SOLARWIND BY JANNENISKA OY

Rekolanvuorten tuulivoimahanke Sysmä

Melu- ja varjostusmallinnukset

Rintamäki, Henna-Riikka 19.2.2021

Sisällysluettelo

Rintamäki, Henna-Riikka

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Rekolanvuorten tuulivoimahanke Sysmä

1 JOHDANTO

Solarwind by Janneniska Oy suunnittelee viiden tuulivoimalan rakentamista Sysmän kuntaan Rekolanvuoren tuulivoimahankkeessa. Voimalatyyppi hankkeessa on Siemens Gamesa SG170-6.0MW. Voimaloiden melupäästö on 106,0 dB(A), roottorin halkaisija on 170 m (RD) ja voimalan napakorkeus (HH) 135 metriä (HH). Voimalan kokonaiskorkeus on 220 metriä.

Tuulivoimaloiden aiheuttama melutaso ympäristöllä on mallinnettu WindPRO-ohjelman DECIBEL-modulilla. Tuulivoimaloiden aiheuttamat varjostukset on mallinnettu WindPro-ohjelman SHADOW-moduulilla.

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

2 LÄHTÖTIEDOT JA MENETELMÄT

2.1 Melu

2.1.1 Melumallinnus

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

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

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

MALLINNUSOHJELMA JA VERSIO:			
WindPRO version 3.4.388		Mallinnusmenetelmä: ISO 9613-2	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskenta korkeus		Laskentaruudun koko [m·m]	
4,0 m		25x25 m	
Suhteellinen kosteus		Lämpötila	
70 %	Muu, mikä ja miksi:	15 C°	
Maastomallin lähde ja tarkkuus			
Maastomallin lähde: MML maastotietokanta		Vaakaresoluutio:1,0	Pystyresoluutio:1,0
Maan- ja vedenpinnan absorption ja heijastuksen huomioiminen, käytetyt kertoimet			
Maa	0,4		HUOM
Vesistöt	0,0		
Ilmakehän stabiilius laskennassa/meteorologinen korjaus			
Neutraali, (0): Neutraali		Muu, mikä ja miksi:	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus			
Tuulen suunta: 0-360°		Tuulennopeus: 8 m/s	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä	Muu, mikä, miksi:		

2.1.2 Matalataajuinen melu

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

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

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

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

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

2.2 Varjostusmallinnus

Tuulivoimaloiden varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Laskentamallin mukaan varjostusta muodostuu, jos aurinko on yli 3 astetta horisontin yläpuolella ja tuulivoimalan siipi peittää vähintään 20 % auringosta.

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

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

Auringon keskimääräiset paistetunnit perustuvat Jyväskylän lentoaseman sääaseman pitkäaikaisiin mitattuihin säätietoihin 1981-2010, (Ilmatieteenlaitos raportti 2012:1). Laskentojen tuulen suunta ja nopeusjakaumana käytettiin NASA:n MERRA-dataa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Varjostusmallinnuksen tuloksia on havainnollistettu kartan avulla. Kartalla esitetään varjostusvaikutuksen (1, 8 ja 20 tuntia vuodessa) laajuus. Lisäksi mallinnuksessa on laskettu vuotuinen varjostustuntien määrä tuulivoimapuistoalueen ympäristössä sijaitsevilla asuin- ja lomarakennuksilla.

2.3 Kartta aineisto

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

Rakennusten käyttötarkoitus on arvoitu MML maastotietokannan asuin-, liike- tai julkisen-, loma-, teollisen-, kirkollisen, tai muun rakennuksen mukaisesti.

2.4 Voimalat

Tuulivoimaloiden melumallinnuksen lähtöarvoina on käytetty valmistajan ilmoittamia tuulivoimaloiden melupäästön arvoja.

Melupäästötiedot perustuvat dokumenttiin *Standard Acoustic Emission, SG 6.0-170, Rev. 0 (0000-046AC30-00) Finland (26.5.2020)*. Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa takuuarvoa (Volker Schick, Siemens Gamesa: e-mail tiistaina 22. syyskuuta 2020 klo 18.31).

Taulukko 3. Rekolanvuorten hankkeen tuulivoimaloiden tyyppitiedot ja äänitehotasot sekä melun erityispiirteet.

TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)					
Tuulivoimalan valmistaja: Siemens Gamesa				Tyyppi: SG170-6.0MW	Sarjanumero/t:-
Nimellisteho: 6.0MW		Napakorkeus: 135 m		Roottorin halkaisija: 170 m	Tornin tyyppi: teräs
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun					
Lapakulman säätö		Pyörimisnopeus		Muu, mikä	
Kyllä	- dB	Kyllä	- dB	Noise mode säätö:	AM 0 – N7
~~Ei~~		~~Ei~~		Noise mode, lähtömelutaso	106,0 dB(A) – 92.0 dB(A)

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT
Melupäästötiedot perustuvat dokumenttiin: Standard Acoustic Emission, SG 6.0-170, Rev. 0 (0000-046AC30-00) Finland (26.5.2020) Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa takuuarvoa (Volker Schick, Siemens Gamesa: e-mail tiistaina 22. syyskuuta 2020 klo 18.31)

Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
31,5	-	20	63,7	200	90	2000	94,4
63	86,5	25	67,7	250	91,5	2500	92
125	93,4	31,5	71,7	315	92,1	3150	90,7
250	96,1	40	75,5	400	91	4000	88,3
500	97,9	50	78,3	500	92,8	5000	84,8
1000	101,8	63	81,1	630	94,8	6300	80,9
2000	99,9	80	83,9	800	96,1	8000	77,2
4000	93,3	100	87,8	1000	97,3	10000	73,5
8000	83	125	88,2	1250	97,5		
106,0 dB(A)		160	89,7	1600	97,3		

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

2.5 Raja- ja ohjearvot

2.5.1 Melu

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

Taulukko 4. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason ohjearvot (Valtioneuvoston asetus 1107/2015).

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

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

Taulukko 5. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.

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

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

2.5.2 Varjostus

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

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

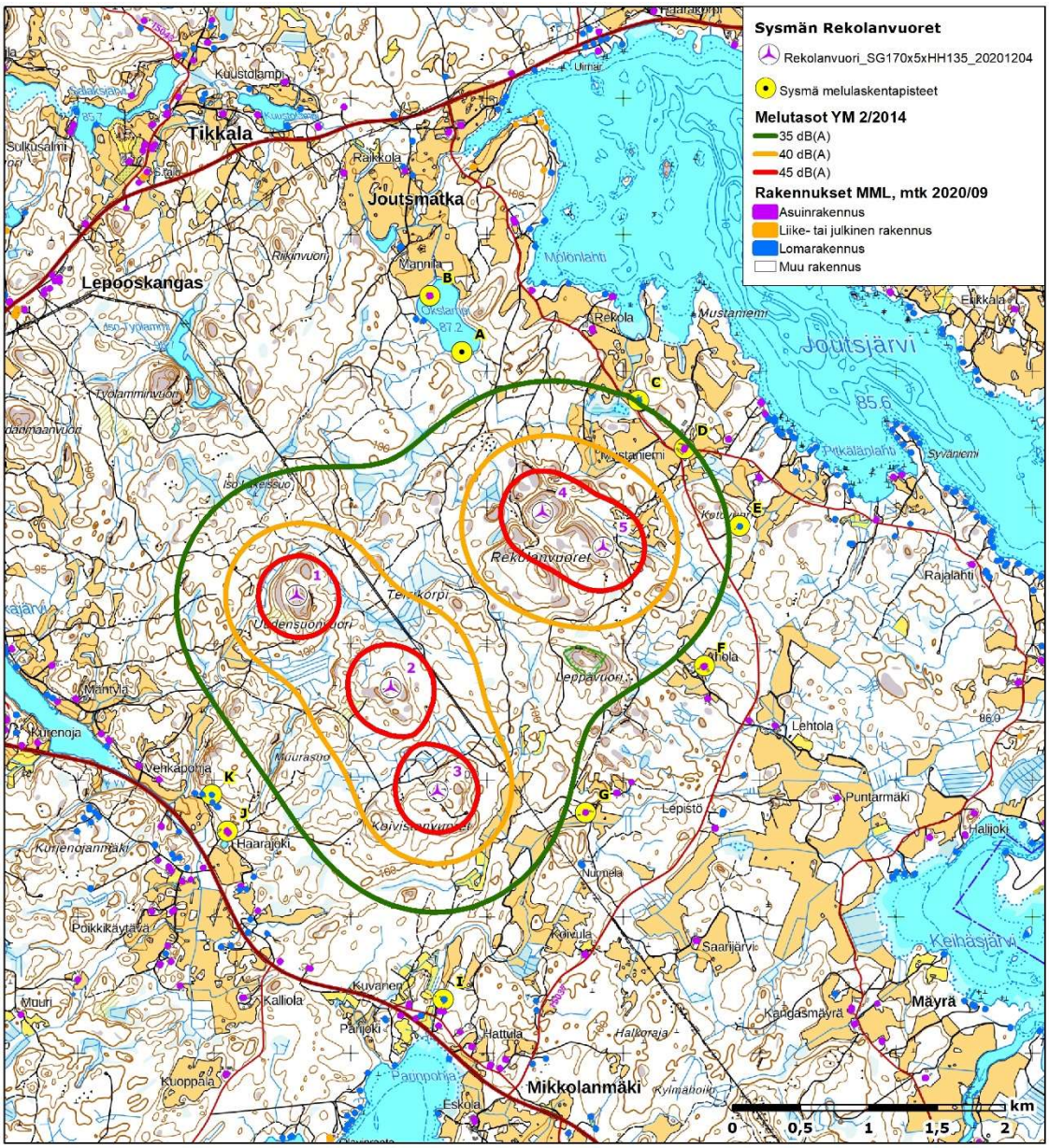
Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa (”real case”) esiintyy vähintään kahdeksan tuntia vuodessa.

3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

3.1 Melun laskentatulokset ISO 9613-2

3.1.1 Hankkeen melu

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



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

Taulukko 6. Laskennalliset melutasot lähtömelutason olleessa 106,0 dB(A).

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Laskenta-korkeus (m)	Melutaso dB(A)
Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	4,0	32,0
Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	4,0	29,9
Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	4,0	34,8
Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95	4,0	35,5
Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	4,0	34,1
Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	4,0	33,3
Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	4,0	33,7
Lomarakennus I (Mikkolanmdentie 24)	435 682	6 815 392	88,6	4,0	29,3
Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	4,0	31,6
Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	4,0	32,0

3.2 Matalataajuiset melutasot

3.2.1 Hankkeen matalataajuinenmelu

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.

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

Matalataajuiset äänitasot jäävät kaikissa rakennuksissa toimenpiderajojen alapuolelle, kun rakenteiden ääneneristävyys huomioidaan.

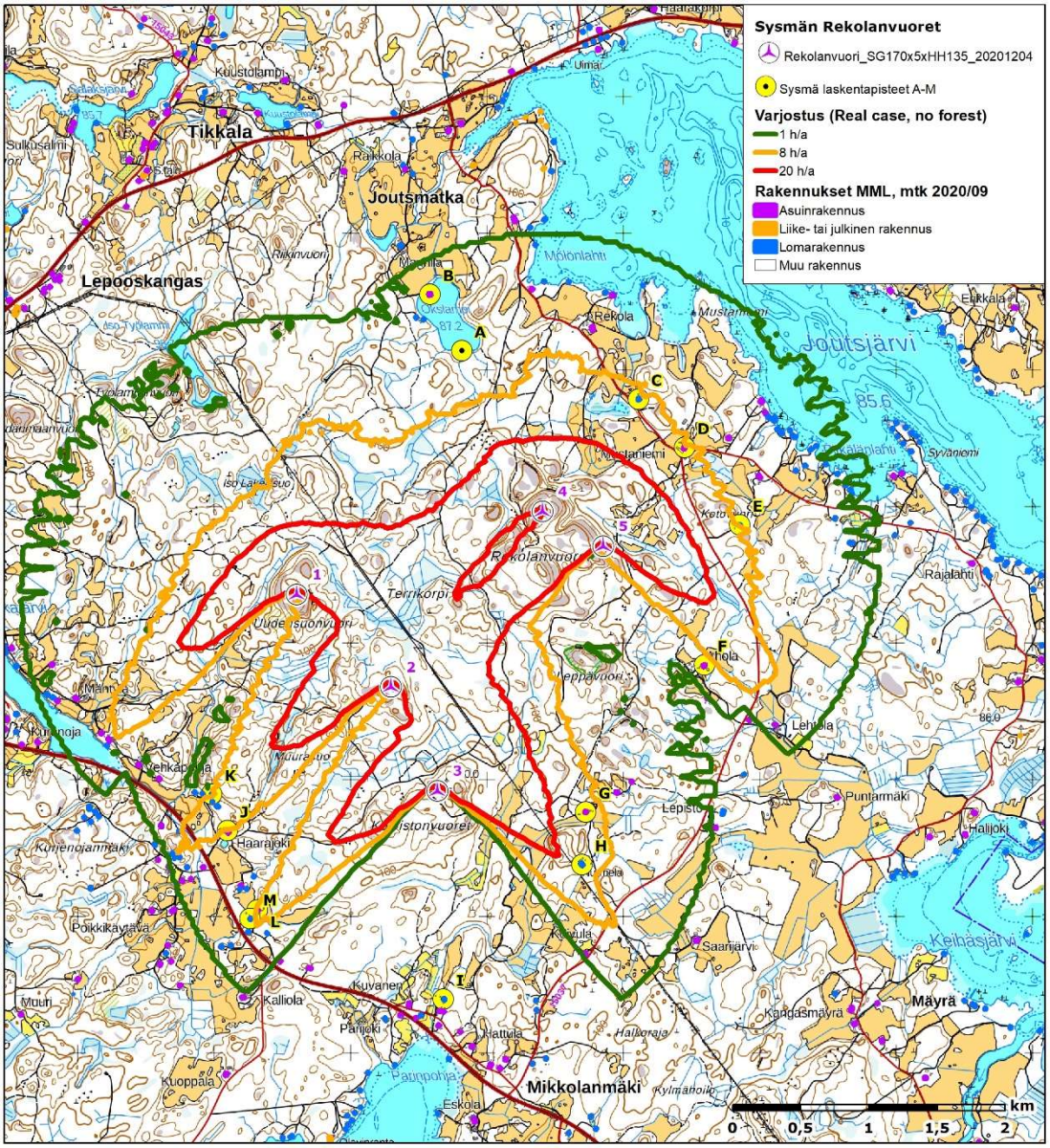
Taulukko 7. Matalataajuisen melun mallinnustulokset herkissä kohteissa verrattuna Sosiaali- ja terveysministeriön asumisterveysohjearvoon.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h - Asumisterveys-asetus ulkona	Hz	L eq,1h - Asumisterveys-ohje sisällä	Hz
A Kaavoitettu asunto/loma-asunto A (Okslampi)	1,8	100	-12,1	50
B Asuinrakennus B (Oksjärventie 150)	-0,2	100	-14,0	50
C Lomarakennus C (Uusjoutsjärventie 312)	3,5	100	-10,4	50
D Asuinrakennus D (Uusjoutsjärventie 362)	4,0	100	-10,0	50
E Lomarakennus E (Uusjoutsjärventie 450)	3,0	100	-11,0	50
F Asuinrakennus F (Ahorajantie 64)	2,6	100	-11,3	50
G Asuinrakennus G (Uutelantie 82)	3,0	100	-11,0	50
I Lomarakennus I (Mikkolanmäentie 24)	-0,3	100	-14,1	50
J Asuinrakennus J (Työlammentie 24)	1,5	100	-12,4	50
K Lomarakennus K (Viitostie 31)	1,8	100	-12,1	50

3.3 Varjostusmallinnuksen tulokset

3.3.1 Hankkeen varjostus

Tuulivoimahanketta lähimpien asuin- ja lomarakennusten pihapiirissä varjostusvaikutus on laskelmien mukaan yli 8 h/a laskentapisteissä C lomarakennus (Uusjoutsjärventie 312), D asuinrakennus (Uusjoutsjärventie 362), E lomarakennus (Uusjoutsjärventie 450), G asuinrakennus (Uutelantie 82), laskentapisteessä H lomarakennus (Nurmela), J asuinrakennus (Työlammentie 24), K lomarakennus (Viitostie 31), L lomarakennus (Mäntymäki) sekä M asuinrakennus (Mäntymäki), kun puuston suojaavaa vaikutusta ei ole huomioitu (Liite 3).

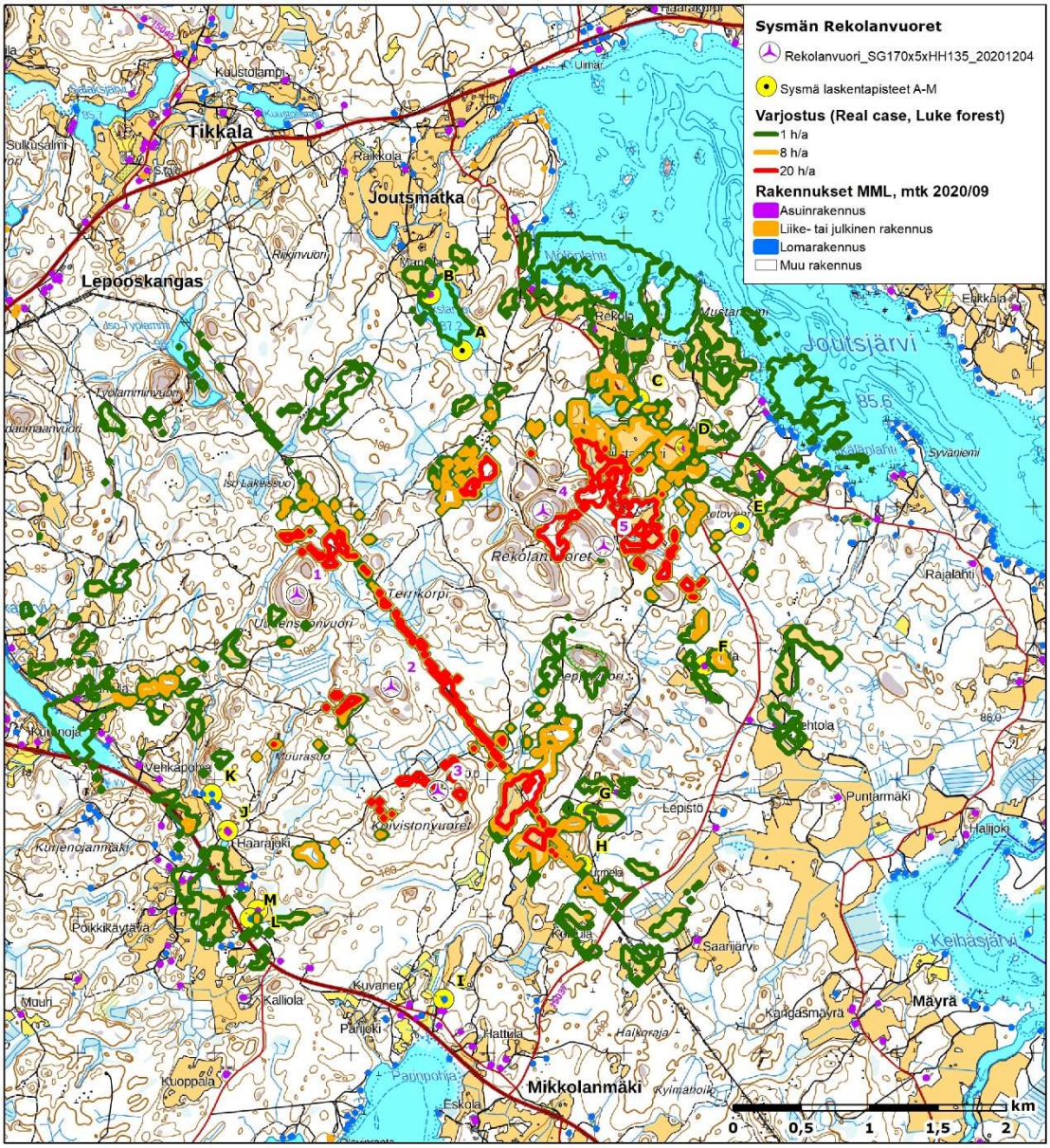


Kuva 2. Laskennalliset varjostusmallinnuksen tulokset "real case, no forest".

Taulukko 8. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu ”real case, no forest”

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Varjostus (h/a)
Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	4:26
Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	1:43
Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	10:01
Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95	9:46
Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	8:13
Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	5:03
Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	11:00
Lomarakennus H (Nurmela)	433 982	6 816 894	95,7	15:10
Lomarakennus I (Mikkolanmdentie 24)	435 682	6 815 392	88,6	0:00
Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	8:30
Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	9:44
Lomarakennus L (Mäntymäki)	434 318	6 816 045	87,5	8:48
Asuinrakennus M (Mäntymäki)	434 265	6 815 982	89,1	8:03

Tuulivoimapuistoa lähimpien rakennusten pihapiirissä varjostusvaikutus on laskelmien mukaan yli 8 h/a laskentapisteessä D Asuinrakennus (Uusjoutsjärventie 362), laskentapisteessä H Lomarakennus (Nurmela), kun huomioidaan puuston suojaava vaikutus (Luonnonvarakeskuksen aineisto 2017) (liite 4).



Kuva 3. Laskennalliset varjostusmallinnuksen tulokset "real case, Luke forest".

Taulukko 9. Laskennalliset varjostustunnit vuodessa lähialueen laskentapisteissä, kun puuston suojaavaa vaikutusta ei ole huomioitu ”real case, Luke forest”.

