07	13.55
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.29	23.34	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.13	09.00	10.29
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.36	19.40	17.49	15.01	13.54
18	09.53	08.11	06.28	05.32	03.40	02.02	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.46	08.20	09.07	10.32
	15.04	16.55	18.26	21.06	22.52	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.03	06.20	05.24	03.32	02.00	03.22	05.12	06.49	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.51	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.52	08.27	09.15	10.34
	15.11	17.02	18.32	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.29	05.19	06.56	08.30	09.18	10.35
	15.14	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.30	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.01	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.55
24	09.35	07.49	06.05	05.09	03.18	02.02	03.37	05.25	07.02	08.37	09.25	10.35
	15.22	17.12	18.42	21.22	23.11	00.35	23.06	21.10	19.14	17.23	14.39	13.55
25	09.32	07.45	06.02	05.05	03.14	02.04	03.40	05.28	07.05	07.40	09.29	10.35
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.01	03.11	02.06	03.44	05.32	07.08	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.19	00.32	22.58	21.03	19.06	16.16	14.34	13.57
27	09.26	07.38	05.54	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.51	21.33	23.23	00.31	22.55	20.59	19.02	16.13	14.31	13.59
28	09.23	07.34	05.50	04.54	03.03	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.26	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.12	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.05	14.25	14.02
30	09.16		06.43	04.46	02.53	02.15	03.59	05.44	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.47	18.51	16.02	14.23	14.04
31	09.13		06.39		02.50		04.02	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Shadow receptor: I - Asuinrakennus (Majava-ahontie 391)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.30	09.09	07.30	06.35	04.43	02.46	02.18	04.06	05.51	07.23	08.03	09.49
	14.08	15.51	17.28	20.07	21.46	23.41	00.22	22.36	20.40	18.47	15.55	14.20
2	10.29	09.06	07.27	06.31	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.54	17.31	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.10	09.55
	14.13	15.58	17.35	20.13	21.53	23.48	00.16	22.28	20.32	18.40	15.48	14.15
4	10.26	08.59	07.19	06.24	04.31	02.36	02.27	04.17	06.00	07.32	08.14	09.58
	14.16	16.01	17.38	20.16	21.57	23.52	00.13	22.25	20.28	18.36	15.44	14.13
5	10.24	08.56	07.16	06.20	04.28	02.33	02.31	04.20	06.03	07.35	08.17	10.01
	14.18	16.05	17.41	20.20	22.01	23.56	00.10	22.21	20.25	18.32	15.41	14.11
6	10.22	08.52	07.12	06.16	04.24	02.30	02.34	04.24	06.06	07.38	08.21	10.04
	14.21	16.09	17.44	20.23	22.04	23.59	00.07	22.17	20.21	18.29	15.37	14.09
7	10.20	08.49	07.08	06.13	04.20	02.26	02.38	04.27	06.09	07.41	08.24	10.07
	14.24	16.12	17.48	20.26	22.08	00.03	00.04	22.14	20.17	18.25	15.34	14.07
8	10.18	08.45	07.05	06.09	04.16	02.23	02.41	04.31	06.12	07.45	08.28	10.10
	14.27	16.16	17.51	20.29	22.11	00.06	00.01	22.10	20.13	18.21	15.30	14.05
9	10.16	08.42	07.01	06.05	04.13	02.21	02.45	04.34	06.16	07.48	08.31	10.12
	14.30	16.19	17.54	20.33	22.15	00.09	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.57	06.01	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.57	20.36	22.19	00.13	23.55	22.02	20.06	18.14	15.24	14.01
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.41	06.22	07.54	08.39	10.17
	14.36	16.27	18.00	20.39	22.22	00.16	23.51	21.59	20.02	18.10	15.20	14.00
12	10.09	08.32	06.50	05.54	04.01	02.13	02.56	04.45	06.25	07.57	08.42	10.20
	14.39	16.30	18.04	20.42	22.26	00.19	23.48	21.55	19.58	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	02.59	04.48	06.28	08.00	08.46	10.22
	14.43	16.34	18.07	20.45	22.30	00.21	23.44	21.51	19.55	18.03	15.14	13.57
14	10.04	08.24	06.42	05.46	03.54	02.08	03.03	04.52	06.31	08.04	08.49	10.24
	14.46	16.37	18.10	20.49	22.33	00.24	23.41	21.47	19.51	17.59	15.10	13.56
15	10.01	08.21	06.39	05.43	03.50	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.49	16.41	18.13	20.52	22.37	00.27	23.37	21.44	19.47	17.56	15.07	13.55
16	09.59	08.17	06.35	05.39	03.47	02.04	03.07	04.58	06.37	08.10	08.56	10.28
	14.53	16.44	18.16	20.55	22.41	00.29	23.34	21.40	19.43	17.52	15.04	13.55
17	09.56	08.14	06.31	05.35	03.43	02.03	03.10	05.02	06.40	08.13	09.00	10.29
	14.56	16.48	18.20	20.59	22.44	00.31	23.30	21.36	19.40	17.48	15.01	13.54
18	09.53	08.10	06.28	05.31	03.39	02.02	03.14	05.05	06.43	08.16	09.04	10.31
	15.00	16.51	18.23	21.02	22.48	00.32	23.27	21.32	19.36	17.45	14.57	13.54
19	09.50	08.07	06.24	05.28	03.36	02.01	03.18	05.08	06.46	08.20	09.07	10.32
	15.03	16.54	18.26	21.05	22.52	00.33	23.23	21.29	19.32	17.41	14.54	13.53
20	09.47	08.03	06.20	05.24	03.32	02.00	03.22	05.12	06.49	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.34	23.20	21.25	19.28	17.37	14.51	13.53
21	09.44	07.59	06.16	05.20	03.28	02.00	03.25	05.15	06.52	08.26	09.14	10.34
	15.11	17.01	18.32	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.41	07.56	06.13	05.16	03.25	02.01	03.29	05.18	06.55	08.30	09.18	10.34
	15.14	17.05	18.35	21.15	23.03	00.35	23.13	21.17	19.21	17.30	14.45	13.54
23	09.38	07.52	06.09	05.13	03.21	02.01	03.33	05.22	06.58	08.33	09.21	10.35
	15.18	17.08	18.38	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.54
24	09.35	07.49	06.05	05.09	03.18	02.02	03.37	05.25	07.01	08.36	09.25	10.35
	15.21	17.11	18.42	21.22	23.11	00.34	23.05	21.10	19.13	17.23	14.39	13.55
25	09.32	07.45	06.01	05.05	03.14	02.04	03.40	05.28	07.04	07.40	09.28	10.35
	15.25	17.15	18.45	21.26	23.15	00.33	23.02	21.06	19.10	16.19	14.36	13.56
26	09.29	07.41	05.58	05.01	03.10	02.06	03.44	05.31	07.07	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.18	00.32	22.58	21.02	19.06	16.16	14.33	13.57
27	09.26	07.38	05.54	04.57	03.07	02.08	03.48	05.35	07.11	07.46	09.35	10.35
	15.32	17.21	18.51	21.32	23.22	00.30	22.54	20.58	19.02	16.12	14.31	13.59
28	09.22	07.34	05.50	04.54	03.03	02.10	03.51	05.38	07.14	07.50	09.39	10.34
	15.36	17.25	18.54	21.36	23.26	00.28	22.51	20.55	18.58	16.09	14.28	14.00
29	09.19		06.46	04.50	03.00	02.12	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.57	21.39	23.30	00.26	22.47	20.51	18.55	16.05	14.25	14.02
30	09.16		06.43	04.46	02.53	02.15	03.59	05.44	07.20	07.57	09.45	10.33
	15.43		20.01	21.43	23.33	00.24	22.43	20.47	18.51	16.02	14.23	14.04
31	09.13		06.39		02.49		04.02	05.47		08.00		10.32
	15.47		20.04		23.37		22.40	20.43		15.58		14.06
Potential sun hours	154	232	362	457	586	662	632	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: J - Asuinrakennus (Kaistontie 30)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April			May			June		
1	10.29	09.09	07.30	06.36			04.43		05.39 (L3)	02.48		04.15 (L4)
	14.10	15.51	17.28	20.07			21.46	23	06.02 (L3)	23.39	25	04.40 (L4)
2	10.28	09.05	07.27	06.32			04.40		05.39 (L3)	02.45		04.15 (L4)
	14.12	15.55	17.32	20.10			21.49	23	06.02 (L3)	23.43	25	04.40 (L4)
3	10.26	09.02	07.23	06.28			04.36		05.38 (L3)	02.41		04.15 (L4)
	14.15	15.59	17.35	20.13			21.53	23	06.01 (L3)	23.46	25	04.40 (L4)
4	10.25	08.59	07.19	06.24			04.32		05.39 (L3)	02.38		04.15 (L4)
	14.17	16.02	17.38	20.16			21.56	22	06.01 (L3)	23.50	26	04.41 (L4)
5	10.23	08.55	07.16	06.21			04.28		05.39 (L3)	02.35		04.15 (L4)
	14.20	16.06	17.41	20.20			22.00	21	06.00 (L3)	23.54	26	04.41 (L4)
6	10.21	08.52	07.12	06.17			04.25		05.40 (L3)	02.32		04.16 (L4)
	14.23	16.09	17.45	20.23			22.04	20	06.00 (L3)	23.57	26	04.42 (L4)
7	10.19	08.49	07.08	06.13			04.21		05.41 (L3)	02.29		04.15 (L4)
	14.25	16.13	17.48	20.26			22.07	18	05.59 (L3)	00.00	26	04.41 (L4)
8	10.17	08.45	07.05	06.09			04.17		05.42 (L3)	02.26		04.16 (L4)
	14.28	16.17	17.51	20.29			22.11	16	05.58 (L3)	00.04	26	04.42 (L4)
9	10.15	08.42	07.01	06.06			04.14		05.43 (L3)	02.23		04.16 (L4)
	14.31	16.20	17.54	20.32			22.14	13	05.56 (L3)	00.07	26	04.42 (L4)
10	10.13	08.38	06.57	06.02			04.10		05.45 (L3)	02.21		04.16 (L4)
	14.34	16.24	17.58	20.36			22.18	9	05.54 (L3)	00.10	27	04.43 (L4)
11	10.11	08.35	06.54	05.58			04.06			02.18		04.16 (L4)
	14.38	16.27	18.01	20.39			22.22			00.13	27	04.43 (L4)
12	10.08	08.31	06.50	05.54			04.02			02.16		04.16 (L4)
	14.41	16.31	18.04	20.42			22.25			00.16	27	04.43 (L4)
13	10.06	08.28	06.46	05.51			03.59			02.13		04.16 (L4)
	14.44	16.34	18.07	20.45			22.29			00.18	27	04.43 (L4)
14	10.03	08.24	06.43	05.47			03.55			02.11		04.16 (L4)
	14.47	16.38	18.10	20.49			22.33			00.21	27	04.43 (L4)
15	10.00	08.21	06.39	05.43			03.51			02.10		04.17 (L4)
	14.51	16.41	18.13	20.52			22.36			00.23	27	04.44 (L4)
16	09.58	08.17	06.35	05.39			03.48			02.08		04.17 (L4)
	14.54	16.45	18.17	20.55			22.40			00.25	26	04.43 (L4)
17	09.55	08.14	06.31	05.36			03.44			02.07		04.17 (L4)
	14.58	16.48	18.20	20.58			22.44			00.27	27	04.44 (L4)
18	09.52	08.10	06.28	05.32			03.41			02.06		04.18 (L4)
	15.01	16.52	18.23	21.02			22.47			00.29	26	04.44 (L4)
19	09.49	08.06	06.24	05.28			03.37			02.05		04.18 (L4)
	15.05	16.55	18.26	21.05			22.51			00.30	26	04.44 (L4)
20	09.47	08.03	06.20	05.24			03.33			02.04		04.18 (L4)
	15.08	16.58	18.29	21.08			22.55			00.31	27	04.45 (L4)
21	09.44	07.59	06.17	05.21			03.30		04.25 (L4)	02.04		04.18 (L4)
	15.12	17.02	18.32	21.12			22.58	3	04.28 (L4)	00.31	27	04.45 (L4)
22	09.41	07.56	06.13	05.17			03.26		04.22 (L4)	02.05		04.18 (L4)
	15.15	17.05	18.35	21.15			23.02	9	04.31 (L4)	00.31	27	04.45 (L4)
23	09.38	07.52	06.09	05.13		05.50 (L3)	03.23		04.20 (L4)	02.05		04.18 (L4)
	15.19	17.08	18.39	21.18	5	05.55 (L3)	23.06	14	04.34 (L4)	00.31	27	04.45 (L4)
24	09.34	07.48	06.05	05.09		05.47 (L3)	03.19		04.18 (L4)	02.06		04.19 (L4)
	15.22	17.12	18.42	21.22	11	05.58 (L3)	23.10	16	04.34 (L4)	00.30	26	04.45 (L4)
25	09.31	07.45	06.02	05.06		05.44 (L3)	03.15		04.18 (L4)	02.08		04.19 (L4)
	15.26	17.15	18.45	21.25	16	06.00 (L3)	23.13	18	04.36 (L4)	00.30	27	04.46 (L4)
26	09.28	07.41	05.58	05.02		05.41 (L3)	03.12		04.18 (L4)	02.09		04.19 (L4)
	15.30	17.18	18.48	21.29	19	06.00 (L3)	23.17	19	04.37 (L4)	00.28	26	04.45 (L4)
27	09.25	07.38	05.54	04.58		05.41 (L3)	03.08		04.16 (L4)	02.11		04.19 (L4)
	15.33	17.22	18.51	21.32	20	06.01 (L3)	23.21	21	04.37 (L4)	00.27	27	04.46 (L4)
28	09.22	07.34	05.50	04.54		05.40 (L3)	03.05		04.16 (L4)	02.13		04.20 (L4)
	15.37	17.25	18.54	21.35	22	06.02 (L3)	23.25	22	04.38 (L4)	00.25	26	04.46 (L4)
29	09.19		06.47	04.51		05.39 (L3)	03.01		04.16 (L4)	02.16		04.20 (L4)
	15.41		19.57	21.39	22	06.01 (L3)	23.28	22	04.38 (L4)	00.23	26	04.46 (L4)
30	09.15		06.43	04.47		05.39 (L3)	02.55		04.16 (L4)	02.18		04.20 (L4)
	15.44		20.01	21.42	23	06.02 (L3)	23.32	23	04.39 (L4)	00.21	26	04.46 (L4)
31	09.12		06.39				02.51		04.15 (L4)			
	15.48		20.04				23.36	24	04.39 (L4)			
Potential sun hours	155	232	362	456			585			659		
Total, worst case					138			379			790	
Sun reduction					0,46			0,47			0,45	
Oper. time red.					0,99			0,99			0,99	
Wind dir. red.					0,62			0,62			0,63	
Total reduction					0,28			0,29			0,28	
Total, real					39			109			220	