Laskentapiste	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Kohteen korkeus-asema (m)	Varjostus (h/a)
Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	0:00
Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	1:43
Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	0:00
Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95	9:46
Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	0:00
Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	0:00
Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	5:56
Lomarakennus H (Nurmela)	433 982	6 816 894	95,7	9:57
Lomarakennus I (Mikkolanmäentie 24)	435 682	6 815 392	88,6	0:00
Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	0:00
Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	0:00
Lomarakennus L (Mäntymäki)	434 318	6 816 045	87,5	8:48
Asuinrakennus M (Mäntymäki)	434 265	6 815 982	89,1	0:00

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Päivämäärä: 2021.04.02 11:21:16 +03'00'

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Allekirjoittaja Liisa Karhu
DN: cn=Liisa Karhu, c=FI, o=FCG Suunnittelu ja tekniikka Oy, email=liisa.karhu@fcg.fi
Päivämäärä: 2021.04.13 10:58:19 +03'00'

Tarkastaja

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

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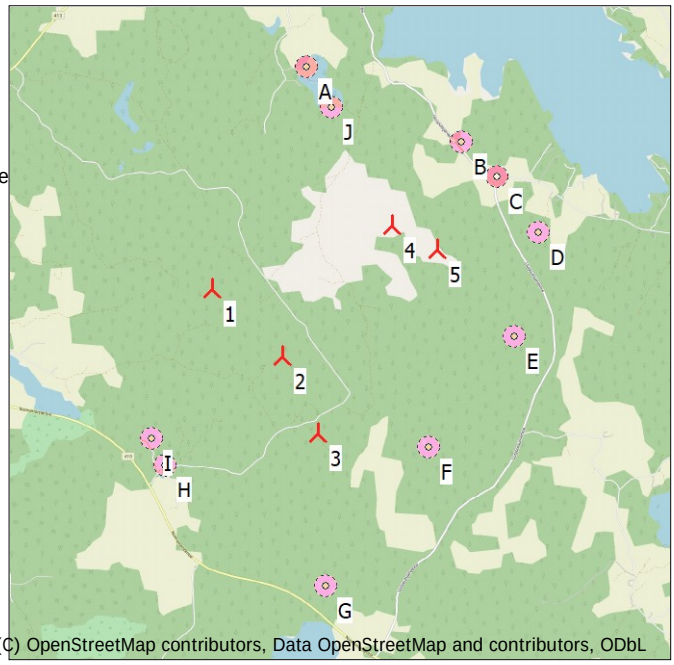
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
4.12.2020 13.45/3.4.388

DECIBEL - Main Result

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204

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

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:75 000
New WTG
Noise sensitive area

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]
1	434 606	6 818 356	128,3	Siemens Gamesa SG 6.0-1...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
2	435 295	6 817 678	125,4	Siemens Gamesa SG 6.0-1...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
3	435 636	6 816 917	118,6	Siemens Gamesa SG 6.0-1...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
4	436 407	6 818 963	135,0	Siemens Gamesa SG 6.0-1...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0
5	436 851	6 818 708	110,7	Siemens Gamesa SG 6.0-1...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	USER	(AM 0, 6.2MW) - 106dB(A)	8,0	106,0

Calculation Results

Sound level

Noise sensitive area No.	Name	East	North	Z [m]	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]
A	Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	4,0	40,0	29,9
B	Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	4,0	40,0	34,8
C	Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95,0	4,0	40,0	35,5
D	Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	4,0	40,0	34,1
E	Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	4,0	40,0	33,3
F	Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	4,0	40,0	33,7
G	Lomarakennus I (Mikkolanmdentie 24)	435 682	6 815 392	88,6	4,0	40,0	29,3
H	Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	4,0	40,0	31,6
I	Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	4,0	40,0	32,0
J	Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	4,0	40,0	32,0

Distances (m)

	WTG				
NSA	1	2	3	4	5
A	2403	2888	3635	1790	2238
B	2885	2782	3225	1083	1108
C	3041	2778	3100	1143	939
D	3288	2821	2952	1451	1016
E	3034	2306	2166	1636	1144
F	2652	1699	1101	2224	1950
G	3153	2318	1525	3644	3516

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DECIBEL - Main Result

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204

...continued from previous page

	WTG				
NSA	1	2	3	4	5
H	1801	1591	1564	3283	3449
I	1590	1530	1655	3188	3395
J	2158	2518	3229	1317	1766

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DECIBEL - Detailed results

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204Noise calculation model: ISO 9613-2 General 8,0 m/s

Assumptions

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

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

Calculation Results

Noise sensitive area: A Asuinrakennus B (Oksjärventie 150)

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	2 403	2 410	22,35	106,0	0,00	78,64	-	-	0,00	0,00	-
2	2 888	2 893	19,98	106,0	0,00	80,23	-	-	0,00	0,00	-
3	3 635	3 639	16,91	106,0	0,00	82,22	-	-	0,00	0,00	-
4	1 790	1 799	26,33	106,0	0,00	76,10	-	-	0,00	0,00	-
5	2 238	2 243	23,46	106,0	0,00	78,02	-	-	0,00	0,00	-
Sum			29,87								

- Data undefined due to calculation with octave data

Noise sensitive area: B Lomarakennus C (Uusjoutsjärventie 312)

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	2 885	2 890	19,14	106,0	0,00	80,22	-	-	0,00	0,00	-
2	2 782	2 787	19,59	106,0	0,00	79,90	-	-	0,00	0,00	-
3	3 225	3 229	17,57	106,0	0,00	81,18	-	-	0,00	0,00	-
4	1 083	1 097	31,57	106,0	0,00	71,80	-	-	0,00	0,00	-
5	1 108	1 118	31,33	106,0	0,00	71,97	-	-	0,00	0,00	-
Sum			34,81								

- Data undefined due to calculation with octave data

Noise sensitive area: C Asuinrakennus D (Uusjoutsjärventie 362)

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	3 041	3 045	18,37	106,0	0,00	80,67	-	-	0,00	0,00	-
2	2 778	2 783	19,60	106,0	0,00	79,89	-	-	0,00	0,00	-
3	3 100	3 104	18,11	106,0	0,00	80,84	-	-	0,00	0,00	-
4	1 143	1 156	30,92	106,0	0,00	72,26	-	-	0,00	0,00	-
5	939	950	33,25	106,0	0,00	70,56	-	-	0,00	0,00	-
Sum			35,53								

- Data undefined due to calculation with octave data

Noise sensitive area: D Lomarakennus E (Uusjoutsjärventie 450)

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	3 288	3 292	17,30	106,0	0,00	81,35	-	-	0,00	0,00	-
2	2 821	2 826	19,39	106,0	0,00	80,02	-	-	0,00	0,00	-
3	2 952	2 956	18,77	106,0	0,00	80,41	-	-	0,00	0,00	-
4	1 451	1 461	28,05	106,0	0,00	74,29	-	-	0,00	0,00	-

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DECIBEL - Detailed results

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204Noise 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]
5	1 016	1 026	32,35	106,0	0,00	71,22	-	-	0,00	0,00	-
Sum			34,10								

- Data undefined due to calculation with octave data

Noise sensitive area: E Asuinrakennus F (Ahorajantie 64)

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	3 034	3 039	18,40	106,0	0,00	80,65	-	-	0,00	0,00	-
2	2 306	2 312	22,09	106,0	0,00	78,28	-	-	0,00	0,00	-
3	2 166	2 172	22,93	106,0	0,00	77,74	-	-	0,00	0,00	-
4	1 636	1 645	26,54	106,0	0,00	75,32	-	-	0,00	0,00	-
5	1 144	1 154	30,95	106,0	0,00	72,24	-	-	0,00	0,00	-
Sum			33,27								

- Data undefined due to calculation with octave data

Noise sensitive area: F Asuinrakennus G (Uutelantie 82)

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	2 652	2 657	20,22	106,0	0,00	79,49	-	-	0,00	0,00	-
2	1 699	1 706	26,08	106,0	0,00	75,64	-	-	0,00	0,00	-
3	1 101	1 111	31,40	106,0	0,00	71,92	-	-	0,00	0,00	-
4	2 224	2 230	22,58	106,0	0,00	77,97	-	-	0,00	0,00	-
5	1 950	1 955	24,31	106,0	0,00	76,82	-	-	0,00	0,00	-
Sum			33,69								

- Data undefined due to calculation with octave data

Noise sensitive area: G Lomarakennus I (Mikkolanmdentie 24)

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	3 153	3 158	17,87	106,0	0,00	80,99	-	-	0,00	0,00	-
2	2 318	2 324	22,02	106,0	0,00	78,33	-	-	0,00	0,00	-
3	1 525	1 534	27,43	106,0	0,00	74,72	-	-	0,00	0,00	-
4	3 644	3 648	15,89	106,0	0,00	82,24	-	-	0,00	0,00	-
5	3 516	3 519	16,38	106,0	0,00	81,93	-	-	0,00	0,00	-
Sum			29,33								

- Data undefined due to calculation with octave data

Noise sensitive area: H Asuinrakennus J (Työlammentie 24)

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	1 801	1 809	25,32	106,0	0,00	76,15	-	-	0,00	0,00	-
2	1 591	1 600	26,90	106,0	0,00	75,08	-	-	0,00	0,00	-
3	1 564	1 571	27,13	106,0	0,00	74,93	-	-	0,00	0,00	-
4	3 283	3 288	17,32	106,0	0,00	81,34	-	-	0,00	0,00	-
5	3 449	3 453	16,64	106,0	0,00	81,76	-	-	0,00	0,00	-
Sum			31,60								

- Data undefined due to calculation with octave data

Noise sensitive area: I Lomarakennus K (Viitostie 31)

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	1 590	1 598	26,91	106,0	0,00	75,07	-	-	0,00	0,00	-
2	1 530	1 538	27,40	106,0	0,00	74,74	-	-	0,00	0,00	-
3	1 655	1 662	26,41	106,0	0,00	75,41	-	-	0,00	0,00	-

To be continued on next page...

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DECIBEL - Detailed results

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204Noise calculation model: ISO 9613-2 General 8,0 m/s

...continued from previous page

WTG

No.	Distance [m]	Sound distance [m]	Calculated [dB(A)]	LwA,ref [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
4	3 188	3 193	17,72	106,0	0,00	81,08	-	-	0,00	0,00	-
5	3 395	3 398	16,86	106,0	0,00	81,62	-	-	0,00	0,00	-
Sum			32,00								

- Data undefined due to calculation with octave data

Noise sensitive area: J Kaavoitettu asunto/loma-asunto A (Okslampi)

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	2 158	2 164	22,98	106,0	0,00	77,71	-	-	0,00	0,00	-
2	2 518	2 523	20,92	106,0	0,00	79,04	-	-	0,00	0,00	-
3	3 229	3 233	17,55	106,0	0,00	81,19	-	-	0,00	0,00	-
4	1 317	1 328	29,23	106,0	0,00	73,47	-	-	0,00	0,00	-
5	1 766	1 773	25,58	106,0	0,00	75,97	-	-	0,00	0,00	-
Sum			31,98								

- Data undefined due to calculation with octave data

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Calculated:
4.12.2020 13.45/3.4.388

DECIBEL - Assumptions for noise calculation

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204

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_Sysmä Rekolanvuori_20200912_6.w2r (3)
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
Noise sensitive area
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: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O!
Noise: (AM 0, 6.2MW) - 106dB(A)

Source	Source/Date	Creator	Edited
SGRE	19.3.2020	USER	4.12.2020 12.48

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					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	135,0	8,0	106,0	No	86,5	93,4	96,1	97,9	101,8	99,9	93,3	83,0

Noise sensitive area: A Asuinrakennus B (Oksjärventie 150)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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

Noise sensitive area: B Lomarakennus C (Uusjoutsjärventie 312)
Predefined calculation standard:
Immission height(a.g.l.): Use standard value from calculation model
Uncertainty margin: Use default value from calculation model

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

Noise sensitive area: C Asuinrakennus D (Uusjoutsjärventie 362)
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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DECIBEL - Assumptions for noise calculation

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204

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

Noise sensitive area: D Lomarakennus E (Uusjoutsjärventie 450)

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

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

Noise sensitive area: E Asuinrakennus F (Ahorajantie 64)

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

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

Noise sensitive area: F Asuinrakennus G (Uutelantie 82)

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 I (Mikkolanmdentie 24)

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

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

Noise sensitive area: H Asuinrakennus J (Työlammentie 24)

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 Lomarakennus K (Viitostie 31)

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 Kaavoitettu asunto/loma-asunto A (Okslampi)

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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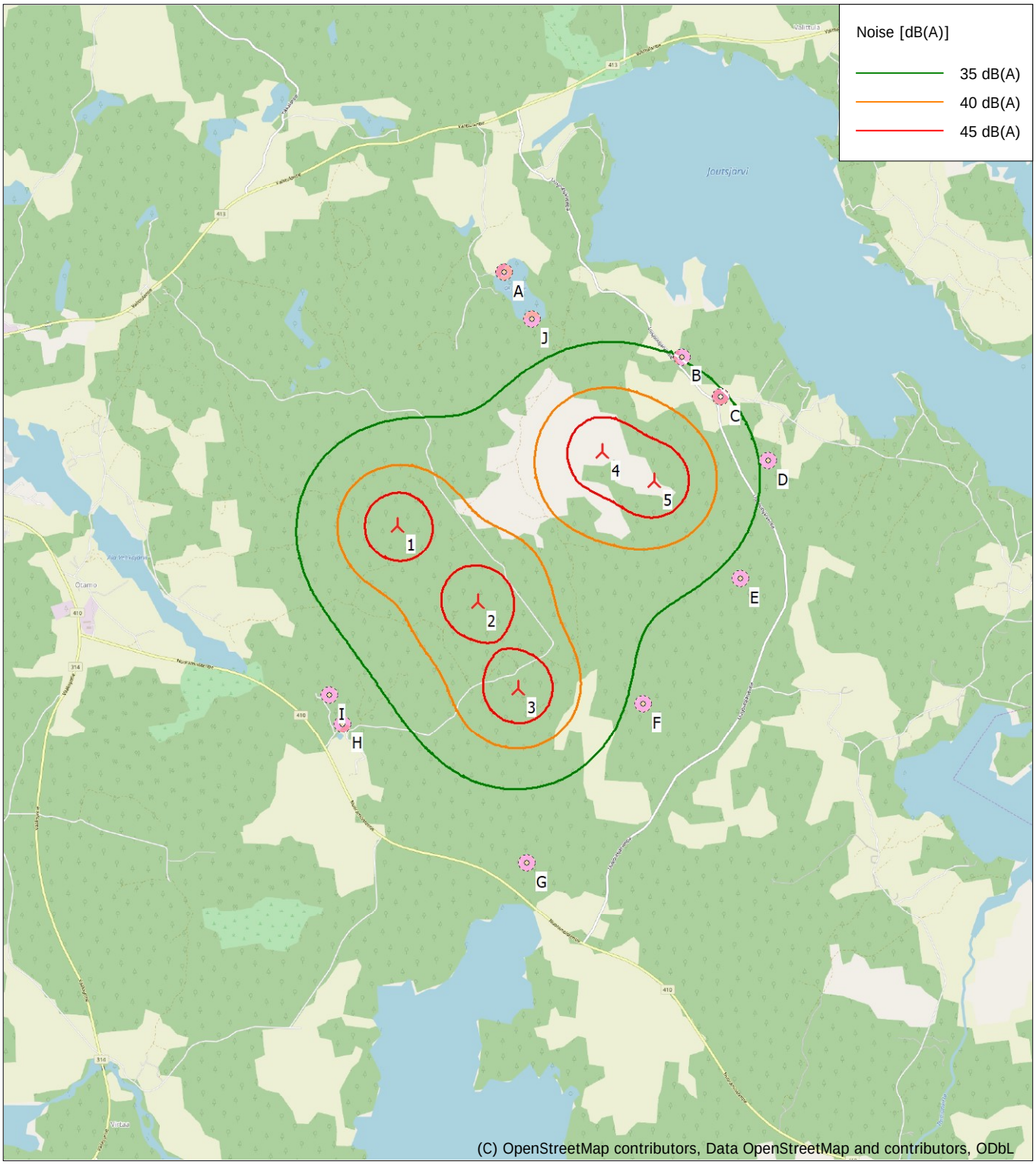
Calculated:
4.12.2020 13.45/3.4.388

DECIBEL - Map 8,0 m/s

Calculation: Rekolanvuori SG170-6,0MW x 5 x HH135_106,0dB_20201204



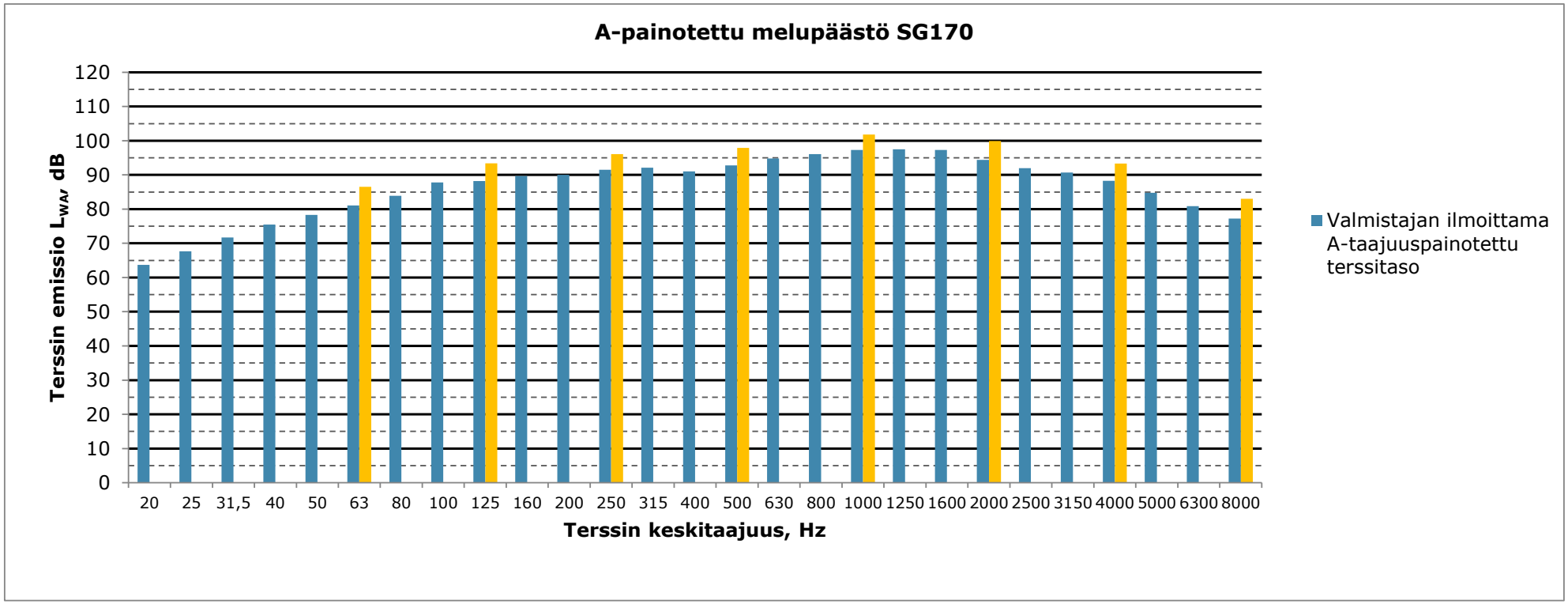
0 500 1000 1500 2000 m

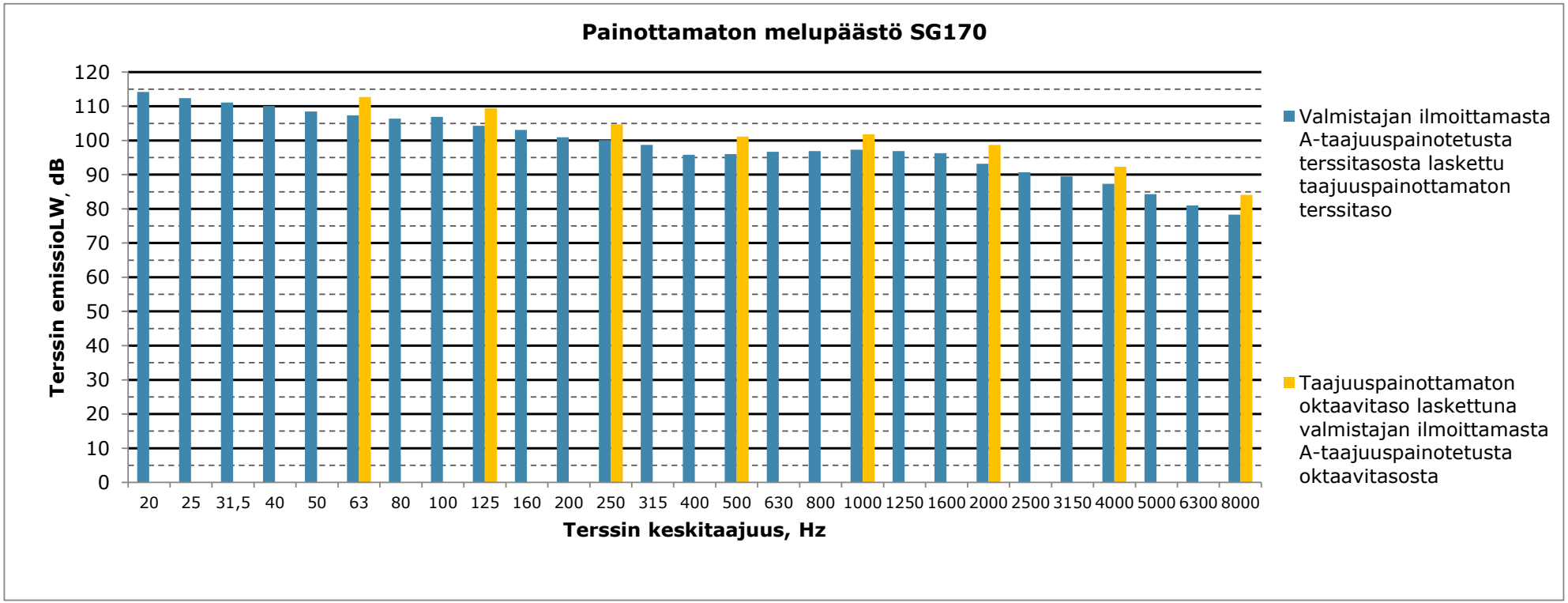
Map: EMD OpenStreetMap , Print scale 1:50 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 435 729 North: 6 817 940

New WTG Noise sensitive area

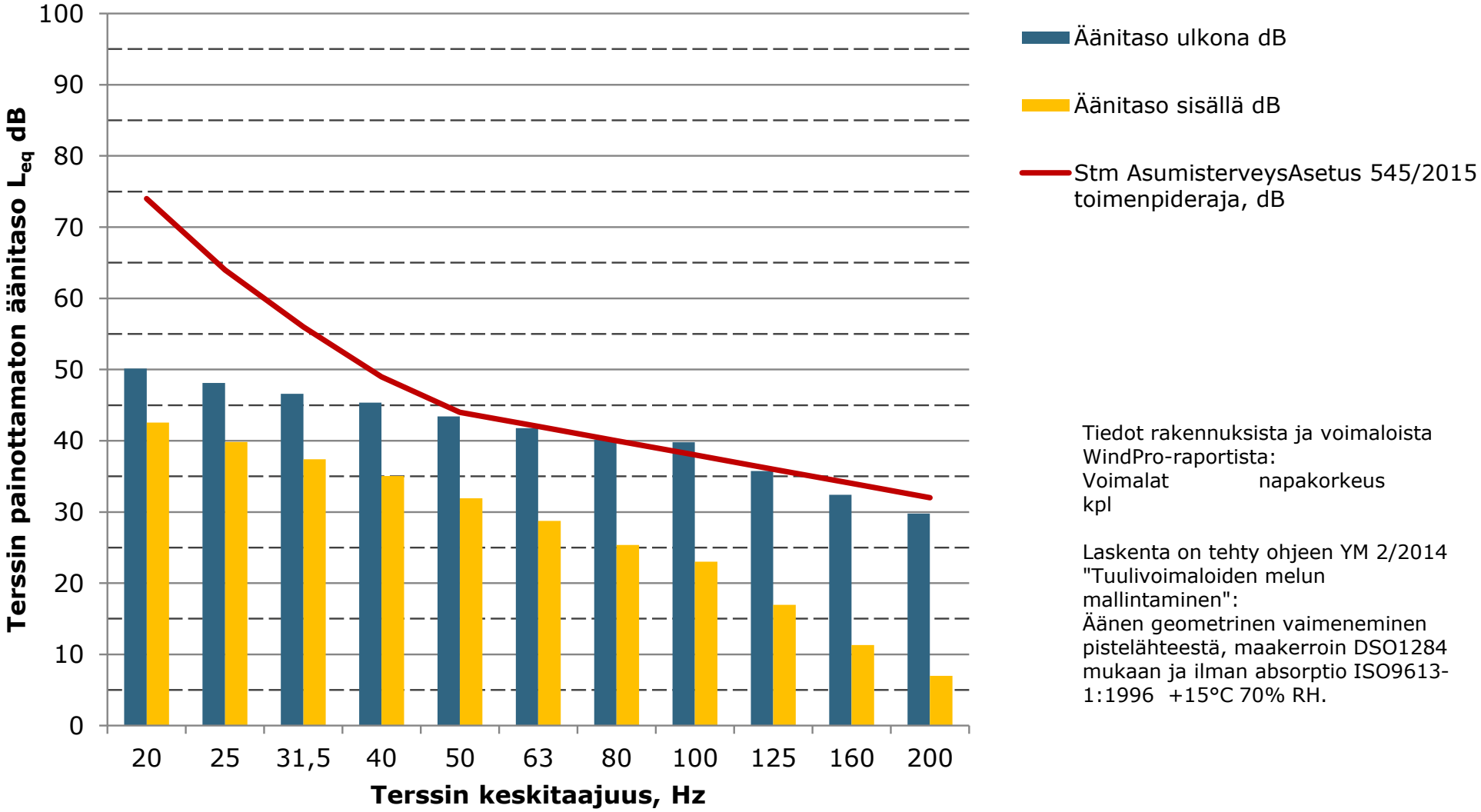
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

Liite 2: Rekolanvuorten tuulivoimahanke - Matalataajuisen melun rakennuskohtaiset arvot


A-painotettu melupäästö SG170
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


Painottamaton melupäästö SG170
Terssin emissioLW, dB
120
110
100
90
80
70
60
50
40
30
20
10
0
20 25 31,5 40 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 1600 2000 2500 3150 4000 5000 6300 8000
Terssin keskitaajuus, Hz
Valmistajan ilmoittamasta A-taajuuspainotetusta terssitasosta laskettu taajuuspainottamaton terssitaso
Taajuuspainottamaton oktaavitaso laskettuna valmistajan ilmoittamasta A-taajuuspainotetusta oktaavitasosta