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

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

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forestShadow receptor: J - Asuinrakennus (Kaistontie 30)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	July		August		September	October	November	December
1	02.21		04.20 (L4)	04.07		05.51	07.23	08.03	09.48
	00.19	26	04.46 (L4)	22.35		20.40	18.47	15.55	14.21
2	02.24		04.21 (L4)	04.11	05.57 (L3)	05.54	07.26	08.06	09.51
	00.16	26	04.47 (L4)	22.31	5 06.02 (L3)	20.36	18.44	15.52	14.19
3	02.27		04.20 (L4)	04.14	05.54 (L3)	05.57	07.29	08.10	09.54
	00.14	27	04.47 (L4)	22.28	11 06.05 (L3)	20.32	18.40	15.48	14.17
4	02.30		04.21 (L4)	04.18	05.53 (L3)	06.00	07.32	08.13	09.57
	00.11	26	04.47 (L4)	22.24	14 06.07 (L3)	20.28	18.36	15.45	14.14
5	02.33		04.21 (L4)	04.21	05.51 (L3)	06.04	07.35	08.17	10.00
	00.08	26	04.47 (L4)	22.20	17 06.08 (L3)	20.25	18.33	15.41	14.12
6	02.37		04.21 (L4)	04.25	05.51 (L3)	06.07	07.38	08.20	10.03
	00.05	26	04.47 (L4)	22.17	18 06.09 (L3)	20.21	18.29	15.38	14.10
7	02.40		04.22 (L4)	04.28	05.49 (L3)	06.10	07.41	08.24	10.06
	00.02	26	04.48 (L4)	22.13	20 06.09 (L3)	20.17	18.25	15.35	14.08
8	02.43		04.22 (L4)	04.32	05.48 (L3)	06.13	07.45	08.27	10.08
	23.59	26	04.48 (L4)	22.09	21 06.09 (L3)	20.13	18.22	15.31	14.06
9	02.47		04.22 (L4)	04.35	05.48 (L3)	06.16	07.48	08.31	10.11
	23.56	26	04.48 (L4)	22.06	22 06.10 (L3)	20.10	18.18	15.28	14.05
10	02.50		04.23 (L4)	04.39	05.47 (L3)	06.19	07.51	08.34	10.14
	23.53	25	04.48 (L4)	22.02	23 06.10 (L3)	20.06	18.14	15.24	14.03
11	02.54		04.23 (L4)	04.42	05.47 (L3)	06.22	07.54	08.38	10.16
	23.49	25	04.48 (L4)	21.58	23 06.10 (L3)	20.02	18.11	15.21	14.02
12	02.58		04.23 (L4)	04.46	05.47 (L3)	06.25	07.57	08.42	10.18
	23.46	24	04.47 (L4)	21.54	23 06.10 (L3)	19.58	18.07	15.18	14.00
13	03.01		04.23 (L4)	04.49	05.47 (L3)	06.28	08.00	08.45	10.21
	23.43	24	04.47 (L4)	21.51	23 06.10 (L3)	19.55	18.03	15.14	13.59
14	03.01		04.25 (L4)	04.52	05.47 (L3)	06.31	08.03	08.49	10.23
	23.39	23	04.48 (L4)	21.47	22 06.09 (L3)	19.51	18.00	15.11	13.58
15	03.05		04.25 (L4)	04.56	05.48 (L3)	06.34	08.07	08.52	10.24
	23.36	22	04.47 (L4)	21.43	21 06.09 (L3)	19.47	17.56	15.08	13.57
16	03.08		04.25 (L4)	04.59	05.48 (L3)	06.37	08.10	08.56	10.26
	23.33	21	04.46 (L4)	21.39	20 06.08 (L3)	19.43	17.52	15.05	13.56
17	03.12		04.26 (L4)	05.02	05.49 (L3)	06.40	08.13	08.59	10.28
	23.29	20	04.46 (L4)	21.36	18 06.07 (L3)	19.40	17.49	15.02	13.56
18	03.16		04.27 (L4)	05.06	05.51 (L3)	06.43	08.16	09.03	10.29
	23.26	18	04.45 (L4)	21.32	15 06.06 (L3)	19.36	17.45	14.58	13.55
19	03.19		04.28 (L4)	05.09	05.54 (L3)	06.46	08.20	09.06	10.30
	23.22	17	04.45 (L4)	21.28	10 06.04 (L3)	19.32	17.42	14.55	13.55
20	03.23		04.29 (L4)	05.12	05.57 (L3)	06.49	08.23	09.10	10.31
	23.19	14	04.43 (L4)	21.24	4 06.01 (L3)	19.28	17.38	14.52	13.55
21	03.27		04.31 (L4)	05.16		06.52	08.26	09.14	10.32
	23.15	12	04.43 (L4)	21.21		19.25	17.34	14.49	13.55
22	03.30		04.33 (L4)	05.19		06.55	08.29	09.17	10.33
	23.11	7	04.40 (L4)	21.17		19.21	17.31	14.46	13.56
23	03.34			05.22		06.59	08.33	09.21	10.33
	23.08			21.13		19.17	17.27	14.43	13.56
24	03.38			05.25		07.02	08.36	09.24	10.33
	23.04			21.09		19.13	17.24	14.40	13.57
25	03.42			05.29		07.05	07.39	09.27	10.34
	23.01			21.06		19.10	16.20	14.37	13.58
26	03.45			05.32		07.08	07.43	09.31	10.33
	22.57			21.02		19.06	16.16	14.35	13.59
27	03.49			05.35		07.11	07.46	09.34	10.33
	22.53			20.58		19.02	16.13	14.32	14.00
28	03.52			05.38		07.14	07.49	09.38	10.33
	22.50			20.55		18.59	16.09	14.29	14.02
29	03.56			05.42		07.17	07.53	09.41	10.32
	22.46			20.51		18.55	16.06	14.27	14.04
30	04.00			05.45		07.20	07.56	09.44	10.31
	22.42			20.47		18.51	16.02	14.24	14.05
31	04.03			05.48			08.00		10.30
	22.39			20.43			15.59		14.07
Potential sun hours	631			517		395	301	187	115
Total, worst case		487			330				
Sun reduction		0,45			0,41				
Oper. time red.		0,99			0,99				
Wind dir. red.		0,63			0,62				
Total reduction		0,28			0,25				
Total, real		135			83				

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

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

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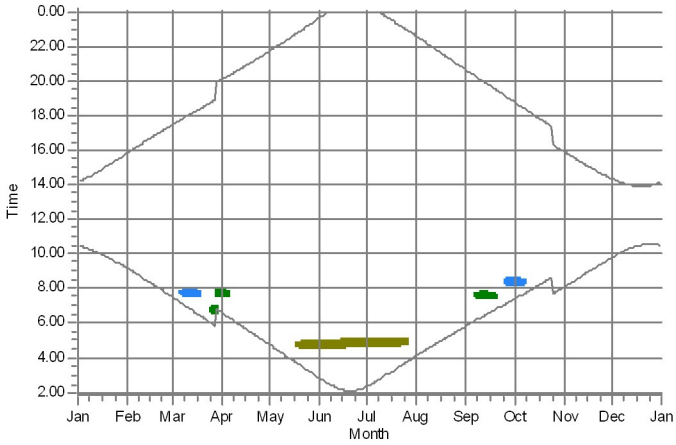
Calculated:
31.3.2023 10.30/3.5.584

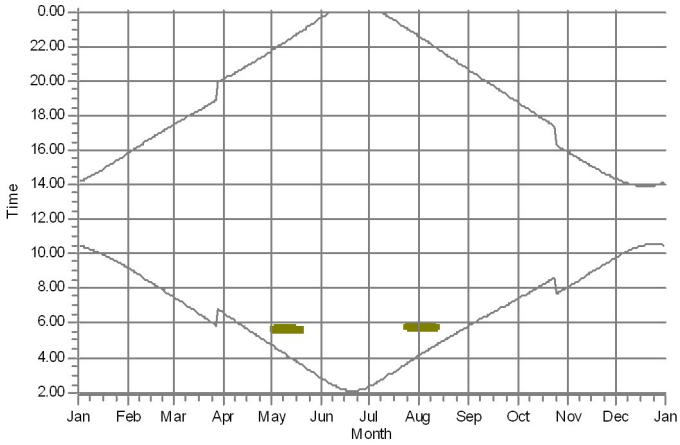
SHADOW - Calendar, graphical

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

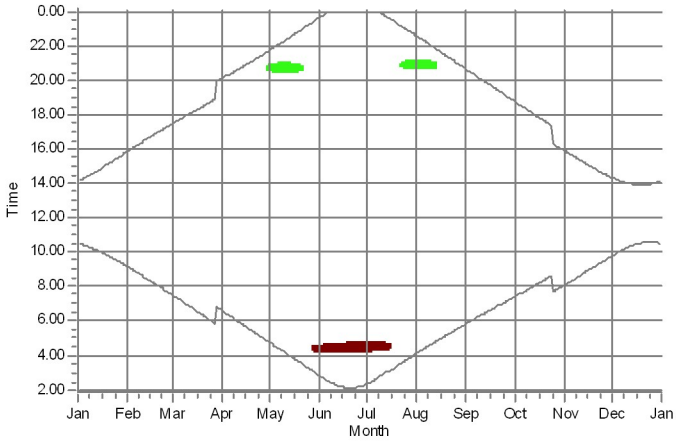
A: Lomarakennus (Orastintie)



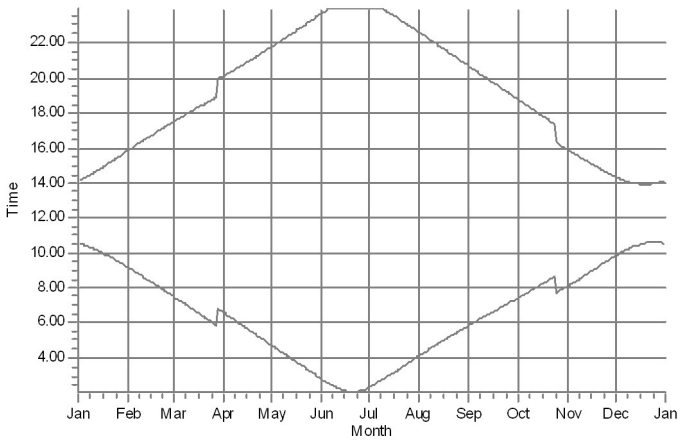
B: Lomarakennus (Orastinjärventie 700)



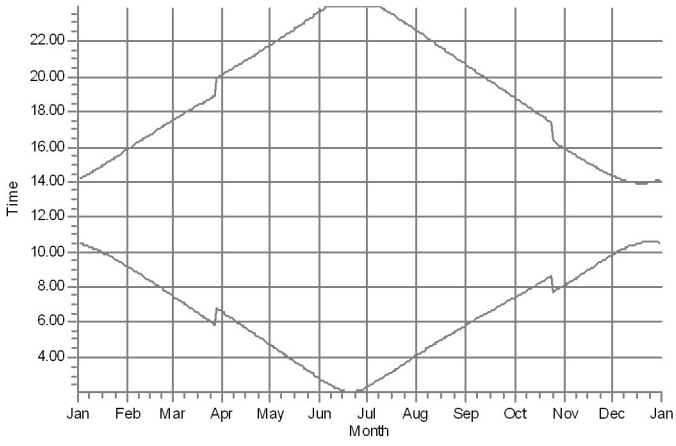
C: Lomarakennus (Orastinjärventie 728)



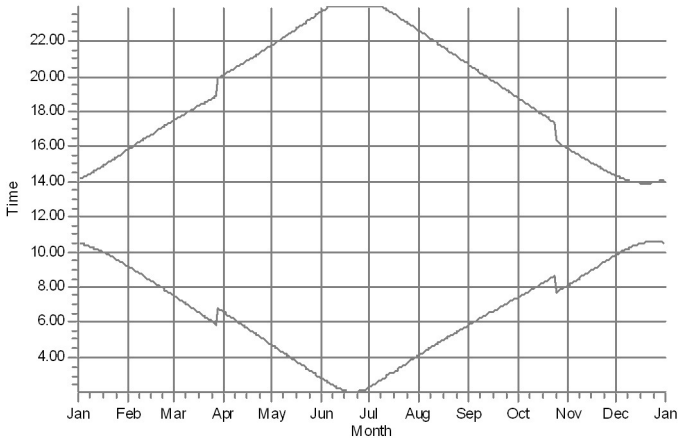
D: Asuinrakennus (Kottarantie 311)



E: Lomarakennus (Orastinjärventie 14d)



F: Lomarakennus (Piimäkoskentie 382b)



WTGs

1: VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (127)
16: VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (142)
18: VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (144)
25: VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (151)
L9: Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)

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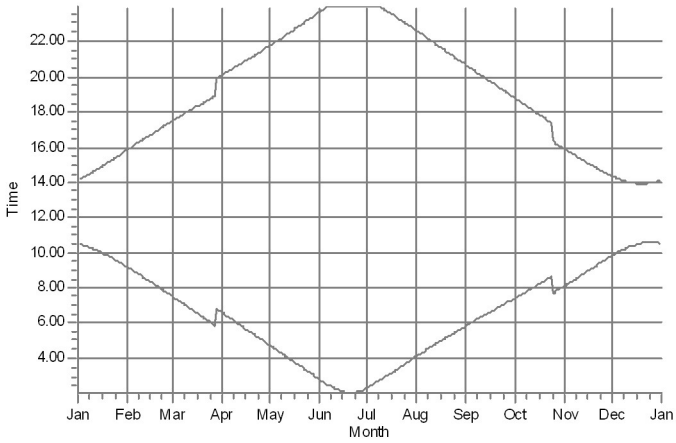
Calculated:
31.3.2023 10.30/3.5.584