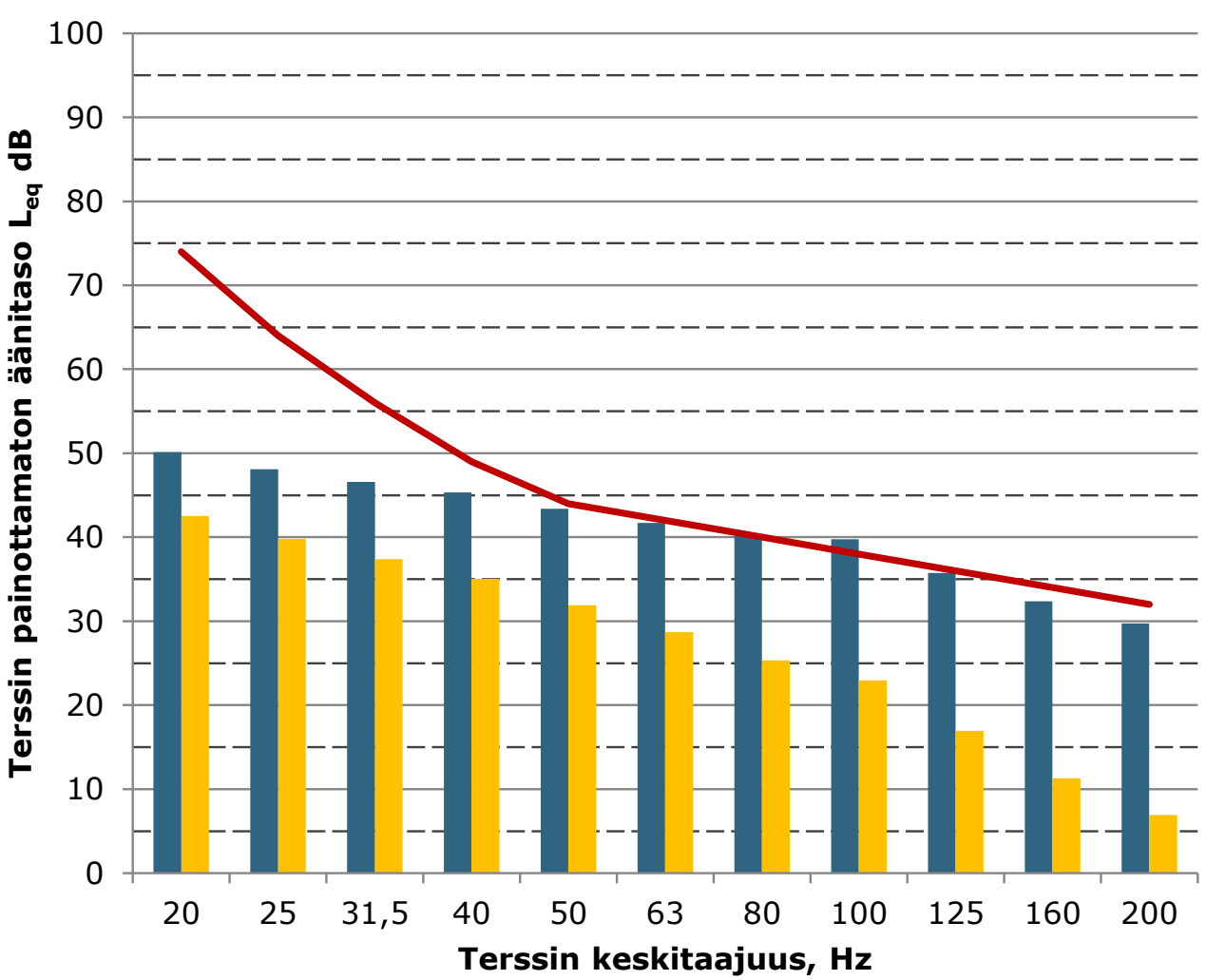
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus K (Viitostie 31), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

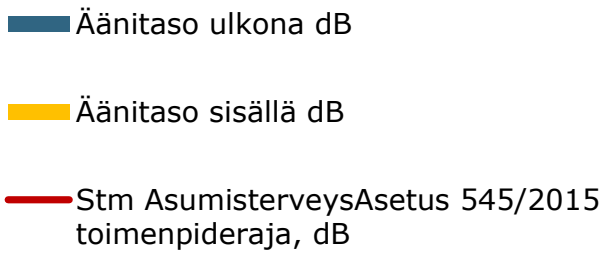


Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Kaavoitettu asunto/loma-asunto A (Okslampi), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

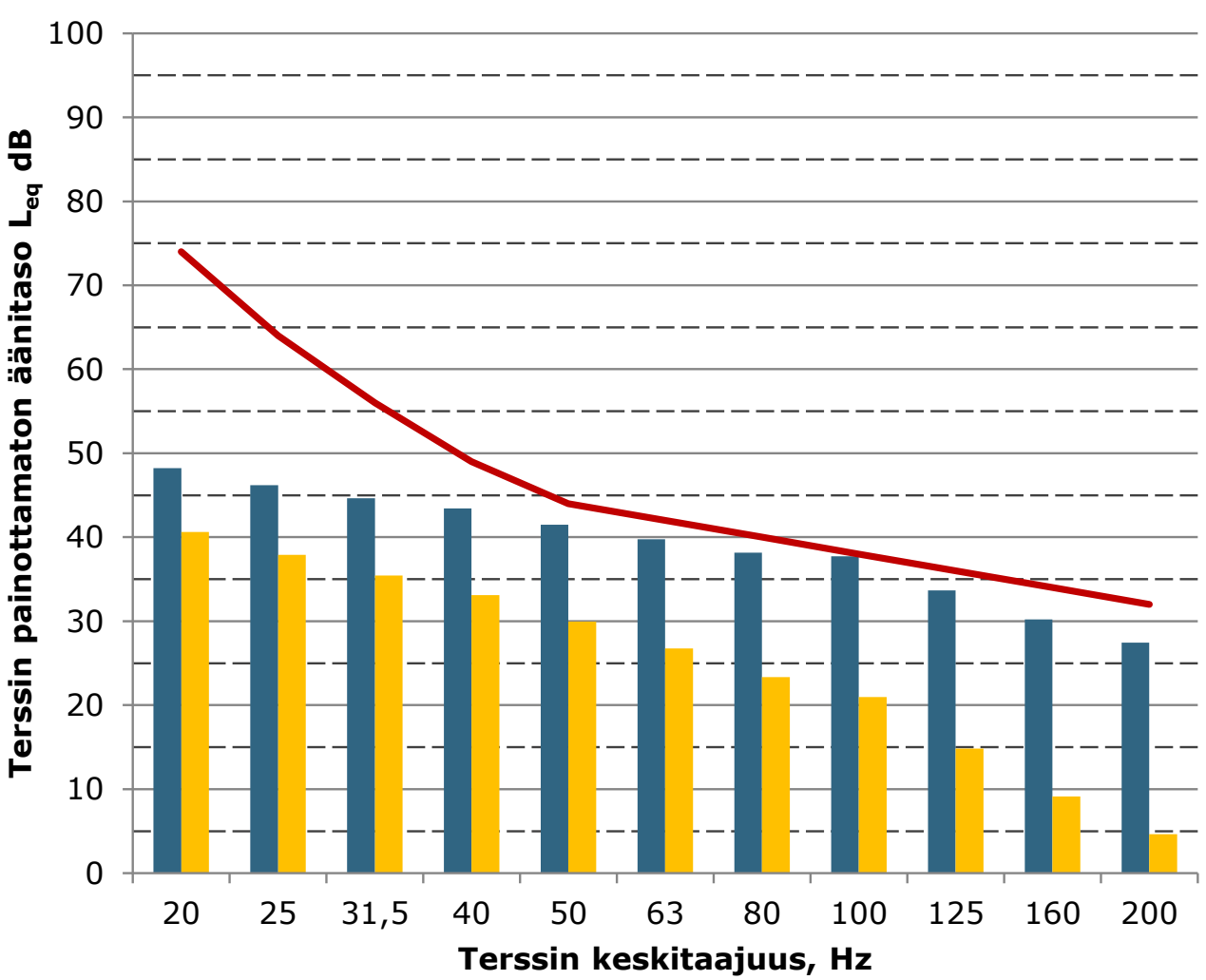




Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B (Oksjärventie 150), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

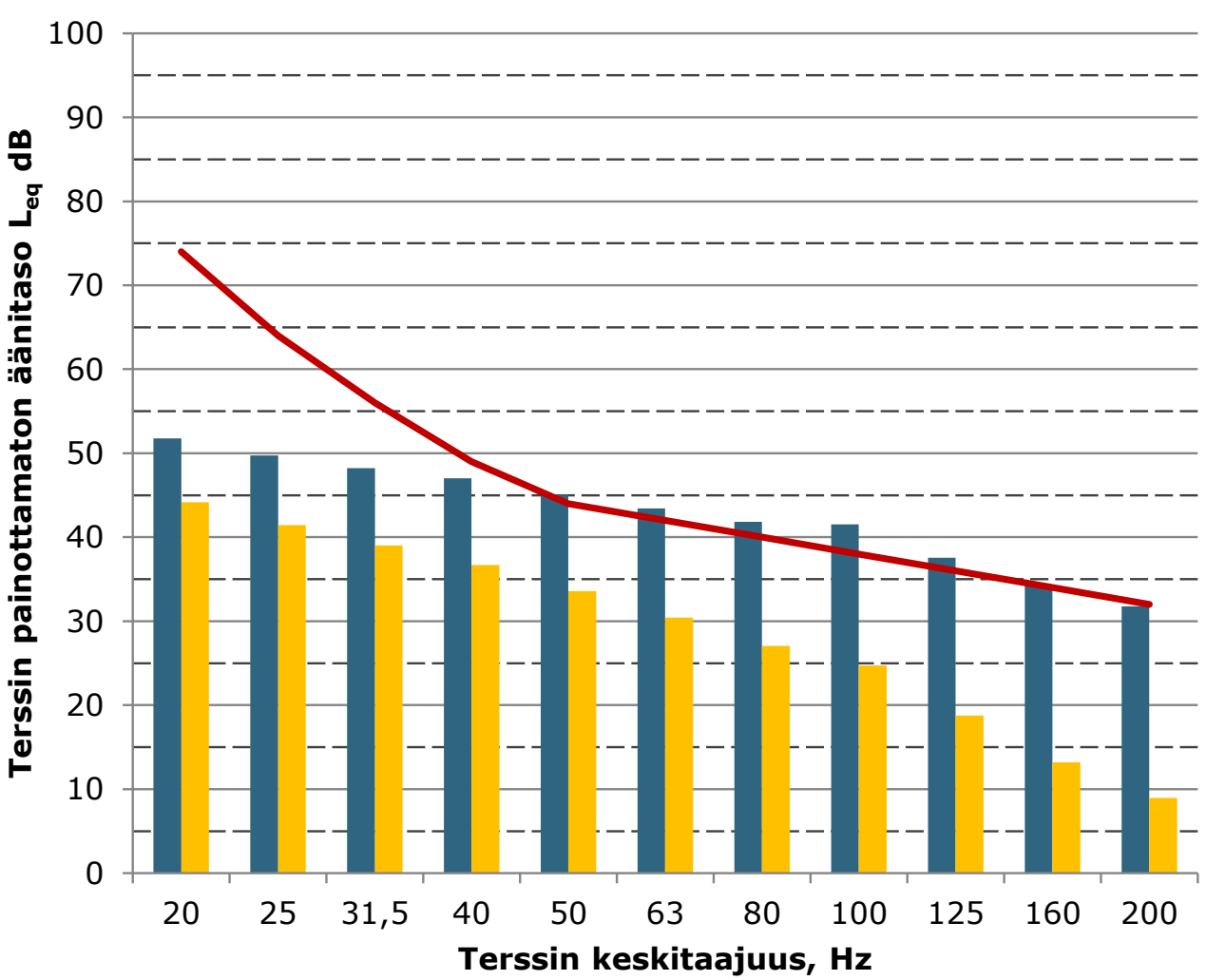
Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus C (Uusjoutsjärventie 312), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

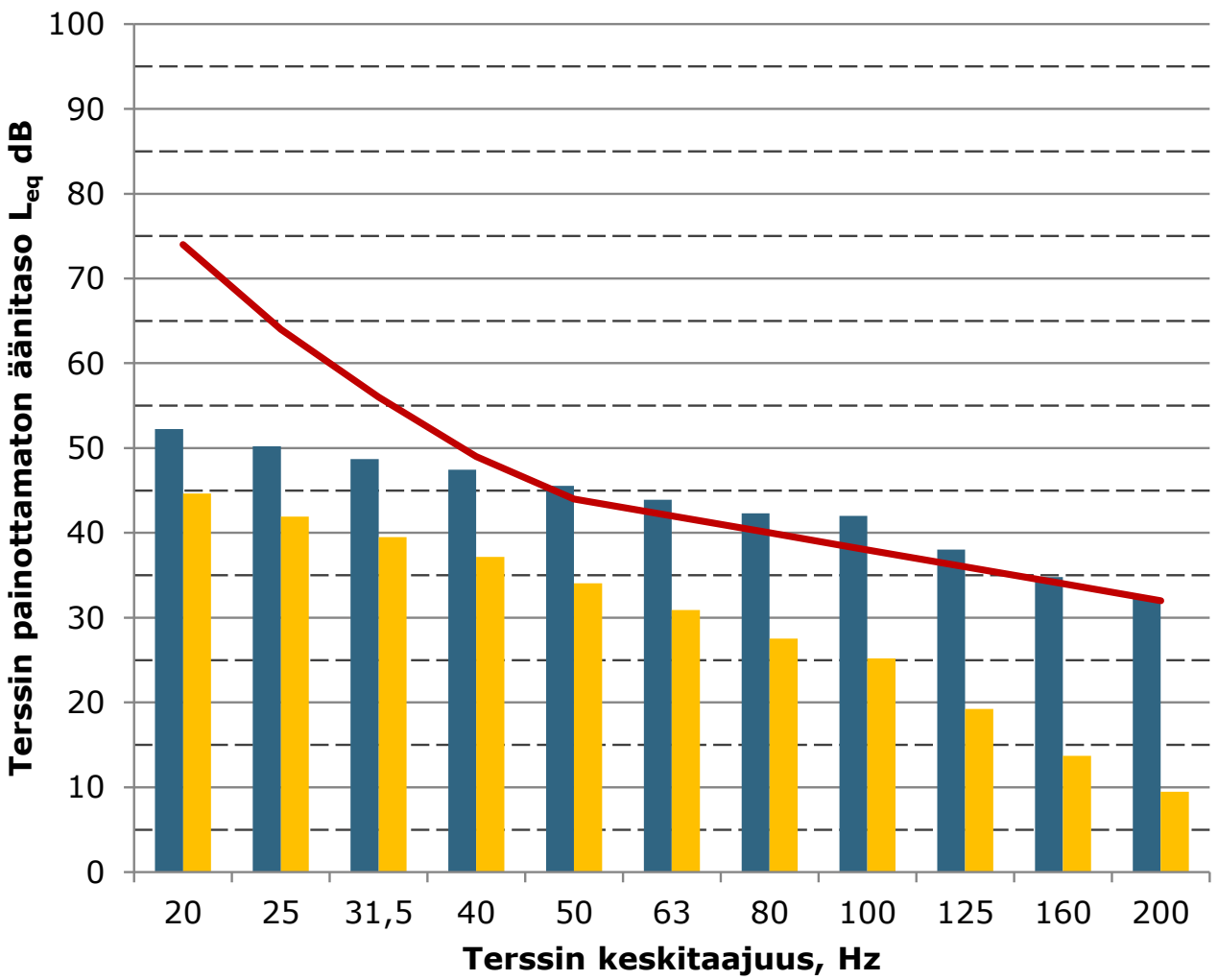
Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Uusjoutsjärventie 362), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

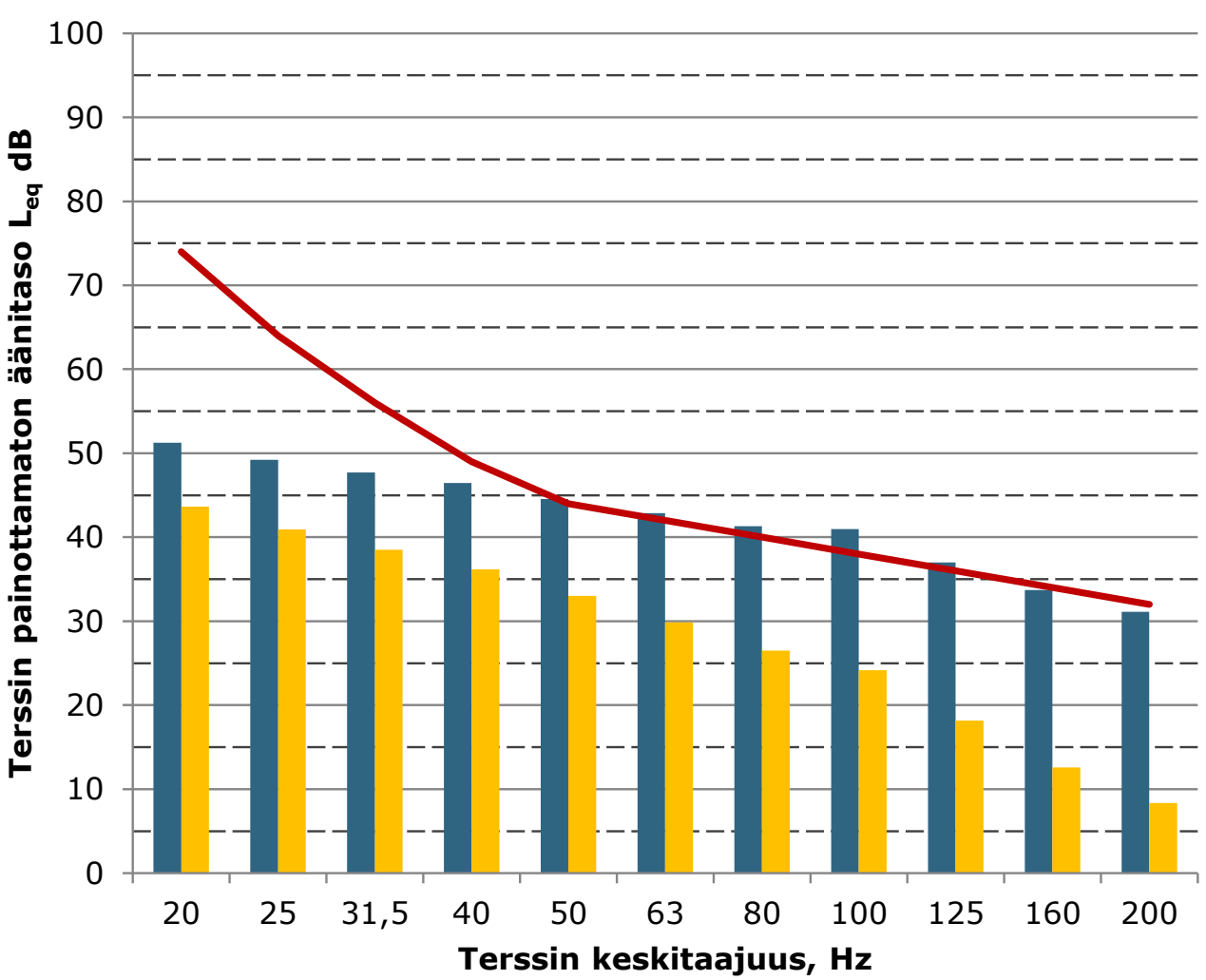
Äänitaso sisällä dB

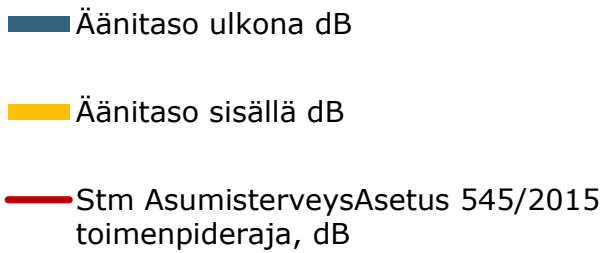
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus
kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus E (Uusjoutsjärventie 450), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

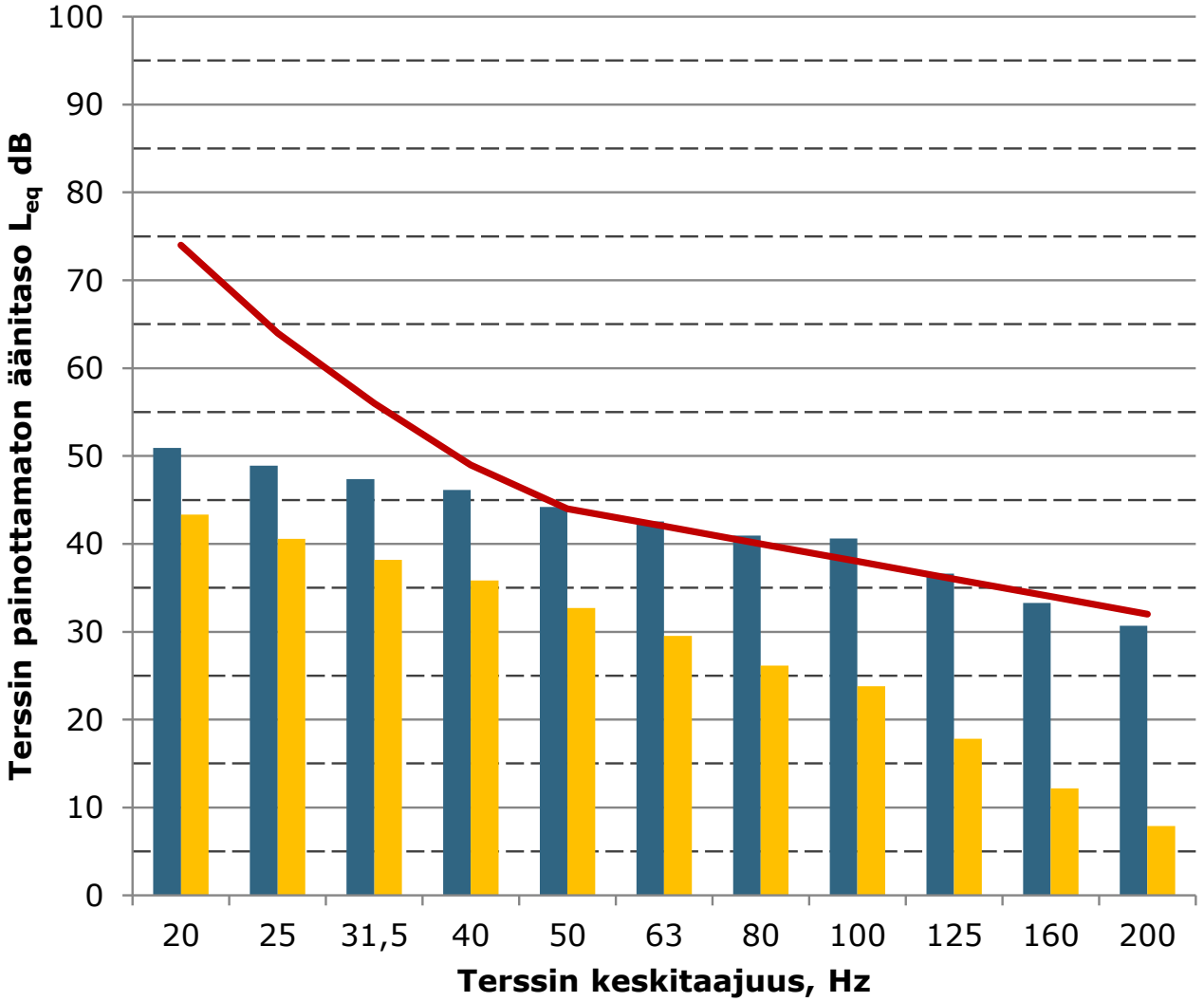




Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Ahorajantie 64), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

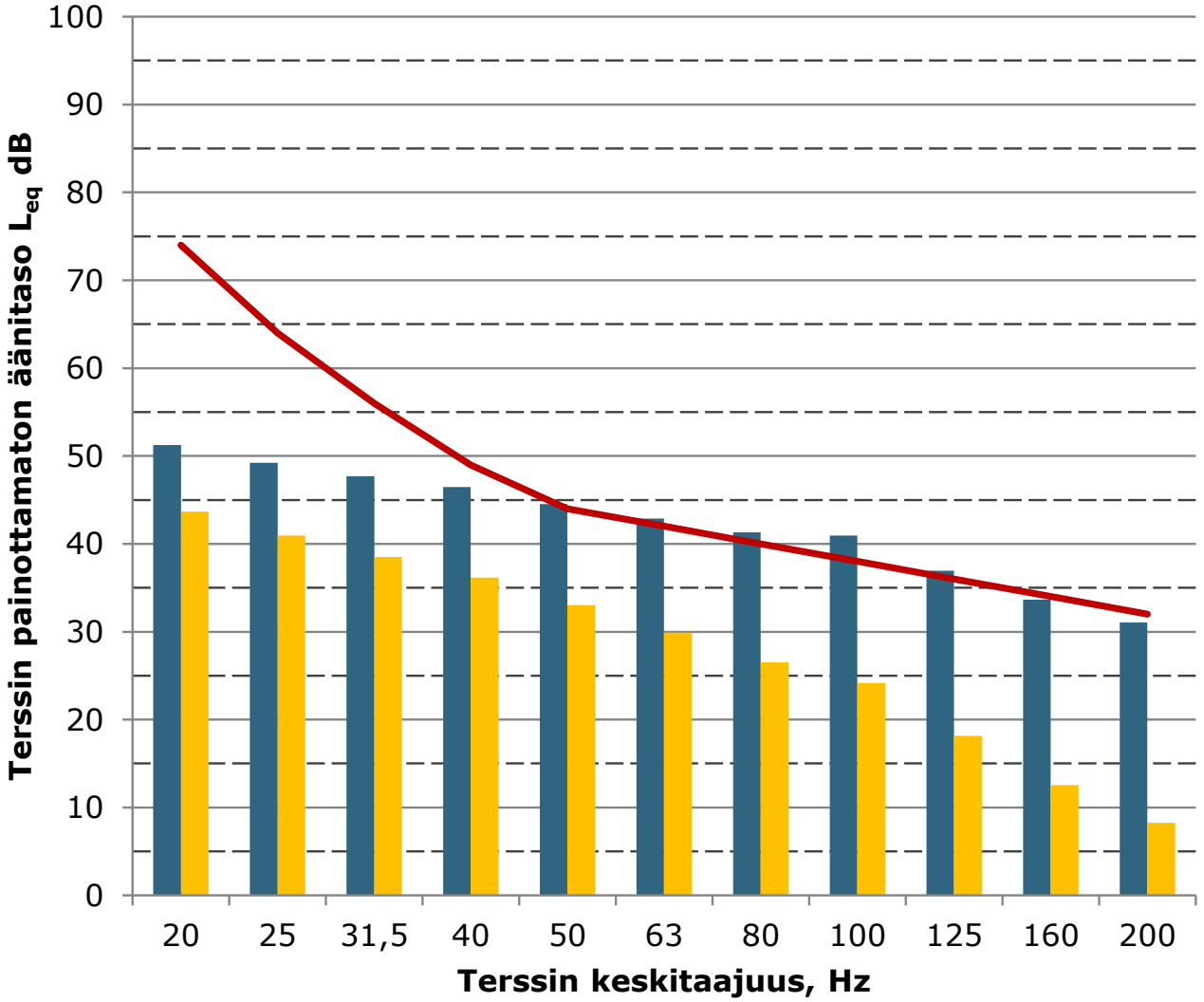
Äänitaso sisällä dB

Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus G (Uutelantie 82), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



Äänitaso ulkona dB

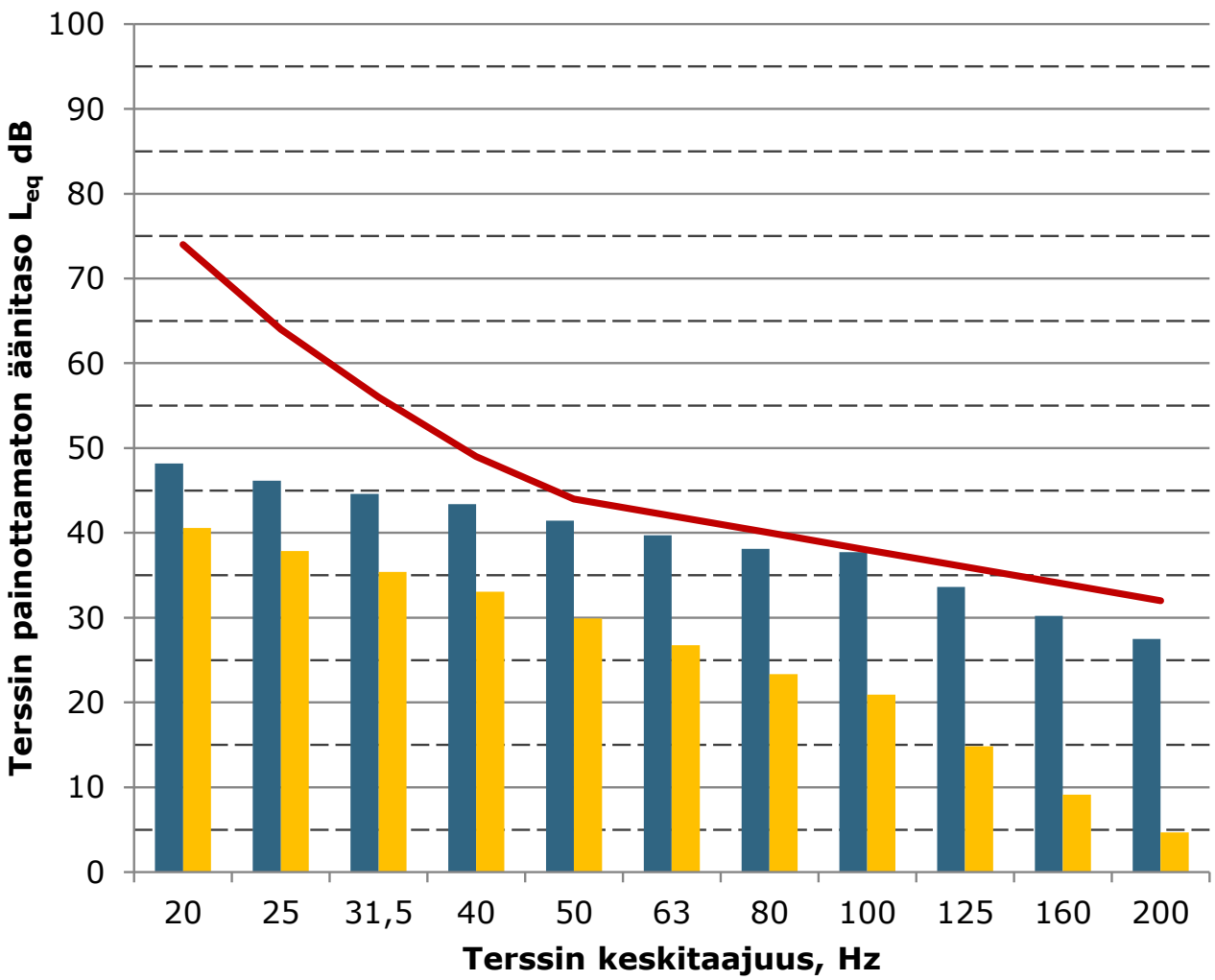
Äänitaso sisällä dB

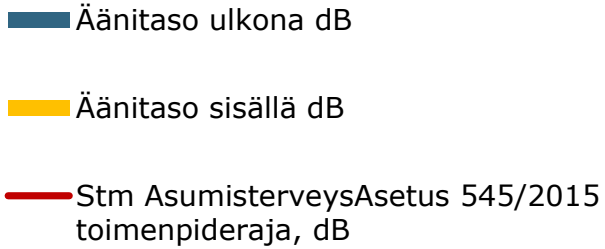
Stm AsumisterveysAsetus 545/2015 toimenpideraja, dB

Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus I (Mikkolanmdentie 24), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

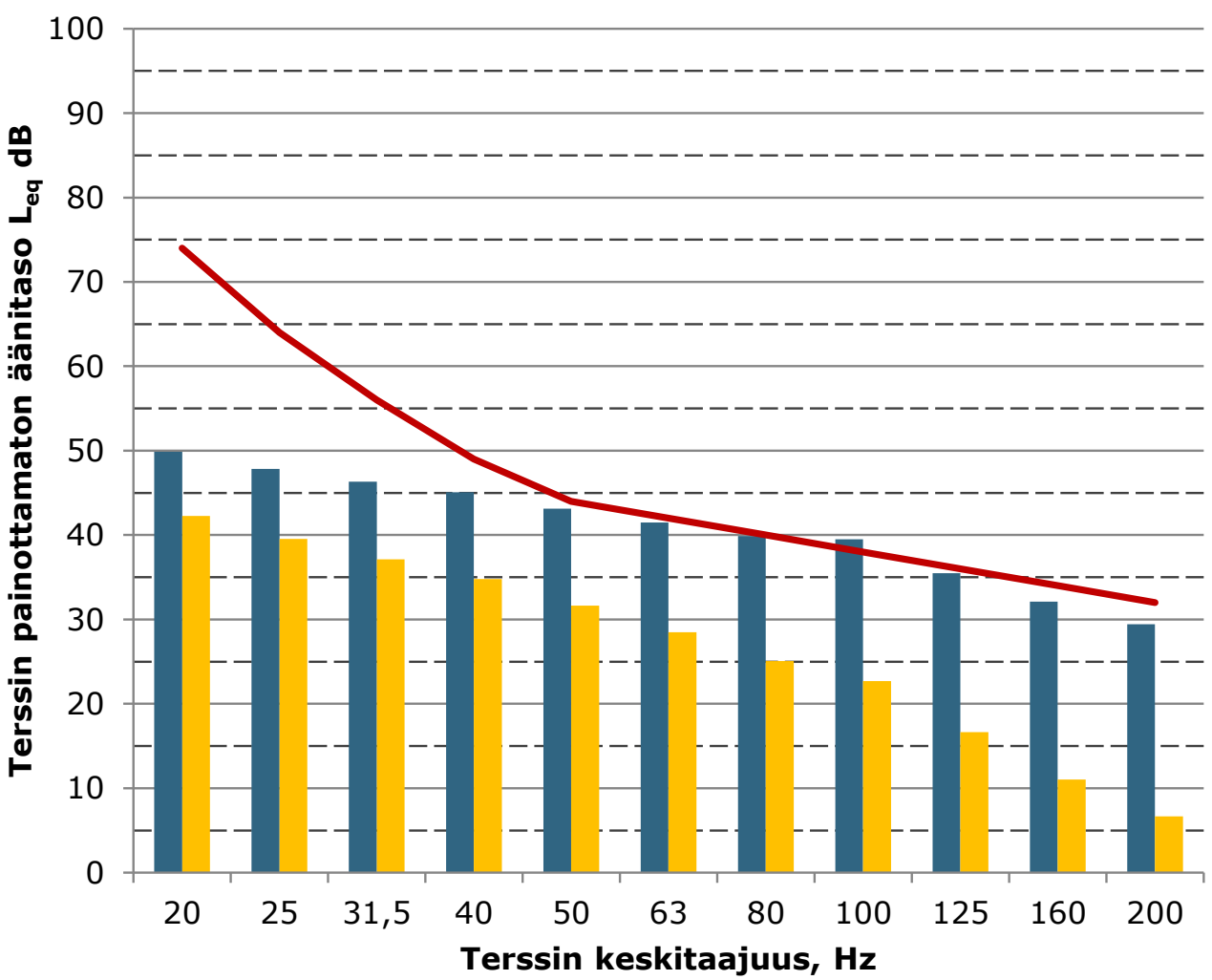


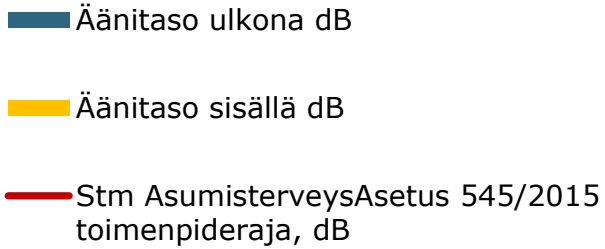


Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus J (Työlammentie 24), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan





Tiedot rakennuksista ja voimaloista WindPro-raportista:
Voimalat napakorkeus kpl

Laskenta on tehty ohjeen YM 2/2014 "Tuulivoimaloiden melun mallintaminen":
Äänen geometrinen vaimeneminen pistelähteestä, maakerroin DSO1284 mukaan ja ilman absorptio ISO9613-1:1996 +15°C 70% RH.

Liite 3: Rekolanvuorten tuulivoimahanke - Varjostusmallinnusten tulokset ”real case, no forest”

Project:
Sysmä Rekolanvuoret_20200912

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Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

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) [JOKIOINEN]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational hours are calculated from WTGs in calculation and wind distribution:
Default Meteo data description (3)

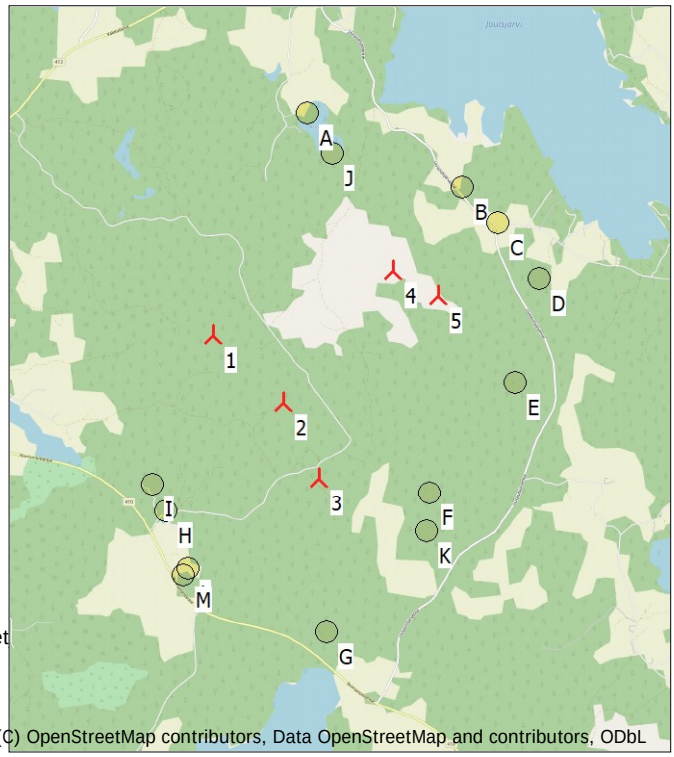
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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_Sysmä Rekolanvuoret
Obstacles used in calculation
Eye height for map: 1,5 m
Grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:75 000
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	434 606	6 818 356	128,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
2	435 295	6 817 678	125,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
3	435 636	6 816 917	118,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
4	436 407	6 818 963	135,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
5	436 851	6 818 708	110,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus I (Mikkolanmäentie 24)	435 682	6 815 392	88,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus H (Nurmela)	436 699	6 816 377	95,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Mäntymäki)	434 318	6 816 045	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Mäntymäki)	434 265	6 815 982	89,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus B (Oksjärventie 150)	1:43
B	Lomarakennus C (Uusjoutsjärventie 312)	10:01
C	Asuinrakennus D (Uusjoutsjärventie 362)	9:46
D	Lomarakennus E (Uusjoutsjärventie 450)	8:13
E	Asuinrakennus F (Ahorajantie 64)	5:03
F	Asuinrakennus G (Uutelantie 82)	11:00
G	Lomarakennus I (Mikkolanmäentie 24)	0:00
H	Asuinrakennus J (Työlammentie 24)	8:30
I	Lomarakennus K (Viitostie 31)	9:44
J	Kaavoitettu asunto/loma-asunto A (Okslampi)	4:26
K	Lomarakennus H (Nurmela)	15:10
L	Asuinrakennus L (Mäntymäki)	8:48
M	Lomarakennus M (Mäntymäki)	8:03

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (6)	0:00	0:00
2	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)	82:26	23:34
3	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)	116:30	30:44
4	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)	106:50	19:48
5	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)	124:02	18:05

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

Project:
Sysmä Rekolanvuoret_20200912

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: A - Asuinrakennus B (Oksjärventie 150)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January		February		March	April	May	June	July	August	September	October	November		December	
1	09.35		08.42	10.22 (4)	07.22	06.43	05.10	03.52	03.40	04.45	06.06	07.21	07.44		09.04	10.01 (4)
	15.06		16.20 15	10.37 (4)	17.39	20.01	21.21	22.40	23.01	22.01	20.28	18.52	16.17		15.08 9	10.10 (4)
2	09.35		08.40	10.23 (4)	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.47		09.06	10.04 (4)
	15.08		16.23 11	10.34 (4)	17.42	20.04	21.24	22.42	23.01	21.58	20.25	18.49	16.14		15.06 5	10.09 (4)
3	09.34		08.37	10.26 (4)	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.27	07.49		09.08	
	15.09		16.26 5	10.31 (4)	17.45	20.07	21.27	22.44	23.00	21.56	20.22	18.45	16.12		15.05	
4	09.33		08.35		07.13	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52		09.10	
	15.11		16.29		17.47	20.09	21.29	22.45	22.59	21.53	20.18	18.42	16.09		15.04	
5	09.33		08.32		07.09	06.31	04.58	03.45	03.45	04.55	06.16	07.32	07.55		09.12	
	15.13		16.32		17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06		15.02	
6	09.32		08.29		07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58		09.14	
	15.15		16.35		17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03		15.01	
7	09.31		08.26		07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.01		09.16	
	15.17		16.38		17.55	20.17	21.38	22.51	22.55	21.44	20.09	18.33	16.01		15.00	
8	09.29		08.24		07.00	06.21	04.50	03.41	03.50	05.03	06.23	07.39	08.03	09.56 (4)	09.18	
	15.19		16.40		17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58 6	10.02 (4)	14.59	
9	09.28		08.21		06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.53 (4)	09.20	
	15.21		16.43		18.01	20.22	21.43	22.54	22.52	21.39	20.02	18.26	15.55 12	10.05 (4)	14.58	
10	09.27	10.21 (4)	08.18		06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45	08.09	09.52 (4)	09.22	
	15.23 5	10.26 (4)	16.46		18.03	20.25	21.46	22.55	22.50	21.36	19.59	18.23	15.53 16	10.08 (4)	14.58	
11	09.25	10.19 (4)	08.15		06.51	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.12	09.51 (4)	09.23	
	15.25 9	10.28 (4)	16.49		18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20	15.50 18	10.09 (4)	14.57	
12	09.24	10.17 (4)	08.13		06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.50 (4)	09.25	
	15.27 12	10.29 (4)	16.52		18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48 20	10.10 (4)	14.56	
13	09.22	10.16 (4)	08.10		06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17	09.50 (4)	09.26	
	15.30 15	10.31 (4)	16.55		18.11	20.33	21.54	22.59	22.45	21.27	19.50	18.14	15.45 21	10.11 (4)	14.56	
14	09.21	10.16 (4)	08.07		06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.50 (4)	09.28	
	15.32 16	10.32 (4)	16.57		18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43 22	10.12 (4)	14.55	
15	09.19	10.15 (4)	08.04		06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58	08.23	09.49 (4)	09.29	
	15.35 18	10.33 (4)	17.00		18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40 23	10.12 (4)	14.55	
16	09.17	10.15 (4)	08.01		06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.49 (4)	09.30	
	15.37 19	10.34 (4)	17.03		18.19	20.41	22.01	23.02	22.39	21.18	19.40	18.05	15.38 23	10.12 (4)	14.55	
17	09.16	10.15 (4)	07.58		06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.49 (4)	09.31	
	15.40 20	10.35 (4)	17.06		18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.35 24	10.13 (4)	14.55	
18	09.14	10.15 (4)	07.55		06.28	05.49	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.49 (4)	09.32	
	15.42 21	10.36 (4)	17.09		18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59	15.33 24	10.13 (4)	14.55	
19	09.12	10.15 (4)	07.52		06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.34	09.49 (4)	09.33	
	15.45 22	10.37 (4)	17.12		18.27	20.49	22.09	23.04	22.33	21.09	19.30	17.55	15.31 24	10.13 (4)	14.55	
20	09.10	10.14 (4)	07.49		06.22	05.43	04.18	03.34	04.15	05.34	06.54	08.11	08.36	09.50 (4)	09.34	
	15.47 23	10.37 (4)	17.14		18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.52	15.29 24	10.14 (4)	14.55	
21	09.08	10.14 (4)	07.46		06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.50 (4)	09.35	
	15.50 23	10.37 (4)	17.17		18.33	20.54	22.14	23.04	22.29	21.02	19.24	17.49	15.27 23	10.13 (4)	14.55	
22	09.06	10.15 (4)	07.43		06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16	08.42	09.50 (4)	09.35	
	15.53 24	10.39 (4)	17.20		18.35	20.57	22.17	23.05	22.26	20.59	19.21	17.46	15.24 23	10.13 (4)	14.56	
23	09.04	10.15 (4)	07.40		06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.51 (4)	09.36	
	15.55 24	10.39 (4)	17.23		18.38	21.00	22.19	23.05	22.24	20.56	19.17	17.43	15.22 22	10.13 (4)	14.56	
24	09.01	10.15 (4)	07.37		06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22	08.47	09.52 (4)	09.36	
	15.58 24	10.39 (4)	17.25		18.40	21.02	22.22	23.05	22.22	20.53	19.14	17.40	15.20 21	10.13 (4)	14.57	
25	08.59	10.15 (4)	07.34		06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.25	08.49	09.53 (4)	09.37	
	16.01 24	10.39 (4)	17.28		18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18 20	10.13 (4)	14.58	
26	08.57	10.16 (4)	07.31		06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27	08.52	09.53 (4)	09.37	
	16.04 23	10.39 (4)	17.31		18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.34	15.16 20	10.13 (4)	14.58	
27	08.55	10.16 (4)	07.28		05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.54 (4)	09.37	
	16.06 23	10.39 (4)	17.34		18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32	15.15 18	10.12 (4)	14.59	
28	08.52	10.17 (4)	07.25		05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.55 (4)	09.37	
	16.09 22	10.39 (4)	17.36		18.51	21.13	22.31	23.03	22.12	20.41	19.01	16.29	15.13 17	10.12 (4)	15.00	
29	08.50	10.18 (4)			06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.57 (4)	09.37	
	16.12 21	10.39 (4)			19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.11 15	10.12 (4)	15.02	
30	08.47	10.19 (4)			06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.59 (4)	09.36	
	16.15 20	10.39 (4)			19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23	15.10 12	10.11 (4)	15.03	
31	08.45	10.20 (4)			06.47		03.54		04.42	06.03		07.41			09.36	
	16.18 18	10.38 (4)			19.59		22.37		22.04	20.31		16.20			15.04	
Potential sun hours	198		249		364	441	543	579	573	493	390	312	218		172	
Total, worst case		426		31										448		14
Sun reduction		0,18		0,29										0,16		0,16
Oper. time red.		0,98		0,98										0,98		0,98
Wind dir. red.		0,66		0,66										0,66		0,66
Total reduction		0,12		0,19										0,10		0,10
Total, real		50		6										47		1