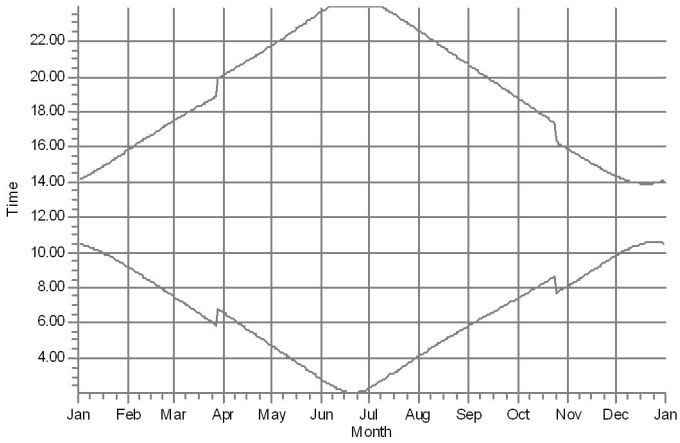
SHADOW - Calendar, graphical

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

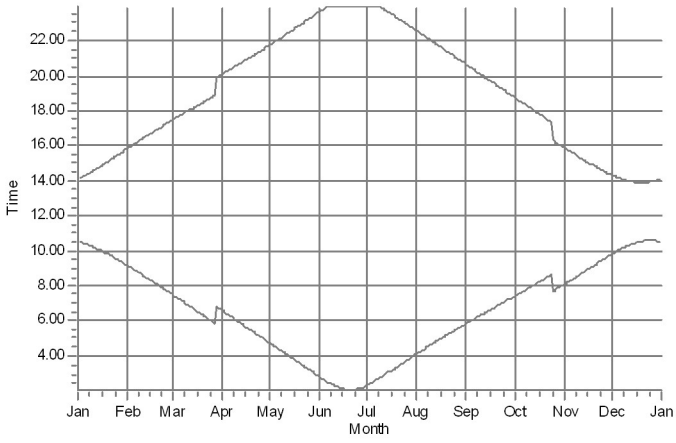
G: Lomarakennus (Hautasaarentie)



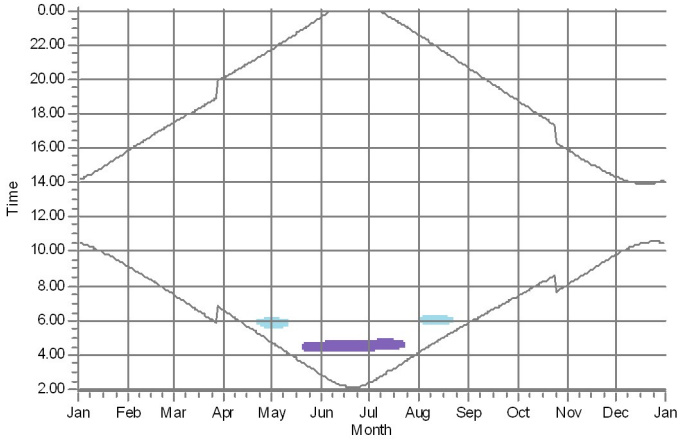
H: Lomarakennus (Turpontie 34)



I: Asuinrakennus (Majava-ahontie 391)



J: Asuinrakennus (Kaistontie 30)



WTGs

L3: Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)

L4: Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)

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Calculated:
31.3.2023 10.30/3.5.584

SHADOW - Map

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_no forest

Map: Maastorasteri 100k , Print scale 1:80 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 456 960 North: 7 243 980

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pahkakoski_Laajennus 2023_0.wpo (2)

Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

Liite 4: Varjostusmallinnusten tulokset ”real case, Luke forest”

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

Assumptions for shadow calculations

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

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

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:
MERRA-2_N65,50_E026,25 (33)

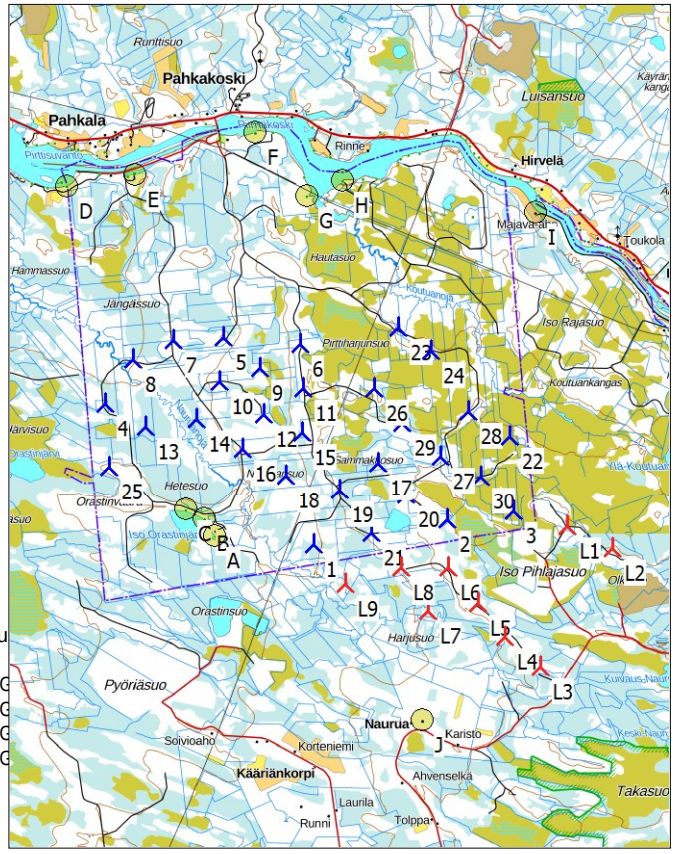
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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_Pahkakoski_Laajennu
Area object(s) used in calculation:
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI obstructions): REC
Obstacles used in calculation
Receptor grid resolution: 10,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



WTGs

	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	456 854	7 241 812	88,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
10	455 290	7 244 505	85,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
11	456 671	7 244 387	96,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
12	456 021	7 243 961	87,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
13	454 082	7 243 750	74,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
14	454 920	7 243 880	75,7	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
15	456 666	7 243 656	93,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
16	455 683	7 243 386	81,8	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
17	457 911	7 243 159	105,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
18	456 386	7 242 947	84,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
19	457 280	7 242 705	101,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
2	459 062	7 242 213	110,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
20	458 383	7 242 622	107,6	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
21	457 806	7 241 988	101,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
22	460 084	7 243 597	101,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
23	458 246	7 245 388	89,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
24	458 794	7 245 015	92,2	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
25	453 473	7 243 093	82,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
26	457 855	7 244 395	97,2	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
27	458 952	7 243 271	108,4	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
28	459 404	7 244 004	100,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
29	458 307	7 243 826	102,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
3	460 158	7 242 355	108,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
30	459 622	7 242 936	106,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
4	453 403	7 244 140	74,3	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
5	455 356	7 245 233	80,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4

To be continued on next page...

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

...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]
6	456 634	7 245 126	95,0	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
7	454 534	7 245 180	73,5	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
8	453 863	7 244 867	69,9	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
9	455 969	7 244 730	86,8	VESTAS V136-3.45 3450 136.0 !...	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	177,0	1 711	10,4
L1	461 046	7 242 109	111,3	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L2	461 788	7 241 743	111,4	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L3	460 604	7 239 781	114,8	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L4	460 009	7 240 284	112,2	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L5	459 566	7 240 829	117,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L6	459 081	7 241 426	117,3	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L7	458 747	7 240 708	102,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L8	458 301	7 241 430	101,1	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	10,4
L9	457 370	7 241 159	92,5	Generic RD200 5600 200.0 !O! h...	Yes	Generic	RD200-5 600	5 600	200,0	200,0	2 448	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 (Orastintie)	455 224	7 241 949	85,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
B	Lomarakennus (Orastinjärventie 700)	455 039	7 242 240	85,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
C	Lomarakennus (Orastinjärventie 728)	454 735	7 242 391	87,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
D	Asuinrakennus (Kottarantie 311)	452 772	7 247 733	62,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
E	Lomarakennus (Orastinjärventie 14d)	453 901	7 247 924	66,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
F	Lomarakennus (Piimäkoskentie 382b)	455 889	7 248 608	82,3	5,0	5,0	2,0	90,0	"Green house mode"	7,0
G	Lomarakennus (Hautasaarentie)	456 737	7 247 566	80,7	5,0	5,0	2,0	90,0	"Green house mode"	7,0
H	Lomarakennus (Turpontie 34)	457 328	7 247 817	80,0	5,0	5,0	2,0	90,0	"Green house mode"	7,0
I	Asuinrakennus (Majava-ahontie 391)	460 512	7 247 294	87,5	5,0	5,0	2,0	90,0	"Green house mode"	7,0
J	Asuinrakennus (Kaistontie 30)	458 648	7 238 915	105,2	5,0	5,0	2,0	90,0	"Green house mode"	7,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Lomarakennus (Orastintie)	0:00
B	Lomarakennus (Orastinjärventie 700)	0:00
C	Lomarakennus (Orastinjärventie 728)	0:00
D	Asuinrakennus (Kottarantie 311)	0:00
E	Lomarakennus (Orastinjärventie 14d)	0:00
F	Lomarakennus (Piimäkoskentie 382b)	0:00
G	Lomarakennus (Hautasaarentie)	0:00
H	Lomarakennus (Turpontie 34)	0:00
I	Asuinrakennus (Majava-ahontie 391)	0:00
J	Asuinrakennus (Kaistontie 30)	9:46

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

No.	Name	Expected [h/year]
1	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (127)	0:00
10	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (136)	0:00
11	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (137)	0:00
12	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (138)	0:00
13	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (139)	0:00
14	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (140)	0:00
15	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (141)	0:00
16	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (142)	0:00
17	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (143)	0:00
18	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (144)	0:00
19	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (145)	0:00

To be continued on next page...

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SHADOW - Main Result

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

...continued from previous page

No.	Name	Expected [h/year]
2	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (128)	0:00
20	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (146)	0:00
21	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (147)	0:00
22	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (148)	0:00
23	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (149)	0:00
24	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (150)	0:00
25	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (151)	0:00
26	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (152)	0:00
27	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (153)	0:00
28	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (154)	0:00
29	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (155)	0:00
3	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (129)	0:00
30	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (156)	0:00
4	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (130)	0:00
5	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (131)	0:00
6	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (132)	0:00
7	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (133)	0:00
8	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (134)	0:00
9	VESTAS V136-3.45 3450 136.0 !O! hub: 177,0 m (TOT: 245,0 m) (135)	0:00
L1	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
L2	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
L3	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	2:55
L4	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	6:50
L5	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
L6	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
L7	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
L8	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
L9	Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	0:00