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

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

Project:
Sysmä Rekolanvuoret_20200912

Licensed user:
FCG Suunnittelu ja tekniikka Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka Rintamäki / henna-riikka.rintamaki@fcg.fi
Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: B - Lomarakennus C (Uusjoutsjärventie 312)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January		February		March	April	May	June	July	August	September	October		November		December	
1	09.35	12.57 (5)	08.42		13.08 (5)	07.22	06.43	05.10	03.52	03.40	04.44	06.05	07.21		07.44	14.23 (4)	09.04	12.40 (5)
	15.06	30 13.27 (5)	16.20	43	15.17 (4)	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52		16.17	36 14.59 (4)	15.08	36 13.16 (5)
2	09.35	12.57 (5)	08.40		13.10 (5)	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24		07.46	14.24 (4)	09.06	12.41 (5)
	15.08	31 13.28 (5)	16.23	45	15.20 (4)	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49		16.14	34 14.58 (4)	15.06	35 13.16 (5)
3	09.34	12.58 (5)	08.37		13.11 (5)	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.26		07.49	14.24 (4)	09.08	12.42 (5)
	15.09	31 13.29 (5)	16.26	47	15.22 (4)	17.45	20.06	21.27	22.43	22.59	21.55	20.22	18.45		16.11	34 14.58 (4)	15.05	35 13.17 (5)
4	09.33	12.58 (5)	08.34		13.14 (5)	07.12	06.34	05.01	03.47	03.44	04.52	06.13	07.29		07.52	14.24 (4)	09.10	12.42 (5)
	15.11	31 13.29 (5)	16.29	45	15.24 (4)	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42		16.09	33 14.57 (4)	15.04	35 13.17 (5)
5	09.32	12.58 (5)	08.32		13.17 (5)	07.09	06.30	04.58	03.45	03.45	04.55	06.16	07.32		07.55	14.25 (4)	09.12	12.43 (5)
	15.13	33 13.31 (5)	16.32	42	15.25 (4)	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39		16.06	31 14.56 (4)	15.02	34 13.17 (5)
6	09.31	12.58 (5)	08.29		14.55 (4)	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34		07.58	12.47 (5)	09.14	12.44 (5)
	15.15	33 13.31 (5)	16.35	31	15.26 (4)	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36		16.03	43 14.56 (4)	15.01	34 13.18 (5)
7	09.30	12.58 (5)	08.26		14.55 (4)	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37		08.00	12.44 (5)	09.16	12.45 (5)
	15.17	34 13.32 (5)	16.37	32	15.27 (4)	17.55	20.17	21.37	22.50	22.55	21.44	20.09	18.33		16.01	45 14.54 (4)	15.00	32 13.17 (5)
8	09.29	12.58 (5)	08.24		14.54 (4)	07.00	06.21	04.49	03.41	03.50	05.03	06.23	07.39		08.03	12.42 (5)	09.18	12.46 (5)
	15.19	35 13.33 (5)	16.40	34	15.28 (4)	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.29		15.58	47 14.53 (4)	14.59	32 13.18 (5)
9	09.28	12.58 (5)	08.21		14.54 (4)	06.57	06.18	04.47	03.40	03.52	05.05	06.26	07.42		08.06	12.40 (5)	09.20	12.46 (5)
	15.21	35 13.33 (5)	16.43	35	15.29 (4)	18.01	20.22	21.43	22.54	22.52	21.38	20.02	18.26		15.55	46 14.51 (4)	14.58	31 13.17 (5)
10	09.27	12.59 (5)	08.18		14.54 (4)	06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45		08.09	12.40 (5)	09.22	12.46 (5)
	15.23	35 13.34 (5)	16.46	36	15.30 (4)	18.03	20.25	21.45	22.55	22.50	21.35	19.59	18.23		15.53	43 14.49 (4)	14.57	31 13.17 (5)
11	09.25	12.59 (5)	08.15		14.53 (4)	06.50	06.11	04.41	03.38	03.55	05.11	06.31	07.47		08.12	12.39 (5)	09.23	12.48 (5)
	15.25	36 13.35 (5)	16.49	36	15.29 (4)	18.06	20.27	21.48	22.56	22.49	21.33	19.56	18.20		15.50	38 14.45 (4)	14.57	30 13.18 (5)
12	09.24	12.58 (5)	08.12		14.52 (4)	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50		08.14	12.38 (5)	09.25	12.49 (5)
	15.27	37 13.35 (5)	16.52	38	15.30 (4)	18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17		15.48	32 13.10 (5)	14.56	29 13.18 (5)
13	09.22	12.59 (5)	08.10		14.52 (4)	06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52		08.17	12.37 (5)	09.26	12.49 (5)
	15.30	37 13.36 (5)	16.55	38	15.30 (4)	18.11	20.33	21.53	22.59	22.45	21.27	19.49	18.14		15.45	33 13.10 (5)	14.56	29 13.18 (5)
14	09.21	13.00 (5)	08.07		14.53 (4)	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55		08.20	12.37 (5)	09.28	12.49 (5)
	15.32	37 13.37 (5)	16.57	37	15.30 (4)	18.14	20.35	21.56	23.00	22.43	21.24	19.46	18.11		15.43	35 13.12 (5)	14.55	29 13.18 (5)
15	09.19	12.59 (5)	08.04		14.53 (4)	06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58		15.40 (4)	08.23	12.36 (5)	09.29	12.50 (5)
	15.34	38 13.37 (5)	17.00	37	15.30 (4)	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	7	15.47 (4)	15.40	36 13.12 (5)	14.55	28 13.18 (5)
16	09.17	13.00 (5)	08.01		14.53 (4)	06.35	05.56	04.28	03.34	04.06	05.24	06.43	08.00		15.35 (4)	08.25	12.36 (5)	09.30	12.51 (5)
	15.37	38 13.38 (5)	17.03	37	15.30 (4)	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	17	15.52 (4)	15.38	36 13.12 (5)	14.55	28 13.19 (5)
17	09.15	13.00 (5)	07.58		14.52 (4)	06.31	05.52	04.25	03.34	04.08	05.26	06.46	08.03		15.31 (4)	08.28	12.36 (5)	09.31	12.52 (5)
	15.39	38 13.38 (5)	17.06	37	15.29 (4)	18.22	20.43	22.04	23.02	22.37	21.15	19.37	18.01	22	15.53 (4)	15.35	38 13.14 (5)	14.55	27 13.19 (5)
18	09.14	13.00 (5)	07.55		14.53 (4)	06.28	05.49	04.23	03.34	04.10	05.29	06.48	08.06		15.29 (4)	08.31	12.36 (5)	09.32	12.52 (5)
	15.42	38 13.38 (5)	17.09	36	15.29 (4)	18.25	20.46	22.06	23.03	22.35	21.12	19.33	17.58	26	15.55 (4)	15.33	38 13.14 (5)	14.55	27 13.19 (5)
19	09.12	13.01 (5)	07.52		14.54 (4)	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08		15.28 (4)	08.33	12.36 (5)	09.33	12.53 (5)
	15.45	38 13.39 (5)	17.11	35	15.29 (4)	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.55	28	15.56 (4)	15.31	38 13.14 (5)	14.55	26 13.19 (5)
20	09.10	13.01 (5)	07.49		14.54 (4)	06.22	05.43	04.18	03.34	04.15	05.34	06.53	08.11		15.26 (4)	08.36	12.36 (5)	09.34	12.53 (5)
	15.47	38 13.39 (5)	17.14	34	15.28 (4)	18.30	20.51	22.12	23.04	22.31	21.05	19.27	17.52	31	15.57 (4)	15.29	38 13.14 (5)	14.55	27 13.20 (5)
21	09.08	13.01 (5)	07.46		14.55 (4)	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14		15.25 (4)	08.39	12.37 (5)	09.35	12.54 (5)
	15.50	38 13.39 (5)	17.17	33	15.28 (4)	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.49	33	15.58 (4)	15.26	38 13.15 (5)	14.55	27 13.21 (5)
22	09.06	13.02 (5)	07.43		14.56 (4)	06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16		15.24 (4)	08.41	12.37 (5)	09.35	12.54 (5)
	15.53	38 13.40 (5)	17.20	30	15.26 (4)	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46	34	15.58 (4)	15.24	38 13.15 (5)	14.56	27 13.21 (5)
23	09.03	13.02 (5)	07.40		14.57 (4)	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19		15.24 (4)	08.44	12.37 (5)	09.36	12.54 (5)
	15.55	38 13.40 (5)	17.23	28	15.25 (4)	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.43	35	15.59 (4)	15.22	38 13.15 (5)	14.56	27 13.21 (5)
24	09.01	13.02 (5)	07.37		14.59 (4)	06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22		15.23 (4)	08.47	12.38 (5)	09.36	12.56 (5)
	15.58	38 13.40 (5)	17.25	24	15.23 (4)	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.40	36	15.59 (4)	15.20	38 13.16 (5)	14.57	26 13.22 (5)
25	08.59	13.03 (5)	07.34		15.01 (4)	06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.24		14.23 (4)	08.49	12.38 (5)	09.36	12.56 (5)
	16.01	37 13.40 (5)	17.28	20	15.21 (4)	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	37	15.00 (4)	15.18	38 13.16 (5)	14.58	27 13.23 (5)
26	08.57	13.03 (5)	07.31		15.04 (4)	06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27		14.22 (4)	08.52	12.38 (5)	09.37	12.55 (5)
	16.03	36 13.39 (5)	17.31	13	15.17 (4)	18.45	21.08	22.26	23.04	22.16	20.47	19.08	16.34	38	15.00 (4)	15.16	38 13.16 (5)	14.58	28 13.23 (5)
27	08.54	13.04 (5)	07.28			05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30		14.22 (4)	08.54	12.38 (5)	09.37	12.56 (5)
	16.06	35 13.39 (5)	17.34			18.48	21.10	22.28	23.04	22.14	20.44	19.04	16.31	38	15.00 (4)	15.15	38 13.16 (5)	14.59	28 13.24 (5)
28	08.52	13.04 (5)	07.25			05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33		14.22 (4)	08.57	12.39 (5)	09.37	12.56 (5)
	16.09	35 13.39 (5)	17.36			18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	38	15.00 (4)	15.13	37 13.16 (5)	15.00	28 13.24 (5)
29	08.50	13.05 (5)				06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35		14.22 (4)	08.59	12.39 (5)	09.36	12.57 (5)
	16.12	33 13.38 (5)				19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	37	14.59 (4)	15.11	37 13.16 (5)	15.02	28 13.25 (5)
30	08.47	13.06 (5)				06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38		14.22 (4)	09.01	12.40 (5)	09.36	12.57 (5)
	16.15	32 13.38 (5)				19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	37	14.59 (4)	15.09	36 13.16 (5)	15.03	29 13.26 (5)
31	08.45	13.07 (5)				06.47		03.54		04.42	06.03		07.41		14.22 (4)			09.36	12.57 (5)
	16.17	39 15.14 (4)				19.59		22.37		22.04	20.31		16.20	37	14.59 (4)			15.04	29 13.26 (5)
Potential sun hours	198		249		364	441	543	579	573	493	390	312		219		172	
Total, worst case		1102		903									531		1130		919
Sun reduction		0,18		0,29									0,27		0,16		0,16
Oper. time red.		0,98		0,98									0,98		0,98		0,98
Wind dir. red.		0,66		0,65									0,64		0,66		0,66
Total reduction		0,12		0,19									0,17		0,10		0,10
Total, real		130		169									89		118		96

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

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

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SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 Shadow receptor: C - Asuinrakennus D (Uusjoutsjärventie 362)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January			February			March			April		May	June
1	09.35			08.42		14.51 (5)	07.22		16.35 (4)	06.43		05.10	03.52
	15.06			16.20	32	15.23 (5)	17.39	20	16.55 (4)	20.01		21.21	22.39
2	09.35			08.40		14.50 (5)	07.19		16.32 (4)	06.40		05.07	03.50
	15.08			16.23	34	15.24 (5)	17.42	24	16.56 (4)	20.04		21.24	22.41
3	09.34			08.37		14.49 (5)	07.16		16.30 (4)	06.37		05.04	03.49
	15.09			16.26	36	15.25 (5)	17.45	27	16.57 (4)	20.06		21.26	22.43
4	09.33			08.34		14.49 (5)	07.12		16.29 (4)	06.34		05.01	03.47
	15.11			16.29	37	15.26 (5)	17.47	30	16.59 (4)	20.09		21.29	22.45
5	09.32			08.32		14.48 (5)	07.09		16.29 (4)	06.30		04.58	03.45
	15.13			16.32	39	15.27 (5)	17.50	31	17.00 (4)	20.12		21.32	22.47
6	09.31			08.29		14.48 (5)	07.06		16.27 (4)	06.27		04.55	03.44
	15.15			16.35	40	15.28 (5)	17.53	32	16.59 (4)	20.14		21.35	22.49
7	09.30			08.26		14.47 (5)	07.03		16.26 (4)	06.24		04.52	03.43
	15.17			16.37	41	15.28 (5)	17.55	34	17.00 (4)	20.17		21.37	22.50
8	09.29			08.24		14.47 (5)	07.00		16.26 (4)	06.21		04.49	03.41
	15.19			16.40	42	15.29 (5)	17.58	34	17.00 (4)	20.20		21.40	22.52
9	09.28			08.21		14.47 (5)	06.57		16.26 (4)	06.18		04.47	03.40
	15.21			16.43	43	15.30 (5)	18.01	35	17.01 (4)	20.22		21.43	22.53
10	09.27			08.18		14.46 (5)	06.54		16.25 (4)	06.15		04.44	03.39
	15.23			16.46	43	15.29 (5)	18.03	35	17.00 (4)	20.25		21.45	22.55
11	09.25			08.15		14.46 (5)	06.50		16.25 (4)	06.11		04.41	03.38
	15.25			16.49	43	15.29 (5)	18.06	35	17.00 (4)	20.27		21.48	22.56
12	09.24			08.12		14.46 (5)	06.47		16.25 (4)	06.08		04.38	03.37
	15.27			16.52	44	15.30 (5)	18.09	34	16.59 (4)	20.30		21.51	22.57
13	09.22			08.10		14.46 (5)	06.44		16.25 (4)	06.05		04.36	03.36
	15.30			16.55	44	15.30 (5)	18.11	34	16.59 (4)	20.33		21.53	22.59
14	09.21			08.07		14.46 (5)	06.41		16.25 (4)	06.02		04.33	03.36
	15.32			16.57	44	15.30 (5)	18.14	32	16.57 (4)	20.35		21.56	23.00
15	09.19			08.04		14.47 (5)	06.38		16.25 (4)	05.59		04.30	03.35
	15.34			17.00	43	15.30 (5)	18.17	32	16.57 (4)	20.38		21.59	23.01
16	09.17			08.01		14.47 (5)	06.35		16.26 (4)	05.56		04.28	03.35
	15.37			17.03	43	15.30 (5)	18.19	30	16.56 (4)	20.41		22.01	23.01
17	09.15			07.58		14.47 (5)	06.31		16.27 (4)	05.52		04.25	03.34
	15.39			17.06	42	15.29 (5)	18.22	28	16.55 (4)	20.43		22.04	23.02
18	09.14			07.55		14.47 (5)	06.28		16.28 (4)	05.49		04.23	03.34
	15.42			17.09	41	15.28 (5)	18.24	24	16.52 (4)	20.46		22.06	23.03
19	09.12			07.52		14.48 (5)	06.25		16.30 (4)	05.46		04.20	03.34
	15.45			17.11	40	15.28 (5)	18.27	21	16.51 (4)	20.49		22.09	23.03
20	09.10			07.49		14.49 (5)	06.22		16.33 (4)	05.43		04.18	03.34
	15.47			17.14	38	15.27 (5)	18.30	15	16.48 (4)	20.51		22.12	23.04
21	09.08			07.46		14.49 (5)	06.19		16.38 (4)	05.40		04.15	03.34
	15.50			17.17	37	15.26 (5)	18.32	5	16.43 (4)	20.54		22.14	23.04
22	09.06			07.43		14.50 (5)	06.15			05.37		04.13	03.34
	15.53			17.20	35	15.25 (5)	18.35			20.57		22.17	23.04
23	09.03			07.40		14.52 (5)	06.12			05.34		04.11	03.34
	15.55			17.23	32	15.24 (5)	18.38			20.59		22.19	23.04
24	09.01			07.37		14.54 (5)	06.09			05.31		04.08	03.34
	15.58			17.25	28	15.22 (5)	18.40			21.02		22.21	23.04
25	08.59			07.34		14.56 (5)	06.06			05.28		04.06	03.35
	16.01			17.28	24	15.20 (5)	18.43			21.05		22.24	23.04
26	08.57		15.04 (5)	07.31		14.58 (5)	06.03			05.25		04.04	03.35
	16.03	2	15.06 (5)	17.31	19	15.17 (5)	18.45			21.08		22.26	23.04
27	08.54		14.59 (5)	07.28		15.03 (5)	05.59			05.22		04.02	03.36
	16.06	13	15.12 (5)	17.34	14	16.47 (4)	18.48			21.10		22.28	23.04
28	08.52		14.56 (5)	07.25		16.37 (4)	05.56			05.19		04.00	03.37
	16.09	19	15.15 (5)	17.36	15	16.52 (4)	18.51			21.13		22.31	23.03
29	08.50		14.54 (5)				06.53			05.16		03.58	03.38
	16.12	24	15.18 (5)				19.53			21.16		22.33	23.03
30	08.47		14.53 (5)				06.50			05.13		03.56	03.39
	16.15	26	15.19 (5)				19.56			21.18		22.35	23.02
31	08.45		14.52 (5)				06.46					03.54	
	16.17	29	15.21 (5)				19.58					22.37	
Potential sun hours	198			249			364			441		543	579
Total, worst case		113			1013			592					
Sun reduction		0,18			0,29			0,34					
Oper. time red.		0,98			0,98			0,98					
Wind dir. red.		0,65			0,65			0,62					
Total reduction		0,12			0,19			0,21					
Total, real		13			189			122					

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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 Shadow receptor: C - Asuinrakennus D (Uusjoutsjärventie 362)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September			October		November			December
1	03.40	04.44	06.05			07.21		17.04 (4)	07.44		14.16 (5)	09.04
	23.01	22.01	20.28			18.52	34	17.38 (4)	16.17	43	14.59 (5)	15.08
2	03.41	04.47	06.08			07.24		17.03 (4)	07.46		14.17 (5)	09.06
	23.00	21.58	20.25			18.48	35	17.38 (4)	16.14	42	14.59 (5)	15.06
3	03.42	04.50	06.11			07.26		17.03 (4)	07.49		14.17 (5)	09.08
	22.59	21.55	20.21			18.45	35	17.38 (4)	16.11	41	14.58 (5)	15.05
4	03.44	04.52	06.13			07.29		17.03 (4)	07.52		14.17 (5)	09.10
	22.58	21.53	20.18			18.42	35	17.38 (4)	16.09	41	14.58 (5)	15.04
5	03.45	04.55	06.16			07.32		17.02 (4)	07.55		14.17 (5)	09.12
	22.57	21.50	20.15			18.39	35	17.37 (4)	16.06	40	14.57 (5)	15.02
6	03.47	04.58	06.18			07.34		17.03 (4)	07.58		14.18 (5)	09.14
	22.56	21.47	20.12			18.36	34	17.37 (4)	16.03	38	14.56 (5)	15.01
7	03.48	05.00	06.21			07.37		17.03 (4)	08.00		14.19 (5)	09.16
	22.55	21.44	20.09			18.33	33	17.36 (4)	16.01	37	14.56 (5)	15.00
8	03.50	05.03	06.23			07.39		17.03 (4)	08.03		14.20 (5)	09.18
	22.53	21.41	20.06			18.29	31	17.34 (4)	15.58	36	14.56 (5)	14.59
9	03.52	05.05	06.26			07.42		17.04 (4)	08.06		14.21 (5)	09.20
	22.52	21.38	20.02			18.26	30	17.34 (4)	15.55	33	14.54 (5)	14.58
10	03.53	05.08	06.28			07.44		17.04 (4)	08.09		14.22 (5)	09.22
	22.50	21.35	19.59			18.23	29	17.33 (4)	15.53	31	14.53 (5)	14.57
11	03.55	05.11	06.31			07.47		17.06 (4)	08.11		14.24 (5)	09.23
	22.49	21.32	19.56			18.20	25	17.31 (4)	15.50	29	14.53 (5)	14.57
12	03.57	05.13	06.33			07.50		17.06 (4)	08.14		14.25 (5)	09.25
	22.47	21.30	19.53			18.17	23	17.29 (4)	15.48	26	14.51 (5)	14.56
13	03.59	05.16	06.36			07.52		17.08 (4)	08.17		14.26 (5)	09.26
	22.45	21.27	19.49			18.14	18	17.26 (4)	15.45	23	14.49 (5)	14.56
14	04.01	05.19	06.38			07.55		17.11 (4)	08.20		14.29 (5)	09.28
	22.43	21.24	19.46			18.11	12	17.23 (4)	15.43	19	14.48 (5)	14.55
15	04.03	05.21	06.41			07.58		15.34 (5)	08.23		14.32 (5)	09.29
	22.41	21.21	19.43			18.08	13	15.47 (5)	15.40	13	14.45 (5)	14.55
16	04.06	05.24	06.43			08.00		15.30 (5)	08.25			09.30
	22.39	21.18	19.40			18.05	21	15.51 (5)	15.38			14.55
17	04.08	05.26	06.46			08.03		15.26 (5)	08.28			09.31
	22.37	21.15	19.37			18.01	26	15.52 (5)	15.35			14.55
18	04.10	05.29	06.48			08.06		15.24 (5)	08.31			09.32
	22.35	21.12	19.33			17.58	30	15.54 (5)	15.33			14.55
19	04.12	05.32	06.51			08.08		15.22 (5)	08.33			09.33
	22.33	21.08	19.30			17.55	33	15.55 (5)	15.31			14.55
20	04.15	05.34	06.53			08.11		15.21 (5)	08.36			09.34
	22.31	21.05	19.27			17.52	35	15.56 (5)	15.29			14.55
21	04.17	05.37	06.56			08.14		15.20 (5)	08.39			09.35
	22.28	21.02	19.24			17.49	37	15.57 (5)	15.26			14.55
22	04.19	05.40	06.58			08.16		15.19 (5)	08.41			09.35
	22.26	20.59	19.21			17.46	39	15.58 (5)	15.24			14.56
23	04.22	05.42	07.01		17.18 (4)	08.19		15.18 (5)	08.44			09.36
	22.24	20.56	19.17	13	17.31 (4)	17.43	40	15.58 (5)	15.22			14.56
24	04.24	05.45	07.04		17.15 (4)	08.22		15.17 (5)	08.47			09.36
	22.21	20.53	19.14	19	17.34 (4)	17.40	41	15.58 (5)	15.20			14.57
25	04.27	05.47	07.06		17.12 (4)	07.24		14.17 (5)	08.49			09.36
	22.19	20.50	19.11	23	17.35 (4)	16.37	42	14.59 (5)	15.18			14.58
26	04.29	05.50	07.09		17.10 (4)	07.27		14.16 (5)	08.52			09.36
	22.16	20.47	19.08	26	17.36 (4)	16.34	43	14.59 (5)	15.16			14.58
27	04.32	05.53	07.11		17.08 (4)	07.30		14.16 (5)	08.54			09.37
	22.14	20.44	19.04	29	17.37 (4)	16.31	43	14.59 (5)	15.15			14.59
28	04.34	05.55	07.14		17.07 (4)	07.33		14.16 (5)	08.56			09.36
	22.11	20.40	19.01	31	17.38 (4)	16.29	43	14.59 (5)	15.13			15.00
29	04.37	05.58	07.16		17.06 (4)	07.35		14.15 (5)	08.59			09.36
	22.09	20.37	18.58	32	17.38 (4)	16.26	44	14.59 (5)	15.11			15.02
30	04.39	06.00	07.19		17.05 (4)	07.38		14.15 (5)	09.01			09.36
	22.06	20.34	18.55	33	17.38 (4)	16.23	44	14.59 (5)	15.09			15.03
31	04.42	06.03				07.41		14.15 (5)				09.36
	22.03	20.31				16.20	44	14.59 (5)				15.04
Potential sun hours	573	492	390			312			219			172
Total, worst case				206			1027			492		
Sun reduction				0,32			0,27			0,16		
Oper. time red.				0,98			0,98			0,98		
Wind dir. red.				0,62			0,64			0,65		
Total reduction				0,20			0,17			0,10		
Total, real				40			171			51		

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

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

Project:
Sysmä Rekolanvuoret_20200912

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: D - Lomarakennus E (Uusjoutsjärventie 450)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March		April		May	June	July	August		September		October	November	December
1	09.35	08.42	07.22		06.43	18.12 (5)	05.10	03.52	03.40	04.44		06.05	19.00 (4)	07.21	07.44	09.03
	15.06	16.20	17.39		20.01	53 19.26 (4)	21.21	22.39	23.01	22.01		20.28	27 19.27 (4)	18.52	16.17	15.08
2	09.35	08.39	07.19		06.40	18.13 (5)	05.07	03.50	03.41	04.47		06.08	19.00 (4)	07.24	07.46	09.06
	15.08	16.23	17.42		20.04	55 19.28 (4)	21.24	22.41	23.00	21.58		20.25	28 19.28 (4)	18.48	16.14	15.06
3	09.34	08.37	07.15		06.37	18.14 (5)	05.04	03.49	03.42	04.50		06.10	18.59 (4)	07.26	07.49	09.08
	15.09	16.26	17.45		20.06	55 19.29 (4)	21.26	22.43	22.59	21.55		20.21	28 19.27 (4)	18.45	16.11	15.05
4	09.33	08.34	07.12		06.34	18.15 (5)	05.01	03.47	03.44	04.52		06.13	18.22 (5)	07.29	07.52	09.10
	15.11	16.29	17.47		20.09	55 19.30 (4)	21.29	22.45	22.58	21.52		20.18	37 19.27 (4)	18.42	16.09	15.04
5	09.32	08.32	07.09		06.30	18.17 (5)	04.58	03.45	03.45	04.55		06.16	18.17 (5)	07.32	07.55	09.12
	15.13	16.32	17.50		20.12	52 19.30 (4)	21.32	22.47	22.57	21.50		20.15	45 19.27 (4)	18.39	16.06	15.02
6	09.31	08.29	07.06		06.27	18.19 (5)	04.55	03.44	03.47	04.58		06.18	18.14 (5)	07.34	07.58	09.14
	15.15	16.35	17.53		20.14	49 19.30 (4)	21.35	22.49	22.56	21.47		20.12	50 19.26 (4)	18.36	16.03	15.01
7	09.30	08.26	07.03		06.24	18.21 (5)	04.52	03.43	03.48	05.00		06.21	18.12 (5)	07.37	08.00	09.16
	15.17	16.37	17.55		20.17	44 19.30 (4)	21.37	22.50	22.55	21.44		20.09	52 19.25 (4)	18.33	16.01	15.00
8	09.29	08.24	07.00		06.21	18.24 (5)	04.49	03.41	03.50	05.03		06.23	18.10 (5)	07.39	08.03	09.18
	15.19	16.40	17.58		20.19	37 19.29 (4)	21.40	22.52	22.53	21.41		20.05	54 19.24 (4)	18.29	15.58	14.59
9	09.28	08.21	06.57		06.18	19.01 (4)	04.47	03.40	03.52	05.05		06.26	18.08 (5)	07.42	08.06	09.20
	15.21	16.43	18.01		20.22	28 19.29 (4)	21.43	22.53	22.52	21.38		20.02	55 19.23 (4)	18.26	15.55	14.58
10	09.27	08.18	06.54		06.15	19.01 (4)	04.44	03.39	03.53	05.08		06.28	18.07 (5)	07.44	08.09	09.21
	15.23	16.46	18.03		20.25	28 19.29 (4)	21.45	22.55	22.50	21.35		19.59	54 19.21 (4)	18.23	15.53	14.58
11	09.25	08.15	06.50		06.11	19.02 (4)	04.41	03.38	03.55	05.11		06.31	18.06 (5)	07.47	08.11	09.23
	15.25	16.49	18.06		20.27	26 19.28 (4)	21.48	22.56	22.48	21.32		19.56	53 19.20 (4)	18.20	15.50	14.57
12	09.24	08.12	06.47		06.08	19.02 (4)	04.38	03.37	03.57	05.13		06.33	18.04 (5)	07.50	08.14	09.25
	15.27	16.52	18.09		20.30	25 19.27 (4)	21.51	22.57	22.47	21.29		19.53	51 19.17 (4)	18.17	15.48	14.56
13	09.22	08.09	06.44		06.05	19.03 (4)	04.36	03.36	03.59	05.16		06.36	18.03 (5)	07.52	08.17	09.26
	15.30	16.55	18.11		20.33	23 19.26 (4)	21.53	22.58	22.45	21.27		19.49	43 19.12 (4)	18.14	15.45	14.56
14	09.21	08.07	06.41		06.02	19.03 (4)	04.33	03.36	04.01	05.19		06.38	18.03 (5)	07.55	08.20	09.27
	15.32	16.57	18.14		20.35	22 19.25 (4)	21.56	23.00	22.43	21.24		19.46	38 18.41 (5)	18.11	15.43	14.55
15	09.19	08.04	06.38	17.29 (5)	05.59	19.05 (4)	04.30	03.35	04.03	05.21		06.41	18.02 (5)	07.58	08.22	09.29
	15.35	17.00	18.17	13 17.42 (5)	20.38	18 19.23 (4)	21.59	23.00	22.41	21.21		19.43	39 18.41 (5)	18.08	15.40	14.55
16	09.17	08.01	06.34	17.25 (5)	05.56	19.06 (4)	04.28	03.35	04.06	05.24		06.43	18.02 (5)	08.00	08.25	09.30
	15.37	17.03	18.19	21 17.46 (5)	20.41	15 19.21 (4)	22.01	23.01	22.39	21.18		19.40	39 18.41 (5)	18.05	15.38	14.55
17	09.15	07.58	06.31	17.23 (5)	05.52	19.09 (4)	04.25	03.34	04.08	05.26		06.46	18.01 (5)	08.03	08.28	09.31
	15.39	17.06	18.22	25 17.48 (5)	20.43	9 19.18 (4)	22.04	23.02	22.37	21.14		19.37	39 18.40 (5)	18.01	15.35	14.55
18	09.13	07.55	06.28	17.20 (5)	05.49		04.23	03.34	04.10	05.29		06.48	18.01 (5)	08.05	08.31	09.32
	15.42	17.09	18.24	29 17.49 (5)	20.46		22.06	23.03	22.35	21.11		19.33	39 18.40 (5)	17.58	15.33	14.55
19	09.12	07.52	06.25	17.19 (5)	05.46		04.20	03.34	04.12	05.32		06.51	18.01 (5)	08.08	08.33	09.33
	15.45	17.11	18.27	31 17.50 (5)	20.49		22.09	23.03	22.33	21.08		19.30	38 18.39 (5)	17.55	15.31	14.55
20	09.10	07.49	06.22	17.18 (5)	05.43		04.18	03.34	04.15	05.34		06.53	18.01 (5)	08.11	08.36	09.34
	15.47	17.14	18.30	33 17.51 (5)	20.51		22.11	23.04	22.31	21.05		19.27	38 18.39 (5)	17.52	15.29	14.55
21	09.08	07.46	06.19	17.17 (5)	05.40		04.15	03.34	04.17	05.37		06.56	18.01 (5)	08.14	08.39	09.34
	15.50	17.17	18.32	35 17.52 (5)	20.54		22.14	23.04	22.28	21.02		19.24	37 18.38 (5)	17.49	15.26	14.55
22	09.05	07.43	06.15	17.15 (5)	05.37		04.13	03.34	04.19	05.40		06.58	18.02 (5)	08.16	08.41	09.35
	15.53	17.20	18.35	37 17.52 (5)	20.57		22.16	23.04	22.26	20.59		19.20	35 18.37 (5)	17.46	15.24	14.56
23	09.03	07.40	06.12	17.14 (5)	05.34		04.11	03.34	04.22	05.42		07.01	18.02 (5)	08.19	08.44	09.36
	15.55	17.23	18.38	38 17.52 (5)	20.59		22.19	23.04	22.24	20.56		19.17	33 18.35 (5)	17.43	15.22	14.56
24	09.01	07.37	06.09	17.14 (5)	05.31		04.08	03.34	04.24	05.45		07.03	18.03 (5)	08.22	08.46	09.36
	15.58	17.25	18.40	38 17.52 (5)	21.02		22.21	23.04	22.21	20.53		19.14	31 18.34 (5)	17.40	15.20	14.57
25	08.59	07.34	06.06	17.14 (5)	05.28		04.06	03.35	04.27	05.47		07.06	18.03 (5)	07.24	08.49	09.36
	16.01	17.28	18.43	39 17.53 (5)	21.05		22.24	23.04	22.19	20.50		19.11	29 18.32 (5)	16.37	15.18	14.58
26	08.57	07.31	06.02	17.12 (5)	05.25		04.04	03.35	04.29	05.50	19.12 (4)	07.09	18.05 (5)	07.27	08.51	09.36
	16.03	17.31	18.45	40 17.52 (5)	21.07		22.26	23.04	22.16	20.47	9 19.21 (4)	19.08	26 18.31 (5)	16.34	15.16	14.58
27	08.54	07.28	05.59	17.12 (5)	05.22		04.02	03.36	04.32	05.53	19.08 (4)	07.11	18.06 (5)	07.30	08.54	09.36
	16.06	17.34	18.48	40 17.52 (5)	21.10		22.28	23.04	22.14	20.44	15 19.23 (4)	19.04	22 18.28 (5)	16.31	15.15	14.59
28	08.52	07.25	05.56	17.12 (5)	05.19		04.00	03.37	04.34	05.55	19.06 (4)	07.14	18.08 (5)	07.33	08.56	09.36
	16.09	17.36	18.51	39 17.51 (5)	21.13		22.31	23.03	22.11	20.40	19 19.25 (4)	19.01	17 18.25 (5)	16.29	15.13	15.00
29	08.49		06.53	18.12 (5)	05.16		03.58	03.38	04.37	05.58	19.04 (4)	07.16	18.12 (5)	07.35	08.59	09.36
	16.12		19.53	39 18.51 (5)	21.16		22.33	23.03	22.09	20.37	22 19.26 (4)	18.58	7 18.19 (5)	16.26	15.11	15.02
30	08.47		06.50	18.13 (5)	05.13		03.56	03.39	04.39	06.00	19.02 (4)	07.19		07.38	09.01	09.36
	16.15		19.56	39 19.20 (4)	21.18		22.35	23.02	22.06	20.34	24 19.26 (4)	18.55		16.23	15.10	15.03
31	08.45		06.46	18.13 (5)			03.54		04.42	06.03	19.02 (4)			07.41		09.36
	16.17		19.58	50 19.25 (4)			22.37		22.03	20.31	25 19.27 (4)			16.20		15.04
Potential sun hours	198	249	364		441		543	579	573	492		390		312	219	172
Total, worst case				586		594					114		1084			
Sun reduction				0,34		0,39					0,42		0,32			
Oper. time red.				0,98		0,98					0,98		0,98			
Wind dir. red.				0,61		0,61					0,61		0,61			
Total reduction				0,20		0,24					0,25		0,19			
Total, real				117		140					29		207			

Table 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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: E - Asuinrakennus F (Ahorajantie 64)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	21.29 (4)	03.40	21.32 (4)	04.45	06.05	07.21	07.44	09.03
	15.06	16.20	17.39	20.01	21.21	22.39 18	21.47 (4)	23.01 25	21.57 (4)	22.01	20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40	05.07	03.50	21.29 (4)	03.41	21.32 (4)	04.47	06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04	21.24	22.41 19	21.48 (4)	23.00 25	21.57 (4)	21.58	20.25	18.48	16.14	15.07
3	09.34	08.37	07.15	06.37	05.04	03.49	21.29 (4)	03.42	21.34 (4)	04.50	06.11	07.26	07.49	09.08
	15.09	16.26	17.45	20.06	21.26	22.43 20	21.49 (4)	22.59 24	21.58 (4)	21.55	20.21	18.45	16.12	15.05
4	09.33	08.34	07.12	06.34	05.01	03.47	21.29 (4)	03.44	21.34 (4)	04.52	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45 21	21.50 (4)	22.58 23	21.57 (4)	21.52	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.30	04.58	03.46	21.28 (4)	03.45	21.34 (4)	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47 22	21.50 (4)	22.57 23	21.57 (4)	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.55	03.44	21.28 (4)	03.47	21.34 (4)	04.58	06.18	07.34	07.57	09.14
	15.15	16.35	17.53	20.14	21.35	22.49 22	21.50 (4)	22.56 23	21.57 (4)	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26	07.03	06.24	04.52	03.43	21.28 (4)	03.48	21.34 (4)	05.00	06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	21.37	22.50 23	21.51 (4)	22.54 22	21.56 (4)	21.44	20.09	18.33	16.01	15.00
8	09.29	08.23	07.00	06.21	04.50	03.42	21.28 (4)	03.50	21.35 (4)	05.03	06.23	07.39	08.03	09.18
	15.19	16.40	17.58	20.19	21.40	22.52 24	21.52 (4)	22.53 22	21.57 (4)	21.41	20.05	18.29	15.58	14.59
9	09.28	08.21	06.57	06.18	04.47	03.40	21.28 (4)	03.52	21.36 (4)	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53 24	21.52 (4)	22.52 20	21.56 (4)	21.38	20.02	18.26	15.55	14.58
10	09.26	08.18	06.54	06.15	04.44	03.39	21.28 (4)	03.54	21.37 (4)	05.08	06.28	07.44	08.09	09.21
	15.23	16.46	18.03	20.25	21.45	22.55 24	21.52 (4)	22.50 19	21.56 (4)	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.50	06.11	04.41	03.38	21.28 (4)	03.55	21.37 (4)	05.11	06.31	07.47	08.11	09.23
	15.25	16.49	18.06	20.27	21.48	22.56 24	21.52 (4)	22.48 18	21.55 (4)	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.38	03.37	21.28 (4)	03.57	21.38 (4)	05.13	06.33	07.50	08.14	09.25
	15.27	16.52	18.09	20.30	21.51	22.57 25	21.53 (4)	22.47 17	21.55 (4)	21.29	19.53	18.17	15.48	14.56
13	09.22	08.09	06.44	06.05	04.36	03.37	21.28 (4)	03.59	21.39 (4)	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.58 25	21.53 (4)	22.45 16	21.55 (4)	21.26	19.49	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	04.33	03.36	21.28 (4)	04.01	21.40 (4)	05.19	06.38	07.55	08.20	09.27
	15.32	16.57	18.14	20.35	21.56	22.59 26	21.54 (4)	22.43 13	21.53 (4)	21.23	19.46	18.11	15.43	14.55
15	09.19	08.04	06.38	05.59	04.30	03.35	21.29 (4)	04.04	21.41 (4)	05.21	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.59	23.00 25	21.54 (4)	22.41 10	21.51 (4)	21.20	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	21.29 (4)	04.06	21.44 (4)	05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01 26	21.55 (4)	22.39 6	21.50 (4)	21.17	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.25	03.34	21.29 (4)	04.08		05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02 25	21.54 (4)	22.37		21.14	19.37	18.01	15.35	14.55
18	09.13	07.55	06.28	05.49	04.23	03.34	21.29 (4)	04.10		05.29	06.48	08.05	08.31	09.32
	15.42	17.09	18.24	20.46	22.06	23.03 25	21.54 (4)	22.35		21.11	19.33	17.58	15.33	14.55
19	09.11	07.52	06.25	05.46	04.20	03.34	21.29 (4)	04.12		05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03 26	21.55 (4)	22.33		21.08	19.30	17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	21.29 (4)	04.15		05.34	06.53	08.11	08.36	09.34
	15.47	17.14	18.30	20.51	22.11	23.04 26	21.55 (4)	22.31		21.05	19.27	17.52	15.29	14.55
21	09.07	07.46	06.19	05.40	04.15	03.34	21.30 (4)	04.17		05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14	23.04 26	21.56 (4)	22.28		21.02	19.24	17.49	15.27	14.55
22	09.05	07.43	06.15	05.37	04.13	03.34	21.30 (4)	04.19		05.40	06.58	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04 26	21.56 (4)	22.26		20.59	19.20	17.46	15.24	14.56
23	09.03	07.40	06.12	05.34	04.11	03.34	21.30 (4)	04.22		05.42	07.01	08.19	08.44	09.35
	15.55	17.23	18.38	20.59	22.19	23.04 26	21.56 (4)	22.24		20.56	19.17	17.43	15.22	14.56
24	09.01	07.37	06.09	05.31	04.08	03.35	21.30 (4)	04.24		05.45	07.04	08.22	08.46	09.36
	15.58	17.25	18.40	21.02	22.21	23.04 25	21.55 (4)	22.21		20.53	19.14	17.40	15.20	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	21.31 (4)	04.27		05.47	07.06	07.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04 25	21.56 (4)	22.19		20.50	19.11	16.37	15.18	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	21.31 (4)	04.29		05.50	07.09	07.27	08.51	09.36
	16.04	17.31	18.45	21.07	22.26	23.04 26	21.57 (4)	22.16		20.47	19.08	16.34	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02 21.37 (4)	03.36	21.31 (4)	04.32		05.53	07.11	07.30	08.54	09.36
	16.06	17.34	18.48	21.10	22.28 3 21.40 (4)	23.03 25	21.56 (4)	22.14		20.44	19.04	16.31	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00 21.33 (4)	03.37	21.32 (4)	04.34		05.55	07.14	07.33	08.56	09.36
	16.09	17.36	18.51	21.13	22.31 9 21.42 (4)	23.03 25	21.57 (4)	22.11		20.40	19.01	16.29	15.13	15.01
29	08.49		06.53	05.16	03.58 21.31 (4)	03.38	21.32 (4)	04.37		05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33 12 21.43 (4)	23.02 25	21.57 (4)	22.09		20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56 21.31 (4)	03.39	21.33 (4)	04.39		06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35 14 21.45 (4)	23.02 24	21.57 (4)	22.06		20.34	18.55	16.23	15.10	15.03
31	08.44		06.46		03.54 21.31 (4)			04.42		06.03		07.41		09.36
	16.18		19.58		22.37 16 21.47 (4)			22.03		20.31		16.20		15.04
Potential sun hours	199	249	364	441	543	579		573		492	390	312	219	172
Total, worst case					54	723		306						
Sun reduction					0,49	0,47		0,44						
Oper. time red.					0,98	0,98		0,98						
Wind dir. red.					0,62	0,62		0,62						
Total reduction					0,30	0,28		0,27						
Total, real					16	205		82						

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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: F - Asuinrakennus G (Uutelantie 82)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April			May			June		
1	09.35	08.42	07.22	06.43			05.10			03.52		20.52 (2)
	15.06	16.21	17.39	20.01			21.21			22.39	11	21.03 (2)
2	09.34	08.39	07.19	06.40			05.07			03.51		20.54 (2)
	15.08	16.23	17.42	20.04			21.24			22.41	8	21.02 (2)
3	09.34	08.37	07.16	06.37			05.04			03.49		20.57 (2)
	15.10	16.26	17.45	20.06			21.26			22.43	3	21.00 (2)
4	09.33	08.34	07.12	06.34			05.01			03.47		
	15.11	16.29	17.47	20.09			21.29			22.45		
5	09.32	08.32	07.09	06.31		19.23 (3)	04.58			03.46		
	15.13	16.32	17.50	20.12	11	19.34 (3)	21.32			22.47		
6	09.31	08.29	07.06	06.27		19.19 (3)	04.55		20.53 (2)	03.44		
	15.15	16.35	17.53	20.14	19	19.38 (3)	21.34	1	20.54 (2)	22.48		
7	09.30	08.26	07.03	06.24		19.17 (3)	04.53		20.50 (2)	03.43		
	15.17	16.38	17.55	20.17	23	19.40 (3)	21.37	7	20.57 (2)	22.50		
8	09.29	08.23	07.00	06.21		19.15 (3)	04.50		20.48 (2)	03.42		
	15.19	16.40	17.58	20.19	26	19.41 (3)	21.40	11	20.59 (2)	22.52		
9	09.28	08.21	06.57	06.18		19.13 (3)	04.47		20.47 (2)	03.41		
	15.21	16.43	18.01	20.22	29	19.42 (3)	21.43	15	21.02 (2)	22.53		
10	09.26	08.18	06.54	06.15		19.11 (3)	04.44		20.46 (2)	03.39		
	15.23	16.46	18.03	20.25	31	19.42 (3)	21.45	17	21.03 (2)	22.55		
11	09.25	08.15	06.50	06.12		19.10 (3)	04.41		20.45 (2)	03.38		
	15.25	16.49	18.06	20.27	33	19.43 (3)	21.48	21	21.06 (2)	22.56		
12	09.24	08.12	06.47	06.08		19.09 (3)	04.39		20.45 (2)	03.38		
	15.28	16.52	18.09	20.30	35	19.44 (3)	21.51	23	21.08 (2)	22.57		
13	09.22	08.09	06.44	06.05		19.09 (3)	04.36		20.44 (2)	03.37		
	15.30	16.55	18.11	20.33	35	19.44 (3)	21.53	24	21.08 (2)	22.58		
14	09.20	08.07	06.41	06.02		19.08 (3)	04.33		20.44 (2)	03.36		
	15.32	16.58	18.14	20.35	36	19.44 (3)	21.56	24	21.08 (2)	22.59		
15	09.19	08.04	06.38	05.59		19.07 (3)	04.31		20.44 (2)	03.35		
	15.35	17.00	18.17	20.38	37	19.44 (3)	21.59	25	21.09 (2)	23.00		
16	09.17	08.01	06.35	05.56		19.07 (3)	04.28		20.44 (2)	03.35		
	15.37	17.03	18.19	20.41	37	19.44 (3)	22.01	25	21.09 (2)	23.01		
17	09.15	07.58	06.31	05.53		19.07 (3)	04.25		20.44 (2)	03.34		
	15.40	17.06	18.22	20.43	37	19.44 (3)	22.04	25	21.09 (2)	23.02		
18	09.13	07.55	06.28	05.49		19.06 (3)	04.23		20.43 (2)	03.34		
	15.42	17.09	18.25	20.46	37	19.43 (3)	22.06	25	21.08 (2)	23.03		
19	09.11	07.52	06.25	05.46		19.06 (3)	04.20		20.43 (2)	03.34		
	15.45	17.12	18.27	20.49	37	19.43 (3)	22.09	25	21.08 (2)	23.03		
20	09.10	07.49	06.22	05.43		19.06 (3)	04.18		20.44 (2)	03.34		
	15.47	17.14	18.30	20.51	36	19.42 (3)	22.11	24	21.08 (2)	23.03		
21	09.07	07.46	06.19	05.40		19.07 (3)	04.16		20.44 (2)	03.34		
	15.50	17.17	18.32	20.54	34	19.41 (3)	22.14	24	21.08 (2)	23.04		
22	09.05	07.43	06.15	05.37		19.08 (3)	04.13		20.44 (2)	03.34		
	15.53	17.20	18.35	20.57	34	19.42 (3)	22.16	24	21.08 (2)	23.04		
23	09.03	07.40	06.12	05.34		19.08 (3)	04.11		20.45 (2)	03.34		
	15.55	17.23	18.38	20.59	33	19.41 (3)	22.19	23	21.08 (2)	23.04		
24	09.01	07.37	06.09	05.31		19.09 (3)	04.09		20.46 (2)	03.35		
	15.58	17.25	18.40	21.02	30	19.39 (3)	22.21	22	21.08 (2)	23.04		
25	08.59	07.34	06.06	05.28		19.09 (3)	04.06		20.46 (2)	03.35		
	16.01	17.28	18.43	21.05	29	19.38 (3)	22.24	21	21.07 (2)	23.04		
26	08.57	07.31	06.03	05.25		19.10 (3)	04.04		20.46 (2)	03.36		
	16.04	17.31	18.45	21.07	27	19.37 (3)	22.26	21	21.07 (2)	23.04		
27	08.54	07.28	05.59	05.22		19.11 (3)	04.02		20.48 (2)	03.36		
	16.06	17.34	18.48	21.10	24	19.35 (3)	22.28	19	21.07 (2)	23.03		
28	08.52	07.25	05.56	05.19		19.14 (3)	04.00		20.48 (2)	03.37		
	16.09	17.36	18.51	21.13	20	19.34 (3)	22.30	18	21.06 (2)	23.03		
29	08.49		06.53	05.16		19.16 (3)	03.58		20.49 (2)	03.38		
	16.12		19.53	21.16	15	19.31 (3)	22.33	17	21.06 (2)	23.02		
30	08.47		06.50	05.13		19.19 (3)	03.56		20.50 (2)	03.39		
	16.15		19.56	21.18	8	19.27 (3)	22.35	15	21.05 (2)	23.02		
31	08.44		06.47				03.54		20.51 (2)			
	16.18		19.59				22.37	13	21.04 (2)			
Potential sun hours	199	249	364	441			543			579		
Total, worst case					753			509			22	
Sun reduction					0,39			0,49			0,47	
Oper. time red.					0,98			0,98			0,98	
Wind dir. red.					0,60			0,63			0,63	
Total reduction					0,23			0,30			0,29	
Total, real					176			155			6	