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: A - Lomarakennus (Orastintie)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.30	09.09	07.31	06.36	04.43	02.48	02.20	04.07	05.51	07.23	08.04	09.48
	14.10	15.51	17.29	20.07	21.46	23.40	00.20	22.36	20.40	18.48	15.55	14.21
2	10.29	09.06	07.27	06.32	04.40	02.44	02.23	04.11	05.54	07.26	08.07	09.52
	14.12	15.55	17.32	20.10	21.50	23.44	00.18	22.32	20.36	18.44	15.52	14.19
3	10.27	09.03	07.23	06.28	04.36	02.41	02.26	04.14	05.57	07.29	08.10	09.55
	14.14	15.59	17.35	20.14	21.53	23.47	00.15	22.28	20.32	18.40	15.48	14.17
4	10.26	08.59	07.20	06.25	04.32	02.38	02.29	04.18	06.01	07.32	08.14	09.58
	14.17	16.02	17.38	20.17	21.57	23.51	00.12	22.25	20.29	18.37	15.45	14.14
5	10.24	08.56	07.16	06.21	04.28	02.35	02.33	04.21	06.04	07.36	08.17	10.01
	14.20	16.06	17.42	20.20	22.01	23.55	00.09	22.21	20.25	18.33	15.41	14.12
6	10.22	08.52	07.12	06.17	04.25	02.32	02.36	04.25	06.07	07.39	08.21	10.04
	14.22	16.10	17.45	20.23	22.04	23.58	00.06	22.17	20.21	18.29	15.38	14.10
7	10.20	08.49	07.09	06.13	04.21	02.28	02.39	04.28	06.10	07.42	08.24	10.07
	14.25	16.13	17.48	20.26	22.08	00.01	00.03	22.13	20.17	18.26	15.35	14.08
8	10.18	08.46	07.05	06.10	04.17	02.26	02.43	04.32	06.13	07.45	08.28	10.09
	14.28	16.17	17.51	20.30	22.11	00.05	00.00	22.10	20.14	18.22	15.31	14.06
9	10.16	08.42	07.01	06.06	04.14	02.23	02.46	04.35	06.16	07.48	08.31	10.12
	14.31	16.20	17.55	20.33	22.15	00.08	23.57	22.06	20.10	18.18	15.28	14.04
10	10.14	08.39	06.58	06.02	04.10	02.20	02.50	04.39	06.19	07.51	08.35	10.14
	14.34	16.24	17.58	20.36	22.19	00.11	23.54	22.02	20.06	18.15	15.24	14.03
11	10.11	08.35	06.54	05.58	04.06	02.17	02.54	04.42	06.22	07.54	08.39	10.17
	14.37	16.27	18.01	20.39	22.22	00.14	23.50	21.59	20.02	18.11	15.21	14.01
12	10.09	08.32	06.50	05.55	04.02	02.15	02.57	04.46	06.25	07.58	08.42	10.19
	14.41	16.31	18.04	20.42	22.26	00.17	23.47	21.55	19.59	18.07	15.18	14.00
13	10.06	08.28	06.47	05.51	03.59	02.13	03.01	04.49	06.28	08.01	08.46	10.21
	14.44	16.34	18.07	20.46	22.29	00.20	23.44	21.51	19.55	18.04	15.15	13.59
14	10.04	08.25	06.43	05.47	03.55	02.11	03.01	04.52	06.31	08.04	08.49	10.23
	14.47	16.38	18.11	20.49	22.33	00.22	23.40	21.47	19.51	18.00	15.11	13.58
15	10.01	08.21	06.39	05.43	03.51	02.09	03.05	04.56	06.34	08.07	08.53	10.25
	14.51	16.41	18.14	20.52	22.37	00.25	23.37	21.44	19.47	17.56	15.08	13.57
16	09.58	08.18	06.35	05.40	03.48	02.07	03.08	04.59	06.38	08.10	08.56	10.27
	14.54	16.45	18.17	20.56	22.41	00.27	23.33	21.40	19.44	17.53	15.05	13.56
17	09.56	08.14	06.32	05.36	03.44	02.06	03.12	05.03	06.41	08.13	09.00	10.29
	14.58	16.48	18.20	20.59	22.44	00.29	23.30	21.36	19.40	17.49	15.02	13.56
18	09.53	08.10	06.28	05.32	03.40	02.05	03.16	05.06	06.44	08.17	09.03	10.30
	15.01	16.52	18.23	21.02	22.48	00.30	23.26	21.32	19.36	17.45	14.58	13.55
19	09.50	08.07	06.24	05.28	03.37	02.04	03.19	05.09	06.47	08.20	09.07	10.31
	15.05	16.55	18.26	21.05	22.52	00.31	23.23	21.29	19.32	17.42	14.55	13.55
20	09.47	08.03	06.21	05.25	03.33	02.03	03.23	05.13	06.50	08.23	09.11	10.32
	15.08	16.59	18.29	21.09	22.55	00.32	23.19	21.25	19.29	17.38	14.52	13.55
21	09.44	08.00	06.17	05.21	03.30	02.03	03.27	05.16	06.53	08.27	09.14	10.33
	15.12	17.02	18.33	21.12	22.59	00.33	23.16	21.21	19.25	17.34	14.49	13.55
22	09.41	07.56	06.13	05.17	03.26	02.04	03.30	05.19	06.56	08.30	09.18	10.34
	15.15	17.05	18.36	21.15	23.03	00.33	23.12	21.17	19.21	17.31	14.46	13.55
23	09.38	07.52	06.09	05.13	03.22	02.04	03.34	05.22	06.59	08.33	09.21	10.34
	15.19	17.09	18.39	21.19	23.07	00.33	23.09	21.14	19.18	17.27	14.43	13.56
24	09.35	07.49	06.06	05.10	03.19	02.05	03.38	05.26	07.02	08.36	09.25	10.34
	15.22	17.12	18.42	21.22	23.10	00.32	23.05	21.10	19.14	17.24	14.40	13.57
25	09.32	07.45	06.02	05.06	03.15	02.07	03.41	05.29	07.05	07.40	09.28	10.34
	15.26	17.15	18.45	21.26	23.14	00.31	23.01	21.06	19.10	16.20	14.37	13.58
26	09.29	07.42	05.58	05.02	03.12	02.08	03.45	05.32	07.08	07.43	09.32	10.34
	15.30	17.19	18.48	21.29	23.18	00.30	22.58	21.02	19.06	16.17	14.35	13.59
27	09.26	07.38	05.54	04.58	03.08	02.10	03.49	05.35	07.11	07.46	09.35	10.34
	15.33	17.22	18.51	21.32	23.22	00.28	22.54	20.59	19.03	16.13	14.32	14.00
28	09.22	07.34	05.51	04.55	03.05	02.12	03.52	05.39	07.14	07.50	09.38	10.34
	15.37	17.25	18.55	21.36	23.25	00.27	22.50	20.55	18.59	16.09	14.29	14.02
29	09.19		06.47	04.51	03.01	02.15	03.56	05.42	07.17	07.53	09.42	10.33
	15.41		19.58	21.39	23.29	00.25	22.47	20.51	18.55	16.06	14.26	14.03
30	09.16		06.43	04.47	02.54	02.18	04.00	05.45	07.20	07.57	09.45	10.32
	15.44		20.01	21.43	23.33	00.23	22.43	20.47	18.51	16.02	14.24	14.05
31	09.13		06.39		02.51		04.03	05.48		08.00		10.31
	15.48		20.04		23.37		22.39	20.44		15.59		14.07
Potential sun hours	155	232	362	456	585	660	631	517	395	301	187	115
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: B - Lomarakennus (Orastinjärventie 700)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.30	09.09	07.31	06.36	04.43	02.48	02.20	04.07	05.51	07.23	08.04	09.48
	14.10	15.51	17.29	20.07	21.46	23.40	00.20	22.36	20.40	18.48	15.55	14.21
2	10.29	09.06	07.27	06.32	04.40	02.44	02.23	04.11	05.54	07.26	08.07	09.52
	14.12	15.55	17.32	20.10	21.50	23.44	00.18	22.32	20.36	18.44	15.52	14.19
3	10.27	09.03	07.23	06.28	04.36	02.41	02.26	04.14	05.57	07.29	08.10	09.55
	14.14	15.59	17.35	20.14	21.53	23.48	00.15	22.28	20.32	18.40	15.48	14.17
4	10.26	08.59	07.20	06.25	04.32	02.38	02.29	04.18	06.01	07.33	08.14	09.58
	14.17	16.02	17.38	20.17	21.57	23.51	00.12	22.25	20.29	18.37	15.45	14.14
5	10.24	08.56	07.16	06.21	04.28	02.35	02.33	04.21	06.04	07.36	08.17	10.01
	14.20	16.06	17.42	20.20	22.01	23.55	00.09	22.21	20.25	18.33	15.41	14.12
6	10.22	08.53	07.12	06.17	04.25	02.31	02.36	04.25	06.07	07.39	08.21	10.04
	14.22	16.10	17.45	20.23	22.04	23.58	00.06	22.17	20.21	18.29	15.38	14.10
7	10.20	08.49	07.09	06.13	04.21	02.28	02.39	04.28	06.10	07.42	08.24	10.07
	14.25	16.13	17.48	20.26	22.08	00.02	00.03	22.14	20.17	18.26	15.35	14.08
8	10.18	08.46	07.05	06.10	04.17	02.25	02.43	04.32	06.13	07.45	08.28	10.09
	14.28	16.17	17.51	20.30	22.11	00.05	00.00	22.10	20.14	18.22	15.31	14.06
9	10.16	08.42	07.01	06.06	04.14	02.23	02.46	04.35	06.16	07.48	08.32	10.12
	14.31	16.20	17.55	20.33	22.15	00.08	23.57	22.06	20.10	18.18	15.28	14.04
10	10.14	08.39	06.58	06.02	04.10	02.20	02.50	04.39	06.19	07.51	08.35	10.15
	14.34	16.24	17.58	20.36	22.19	00.11	23.54	22.02	20.06	18.15	15.24	14.03
11	10.11	08.35	06.54	05.58	04.06	02.17	02.54	04.42	06.22	07.54	08.39	10.17
	14.37	16.27	18.01	20.39	22.22	00.14	23.51	21.59	20.02	18.11	15.21	14.01
12	10.09	08.32	06.50	05.55	04.02	02.15	02.57	04.46	06.25	07.58	08.42	10.19
	14.41	16.31	18.04	20.43	22.26	00.17	23.47	21.55	19.59	18.07	15.18	14.00
13	10.06	08.28	06.47	05.51	03.59	02.13	03.01	04.49	06.28	08.01	08.46	10.21
	14.44	16.34	18.07	20.46	22.30	00.20	23.44	21.51	19.55	18.04	15.15	13.59
14	10.04	08.25	06.43	05.47	03.55	02.10	03.01	04.52	06.31	08.04	08.49	10.23
	14.47	16.38	18.11	20.49	22.33	00.22	23.40	21.47	19.51	18.00	15.11	13.58
15	10.01	08.21	06.39	05.43	03.51	02.09	03.04	04.56	06.34	08.07	08.53	10.25
	14.51	16.41	18.14	20.52	22.37	00.25	23.37	21.44	19.47	17.56	15.08	13.57
16	09.59	08.18	06.35	05.40	03.48	02.07	03.08	04.59	06.38	08.10	08.56	10.27
	14.54	16.45	18.17	20.56	22.41	00.27	23.33	21.40	19.44	17.53	15.05	13.56
17	09.56	08.14	06.32	05.36	03.44	02.06	03.12	05.03	06.41	08.14	09.00	10.29
	14.58	16.48	18.20	20.59	22.44	00.29	23.30	21.36	19.40	17.49	15.02	13.55
18	09.53	08.10	06.28	05.32	03.40	02.04	03.16	05.06	06.44	08.17	09.04	10.30
	15.01	16.52	18.23	21.02	22.48	00.30	23.26	21.32	19.36	17.45	14.58	13.55
19	09.50	08.07	06.24	05.28	03.37	02.04	03.19	05.09	06.47	08.20	09.07	10.31
	15.05	16.55	18.26	21.05	22.52	00.31	23.23	21.29	19.32	17.42	14.55	13.55
20	09.47	08.03	06.21	05.25	03.33	02.03	03.23	05.13	06.50	08.23	09.11	10.32
	15.08	16.59	18.29	21.09	22.55	00.32	23.19	21.25	19.29	17.38	14.52	13.55
21	09.44	08.00	06.17	05.21	03.30	02.03	03.27	05.16	06.53	08.27	09.14	10.33
	15.12	17.02	18.33	21.12	22.59	00.33	23.16	21.21	19.25	17.34	14.49	13.55
22	09.41	07.56	06.13	05.17	03.26	02.04	03.30	05.19	06.56	08.30	09.18	10.34
	15.15	17.05	18.36	21.16	23.03	00.33	23.12	21.17	19.21	17.31	14.46	13.55
23	09.38	07.53	06.09	05.13	03.22	02.04	03.34	05.22	06.59	08.33	09.21	10.34
	15.19	17.09	18.39	21.19	23.07	00.33	23.09	21.14	19.18	17.27	14.43	13.56
24	09.35	07.49	06.06	05.10	03.19	02.05	03.38	05.26	07.02	08.36	09.25	10.34
	15.22	17.12	18.42	21.22	23.10	00.32	23.05	21.10	19.14	17.24	14.40	13.57
25	09.32	07.45	06.02	05.06	03.15	02.07	03.41	05.29	07.05	07.40	09.28	10.35
	15.26	17.15	18.45	21.26	23.14	00.31	23.01	21.06	19.10	16.20	14.37	13.58
26	09.29	07.42	05.58	05.02	03.12	02.08	03.45	05.32	07.08	07.43	09.32	10.34
	15.30	17.19	18.48	21.29	23.18	00.30	22.58	21.02	19.06	16.17	14.35	13.59
27	09.26	07.38	05.54	04.58	03.08	02.10	03.49	05.35	07.11	07.47	09.35	10.34
	15.33	17.22	18.52	21.33	23.22	00.29	22.54	20.59	19.03	16.13	14.32	14.00
28	09.22	07.34	05.51	04.55	03.05	02.12	03.52	05.39	07.14	07.50	09.38	10.34
	15.37	17.25	18.55	21.36	23.25	00.27	22.50	20.55	18.59	16.09	14.29	14.02
29	09.19		06.47	04.51	03.01	02.15	03.56	05.42	07.17	07.53	09.42	10.33
	15.41		19.58	21.39	23.29	00.25	22.47	20.51	18.55	16.06	14.26	14.03
30	09.16		06.43	04.47	02.54	02.17	04.00	05.45	07.20	07.57	09.45	10.32
	15.44		20.01	21.43	23.33	00.23	22.43	20.47	18.51	16.02	14.24	14.05
31	09.13		06.39		02.51		04.03	05.48		08.00		10.31
	15.48		20.04		23.37		22.39	20.44		15.59		14.07
Potential sun hours	155	232	362	456	585	660	631	517	395	301	186	115
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: C - Lomarakennus (Orastinjärventie 728)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.30	09.09	07.31	06.36	04.43	02.48	02.20	04.07	05.51	07.23	08.04	09.48
	14.10	15.51	17.29	20.07	21.46	23.40	00.20	22.36	20.40	18.48	15.55	14.21
2	10.29	09.06	07.27	06.32	04.40	02.44	02.23	04.11	05.54	07.26	08.07	09.52
	14.12	15.55	17.32	20.10	21.50	23.44	00.18	22.32	20.36	18.44	15.52	14.19
3	10.27	09.03	07.23	06.28	04.36	02.41	02.26	04.14	05.58	07.29	08.11	09.55
	14.14	15.59	17.35	20.14	21.53	23.48	00.15	22.28	20.32	18.40	15.48	14.17
4	10.26	08.59	07.20	06.25	04.32	02.38	02.29	04.18	06.01	07.33	08.14	09.58
	14.17	16.02	17.38	20.17	21.57	23.51	00.12	22.25	20.29	18.37	15.45	14.14
5	10.24	08.56	07.16	06.21	04.28	02.35	02.33	04.21	06.04	07.36	08.17	10.01
	14.20	16.06	17.42	20.20	22.01	23.55	00.09	22.21	20.25	18.33	15.41	14.12
6	10.22	08.53	07.12	06.17	04.25	02.31	02.36	04.25	06.07	07.39	08.21	10.04
	14.22	16.10	17.45	20.23	22.04	23.58	00.07	22.17	20.21	18.29	15.38	14.10
7	10.20	08.49	07.09	06.13	04.21	02.28	02.39	04.28	06.10	07.42	08.24	10.07
	14.25	16.13	17.48	20.26	22.08	00.02	00.03	22.14	20.17	18.26	15.35	14.08
8	10.18	08.46	07.05	06.10	04.17	02.25	02.43	04.32	06.13	07.45	08.28	10.09
	14.28	16.17	17.51	20.30	22.11	00.05	00.00	22.10	20.14	18.22	15.31	14.06
9	10.16	08.42	07.01	06.06	04.14	02.23	02.46	04.35	06.16	07.48	08.32	10.12
	14.31	16.20	17.55	20.33	22.15	00.08	23.57	22.06	20.10	18.18	15.28	14.04
10	10.14	08.39	06.58	06.02	04.10	02.20	02.50	04.39	06.19	07.51	08.35	10.15
	14.34	16.24	17.58	20.36	22.19	00.11	23.54	22.02	20.06	18.15	15.24	14.03
11	10.11	08.35	06.54	05.58	04.06	02.17	02.54	04.42	06.22	07.54	08.39	10.17
	14.37	16.27	18.01	20.39	22.22	00.14	23.51	21.59	20.02	18.11	15.21	14.01
12	10.09	08.32	06.50	05.55	04.02	02.15	02.57	04.46	06.25	07.58	08.42	10.19
	14.41	16.31	18.04	20.43	22.26	00.17	23.47	21.55	19.59	18.07	15.18	14.00
13	10.06	08.28	06.47	05.51	03.59	02.13	03.01	04.49	06.28	08.01	08.46	10.21
	14.44	16.34	18.07	20.46	22.30	00.20	23.44	21.51	19.55	18.04	15.15	13.59
14	10.04	08.25	06.43	05.47	03.55	02.10	03.01	04.52	06.31	08.04	08.49	10.23
	14.47	16.38	18.11	20.49	22.33	00.23	23.40	21.47	19.51	18.00	15.11	13.58
15	10.01	08.21	06.39	05.43	03.51	02.09	03.04	04.56	06.34	08.07	08.53	10.25
	14.51	16.41	18.14	20.52	22.37	00.25	23.37	21.44	19.47	17.56	15.08	13.57
16	09.59	08.18	06.35	05.40	03.48	02.07	03.08	04.59	06.38	08.10	08.56	10.27
	14.54	16.45	18.17	20.56	22.41	00.27	23.34	21.40	19.44	17.53	15.05	13.56
17	09.56	08.14	06.32	05.36	03.44	02.05	03.12	05.03	06.41	08.14	09.00	10.29
	14.58	16.48	18.20	20.59	22.44	00.29	23.30	21.36	19.40	17.49	15.02	13.55
18	09.53	08.11	06.28	05.32	03.40	02.04	03.16	05.06	06.44	08.17	09.04	10.30
	15.01	16.52	18.23	21.02	22.48	00.30	23.27	21.32	19.36	17.45	14.58	13.55
19	09.50	08.07	06.24	05.28	03.37	02.04	03.19	05.09	06.47	08.20	09.07	10.31
	15.05	16.55	18.26	21.06	22.52	00.32	23.23	21.29	19.32	17.42	14.55	13.55
20	09.47	08.03	06.21	05.25	03.33	02.03	03.23	05.13	06.50	08.23	09.11	10.32
	15.08	16.59	18.30	21.09	22.56	00.32	23.19	21.25	19.29	17.38	14.52	13.55
21	09.44	08.00	06.17	05.21	03.30	02.03	03.27	05.16	06.53	08.27	09.14	10.33
	15.12	17.02	18.33	21.12	22.59	00.33	23.16	21.21	19.25	17.34	14.49	13.55
22	09.41	07.56	06.13	05.17	03.26	02.03	03.30	05.19	06.56	08.30	09.18	10.34
	15.15	17.05	18.36	21.16	23.03	00.33	23.12	21.18	19.21	17.31	14.46	13.55
23	09.38	07.53	06.09	05.13	03.22	02.04	03.34	05.22	06.59	08.33	09.21	10.34
	15.19	17.09	18.39	21.19	23.07	00.33	23.09	21.14	19.18	17.27	14.43	13.56
24	09.35	07.49	06.06	05.10	03.19	02.05	03.38	05.26	07.02	08.36	09.25	10.34
	15.22	17.12	18.42	21.22	23.11	00.32	23.05	21.10	19.14	17.24	14.40	13.57
25	09.32	07.45	06.02	05.06	03.15	02.07	03.41	05.29	07.05	07.40	09.28	10.35
	15.26	17.15	18.45	21.26	23.14	00.31	23.01	21.06	19.10	16.20	14.37	13.58
26	09.29	07.42	05.58	05.02	03.12	02.08	03.45	05.32	07.08	07.43	09.32	10.34
	15.30	17.19	18.48	21.29	23.18	00.30	22.58	21.02	19.06	16.17	14.35	13.59
27	09.26	07.38	05.54	04.58	03.08	02.10	03.49	05.35	07.11	07.47	09.35	10.34
	15.33	17.22	18.52	21.33	23.22	00.29	22.54	20.59	19.03	16.13	14.32	14.00
28	09.22	07.34	05.51	04.55	03.05	02.12	03.52	05.39	07.14	07.50	09.39	10.34
	15.37	17.25	18.55	21.36	23.26	00.27	22.50	20.55	18.59	16.09	14.29	14.02
29	09.19		06.47	04.51	03.01	02.15	03.56	05.42	07.17	07.53	09.42	10.33
	15.41		19.58	21.39	23.29	00.25	22.47	20.51	18.55	16.06	14.26	14.03
30	09.16		06.43	04.47	02.54	02.17	04.00	05.45	07.20	07.57	09.45	10.32
	15.44		20.01	21.43	23.33	00.23	22.43	20.47	18.52	16.02	14.24	14.05
31	09.13		06.40		02.51		04.03	05.48		08.00		10.31
	15.48		20.04		23.37		22.39	20.44		15.59		14.07
Potential sun hours	155	232	362	456	585	660	631	517	395	301	186	115
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: D - Asuinrakennus (Kottarantie 311)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.47	02.18	04.07	05.51	07.24	08.04	09.49
	14.09	15.51	17.29	20.08	21.47	23.42	00.22	22.37	20.40	18.48	15.55	14.21
2	10.30	09.07	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.27	08.08	09.53
	14.11	15.55	17.32	20.11	21.51	23.45	00.20	22.33	20.37	18.44	15.52	14.18
3	10.28	09.03	07.24	06.28	04.36	02.40	02.25	04.14	05.58	07.30	08.11	09.56
	14.14	15.59	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.41	15.48	14.16
4	10.27	09.00	07.20	06.25	04.32	02.37	02.28	04.17	06.01	07.33	08.14	09.59
	14.16	16.02	17.39	20.17	21.58	23.53	00.14	22.25	20.29	18.37	15.45	14.14
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.04	07.36	08.18	10.02
	14.19	16.06	17.42	20.20	22.01	23.56	00.11	22.22	20.25	18.33	15.41	14.11
6	10.23	08.53	07.13	06.17	04.24	02.30	02.35	04.24	06.07	07.39	08.22	10.05
	14.22	16.09	17.45	20.24	22.05	00.00	00.08	22.18	20.22	18.29	15.38	14.09
7	10.21	08.50	07.09	06.13	04.21	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.27	22.08	00.03	00.05	22.14	20.18	18.26	15.34	14.07
8	10.19	08.46	07.05	06.10	04.17	02.24	02.42	04.31	06.13	07.45	08.29	10.10
	14.27	16.17	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.02	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.55	20.33	22.16	00.10	23.59	22.07	20.10	18.18	15.28	14.04
10	10.15	08.39	06.58	06.02	04.10	02.18	02.49	04.38	06.19	07.52	08.36	10.16
	14.34	16.24	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.15	15.24	14.02
11	10.12	08.36	06.54	05.58	04.06	02.16	02.53	04.42	06.22	07.55	08.39	10.18
	14.37	16.27	18.01	20.40	22.23	00.16	23.52	21.59	20.03	18.11	15.21	14.00
12	10.10	08.32	06.51	05.55	04.02	02.13	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.31	18.04	20.43	22.27	00.19	23.49	21.56	19.59	18.07	15.18	13.59
13	10.07	08.29	06.47	05.51	03.58	02.11	03.00	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.08	20.46	22.30	00.22	23.45	21.52	19.55	18.04	15.14	13.58
14	10.05	08.25	06.43	05.47	03.55	02.08	03.00	04.52	06.32	08.04	08.50	10.25
	14.47	16.38	18.11	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.57
15	10.02	08.22	06.39	05.43	03.51	02.06	03.04	04.56	06.35	08.07	08.54	10.27
	14.50	16.41	18.14	20.53	22.38	00.27	23.38	21.44	19.48	17.56	15.08	13.56
16	09.59	08.18	06.36	05.39	03.47	02.05	03.07	04.59	06.38	08.11	08.57	10.28
	14.54	16.45	18.17	20.56	22.41	00.30	23.35	21.41	19.44	17.53	15.04	13.55
17	09.57	08.14	06.32	05.36	03.44	02.03	03.11	05.02	06.41	08.14	09.01	10.30
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.37	19.40	17.49	15.01	13.55
18	09.54	08.11	06.28	05.32	03.40	02.02	03.15	05.06	06.44	08.17	09.04	10.31
	15.01	16.52	18.23	21.03	22.49	00.33	23.28	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.25	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.27	21.06	22.53	00.34	23.24	21.29	19.33	17.42	14.55	13.54
20	09.48	08.04	06.21	05.24	03.33	02.01	03.22	05.12	06.50	08.24	09.11	10.34
	15.08	16.58	18.30	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.21	03.29	02.01	03.26	05.16	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.13	23.00	00.36	23.17	21.22	19.25	17.34	14.49	13.54
22	09.42	07.57	06.13	05.17	03.25	02.01	03.30	05.19	06.56	08.30	09.19	10.35
	15.15	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.46	13.55
23	09.39	07.53	06.10	05.13	03.22	02.02	03.33	05.22	06.59	08.34	09.22	10.35
	15.18	17.09	18.39	21.19	23.08	00.36	23.10	21.14	19.18	17.27	14.43	13.55
24	09.36	07.49	06.06	05.09	03.18	02.03	03.37	05.26	07.02	08.37	09.26	10.36
	15.22	17.12	18.42	21.23	23.12	00.35	23.06	21.10	19.14	17.24	14.40	13.56
25	09.33	07.46	06.02	05.06	03.15	02.04	03.41	05.29	07.05	07.40	09.29	10.36
	15.26	17.15	18.45	21.26	23.15	00.34	23.02	21.07	19.10	16.20	14.37	13.57
26	09.30	07.42	05.58	05.02	03.11	02.06	03.45	05.32	07.08	07.44	09.33	10.36
	15.29	17.19	18.49	21.30	23.19	00.33	22.59	21.03	19.07	16.16	14.34	13.58
27	09.26	07.38	05.55	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.35	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.37	17.25	18.55	21.37	23.27	00.29	22.51	20.55	18.59	16.09	14.29	14.01
29	09.20		06.47	04.51	03.00	02.13	03.56	05.42	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.48	20.52	18.55	16.06	14.26	14.02
30	09.17		06.43	04.47	02.53	02.16	03.59	05.45	07.20	07.57	09.46	10.34
	15.44		20.01	21.44	23.34	00.25	22.44	20.48	18.52	16.02	14.23	14.04
31	09.13		06.40		02.50		04.03	05.48		08.01		10.33
	15.48		20.04		23.38		22.40	20.44		15.59		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: E - Lomarakennus (Orastinjärventie 14d)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.09	15.51	17.29	20.07	21.47	23.42	00.22	22.36	20.40	18.48	15.55	14.21
2	10.30	09.07	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.53
	14.11	15.55	17.32	20.11	21.50	23.45	00.20	22.33	20.36	18.44	15.52	14.18
3	10.28	09.03	07.24	06.28	04.36	02.40	02.24	04.14	05.57	07.30	08.11	09.56
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.40	15.48	14.16
4	10.27	09.00	07.20	06.24	04.32	02.36	02.28	04.17	06.01	07.33	08.14	09.59
	14.16	16.02	17.38	20.17	21.58	23.53	00.14	22.25	20.29	18.37	15.45	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.04	07.36	08.18	10.02
	14.19	16.06	17.42	20.20	22.01	23.56	00.11	22.22	20.25	18.33	15.41	14.11
6	10.23	08.53	07.13	06.17	04.24	02.30	02.35	04.24	06.07	07.39	08.21	10.05
	14.21	16.09	17.45	20.23	22.05	00.00	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.50	07.09	06.13	04.21	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.27	22.08	00.03	00.05	22.14	20.18	18.26	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.42	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.02	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.55	20.33	22.16	00.10	23.59	22.07	20.10	18.18	15.28	14.04
10	10.15	08.39	06.58	06.02	04.09	02.18	02.49	04.38	06.19	07.51	08.36	10.16
	14.33	16.24	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.15	15.24	14.02
11	10.12	08.36	06.54	05.58	04.06	02.15	02.52	04.42	06.22	07.55	08.39	10.18
	14.37	16.27	18.01	20.40	22.23	00.16	23.52	21.59	20.03	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.31	18.04	20.43	22.27	00.19	23.49	21.55	19.59	18.07	15.17	13.59
13	10.07	08.29	06.47	05.51	03.58	02.10	03.00	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.52	19.55	18.04	15.14	13.58
14	10.05	08.25	06.43	05.47	03.55	02.08	03.00	04.52	06.31	08.04	08.50	10.25
	14.47	16.38	18.11	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.57
15	10.02	08.22	06.39	05.43	03.51	02.06	03.03	04.56	06.34	08.07	08.53	10.27
	14.50	16.41	18.14	20.53	22.38	00.27	23.38	21.44	19.48	17.56	15.08	13.56
16	09.59	08.18	06.36	05.39	03.47	02.05	03.07	04.59	06.38	08.11	08.57	10.28
	14.53	16.45	18.17	20.56	22.41	00.29	23.35	21.40	19.44	17.53	15.04	13.55
17	09.57	08.14	06.32	05.36	03.44	02.03	03.11	05.02	06.41	08.14	09.01	10.30
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.37	19.40	17.49	15.01	13.54
18	09.54	08.11	06.28	05.32	03.40	02.02	03.15	05.06	06.44	08.17	09.04	10.31
	15.00	16.52	18.23	21.03	22.49	00.33	23.28	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.26	21.06	22.53	00.34	23.24	21.29	19.33	17.42	14.55	13.54
20	09.48	08.04	06.21	05.24	03.33	02.01	03.22	05.12	06.50	08.24	09.11	10.33
	15.08	16.58	18.30	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.21	03.29	02.01	03.26	05.16	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.13	23.00	00.36	23.17	21.22	19.25	17.34	14.49	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.30	05.19	06.56	08.30	09.18	10.35
	15.15	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.46	13.54
23	09.39	07.53	06.09	05.13	03.22	02.02	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.09	18.39	21.19	23.08	00.36	23.10	21.14	19.18	17.27	14.43	13.55
24	09.36	07.49	06.06	05.09	03.18	02.03	03.37	05.25	07.02	08.37	09.25	10.36
	15.22	17.12	18.42	21.23	23.11	00.35	23.06	21.10	19.14	17.24	14.40	13.56
25	09.33	07.46	06.02	05.06	03.14	02.04	03.41	05.29	07.05	07.40	09.29	10.36
	15.26	17.15	18.45	21.26	23.15	00.34	23.02	21.07	19.10	16.20	14.37	13.57
26	09.29	07.42	05.58	05.02	03.11	02.06	03.44	05.32	07.08	07.44	09.32	10.36
	15.29	17.19	18.49	21.30	23.19	00.33	22.59	21.03	19.06	16.16	14.34	13.58
27	09.26	07.38	05.55	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.35	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.37	17.25	18.55	21.36	23.27	00.29	22.51	20.55	18.59	16.09	14.28	14.01
29	09.20		06.47	04.51	03.00	02.13	03.55	05.42	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.48	20.52	18.55	16.06	14.26	14.02
30	09.17		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.52	16.02	14.23	14.04
31	09.13		06.40		02.50		04.03	05.48		08.01		10.32
	15.47		20.04		23.38		22.40	20.44		15.59		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: F - Lomarakennus (Piimäkoskentie 382b)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.08	15.51	17.28	20.07	21.47	23.42	00.23	22.36	20.40	18.48	15.55	14.20
2	10.30	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.55	17.32	20.11	21.50	23.45	00.20	22.33	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.11	09.56