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: F - Asuinrakennus G (Uutelantie 82)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July		August		September		October	November	December
1	03.40		04.45		20.56 (2)		06.06	19.09 (3)	07.21	07.44	09.03
	23.01		22.01	22	21.18 (2)	33	20.28	19.42 (3)	18.52	16.17	15.08
2	03.41		04.47		20.56 (2)		06.08	19.10 (3)	07.24	07.46	09.06
	23.00		21.58	19	21.15 (2)	31	20.25	19.41 (3)	18.49	16.14	15.07
3	03.43		04.50		20.57 (2)		06.11	19.11 (3)	07.26	07.49	09.08
	22.59		21.55	17	21.14 (2)	29	20.21	19.40 (3)	18.45	16.12	15.05
4	03.44		04.53		20.58 (2)		06.13	19.12 (3)	07.29	07.52	09.10
	22.58		21.52	13	21.11 (2)	26	20.18	19.38 (3)	18.42	16.09	15.04
5	03.45		04.55		20.59 (2)		06.16	19.13 (3)	07.32	07.55	09.12
	22.57		21.50	9	21.08 (2)	23	20.15	19.36 (3)	18.39	16.06	15.03
6	03.47		04.58		21.01 (2)		06.18	19.14 (3)	07.34	07.57	09.14
	22.56		21.47	5	21.06 (2)	19	20.12	19.33 (3)	18.36	16.03	15.02
7	03.49		05.00				06.21	19.18 (3)	07.37	08.00	09.16
	22.54		21.44			12	20.09	19.30 (3)	18.33	16.01	15.01
8	03.50		05.03				06.23		07.39	08.03	09.18
	22.53		21.41				20.06		18.30	15.58	15.00
9	03.52		05.06				06.26		07.42	08.06	09.20
	22.51		21.38				20.02		18.26	15.55	14.59
10	03.54		05.08				06.28		07.44	08.09	09.21
	22.50	7	21.09 (2)	21.35			19.59		18.23	15.53	14.58
11	03.56		21.00 (2)	05.11			06.31		07.47	08.11	09.23
	22.48	10	21.10 (2)	21.32			19.56		18.20	15.50	14.57
12	03.58		21.00 (2)	05.14			06.33		07.50	08.14	09.25
	22.47	12	21.12 (2)	21.29			19.53		18.17	15.48	14.56
13	04.00		20.59 (2)	05.16		19.26 (3)	06.36		07.52	08.17	09.26
	22.45	14	21.13 (2)	21.26	11	19.37 (3)	19.49		18.14	15.45	14.56
14	04.02		20.58 (2)	05.19		19.23 (3)	06.38		07.55	08.20	09.27
	22.43	15	21.13 (2)	21.23	16	19.39 (3)	19.46		18.11	15.43	14.56
15	04.04		20.57 (2)	05.21		19.21 (3)	06.41		07.58	08.22	09.29
	22.41	17	21.14 (2)	21.21	21	19.42 (3)	19.43		18.08	15.40	14.55
16	04.06		20.57 (2)	05.24		19.18 (3)	06.43		08.00	08.25	09.30
	22.39	18	21.15 (2)	21.17	25	19.43 (3)	19.40		18.05	15.38	14.55
17	04.08		20.56 (2)	05.27		19.16 (3)	06.46		08.03	08.28	09.31
	22.37	20	21.16 (2)	21.14	27	19.43 (3)	19.37		18.02	15.36	14.55
18	04.10		20.56 (2)	05.29		19.16 (3)	06.48		08.06	08.31	09.32
	22.35	21	21.17 (2)	21.11	29	19.45 (3)	19.33		17.59	15.33	14.55
19	04.13		20.56 (2)	05.32		19.14 (3)	06.51		08.08	08.33	09.33
	22.33	22	21.18 (2)	21.08	31	19.45 (3)	19.30		17.55	15.31	14.55
20	04.15		20.55 (2)	05.35		19.14 (3)	06.54		08.11	08.36	09.34
	22.30	23	21.18 (2)	21.05	32	19.46 (3)	19.27		17.52	15.29	14.55
21	04.17		20.55 (2)	05.37		19.12 (3)	06.56		08.14	08.39	09.34
	22.28	24	21.19 (2)	21.02	34	19.46 (3)	19.24		17.49	15.27	14.56
22	04.20		20.55 (2)	05.40		19.11 (3)	06.59		08.16	08.41	09.35
	22.26	24	21.19 (2)	20.59	35	19.46 (3)	19.21		17.46	15.25	14.56
23	04.22		20.55 (2)	05.42		19.11 (3)	07.01		08.19	08.44	09.35
	22.24	24	21.19 (2)	20.56	36	19.47 (3)	19.17		17.43	15.23	14.57
24	04.24		20.55 (2)	05.45		19.10 (3)	07.04		08.22	08.46	09.36
	22.21	24	21.19 (2)	20.53	36	19.46 (3)	19.14		17.40	15.21	14.57
25	04.27		20.54 (2)	05.48		19.10 (3)	07.06		07.24	08.49	09.36
	22.19	25	21.19 (2)	20.50	37	19.47 (3)	19.11		16.37	15.19	14.58
26	04.29		20.54 (2)	05.50		19.09 (3)	07.09		07.27	08.51	09.36
	22.16	25	21.19 (2)	20.47	37	19.46 (3)	19.08		16.35	15.17	14.59
27	04.32		20.54 (2)	05.53		19.09 (3)	07.11		07.30	08.54	09.36
	22.14	25	21.19 (2)	20.44	37	19.46 (3)	19.05		16.32	15.15	15.00
28	04.34		20.54 (2)	05.55		19.09 (3)	07.14		07.33	08.56	09.36
	22.11	25	21.19 (2)	20.40	37	19.46 (3)	19.01		16.29	15.13	15.01
29	04.37		20.54 (2)	05.58		19.09 (3)	07.16		07.35	08.59	09.36
	22.09	25	21.19 (2)	20.37	36	19.45 (3)	18.58		16.26	15.11	15.02
30	04.40		20.55 (2)	06.00		19.10 (3)	07.19		07.38	09.01	09.36
	22.06	24	21.19 (2)	20.34	35	19.45 (3)	18.55		16.23	15.10	15.03
31	04.42		20.55 (2)	06.03		19.09 (3)			07.41		09.36
	22.03	23	21.18 (2)	20.31	34	19.43 (3)			16.20		15.05
Potential sun hours	573			492			390		312	219	172
Total, worst case		447			671			173			
Sun reduction		0,44			0,42			0,32			
Oper. time red.		0,98			0,98			0,98			
Wind dir. red.		0,63			0,61			0,60			
Total reduction		0,27			0,25			0,19			
Total, real		121			169			33			

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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

Shadow receptor: G - Lomarakennus I (Mikkolanmäentie 24)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.53	03.40	04.45	06.06	07.21	07.44	09.03
	15.07	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40	05.07	03.51	03.42	04.47	06.08	07.24	07.46	09.06
	15.08	16.24	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.06	21.26	22.43	22.59	21.55	20.22	18.45	16.12	15.06
4	09.33	08.34	07.12	06.34	05.01	03.48	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.52	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.46	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.56	03.45	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.34	22.48	22.56	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	21.37	22.50	22.54	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.51	21.38	20.02	18.27	15.56	14.59
10	09.26	08.18	06.54	06.15	04.44	03.40	03.54	05.08	06.28	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	03.56	05.11	06.31	07.47	08.11	09.23
	15.26	16.49	18.06	20.27	21.48	22.56	22.48	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.39	03.38	03.58	05.14	06.34	07.50	08.14	09.24
	15.28	16.52	18.09	20.30	21.51	22.57	22.46	21.29	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.58	22.45	21.26	19.50	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.35	21.56	22.59	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	04.04	05.22	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.58	23.00	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.26	03.35	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.14	19.37	18.02	15.36	14.55
18	09.13	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.02	22.35	21.11	19.33	17.59	15.33	14.55
19	09.11	07.52	06.25	05.47	04.21	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.56	15.31	14.55
20	09.09	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11	23.03	22.30	21.05	19.27	17.53	15.29	14.55
21	09.07	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.50	15.27	14.56
22	09.05	07.43	06.15	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	04.22	05.42	07.01	08.19	08.44	09.35
	15.56	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.25	05.45	07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	04.27	05.48	07.06	08.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.30	05.50	07.09	07.27	08.51	09.36
	16.04	17.31	18.46	21.07	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02	03.37	04.32	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	23.03	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.35	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.30	23.03	22.11	20.40	19.01	16.29	15.13	15.01
29	08.49		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.02	22.09	20.37	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.44		06.47		03.54		04.42	06.03		07.41		09.35
	16.18		19.59		22.37		22.03	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 Shadow receptor: H - Asuinrakennus J (Työlammentie 24)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April		May		June		
1	09.35	08.42	07.22	06.44		05.10		03.53		04.39 (2)
	15.07	16.21	17.39	20.01		21.21		22.39	20	04.59 (2)
2	09.35	08.40	07.19	06.40		05.07		03.51		04.38 (2)
	15.08	16.24	17.42	20.04		21.24		22.41	21	04.59 (2)
3	09.34	08.37	07.16	06.37		05.04		03.49		04.38 (2)
	15.10	16.26	17.45	20.07		21.27		22.43	22	05.00 (2)
4	09.33	08.34	07.13	06.34		05.01		03.48		04.38 (2)
	15.12	16.29	17.48	20.09		21.29		22.45	22	05.00 (2)
5	09.32	08.32	07.10	06.31		04.58		03.46		04.38 (2)
	15.13	16.32	17.50	20.12		21.32		22.47	23	05.01 (2)
6	09.31	08.29	07.06	06.28		04.56		03.45		04.38 (2)
	15.15	16.35	17.53	20.14		21.35		22.49	23	05.01 (2)
7	09.30	08.26	07.03	06.24		04.53		03.43		04.37 (2)
	15.17	16.38	17.56	20.17		21.37		22.50	25	05.02 (2)
8	09.29	08.24	07.00	06.21		04.50		03.42		04.37 (2)
	15.19	16.41	17.58	20.20		21.40		22.52	25	05.02 (2)
9	09.28	08.21	06.57	06.18		06.48 (3)	04.47	03.41		04.37 (2)
	15.21	16.44	18.01	20.22	4	06.52 (3)	21.43	22.53	25	05.02 (2)
10	09.27	08.18	06.54	06.15		06.45 (3)	04.44	03.40		04.37 (2)
	15.23	16.46	18.04	20.25	10	06.55 (3)	21.45	22.55	25	05.02 (2)
11	09.25	08.15	06.51	06.12		06.41 (3)	04.42	03.39		04.38 (2)
	15.26	16.49	18.06	20.28	15	06.56 (3)	21.48	22.56	25	05.03 (2)
12	09.24	08.13	06.47	06.09		06.38 (3)	04.39	03.38		04.37 (2)
	15.28	16.52	18.09	20.30	19	06.57 (3)	21.51	22.57	26	05.03 (2)
13	09.22	08.10	06.44	06.05		06.35 (3)	04.36	03.37		04.38 (2)
	15.30	16.55	18.12	20.33	23	06.58 (3)	21.53	22.58	26	05.04 (2)
14	09.21	08.07	06.41	06.02		06.34 (3)	04.33	03.36		04.37 (2)
	15.33	16.58	18.14	20.36	24	06.58 (3)	21.56	23.00	27	05.04 (2)
15	09.19	08.04	06.38	05.59		06.33 (3)	04.31	03.36		04.38 (2)
	15.35	17.01	18.17	20.38	25	06.58 (3)	21.59	23.00	26	05.04 (2)
16	09.17	08.01	06.35	05.56		06.33 (3)	04.28	03.35		04.38 (2)
	15.37	17.03	18.19	20.41	26	06.59 (3)	22.01	23.01	27	05.05 (2)
17	09.15	07.58	06.32	05.53		06.32 (3)	04.26	03.35		04.39 (2)
	15.40	17.06	18.22	20.44	26	06.58 (3)	22.04	23.02	26	05.05 (2)
18	09.14	07.55	06.28	05.50		06.32 (3)	04.23	03.34		04.39 (2)
	15.42	17.09	18.25	20.46	26	06.58 (3)	22.06	23.03	26	05.05 (2)
19	09.12	07.52	06.25	05.47		06.32 (3)	04.21	03.34		04.39 (2)
	15.45	17.12	18.27	20.49	26	06.58 (3)	22.09	23.03	27	05.06 (2)
20	09.10	07.49	06.22	05.43		06.33 (3)	04.18	03.34		04.39 (2)
	15.48	17.15	18.30	20.52	25	06.58 (3)	22.12	23.04	27	05.06 (2)
21	09.08	07.46	06.19	05.40		06.33 (3)	04.16	03.34		04.39 (2)
	15.50	17.17	18.33	20.54	24	06.57 (3)	22.14	23.04	27	05.06 (2)
22	09.06	07.43	06.16	05.37		06.33 (3)	04.13	03.34		04.39 (2)
	15.53	17.20	18.35	20.57	23	06.56 (3)	22.17	23.04	27	05.06 (2)
23	09.03	07.40	06.12	05.34		06.34 (3)	04.11	03.35		04.39 (2)
	15.56	17.23	18.38	21.00	21	06.55 (3)	22.19	23.04	27	05.06 (2)
24	09.01	07.37	06.09	05.31		06.35 (3)	04.09	03.35		04.40 (2)
	15.58	17.26	18.40	21.02	18	06.53 (3)	22.21	23.04	27	05.07 (2)
25	08.59	07.34	06.06	05.28		06.36 (3)	04.07	03.35		04.40 (2)
	16.01	17.28	18.43	21.05	16	06.52 (3)	22.24	23.04	26	05.06 (2)
26	08.57	07.31	06.03	05.25		06.37 (3)	04.04	04.48 (2)	03.36	04.40 (2)
	16.04	17.31	18.46	21.08	12	06.49 (3)	22.26	3 04.51 (2)	23.04	27 05.07 (2)
27	08.54	07.28	06.00	05.22		06.43 (3)	04.02	04.46 (2)	03.37	04.41 (2)
	16.07	17.34	18.48	21.10	2	06.45 (3)	22.28	7 04.53 (2)	23.04	26 05.07 (2)
28	08.52	07.25	05.56	05.19			04.00	04.44 (2)	03.37	04.41 (2)
	16.09	17.37	18.51	21.13			22.31	10 04.54 (2)	23.03	26 05.07 (2)
29	08.50		06.53	05.16			03.58	04.43 (2)	03.38	04.41 (2)
	16.12		19.53	21.16			22.33	13 04.56 (2)	23.03	26 05.07 (2)
30	08.47		06.50	05.13			03.56	04.41 (2)	03.39	04.41 (2)
	16.15		19.56	21.18			22.35	16 04.57 (2)	23.02	26 05.07 (2)
31	08.45		06.47				03.54	04.40 (2)		
	16.18		19.59				22.37	18 04.58 (2)		
Potential sun hours	199	249	364	441		543		579		
Total, worst case					365		67		759	
Sun reduction					0,39		0,49		0,47	
Oper. time red.					0,98		0,98		0,98	
Wind dir. red.					0,60		0,63		0,63	
Total reduction					0,23		0,31		0,29	
Total, real					85		21		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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 Shadow receptor: H - Asuinrakennus J (Työlammentie 24)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July		August			September			October	November	December
1	03.40		04.42 (2)	04.45		06.06		06.41 (3)	07.22	07.44	09.04
	23.01	26	05.08 (2)	22.01		20.28	15	06.56 (3)	18.52	16.17	15.08
2	03.42		04.42 (2)	04.48		06.08		06.43 (3)	07.24	07.47	09.06
	23.00	26	05.08 (2)	21.58		20.25	10	06.53 (3)	18.49	16.15	15.07
3	03.43		04.42 (2)	04.50		06.11		06.45 (3)	07.27	07.49	09.08
	22.59	26	05.08 (2)	21.55		20.22	4	06.49 (3)	18.46	16.12	15.06
4	03.44		04.43 (2)	04.53		06.13			07.29	07.52	09.10
	22.58	25	05.08 (2)	21.53		20.18			18.42	16.09	15.04
5	03.46		04.43 (2)	04.55		06.16			07.32	07.55	09.12
	22.57	24	05.07 (2)	21.50		20.15			18.39	16.06	15.03
6	03.47		04.43 (2)	04.58		06.18			07.34	07.58	09.14
	22.56	24	05.07 (2)	21.47		20.12			18.36	16.04	15.02
7	03.49		04.44 (2)	05.01		06.21			07.37	08.00	09.16
	22.55	24	05.08 (2)	21.44		20.09			18.33	16.01	15.01
8	03.50		04.44 (2)	05.03		06.24			07.39	08.03	09.18
	22.53	23	05.07 (2)	21.41		20.06			18.30	15.58	15.00
9	03.52		04.45 (2)	05.06		06.26			07.42	08.06	09.20
	22.52	23	05.08 (2)	21.38		20.03			18.27	15.56	14.59
10	03.54		04.45 (2)	05.08		06.29			07.45	08.09	09.22
	22.50	22	05.07 (2)	21.35		19.59			18.23	15.53	14.58
11	03.56		04.46 (2)	05.11		06.31			07.47	08.12	09.23
	22.48	21	05.07 (2)	21.33		19.56			18.20	15.50	14.57
12	03.58		04.47 (2)	05.14		06.34			07.50	08.14	09.25
	22.47	19	05.06 (2)	21.30		19.53			18.17	15.48	14.57
13	04.00		04.49 (2)	05.16		06.36			07.53	08.17	09.26
	22.45	17	05.06 (2)	21.27		19.50			18.14	15.45	14.56
14	04.02		04.51 (2)	05.19		06.39			07.55	08.20	09.28
	22.43	14	05.05 (2)	21.24		19.46			18.11	15.43	14.56
15	04.04		04.52 (2)	05.22		06.41			07.58	08.23	09.29
	22.41	12	05.04 (2)	21.21		19.43			18.08	15.41	14.55
16	04.06		04.54 (2)	05.24	06.47 (3)	06.44			08.00	08.25	09.30
	22.39	9	05.03 (2)	21.18	6	06.53 (3)	19.40		18.05	15.38	14.55
17	04.08		04.56 (2)	05.27	06.44 (3)	06.46			08.03	08.28	09.31
	22.37	5	05.01 (2)	21.15	13	06.57 (3)	19.37		18.02	15.36	14.55
18	04.10			05.29	06.42 (3)	06.49			08.06	08.31	09.32
	22.35			21.12	16	06.58 (3)	19.34		17.59	15.34	14.55
19	04.13			05.32	06.40 (3)	06.51			08.08	08.33	09.33
	22.33			21.09	19	06.59 (3)	19.30		17.56	15.31	14.55
20	04.15			05.35	06.39 (3)	06.54			08.11	08.36	09.34
	22.31			21.06	22	07.01 (3)	19.27		17.53	15.29	14.55
21	04.17			05.37	06.38 (3)	06.56			08.14	08.39	09.35
	22.28			21.02	23	07.01 (3)	19.24		17.50	15.27	14.56
22	04.20			05.40	06.38 (3)	06.59			08.16	08.41	09.35
	22.26			20.59	24	07.02 (3)	19.21		17.47	15.25	14.56
23	04.22			05.43	06.36 (3)	07.01			08.19	08.44	09.36
	22.24			20.56	26	07.02 (3)	19.18		17.44	15.23	14.57
24	04.25			05.45	06.35 (3)	07.04			08.22	08.47	09.36
	22.21			20.53	26	07.01 (3)	19.14		17.41	15.21	14.57
25	04.27			05.48	06.36 (3)	07.06			08.25	08.49	09.36
	22.19			20.50	26	07.02 (3)	19.11		16.38	15.19	14.58
26	04.30			05.50	06.35 (3)	07.09			07.27	08.52	09.36
	22.16			20.47	26	07.01 (3)	19.08		16.35	15.17	14.59
27	04.32			05.53	06.35 (3)	07.11			07.30	08.54	09.36
	22.14			20.44	26	07.01 (3)	19.05		16.32	15.15	15.00
28	04.35			05.55	06.35 (3)	07.14			07.33	08.56	09.36
	22.11			20.41	25	07.00 (3)	19.02		16.29	15.13	15.01
29	04.37			05.58	06.35 (3)	07.16			07.36	08.59	09.36
	22.09			20.38	24	06.59 (3)	18.58		16.26	15.12	15.02
30	04.40			06.01	06.36 (3)	07.19			07.38	09.01	09.36
	22.06			20.34	22	06.58 (3)	18.55		16.23	15.10	15.03
31	04.42			06.03	06.38 (3)				07.41		09.36
	22.04			20.31	19	06.57 (3)			16.20		15.05
Potential sun hours	573			492		390			312	219	172
Total, worst case		340			343			29			
Sun reduction		0,44			0,42			0,32			
Oper. time red.		0,98			0,98			0,98			
Wind dir. red.		0,63			0,60			0,60			
Total reduction		0,27			0,25			0,19			
Total, real		93			86			5			

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: I - Lomarakennus K (Viitostie 31)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March			April			May			June		
1	09.35	08.42	07.22			06.44		07.13 (3)	05.10			03.53		05.19 (2)
	15.07	16.21	17.39			20.01	23	07.36 (3)	21.21			22.39	22	05.41 (2)
2	09.35	08.40	07.19			06.40		07.12 (3)	05.07			03.51		05.19 (2)
	15.08	16.24	17.42			20.04	24	07.36 (3)	21.24			22.41	21	05.40 (2)
3	09.34	08.37	07.16			06.37		07.11 (3)	05.04			03.49		05.20 (2)
	15.10	16.26	17.45			20.07	25	07.36 (3)	21.27			22.43	20	05.40 (2)
4	09.33	08.34	07.13			06.34		07.11 (3)	05.01			03.48		05.21 (2)
	15.11	16.29	17.48			20.09	25	07.36 (3)	21.29			22.45	19	05.40 (2)
5	09.32	08.32	07.10			06.31		07.11 (3)	04.58			03.46		05.21 (2)
	15.13	16.32	17.50			20.12	24	07.35 (3)	21.32			22.47	19	05.40 (2)
6	09.31	08.29	07.06			06.28		07.11 (3)	04.56			03.45		05.22 (2)
	15.15	16.35	17.53			20.14	24	07.35 (3)	21.35			22.49	17	05.39 (2)
7	09.30	08.26	07.03			06.24		07.12 (3)	04.53		05.28 (2)	03.43		05.23 (2)
	15.17	16.38	17.56			20.17	22	07.34 (3)	21.37	3	05.31 (2)	22.50	16	05.39 (2)
8	09.29	08.24	07.00			06.21		07.12 (3)	04.50		05.26 (2)	03.42		05.23 (2)
	15.19	16.41	17.58			20.20	21	07.33 (3)	21.40	9	05.35 (2)	22.52	15	05.38 (2)
9	09.28	08.21	06.57			06.18		07.13 (3)	04.47		05.23 (2)	03.41		05.24 (2)
	15.21	16.44	18.01			20.22	19	07.32 (3)	21.43	13	05.36 (2)	22.53	13	05.37 (2)
10	09.27	08.18	06.54			06.15		07.14 (3)	04.44		05.21 (2)	03.40		05.25 (2)
	15.23	16.46	18.04			20.25	16	07.30 (3)	21.45	17	05.38 (2)	22.55	12	05.37 (2)
11	09.25	08.15	06.51			06.12		07.15 (3)	04.42		05.18 (2)	03.39		05.26 (2)
	15.26	16.49	18.06			20.28	11	07.26 (3)	21.48	21	05.39 (2)	22.56	11	05.37 (2)
12	09.24	08.13	06.47			06.09			04.39		05.17 (2)	03.38		05.27 (2)
	15.28	16.52	18.09			20.30			21.51	23	05.40 (2)	22.57	9	05.36 (2)
13	09.22	08.10	06.44			06.05			04.36		05.17 (2)	03.37		05.28 (2)
	15.30	16.55	18.12			20.33			21.53	24	05.41 (2)	22.59	8	05.36 (2)
14	09.21	08.07	06.41			06.02			04.33		05.16 (2)	03.36		05.29 (2)
	15.33	16.58	18.14			20.36			21.56	24	05.40 (2)	23.00	5	05.34 (2)
15	09.19	08.04	06.38			05.59			04.31		05.15 (2)	03.36		05.30 (2)
	15.35	17.01	18.17			20.38			21.59	26	05.41 (2)	23.01	3	05.33 (2)
16	09.17	08.01	06.35			05.56			04.28		05.15 (2)	03.35		
	15.37	17.03	18.20			20.41			22.01	27	05.42 (2)	23.01		
17	09.15	07.58	06.32			05.53			04.26		05.15 (2)	03.35		
	15.40	17.06	18.22			20.44			22.04	27	05.42 (2)	23.02		
18	09.14	07.55	06.28			05.50			04.23		05.15 (2)	03.34		
	15.42	17.09	18.25			20.46			22.06	28	05.43 (2)	23.03		
19	09.12	07.52	06.25			05.47			04.21		05.15 (2)	03.34		
	15.45	17.12	18.27			20.49			22.09	28	05.43 (2)	23.03		
20	09.10	07.49	06.22			05.43			04.18		05.15 (2)	03.34		
	15.48	17.15	18.30			20.52			22.12	28	05.43 (2)	23.04		
21	09.08	07.46	06.19			05.40			04.16		05.15 (2)	03.34		
	15.50	17.17	18.33			20.54			22.14	28	05.43 (2)	23.04		
22	09.06	07.43	06.16			05.37			04.13		05.15 (2)	03.34		
	15.53	17.20	18.35			20.57			22.17	28	05.43 (2)	23.04		
23	09.03	07.40	06.12			05.34			04.11		05.15 (2)	03.35		
	15.56	17.23	18.38			21.00			22.19	28	05.43 (2)	23.04		
24	09.01	07.37	06.09			05.31			04.09		05.15 (2)	03.35		
	15.58	17.26	18.40			21.02			22.21	28	05.43 (2)	23.04		
25	08.59	07.34	06.06			05.28			04.07		05.15 (2)	03.35		
	16.01	17.28	18.43			21.05			22.24	27	05.42 (2)	23.04		
26	08.57	07.31	06.03			05.25			04.04		05.16 (2)	03.36		
	16.04	17.31	18.46			21.08			22.26	27	05.43 (2)	23.04		
27	08.54	07.28	06.00			05.22			04.02		05.16 (2)	03.37		05.35 (2)
	16.07	17.34	18.48			21.10			22.28	26	05.42 (2)	23.04	1	05.36 (2)
28	08.52	07.25	05.56		06.25 (3)	05.19			04.00		05.16 (2)	03.37		05.32 (2)
	16.09	17.37	18.51	7	06.32 (3)	21.13			22.31	26	05.42 (2)	23.03	5	05.37 (2)
29	08.50		06.53		07.22 (3)	05.16			03.58		05.17 (2)	03.38		05.32 (2)
	16.12		19.53	12	07.34 (3)	21.16			22.33	25	05.42 (2)	23.03	6	05.38 (2)
30	08.47		06.50		07.19 (3)	05.13			03.56		05.17 (2)	03.39		05.31 (2)
	16.15		19.56	16	07.35 (3)	21.18			22.35	24	05.41 (2)	23.02	9	05.40 (2)
31	08.45		06.47		07.16 (3)				03.54		05.18 (2)			
	16.18		19.59	20	07.36 (3)				22.37	23	05.41 (2)			
Potential sun hours	199	249	364			441			543			579		
Total, worst case				55			234			588			231	
Sun reduction				0,34			0,39			0,49			0,47	
Oper. time red.				0,98			0,98			0,98			0,98	
Wind dir. red.				0,61			0,61			0,63			0,63	
Total reduction				0,20			0,24			0,31			0,29	
Total, real				11			56			181			67	