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.33	18.40	15.48	14.16
4	10.27	09.00	07.20	06.24	04.32	02.36	02.27	04.17	06.00	07.33	08.14	09.59
	14.16	16.02	17.38	20.17	21.57	23.53	00.14	22.25	20.29	18.37	15.44	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.03	07.36	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.07	07.39	08.21	10.05
	14.21	16.09	17.45	20.23	22.05	00.00	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.08
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.18	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.23	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.07	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.43	07.01	06.06	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.59	22.07	20.10	18.18	15.27	14.03
10	10.15	08.39	06.58	06.02	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.16
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.36	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.12	02.56	04.45	06.25	07.58	08.43	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.49	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.47	05.50	03.58	02.10	02.59	04.49	06.28	08.01	08.46	10.23
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.52	19.55	18.03	15.14	13.57
14	10.05	08.25	06.43	05.47	03.54	02.08	03.03	04.52	06.31	08.04	08.50	10.25
	14.46	16.37	18.10	20.49	22.34	00.25	23.42	21.48	19.51	18.00	15.11	13.56
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.14	20.52	22.38	00.27	23.38	21.44	19.47	17.56	15.07	13.55
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.30	23.35	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.14	09.00	10.30
	14.57	16.48	18.20	20.59	22.45	00.32	23.31	21.37	19.40	17.49	15.01	13.54
18	09.54	08.11	06.28	05.32	03.40	02.01	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.47	08.20	09.08	10.32
	15.04	16.55	18.26	21.06	22.53	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.04	06.21	05.24	03.32	02.00	03.22	05.12	06.50	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.12	23.00	00.36	23.17	21.22	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.00	03.29	05.19	06.56	08.30	09.18	10.35
	15.14	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.31	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.01	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.08	00.36	23.09	21.14	19.17	17.27	14.42	13.55
24	09.36	07.49	06.06	05.09	03.18	02.02	03.37	05.25	07.02	08.37	09.25	10.36
	15.22	17.12	18.42	21.23	23.11	00.35	23.06	21.10	19.14	17.23	14.39	13.55
25	09.33	07.45	06.02	05.05	03.14	02.04	03.40	05.28	07.05	07.40	09.29	10.36
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.02	03.11	02.05	03.44	05.32	07.08	07.43	09.32	10.36
	15.29	17.18	18.48	21.29	23.19	00.33	22.59	21.03	19.06	16.16	14.34	13.57
27	09.26	07.38	05.54	04.58	03.07	02.07	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.52	21.33	23.23	00.31	22.55	20.59	19.03	16.13	14.31	13.59
28	09.23	07.34	05.51	04.54	03.03	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.27	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.12	03.55	05.41	07.17	07.54	09.43	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.06	14.26	14.02
30	09.16		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.51	16.02	14.23	14.04
31	09.13		06.39		02.49		04.03	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	113
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest Shadow receptor: G - Lomarakennus (Hautasaarentie)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.36	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.09	15.51	17.28	20.07	21.47	23.41	00.22	22.36	20.40	18.48	15.55	14.20
2	10.29	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.55	17.32	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.40	02.24	04.13	05.57	07.29	08.11	09.55
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.32	18.40	15.48	14.16
4	10.26	09.00	07.20	06.24	04.32	02.36	02.28	04.17	06.00	07.32	08.14	09.59
	14.16	16.02	17.38	20.17	21.57	23.52	00.14	22.25	20.29	18.36	15.44	14.13
5	10.25	08.56	07.16	06.21	04.28	02.33	02.31	04.21	06.03	07.36	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.07	07.39	08.21	10.04
	14.21	16.09	17.45	20.23	22.04	23.59	00.08	22.18	20.21	18.29	15.38	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.07
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.17	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.06	00.01	22.10	20.14	18.22	15.31	14.05
9	10.17	08.42	07.01	06.05	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.58	06.02	04.09	02.18	02.49	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.58	08.42	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.48	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	03.00	04.49	06.28	08.01	08.46	10.22
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.51	19.55	18.03	15.14	13.58
14	10.04	08.25	06.43	05.47	03.54	02.08	03.00	04.52	06.31	08.04	08.50	10.24
	14.46	16.37	18.10	20.49	22.34	00.24	23.41	21.48	19.51	18.00	15.11	13.57
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.14	20.52	22.37	00.27	23.38	21.44	19.47	17.56	15.07	13.56
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.29	23.34	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.14	09.00	10.29
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.36	19.40	17.49	15.01	13.54
18	09.53	08.11	06.28	05.32	03.40	02.02	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.46	08.20	09.07	10.32
	15.04	16.55	18.26	21.06	22.52	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.03	06.20	05.24	03.32	02.01	03.22	05.12	06.50	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.52	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.53	08.27	09.15	10.34
	15.11	17.02	18.33	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.29	05.19	06.56	08.30	09.18	10.35
	15.15	17.05	18.36	21.16	23.04	00.35	23.13	21.18	19.21	17.31	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.02	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.55
24	09.36	07.49	06.05	05.09	03.18	02.03	03.37	05.25	07.02	08.37	09.25	10.35
	15.22	17.12	18.42	21.22	23.11	00.35	23.06	21.10	19.14	17.23	14.40	13.56
25	09.32	07.45	06.02	05.05	03.14	02.04	03.41	05.28	07.05	07.40	09.29	10.35
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.02	03.11	02.06	03.44	05.32	07.08	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.19	00.32	22.58	21.03	19.06	16.16	14.34	13.58
27	09.26	07.38	05.54	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.51	21.33	23.23	00.31	22.55	20.59	19.02	16.13	14.31	13.59
28	09.23	07.34	05.51	04.54	03.04	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.26	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.13	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.05	14.26	14.02
30	09.16		06.43	04.47	02.53	02.15	03.59	05.45	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.48	18.51	16.02	14.23	14.04
31	09.13		06.39		02.50		04.03	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forestShadow receptor: H - Lomarakennus (Turpontie 34)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.31	09.10	07.31	06.35	04.43	02.46	02.18	04.06	05.51	07.23	08.04	09.49
	14.08	15.51	17.28	20.07	21.47	23.41	00.22	22.36	20.40	18.48	15.55	14.20
2	10.29	09.06	07.27	06.32	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.54	17.32	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.11	09.55
	14.13	15.58	17.35	20.14	21.54	23.49	00.17	22.29	20.32	18.40	15.48	14.16
4	10.26	09.00	07.20	06.24	04.32	02.36	02.27	04.17	06.00	07.32	08.14	09.58
	14.16	16.02	17.38	20.17	21.57	23.52	00.14	22.25	20.29	18.36	15.44	14.13
5	10.25	08.56	07.16	06.20	04.28	02.33	02.31	04.20	06.03	07.35	08.18	10.02
	14.18	16.05	17.41	20.20	22.01	23.56	00.11	22.21	20.25	18.33	15.41	14.11
6	10.23	08.53	07.12	06.17	04.24	02.30	02.34	04.24	06.06	07.39	08.21	10.04
	14.21	16.09	17.45	20.23	22.04	23.59	00.08	22.18	20.21	18.29	15.37	14.09
7	10.21	08.49	07.09	06.13	04.20	02.27	02.38	04.28	06.10	07.42	08.25	10.07
	14.24	16.13	17.48	20.26	22.08	00.03	00.05	22.14	20.17	18.25	15.34	14.07
8	10.19	08.46	07.05	06.09	04.17	02.24	02.41	04.31	06.13	07.45	08.28	10.10
	14.27	16.16	17.51	20.30	22.12	00.06	00.02	22.10	20.14	18.22	15.31	14.05
9	10.17	08.42	07.01	06.05	04.13	02.21	02.45	04.35	06.16	07.48	08.32	10.13
	14.30	16.20	17.54	20.33	22.15	00.10	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.58	06.02	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.58	20.36	22.19	00.13	23.55	22.03	20.06	18.14	15.24	14.02
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.42	06.22	07.54	08.39	10.18
	14.36	16.27	18.01	20.39	22.23	00.16	23.52	21.59	20.02	18.11	15.21	14.00
12	10.10	08.32	06.50	05.54	04.02	02.13	02.56	04.45	06.25	07.57	08.42	10.20
	14.40	16.30	18.04	20.43	22.26	00.19	23.48	21.55	19.59	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	02.59	04.48	06.28	08.01	08.46	10.22
	14.43	16.34	18.07	20.46	22.30	00.22	23.45	21.51	19.55	18.03	15.14	13.57
14	10.04	08.25	06.43	05.47	03.54	02.08	03.03	04.52	06.31	08.04	08.50	10.24
	14.46	16.37	18.10	20.49	22.34	00.25	23.41	21.48	19.51	18.00	15.11	13.56
15	10.02	08.21	06.39	05.43	03.51	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.50	16.41	18.13	20.52	22.37	00.27	23.38	21.44	19.47	17.56	15.07	13.55
16	09.59	08.18	06.35	05.39	03.47	02.04	03.07	04.59	06.37	08.10	08.57	10.28
	14.53	16.44	18.17	20.56	22.41	00.29	23.34	21.40	19.44	17.52	15.04	13.55
17	09.56	08.14	06.32	05.35	03.43	02.03	03.11	05.02	06.40	08.13	09.00	10.29
	14.57	16.48	18.20	20.59	22.45	00.31	23.31	21.36	19.40	17.49	15.01	13.54
18	09.53	08.11	06.28	05.32	03.40	02.02	03.14	05.05	06.43	08.17	09.04	10.31
	15.00	16.51	18.23	21.02	22.49	00.33	23.27	21.33	19.36	17.45	14.58	13.54
19	09.51	08.07	06.24	05.28	03.36	02.01	03.18	05.09	06.46	08.20	09.07	10.32
	15.04	16.55	18.26	21.06	22.52	00.34	23.24	21.29	19.32	17.41	14.55	13.54
20	09.48	08.03	06.20	05.24	03.32	02.00	03.22	05.12	06.49	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.35	23.20	21.25	19.29	17.38	14.51	13.54
21	09.45	08.00	06.17	05.20	03.29	02.00	03.26	05.15	06.52	08.27	09.15	10.34
	15.11	17.02	18.32	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.42	07.56	06.13	05.17	03.25	02.01	03.29	05.19	06.56	08.30	09.18	10.35
	15.14	17.05	18.36	21.16	23.04	00.36	23.13	21.18	19.21	17.30	14.45	13.54
23	09.39	07.53	06.09	05.13	03.21	02.01	03.33	05.22	06.59	08.33	09.22	10.35
	15.18	17.08	18.39	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.55
24	09.35	07.49	06.05	05.09	03.18	02.02	03.37	05.25	07.02	08.37	09.25	10.35
	15.22	17.12	18.42	21.22	23.11	00.35	23.06	21.10	19.14	17.23	14.39	13.55
25	09.32	07.45	06.02	05.05	03.14	02.04	03.40	05.28	07.05	07.40	09.29	10.35
	15.25	17.15	18.45	21.26	23.15	00.34	23.02	21.06	19.10	16.20	14.37	13.56
26	09.29	07.42	05.58	05.01	03.11	02.06	03.44	05.32	07.08	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.19	00.32	22.58	21.03	19.06	16.16	14.34	13.57
27	09.26	07.38	05.54	04.58	03.07	02.08	03.48	05.35	07.11	07.47	09.36	10.35
	15.33	17.22	18.51	21.33	23.23	00.31	22.55	20.59	19.02	16.13	14.31	13.59
28	09.23	07.34	05.50	04.54	03.03	02.10	03.52	05.38	07.14	07.50	09.39	10.35
	15.36	17.25	18.55	21.36	23.26	00.29	22.51	20.55	18.59	16.09	14.28	14.00
29	09.20		06.47	04.50	03.00	02.12	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.58	21.40	23.30	00.27	22.47	20.51	18.55	16.05	14.25	14.02
30	09.16		06.43	04.46	02.53	02.15	03.59	05.44	07.20	07.57	09.46	10.33
	15.44		20.01	21.43	23.34	00.25	22.44	20.47	18.51	16.02	14.23	14.04
31	09.13		06.39		02.50		04.02	05.48		08.00		10.32
	15.47		20.04		23.38		22.40	20.44		15.58		14.06
Potential sun hours	154	231	362	457	586	662	633	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

Shadow receptor: I - Asuinrakennus (Majava-ahontie 391)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10.30	09.09	07.30	06.35	04.43	02.46	02.18	04.06	05.51	07.23	08.03	09.49
	14.08	15.51	17.28	20.07	21.46	23.41	00.22	22.36	20.40	18.47	15.55	14.20
2	10.29	09.06	07.27	06.31	04.39	02.43	02.21	04.10	05.54	07.26	08.07	09.52
	14.11	15.54	17.31	20.10	21.50	23.45	00.19	22.32	20.36	18.44	15.51	14.18
3	10.28	09.03	07.23	06.28	04.35	02.39	02.24	04.13	05.57	07.29	08.10	09.55
	14.13	15.58	17.35	20.13	21.53	23.48	00.16	22.28	20.32	18.40	15.48	14.15
4	10.26	08.59	07.19	06.24	04.31	02.36	02.27	04.17	06.00	07.32	08.14	09.58
	14.16	16.01	17.38	20.16	21.57	23.52	00.13	22.25	20.28	18.36	15.44	14.13
5	10.24	08.56	07.16	06.20	04.28	02.33	02.31	04.20	06.03	07.35	08.17	10.01
	14.18	16.05	17.41	20.20	22.01	23.56	00.10	22.21	20.25	18.32	15.41	14.11
6	10.22	08.52	07.12	06.16	04.24	02.30	02.34	04.24	06.06	07.38	08.21	10.04
	14.21	16.09	17.44	20.23	22.04	23.59	00.07	22.17	20.21	18.29	15.37	14.09
7	10.20	08.49	07.08	06.13	04.20	02.26	02.38	04.27	06.09	07.41	08.24	10.07
	14.24	16.12	17.48	20.26	22.08	00.03	00.04	22.14	20.17	18.25	15.34	14.07
8	10.18	08.45	07.05	06.09	04.16	02.23	02.41	04.31	06.12	07.45	08.28	10.10
	14.27	16.16	17.51	20.29	22.11	00.06	00.01	22.10	20.13	18.21	15.30	14.05
9	10.16	08.42	07.01	06.05	04.13	02.21	02.45	04.34	06.16	07.48	08.31	10.12
	14.30	16.19	17.54	20.33	22.15	00.09	23.58	22.06	20.10	18.18	15.27	14.03
10	10.14	08.39	06.57	06.01	04.09	02.18	02.48	04.38	06.19	07.51	08.35	10.15
	14.33	16.23	17.57	20.36	22.19	00.13	23.55	22.02	20.06	18.14	15.24	14.01
11	10.12	08.35	06.54	05.58	04.05	02.15	02.52	04.41	06.22	07.54	08.39	10.17
	14.36	16.27	18.00	20.39	22.22	00.16	23.51	21.59	20.02	18.10	15.20	14.00
12	10.09	08.32	06.50	05.54	04.01	02.13	02.56	04.45	06.25	07.57	08.42	10.20
	14.39	16.30	18.04	20.42	22.26	00.19	23.48	21.55	19.58	18.07	15.17	13.59
13	10.07	08.28	06.46	05.50	03.58	02.10	02.59	04.48	06.28	08.00	08.46	10.22
	14.43	16.34	18.07	20.45	22.30	00.21	23.44	21.51	19.55	18.03	15.14	13.57
14	10.04	08.24	06.42	05.46	03.54	02.08	03.03	04.52	06.31	08.04	08.49	10.24
	14.46	16.37	18.10	20.49	22.33	00.24	23.41	21.47	19.51	17.59	15.10	13.56
15	10.01	08.21	06.39	05.43	03.50	02.06	03.03	04.55	06.34	08.07	08.53	10.26
	14.49	16.41	18.13	20.52	22.37	00.27	23.37	21.44	19.47	17.56	15.07	13.55
16	09.59	08.17	06.35	05.39	03.47	02.04	03.07	04.58	06.37	08.10	08.56	10.28
	14.53	16.44	18.16	20.55	22.41	00.29	23.34	21.40	19.43	17.52	15.04	13.55
17	09.56	08.14	06.31	05.35	03.43	02.03	03.10	05.02	06.40	08.13	09.00	10.29
	14.56	16.48	18.20	20.59	22.44	00.31	23.30	21.36	19.40	17.48	15.01	13.54
18	09.53	08.10	06.28	05.31	03.39	02.02	03.14	05.05	06.43	08.16	09.04	10.31
	15.00	16.51	18.23	21.02	22.48	00.32	23.27	21.32	19.36	17.45	14.57	13.54
19	09.50	08.07	06.24	05.28	03.36	02.01	03.18	05.08	06.46	08.20	09.07	10.32
	15.03	16.54	18.26	21.05	22.52	00.33	23.23	21.29	19.32	17.41	14.54	13.53
20	09.47	08.03	06.20	05.24	03.32	02.00	03.22	05.12	06.49	08.23	09.11	10.33
	15.07	16.58	18.29	21.09	22.56	00.34	23.20	21.25	19.28	17.37	14.51	13.53
21	09.44	07.59	06.16	05.20	03.28	02.00	03.25	05.15	06.52	08.26	09.14	10.34
	15.11	17.01	18.32	21.12	23.00	00.35	23.16	21.21	19.25	17.34	14.48	13.54
22	09.41	07.56	06.13	05.16	03.25	02.01	03.29	05.18	06.55	08.30	09.18	10.34
	15.14	17.05	18.35	21.15	23.03	00.35	23.13	21.17	19.21	17.30	14.45	13.54
23	09.38	07.52	06.09	05.13	03.21	02.01	03.33	05.22	06.58	08.33	09.21	10.35
	15.18	17.08	18.38	21.19	23.07	00.35	23.09	21.14	19.17	17.27	14.42	13.54
24	09.35	07.49	06.05	05.09	03.18	02.02	03.37	05.25	07.01	08.36	09.25	10.35
	15.21	17.11	18.42	21.22	23.11	00.34	23.05	21.10	19.13	17.23	14.39	13.55
25	09.32	07.45	06.01	05.05	03.14	02.04	03.40	05.28	07.04	07.40	09.28	10.35
	15.25	17.15	18.45	21.26	23.15	00.33	23.02	21.06	19.10	16.19	14.36	13.56
26	09.29	07.41	05.58	05.01	03.10	02.06	03.44	05.31	07.07	07.43	09.32	10.35
	15.29	17.18	18.48	21.29	23.18	00.32	22.58	21.02	19.06	16.16	14.33	13.57
27	09.26	07.38	05.54	04.57	03.07	02.08	03.48	05.35	07.11	07.46	09.35	10.35
	15.32	17.21	18.51	21.32	23.22	00.30	22.54	20.58	19.02	16.12	14.31	13.59
28	09.22	07.34	05.50	04.54	03.03	02.10	03.51	05.38	07.14	07.50	09.39	10.34
	15.36	17.25	18.54	21.36	23.26	00.28	22.51	20.55	18.58	16.09	14.28	14.00
29	09.19		06.46	04.50	03.00	02.12	03.55	05.41	07.17	07.53	09.42	10.34
	15.40		19.57	21.39	23.30	00.26	22.47	20.51	18.55	16.05	14.25	14.02
30	09.16		06.43	04.46	02.53	02.15	03.59	05.44	07.20	07.57	09.45	10.33
	15.43		20.01	21.43	23.33	00.24	22.43	20.47	18.51	16.02	14.23	14.04
31	09.13		06.39		02.49		04.02	05.47		08.00		10.32
	15.47		20.04		23.37		22.40	20.43		15.58		14.06
Potential sun hours	154	232	362	457	586	662	632	518	395	301	186	114
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forestShadow receptor: J - Asuinrakennus (Kaistontie 30)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	January	February	March	April			May			June		
1	10.29	09.09	07.30	06.36			04.43		05.39 (L3)	02.48		04.15 (L4)
	14.10	15.51	17.28	20.07			21.46	23	06.02 (L3)	23.39	25	04.40 (L4)
2	10.28	09.05	07.27	06.32			04.40		05.39 (L3)	02.45		04.15 (L4)
	14.12	15.55	17.32	20.10			21.49	23	06.02 (L3)	23.43	25	04.40 (L4)
3	10.26	09.02	07.23	06.28			04.36		05.38 (L3)	02.41		04.15 (L4)
	14.15	15.59	17.35	20.13			21.53	23	06.01 (L3)	23.46	25	04.40 (L4)
4	10.25	08.59	07.19	06.24			04.32		05.39 (L3)	02.38		04.15 (L4)
	14.17	16.02	17.38	20.16			21.56	22	06.01 (L3)	23.50	26	04.41 (L4)
5	10.23	08.55	07.16	06.21			04.28		05.39 (L3)	02.35		04.15 (L4)
	14.20	16.06	17.41	20.20			22.00	21	06.00 (L3)	23.54	26	04.41 (L4)
6	10.21	08.52	07.12	06.17			04.25		05.40 (L3)	02.32		04.16 (L4)
	14.23	16.09	17.45	20.23			22.04	20	06.00 (L3)	23.57	26	04.42 (L4)
7	10.19	08.49	07.08	06.13			04.21		05.41 (L3)	02.29		04.15 (L4)
	14.25	16.13	17.48	20.26			22.07	18	05.59 (L3)	00.00	26	04.41 (L4)
8	10.17	08.45	07.05	06.09			04.17		05.42 (L3)	02.26		04.16 (L4)
	14.28	16.17	17.51	20.29			22.11	16	05.58 (L3)	00.04	26	04.42 (L4)
9	10.15	08.42	07.01	06.06			04.14		05.43 (L3)	02.23		04.16 (L4)
	14.31	16.20	17.54	20.32			22.14	13	05.56 (L3)	00.07	26	04.42 (L4)
10	10.13	08.38	06.57	06.02			04.10		05.45 (L3)	02.21		04.16 (L4)
	14.34	16.24	17.58	20.36			22.18	9	05.54 (L3)	00.10	27	04.43 (L4)
11	10.11	08.35	06.54	05.58			04.06			02.18		04.16 (L4)
	14.38	16.27	18.01	20.39			22.22			00.13	27	04.43 (L4)
12	10.08	08.31	06.50	05.54			04.02			02.16		04.16 (L4)
	14.41	16.31	18.04	20.42			22.25			00.16	27	04.43 (L4)
13	10.06	08.28	06.46	05.51			03.59			02.13		04.16 (L4)
	14.44	16.34	18.07	20.45			22.29			00.18	27	04.43 (L4)
14	10.03	08.24	06.43	05.47			03.55			02.11		04.16 (L4)
	14.47	16.38	18.10	20.49			22.33			00.21	27	04.43 (L4)
15	10.00	08.21	06.39	05.43			03.51			02.10		04.17 (L4)
	14.51	16.41	18.13	20.52			22.36			00.23	27	04.44 (L4)
16	09.58	08.17	06.35	05.39			03.48			02.08		04.17 (L4)
	14.54	16.45	18.17	20.55			22.40			00.25	26	04.43 (L4)
17	09.55	08.14	06.31	05.36			03.44			02.07		04.17 (L4)
	14.58	16.48	18.20	20.58			22.44			00.27	27	04.44 (L4)
18	09.52	08.10	06.28	05.32			03.41			02.06		04.18 (L4)
	15.01	16.52	18.23	21.02			22.47			00.29	26	04.44 (L4)
19	09.49	08.06	06.24	05.28			03.37			02.05		04.18 (L4)
	15.05	16.55	18.26	21.05			22.51			00.30	26	04.44 (L4)
20	09.47	08.03	06.20	05.24			03.33			02.04		04.18 (L4)
	15.08	16.58	18.29	21.08			22.55			00.31	27	04.45 (L4)
21	09.44	07.59	06.17	05.21			03.30		04.25 (L4)	02.04		04.18 (L4)
	15.12	17.02	18.32	21.12			22.58	3	04.28 (L4)	00.31	27	04.45 (L4)
22	09.41	07.56	06.13	05.17			03.26		04.22 (L4)	02.05		04.18 (L4)
	15.15	17.05	18.35	21.15			23.02	9	04.31 (L4)	00.31	27	04.45 (L4)
23	09.38	07.52	06.09	05.13		05.50 (L3)	03.23		04.20 (L4)	02.05		04.18 (L4)
	15.19	17.08	18.39	21.18	5	05.55 (L3)	23.06	14	04.34 (L4)	00.31	27	04.45 (L4)
24	09.34	07.48	06.05	05.09		05.47 (L3)	03.19		04.18 (L4)	02.06		04.19 (L4)
	15.22	17.12	18.42	21.22	11	05.58 (L3)	23.10	16	04.34 (L4)	00.30	26	04.45 (L4)
25	09.31	07.45	06.02	05.06		05.44 (L3)	03.15		04.18 (L4)	02.08		04.19 (L4)
	15.26	17.15	18.45	21.25	16	06.00 (L3)	23.13	18	04.36 (L4)	00.30	27	04.46 (L4)
26	09.28	07.41	05.58	05.02		05.41 (L3)	03.12		04.18 (L4)	02.09		04.19 (L4)
	15.30	17.18	18.48	21.29	19	06.00 (L3)	23.17	19	04.37 (L4)	00.28	26	04.45 (L4)
27	09.25	07.38	05.54	04.58		05.41 (L3)	03.08		04.16 (L4)	02.11		04.19 (L4)
	15.33	17.22	18.51	21.32	20	06.01 (L3)	23.21	21	04.37 (L4)	00.27	27	04.46 (L4)
28	09.22	07.34	05.50	04.54		05.40 (L3)	03.05		04.16 (L4)	02.13		04.20 (L4)
	15.37	17.25	18.54	21.35	22	06.02 (L3)	23.25	22	04.38 (L4)	00.25	26	04.46 (L4)
29	09.19		06.47	04.51		05.39 (L3)	03.01		04.16 (L4)	02.16		04.20 (L4)
	15.41		19.57	21.39	22	06.01 (L3)	23.28	22	04.38 (L4)	00.23	26	04.46 (L4)
30	09.15		06.43	04.47		05.39 (L3)	02.55		04.16 (L4)	02.18		04.20 (L4)
	15.44		20.01	21.42	23	06.02 (L3)	23.32	23	04.39 (L4)	00.21	26	04.46 (L4)
31	09.12		06.39				02.51		04.15 (L4)			
	15.48		20.04				23.36	24	04.39 (L4)			
Potential sun hours	155	232	362	456			585			659		
Total, worst case					138			379			790	
Sun reduction					0,46			0,47			0,45	
Oper. time red.					0,99			0,99			0,99	
Wind dir. red.					0,62			0,62			0,63	
Total reduction					0,28			0,29			0,28	
Total, real					39			109			220	

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

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

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Calendar

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forestShadow receptor: J - Asuinrakennus (Kaistontie 30)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,38	4,42	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
580	580	544	614	755	916	1 016	1 101	929	632	482	531	8 680

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

	July		August		September	October	November	December
1	02.21		04.20 (L4)	04.07		05.51	07.23	08.03	09.48
	00.19	26	04.46 (L4)	22.35		20.40	18.47	15.55	14.21
2	02.24		04.21 (L4)	04.11	05.57 (L3)	05.54	07.26	08.06	09.51
	00.16	26	04.47 (L4)	22.31	5 06.02 (L3)	20.36	18.44	15.52	14.19
3	02.27		04.20 (L4)	04.14	05.54 (L3)	05.57	07.29	08.10	09.54
	00.14	27	04.47 (L4)	22.28	11 06.05 (L3)	20.32	18.40	15.48	14.17
4	02.30		04.21 (L4)	04.18	05.53 (L3)	06.00	07.32	08.13	09.57
	00.11	26	04.47 (L4)	22.24	14 06.07 (L3)	20.28	18.36	15.45	14.14
5	02.33		04.21 (L4)	04.21	05.51 (L3)	06.04	07.35	08.17	10.00
	00.08	26	04.47 (L4)	22.20	17 06.08 (L3)	20.25	18.33	15.41	14.12
6	02.37		04.21 (L4)	04.25	05.51 (L3)	06.07	07.38	08.20	10.03
	00.05	26	04.47 (L4)	22.17	18 06.09 (L3)	20.21	18.29	15.38	14.10
7	02.40		04.22 (L4)	04.28	05.49 (L3)	06.10	07.41	08.24	10.06
	00.02	26	04.48 (L4)	22.13	20 06.09 (L3)	20.17	18.25	15.35	14.08
8	02.43		04.22 (L4)	04.32	05.48 (L3)	06.13	07.45	08.27	10.08
	23.59	26	04.48 (L4)	22.09	21 06.09 (L3)	20.13	18.22	15.31	14.06
9	02.47		04.22 (L4)	04.35	05.48 (L3)	06.16	07.48	08.31	10.11
	23.56	26	04.48 (L4)	22.06	22 06.10 (L3)	20.10	18.18	15.28	14.05
10	02.50		04.23 (L4)	04.39	05.47 (L3)	06.19	07.51	08.34	10.14
	23.53	25	04.48 (L4)	22.02	23 06.10 (L3)	20.06	18.14	15.24	14.03
11	02.54		04.23 (L4)	04.42	05.47 (L3)	06.22	07.54	08.38	10.16
	23.49	25	04.48 (L4)	21.58	23 06.10 (L3)	20.02	18.11	15.21	14.02
12	02.58		04.23 (L4)	04.46	05.47 (L3)	06.25	07.57	08.42	10.18
	23.46	24	04.47 (L4)	21.54	23 06.10 (L3)	19.58	18.07	15.18	14.00
13	03.01		04.23 (L4)	04.49	05.47 (L3)	06.28	08.00	08.45	10.21
	23.43	24	04.47 (L4)	21.51	23 06.10 (L3)	19.55	18.03	15.14	13.59
14	03.01		04.25 (L4)	04.52	05.47 (L3)	06.31	08.03	08.49	10.23
	23.39	23	04.48 (L4)	21.47	22 06.09 (L3)	19.51	18.00	15.11	13.58
15	03.05		04.25 (L4)	04.56	05.48 (L3)	06.34	08.07	08.52	10.24
	23.36	22	04.47 (L4)	21.43	21 06.09 (L3)	19.47	17.56	15.08	13.57
16	03.08		04.25 (L4)	04.59	05.48 (L3)	06.37	08.10	08.56	10.26
	23.33	21	04.46 (L4)	21.39	20 06.08 (L3)	19.43	17.52	15.05	13.56
17	03.12		04.26 (L4)	05.02	05.49 (L3)	06.40	08.13	08.59	10.28
	23.29	20	04.46 (L4)	21.36	18 06.07 (L3)	19.40	17.49	15.02	13.56
18	03.16		04.27 (L4)	05.06	05.51 (L3)	06.43	08.16	09.03	10.29
	23.26	18	04.45 (L4)	21.32	15 06.06 (L3)	19.36	17.45	14.58	13.55
19	03.19		04.28 (L4)	05.09	05.54 (L3)	06.46	08.20	09.06	10.30
	23.22	17	04.45 (L4)	21.28	10 06.04 (L3)	19.32	17.42	14.55	13.55
20	03.23		04.29 (L4)	05.12	05.57 (L3)	06.49	08.23	09.10	10.31
	23.19	14	04.43 (L4)	21.24	4 06.01 (L3)	19.28	17.38	14.52	13.55
21	03.27		04.31 (L4)	05.16		06.52	08.26	09.14	10.32
	23.15	12	04.43 (L4)	21.21		19.25	17.34	14.49	13.55
22	03.30		04.33 (L4)	05.19		06.55	08.29	09.17	10.33
	23.11	7	04.40 (L4)	21.17		19.21	17.31	14.46	13.56
23	03.34			05.22		06.59	08.33	09.21	10.33
	23.08			21.13		19.17	17.27	14.43	13.56
24	03.38			05.25		07.02	08.36	09.24	10.33
	23.04			21.09		19.13	17.24	14.40	13.57
25	03.42			05.29		07.05	07.39	09.27	10.34
	23.01			21.06		19.10	16.20	14.37	13.58
26	03.45			05.32		07.08	07.43	09.31	10.33
	22.57			21.02		19.06	16.16	14.35	13.59
27	03.49			05.35		07.11	07.46	09.34	10.33
	22.53			20.58		19.02	16.13	14.32	14.00
28	03.52			05.38		07.14	07.49	09.38	10.33
	22.50			20.55		18.59	16.09	14.29	14.02
29	03.56			05.42		07.17	07.53	09.41	10.32
	22.46			20.51		18.55	16.06	14.27	14.04
30	04.00			05.45		07.20	07.56	09.44	10.31
	22.42			20.47		18.51	16.02	14.24	14.05
31	04.03			05.48			08.00		10.30
	22.39			20.43			15.59		14.07
Potential sun hours	631			517		395	301	187	115
Total, worst case		487			330				
Sun reduction		0,45			0,41				
Oper. time red.		0,99			0,99				
Wind dir. red.		0,63			0,62				
Total reduction		0,28			0,25				
Total, real		135			83				

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

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

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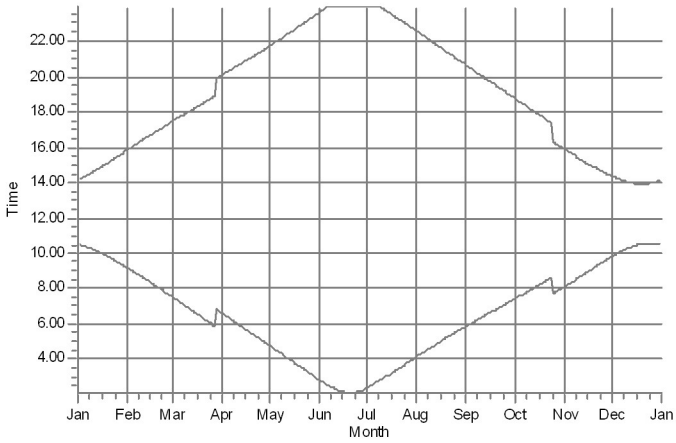
Calculated:
31.3.2023 10.36/3.5.584

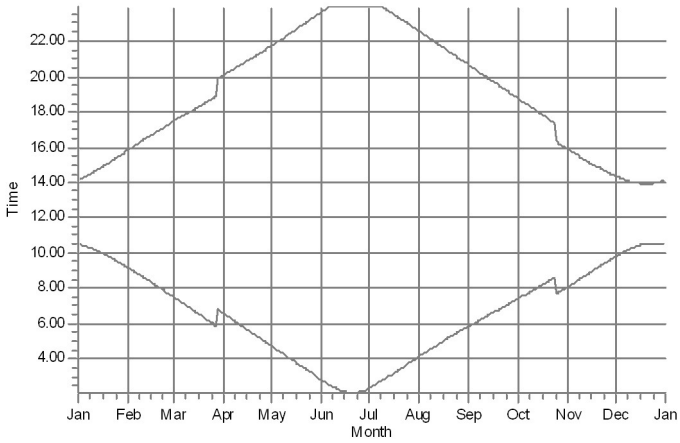
SHADOW - Calendar, graphical

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

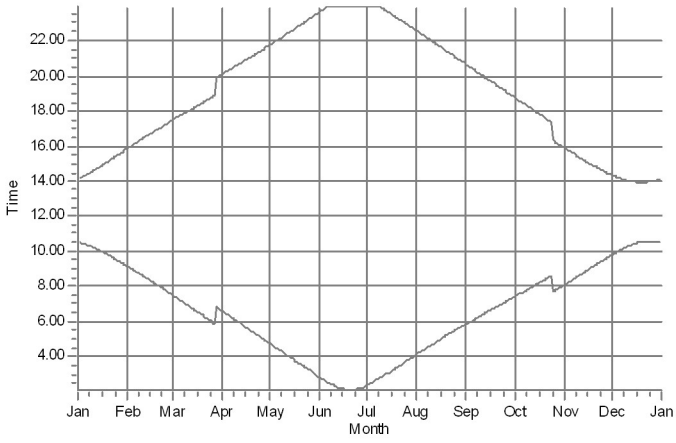
A: Lomarakennus (Orastintie)



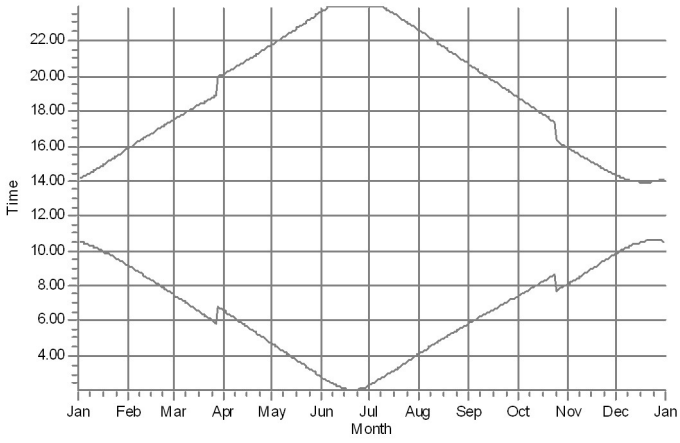
B: Lomarakennus (Orastinjärventie 700)



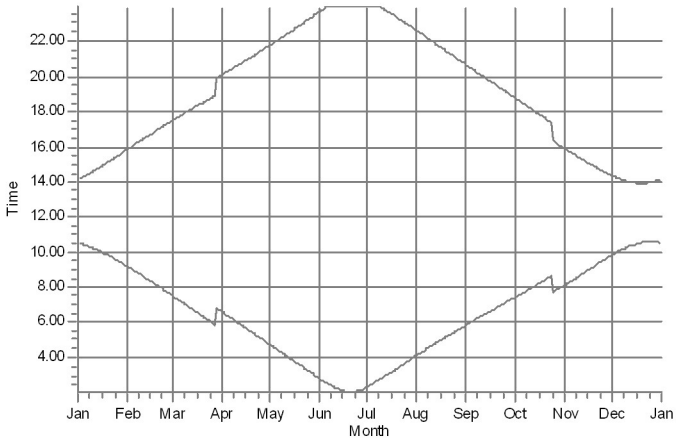
C: Lomarakennus (Orastinjärventie 728)



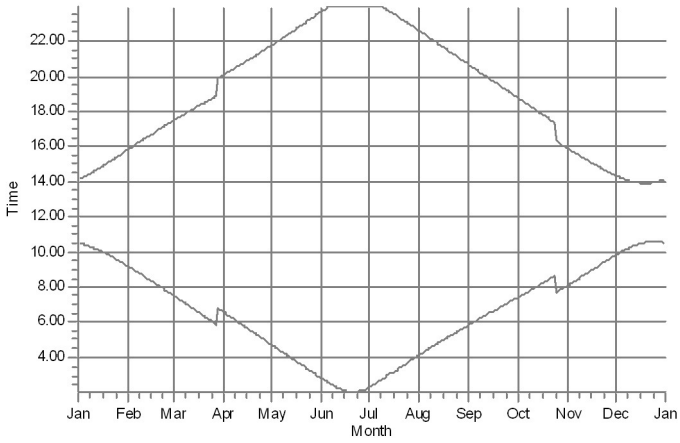
D: Asuinrakennus (Kottarantie 311)



E: Lomarakennus (Orastinjärventie 14d)



F: Lomarakennus (Piimäkoskentie 382b)



WTGs

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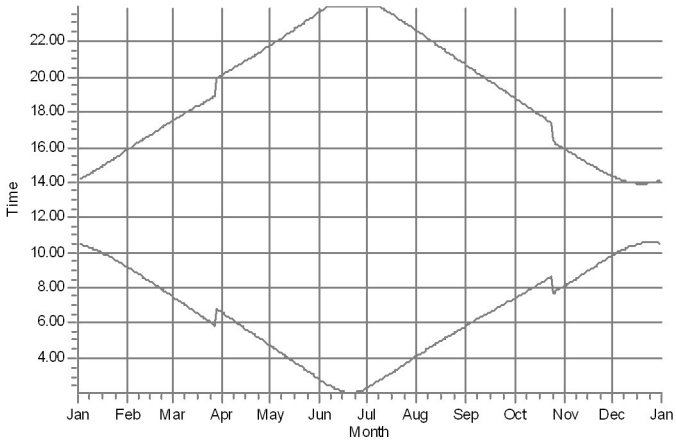
Calculated:
31.3.2023 10.36/3.5.584

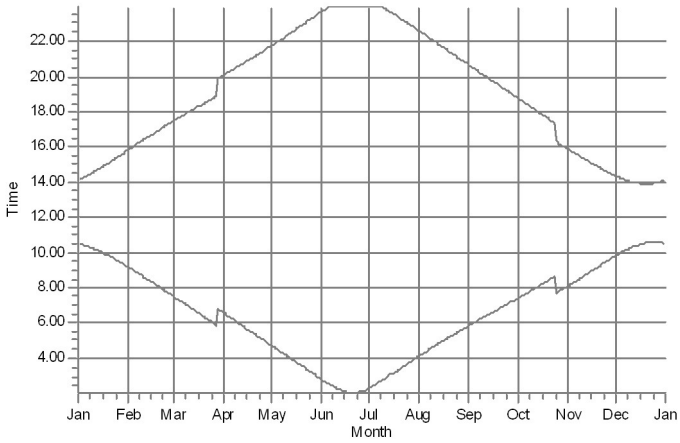
SHADOW - Calendar, graphical

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

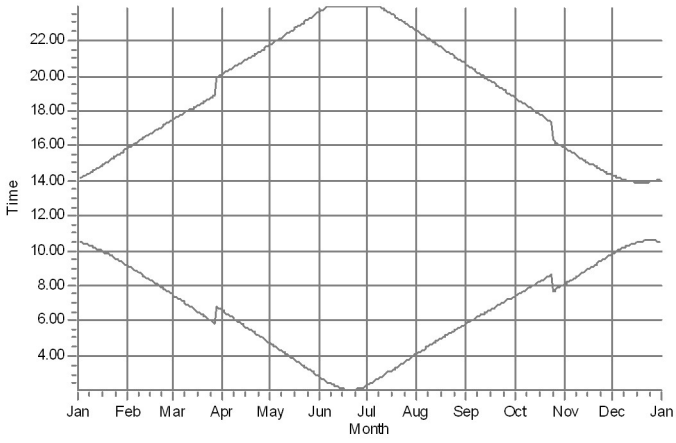
G: Lomarakennus (Hautasaarentie)



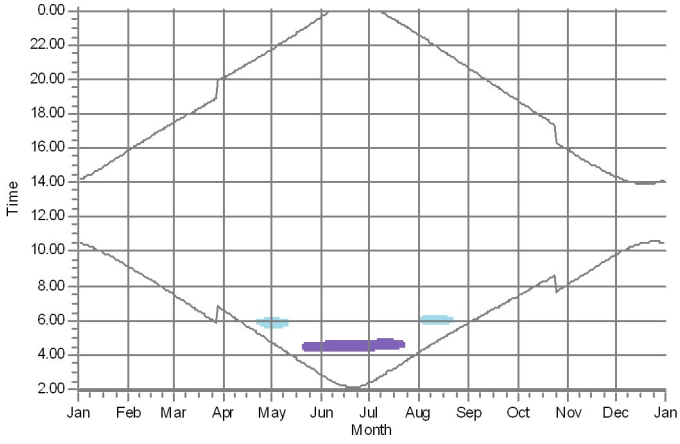
H: Lomarakennus (Turpontie 34)



I: Asuinrakennus (Majava-ahontie 391)



J: Asuinrakennus (Kaistontie 30)



WTGs

L3: Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)

L4: Generic RD200 5600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)

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Calculated:
31.3.2023 10.36/3.5.584

SHADOW - Map

Calculation: Pahkakoski V136 x 30 x HH177 + RD200 x 9 x HH200_real case_Luke forest

Map: Maastorasteri 100k , Print scale 1:80 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 456 960 North: 7 243 980

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Pahkakoski_Laajennus 2023_0.wpo (2)

Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m