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

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

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SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: I - Lomarakennus K (Viitostie 31)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July		August		September		October	November	December
1	03.40		05.31 (2)		04.45		05.28 (2)	06.06		07.15 (3)	07.22	07.44	09.04
	23.01	10	05.41 (2)	22	22.01	22	05.50 (2)	20.28	11	07.26 (3)	18.52	16.17	15.08
2	03.42		05.30 (2)		04.48		05.30 (2)	06.08		07.12 (3)	07.24	07.47	09.06
	23.00	12	05.42 (2)		21.58	19	05.49 (2)	20.25	16	07.28 (3)	18.49	16.15	15.07
3	03.43		05.30 (2)		04.50		05.32 (2)	06.11		07.10 (3)	07.27	07.49	09.08
	22.59	12	05.42 (2)		21.55	16	05.48 (2)	20.22	19	07.29 (3)	18.46	16.12	15.06
4	03.44		05.29 (2)		04.53		05.34 (2)	06.13		07.09 (3)	07.29	07.52	09.10
	22.58	14	05.43 (2)		21.53	12	05.46 (2)	20.19	21	07.30 (3)	18.42	16.09	15.04
5	03.46		05.29 (2)		04.55		05.36 (2)	06.16		07.08 (3)	07.32	07.55	09.12
	22.57	15	05.44 (2)		21.50	7	05.43 (2)	20.15	22	07.30 (3)	18.39	16.06	15.03
6	03.47		05.28 (2)		04.58			06.18		07.07 (3)	07.34	07.58	09.14
	22.56	16	05.44 (2)		21.47			20.12	24	07.31 (3)	18.36	16.04	15.02
7	03.49		05.28 (2)		05.01			06.21		07.06 (3)	07.37	08.00	09.16
	22.55	18	05.46 (2)		21.44			20.09	24	07.30 (3)	18.33	16.01	15.01
8	03.50		05.27 (2)		05.03			06.24		07.06 (3)	07.40	08.03	09.18
	22.53	19	05.46 (2)		21.41			20.06	25	07.31 (3)	18.30	15.58	15.00
9	03.52		05.28 (2)		05.06			06.26		07.06 (3)	07.42	08.06	09.20
	22.52	20	05.48 (2)		21.38			20.03	24	07.30 (3)	18.27	15.56	14.59
10	03.54		05.27 (2)		05.08			06.29		07.05 (3)	07.45	08.09	09.22
	22.50	21	05.48 (2)		21.36			19.59	24	07.29 (3)	18.23	15.53	14.58
11	03.56		05.27 (2)		05.11			06.31		07.06 (3)	07.47	08.12	09.23
	22.48	22	05.49 (2)		21.33			19.56	23	07.29 (3)	18.20	15.50	14.57
12	03.58		05.26 (2)		05.14			06.34		07.07 (3)	07.50	08.14	09.25
	22.47	23	05.49 (2)		21.30			19.53	20	07.27 (3)	18.17	15.48	14.57
13	04.00		05.26 (2)		05.16			06.36		07.10 (3)	07.53	08.17	09.26
	22.45	24	05.50 (2)		21.27			19.50	16	07.26 (3)	18.14	15.45	14.56
14	04.02		05.26 (2)		05.19			06.39		07.12 (3)	07.55	08.20	09.28
	22.43	25	05.51 (2)		21.24			19.46	12	07.24 (3)	18.11	15.43	14.56
15	04.04		05.25 (2)		05.22			06.41		07.15 (3)	07.58	08.23	09.29
	22.41	25	05.50 (2)		21.21			19.43	8	07.23 (3)	18.08	15.41	14.55
16	04.06		05.25 (2)		05.24			06.44		07.17 (3)	08.00	08.25	09.30
	22.39	26	05.51 (2)		21.18			19.40	2	07.19 (3)	18.05	15.38	14.55
17	04.08		05.25 (2)		05.27			06.46			08.03	08.28	09.31
	22.37	27	05.52 (2)		21.15			19.37			18.02	15.36	14.55
18	04.10		05.25 (2)		05.29			06.49			08.06	08.31	09.32
	22.35	27	05.52 (2)		21.12			19.34			17.59	15.33	14.55
19	04.13		05.25 (2)		05.32			06.51			08.08	08.33	09.33
	22.33	27	05.52 (2)		21.09			19.30			17.56	15.31	14.55
20	04.15		05.25 (2)		05.35			06.54			08.11	08.36	09.34
	22.31	28	05.53 (2)		21.06			19.27			17.53	15.29	14.55
21	04.17		05.25 (2)		05.37			06.56			08.14	08.39	09.35
	22.28	28	05.53 (2)		21.02			19.24			17.50	15.27	14.56
22	04.20		05.25 (2)		05.40			06.59			08.16	08.41	09.35
	22.26	28	05.53 (2)		20.59			19.21			17.47	15.25	14.56
23	04.22		05.25 (2)		05.43			07.01			08.19	08.44	09.36
	22.24	28	05.53 (2)		20.56			19.18			17.44	15.23	14.57
24	04.25		05.25 (2)		05.45			07.04			08.22	08.47	09.36
	22.21	28	05.53 (2)		20.53			19.14			17.41	15.21	14.57
25	04.27		05.25 (2)		05.48			07.06			07.25	08.49	09.36
	22.19	28	05.53 (2)		20.50			19.11			16.38	15.19	14.58
26	04.30		05.25 (2)		05.50			07.09			07.27	08.52	09.36
	22.16	28	05.53 (2)		20.47			19.08			16.35	15.17	14.59
27	04.32		05.25 (2)		05.53			07.11			07.30	08.54	09.37
	22.14	27	05.52 (2)		20.44			19.05			16.32	15.15	15.00
28	04.35		05.25 (2)		05.55			07.14			07.33	08.57	09.36
	22.11	27	05.52 (2)		20.41			19.02			16.29	15.13	15.01
29	04.37		05.27 (2)		05.58			07.16			07.36	08.59	09.36
	22.09	25	05.52 (2)		20.38			18.58			16.26	15.12	15.02
30	04.40		05.27 (2)		06.01			07.19			07.38	09.01	09.36
	22.06	24	05.51 (2)		20.34			18.55			16.23	15.10	15.03
31	04.42		05.27 (2)		06.03						07.41		09.36
	22.04	24	05.51 (2)		20.31						16.20		15.05
Potential sun hours	573				492			390			312	219	172
Total, worst case		706				76			291				
Sun reduction		0,44				0,42			0,32				
Oper. time red.		0,98				0,98			0,98				
Wind dir. red.		0,63				0,63			0,61				
Total reduction		0,27				0,26			0,19				
Total, real		194				20			56				

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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: J - Kaavoitettu asunto/loma-asunto A (Okslampi)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January		February		March	April	May	June	July	August	September	October		November		December
1	09.35		08.42	09.42 (5)	07.22	06.43	05.10	03.52	03.40	04.45	06.05	07.21		07.44	09.56 (4)	09.04
	15.06		16.20	55 10.50 (4)	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52		16.17	17 10.13 (4)	15.08
2	09.35		08.40	09.43 (5)	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24		07.47	09.54 (4)	09.06
	15.08		16.23	54 10.50 (4)	17.42	20.04	21.24	22.42	23.01	21.58	20.25	18.49		16.14	21 10.15 (4)	15.07
3	09.34		08.37	09.43 (5)	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.27		07.49	09.21 (5)	09.08
	15.09		16.26	52 10.49 (4)	17.45	20.06	21.27	22.43	23.00	21.55	20.22	18.45		16.12	30 10.16 (4)	15.05
4	09.33		08.34	09.44 (5)	07.13	06.34	05.01	03.47	03.44	04.52	06.13	07.29		07.52	09.18 (5)	09.10
	15.11		16.29	49 10.49 (4)	17.47	20.09	21.29	22.45	22.59	21.53	20.18	18.42		16.09	38 10.17 (4)	15.04
5	09.32		08.32	09.45 (5)	07.09	06.31	04.58	03.45	03.45	04.55	06.16	07.32		07.55	09.16 (5)	09.12
	15.13		16.32	48 10.49 (4)	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39		16.06	43 10.18 (4)	15.03
6	09.31		08.29	09.47 (5)	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34		07.58	09.16 (5)	09.14
	15.15		16.35	42 10.48 (4)	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36		16.03	47 10.20 (4)	15.01
7	09.30		08.26	09.49 (5)	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37		08.01	09.15 (5)	09.16
	15.17		16.38	38 10.48 (4)	17.55	20.17	21.37	22.51	22.55	21.44	20.09	18.33		16.01	50 10.20 (4)	15.00
8	09.29		08.24	09.52 (5)	07.00	06.21	04.50	03.41	03.50	05.03	06.23	07.39		08.03	09.14 (5)	09.18
	15.19		16.40	28 10.47 (4)	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30		15.58	52 10.20 (4)	14.59
9	09.28		08.21	10.25 (4)	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42		08.06	09.13 (5)	09.20
	15.21		16.43	20 10.45 (4)	18.01	20.22	21.43	22.54	22.52	21.38	20.02	18.26		15.55	54 10.20 (4)	14.58
10	09.27		08.18	10.27 (4)	06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45		08.09	09.14 (5)	09.22
	15.23		16.46	16 10.43 (4)	18.03	20.25	21.46	22.55	22.50	21.36	19.59	18.23		15.53	54 10.21 (4)	14.58
11	09.25		08.15	10.31 (4)	06.51	06.11	04.41	03.38	03.55	05.11	06.31	07.47		08.12	09.13 (5)	09.23
	15.25		16.49	9 10.40 (4)	18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20		15.50	56 10.21 (4)	14.57
12	09.24		08.13		06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50		08.14	09.13 (5)	09.25
	15.27		16.52		18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17		15.48	56 10.21 (4)	14.56
13	09.22		08.10		06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52		08.17	09.13 (5)	09.26
	15.30		16.55		18.11	20.33	21.54	22.59	22.45	21.27	19.50	18.14		15.45	56 10.21 (4)	14.56
14	09.21	10.27 (4)	08.07		06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55		08.20	09.14 (5)	09.28
	15.32	6 10.33 (4)	16.57		18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11		15.43	56 10.22 (4)	14.55
15	09.19	10.24 (4)	08.04		06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58		08.23	09.14 (5)	09.29
	15.35	11 10.35 (4)	17.00		18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08		15.40	54 10.21 (4)	14.55
16	09.17	10.23 (4)	08.01		06.35	05.56	04.28	03.35	04.06	05.24	06.43	08.00		08.25	09.14 (5)	09.30
	15.37	15 10.38 (4)	17.03		18.19	20.41	22.01	23.02	22.39	21.18	19.40	18.05		15.38	54 10.21 (4)	14.55
17	09.16	10.21 (4)	07.58		06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03		08.28	09.16 (5)	09.31
	15.40	18 10.39 (4)	17.06		18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02		15.35	50 10.21 (4)	14.55
18	09.14	10.20 (4)	07.55		06.28	05.49	04.23	03.34	04.10	05.29	06.49	08.06		08.31	09.19 (5)	09.32
	15.42	20 10.40 (4)	17.09		18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59		15.33	47 10.21 (4)	14.55
19	09.12	10.20 (4)	07.52		06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08		08.34	09.22 (5)	09.33
	15.45	22 10.42 (4)	17.12		18.27	20.49	22.09	23.04	22.33	21.09	19.30	17.55		15.31	42 10.20 (4)	14.55
20	09.10	09.56 (5)	07.49		06.22	05.43	04.18	03.34	04.15	05.34	06.54	08.11		08.36	09.26 (5)	09.34
	15.47	26 10.43 (4)	17.14		18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.52		15.29	37 10.21 (4)	14.55
21	09.08	09.53 (5)	07.46		06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14		08.39	09.29 (5)	09.35
	15.50	32 10.44 (4)	17.17		18.32	20.54	22.14	23.04	22.29	21.02	19.24	17.49		15.27	31 10.20 (4)	14.55
22	09.06	09.51 (5)	07.43		06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16		08.41	09.32 (5)	09.35
	15.53	37 10.46 (4)	17.20		18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46		15.24	26 10.19 (4)	14.56
23	09.04	09.48 (5)	07.40		06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19		08.44	09.56 (4)	09.36
	15.55	42 10.46 (4)	17.23		18.38	21.00	22.19	23.05	22.24	20.56	19.17	17.43		15.22	22 10.18 (4)	14.56
24	09.01	09.45 (5)	07.37		06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22		08.47	09.58 (4)	09.36
	15.58	47 10.47 (4)	17.25		18.40	21.02	22.22	23.05	22.22	20.53	19.14	17.40		15.20	21 10.19 (4)	14.57
25	08.59	09.42 (5)	07.34		06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.25		08.49	09.59 (4)	09.36
	16.01	50 10.47 (4)	17.28		18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37		15.18	18 10.17 (4)	14.58
26	08.57	09.41 (5)	07.31		06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27		08.52	10.01 (4)	09.37
	16.04	54 10.48 (4)	17.31		18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.34		15.16	15 10.16 (4)	14.58
27	08.54	09.41 (5)	07.28		05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30		08.54	10.03 (4)	09.37
	16.06	54 10.48 (4)	17.34		18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32		15.15	12 10.15 (4)	14.59
28	08.52	09.41 (5)	07.25		05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33		08.57	10.06 (4)	09.37
	16.09	56 10.49 (4)	17.36		18.51	21.13	22.31	23.03	22.12	20.41	19.01	16.29		15.13	6 10.12 (4)	15.01
29	08.50	09.41 (5)			06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36		08.59		09.37
	16.12	56 10.49 (4)			19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26		15.11		15.02
30	08.47	09.41 (5)			06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38		09.01		09.36
	16.15	56 10.49 (4)			19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23		15.10		15.03
31	08.45	09.42 (5)			06.47		03.54		04.42	06.03		07.41	09.59 (4)			09.36
	16.18	54 10.49 (4)			19.59		22.37		22.04	20.31		16.20	11 10.10 (4)			15.04
Potential sun hours	198		249		364	441	543	579	573	493	390	312		218		172
Total, worst case		656		411									11		1065	
Sun reduction		0,18		0,29									0,27		0,16	
Oper. time red.		0,98		0,98									0,98		0,98	
Wind dir. red.		0,65		0,65									0,66		0,65	
Total reduction		0,12		0,19									0,17		0,10	
Total, real		76		77									2		111	

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

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

Project:
Sysmä Rekolanvuoret_20200912

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: K - Lomarakennus H (Nurmela)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April			May		June		July		August		September	October	November	December
1	09.35	08.42	07.22	06.43			05.10		20.22 (3)	03.52	20.22 (3)	03.40	21.33 (2)	04.45	20.24 (3)	06.06	07.21	07.44	09.03
	15.06	16.21	17.39	20.01			21.21	18	20.40 (3)	22.39	42	21.48 (2)	23.01	23	21.56 (2)	22.01	35	20.59 (3)	20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40			05.07		20.21 (3)	03.51		20.23 (3)	03.41		21.33 (2)	04.47		20.24 (3)	06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04			21.24	22	20.43 (3)	22.41	40	21.49 (2)	23.00	23	21.56 (2)	21.58	34	20.58 (3)	20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37			05.04		20.19 (3)	03.49		20.25 (3)	03.43		21.34 (2)	04.50		20.25 (3)	06.11	07.26	07.49	09.08
	15.10	16.26	17.45	20.06			21.26	25	20.44 (3)	22.43	39	21.50 (2)	22.59	22	21.56 (2)	21.55	34	20.59 (3)	20.21	18.45	16.12	15.05
4	09.33	08.34	07.12	06.34			05.01		20.19 (3)	03.47		20.26 (3)	03.44		21.34 (2)	04.53		20.25 (3)	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09			21.29	26	20.45 (3)	22.45	37	21.50 (2)	22.58	23	21.57 (2)	21.52	33	20.58 (3)	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31			04.58		20.17 (3)	03.46		20.28 (3)	03.45		20.38 (3)	04.55		20.25 (3)	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12			21.32	29	20.46 (3)	22.47	35	21.51 (2)	22.57	26	21.56 (2)	21.50	32	20.57 (3)	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27			04.55		20.16 (3)	03.44		20.29 (3)	03.47		20.35 (3)	04.58		20.26 (3)	06.18	07.34	07.57	09.14
	15.15	16.35	17.53	20.14			21.34	30	20.46 (3)	22.48	33	21.51 (2)	22.56	31	21.56 (2)	21.47	31	20.57 (3)	20.12	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24			04.53		20.16 (3)	03.43		20.31 (3)	03.49		20.35 (3)	05.00		20.26 (3)	06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17			21.37	31	20.47 (3)	22.50	29	21.51 (2)	22.54	33	21.57 (2)	21.44	30	20.56 (3)	20.09	18.33	16.01	15.01
8	09.29	08.23	07.00	06.21			04.50		20.15 (3)	03.42		21.28 (2)	03.50		20.33 (3)	05.03		20.27 (3)	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.19			21.40	32	20.47 (3)	22.52	23	21.51 (2)	22.53	36	21.57 (2)	21.41	28	20.55 (3)	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18			04.47		20.14 (3)	03.41		21.28 (2)	03.52		20.32 (3)	05.06		20.28 (3)	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22			21.43	34	20.48 (3)	22.53	23	21.51 (2)	22.51	38	21.56 (2)	21.38	26	20.54 (3)	20.02	18.26	15.55	14.59
10	09.26	08.18	06.54	06.15			04.44		20.14 (3)	03.39		21.28 (2)	03.54		20.32 (3)	05.08		20.29 (3)	06.28	07.44	08.09	09.21
	15.23	16.46	18.03	20.25			21.45	35	20.49 (3)	22.55	23	21.51 (2)	22.50	39	21.57 (2)	21.35	24	20.53 (3)	19.59	18.23	15.53	14.58
11	09.25	08.15	06.50	06.12			04.41		20.14 (3)	03.38		21.29 (2)	03.56		20.30 (3)	05.11		20.30 (3)	06.31	07.47	08.11	09.23
	15.25	16.49	18.06	20.27			21.48	34	20.48 (3)	22.56	23	21.52 (2)	22.48	41	21.56 (2)	21.32	21	20.51 (3)	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08			04.39		20.14 (3)	03.38		21.29 (2)	03.58		20.30 (3)	05.14		20.32 (3)	06.33	07.50	08.14	09.24
	15.28	16.52	18.09	20.30			21.51	35	20.49 (3)	22.57	23	21.52 (2)	22.47	41	21.56 (2)	21.29	17	20.49 (3)	19.53	18.17	15.48	14.57
13	09.22	08.09	06.44	06.05			04.36		20.13 (3)	03.37		21.29 (2)	04.00		20.30 (3)	05.16		20.34 (3)	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33			21.53	35	20.48 (3)	22.58	23	21.52 (2)	22.45	40	21.55 (2)	21.26	12	20.46 (3)	19.49	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02			04.33		20.13 (3)	03.36		21.29 (2)	04.02		20.28 (3)	05.19			06.38	07.55	08.20	09.27
	15.32	16.58	18.14	20.35			21.56	36	20.49 (3)	22.59	23	21.52 (2)	22.43	41	21.52 (2)	21.23			19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59			04.31		20.13 (3)	03.35		21.30 (2)	04.04		20.28 (3)	05.21			06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38			21.58	36	20.49 (3)	23.00	22	21.52 (2)	22.41	40	21.51 (2)	21.20			19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56			04.28		20.14 (3)	03.35		21.30 (2)	04.06		20.28 (3)	05.24			06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41			22.01	35	20.49 (3)	23.01	23	21.53 (2)	22.39	38	21.50 (2)	21.17			19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53			04.25		20.14 (3)	03.35		21.30 (2)	04.08		20.27 (3)	05.27			06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43			22.04	35	20.49 (3)	23.02	23	21.53 (2)	22.37	37	21.48 (2)	21.14			19.37	18.02	15.36	14.55
18	09.13	07.55	06.28	05.50			04.23		20.13 (3)	03.34		21.30 (2)	04.10		20.27 (3)	05.29			06.48	08.06	08.31	09.32
	15.42	17.09	18.25	20.46			22.06	35	20.48 (3)	23.02	22	21.52 (2)	22.35	36	21.47 (2)	21.11			19.33	17.59	15.33	14.55
19	09.11	07.52	06.25	05.46			04.20		20.14 (3)	03.34		21.30 (2)	04.13		20.26 (3)	05.32			06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49			22.09	34	20.48 (3)	23.03	23	21.53 (2)	22.33	35	21.45 (2)	21.08			19.30	17.55	15.31	14.55
20	09.09	07.49	06.22	05.43			04.18		20.14 (3)	03.34		21.31 (2)	04.15		20.26 (3)	05.35			06.54	08.11	08.36	09.34
	15.47	17.14	18.30	20.51			22.11	34	20.48 (3)	23.03	23	21.54 (2)	22.30	32	21.43 (2)	21.05			19.27	17.52	15.29	14.55
21	09.07	07.46	06.19	05.40			04.16		20.14 (3)	03.34		21.31 (2)	04.17		20.26 (3)	05.37			06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54			22.14	33	20.47 (3)	23.04	23	21.54 (2)	22.28	32	20.58 (3)	21.02			19.24	17.49	15.27	14.56
22	09.05	07.43	06.15	05.37			04.13		20.16 (3)	03.34		21.31 (2)	04.20		20.25 (3)	05.40			06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57			22.16	32	20.48 (3)	23.04	23	21.54 (2)	22.26	33	20.58 (3)	20.59			19.21	17.46	15.25	14.56
23	09.03	07.40	06.12	05.34			04.11		20.16 (3)	03.34		21.31 (2)	04.22		20.25 (3)	05.42			07.01	08.19	08.44	09.35
	15.55	17.23	18.38	20.59			22.19	31	20.47 (3)	23.04	23	21.54 (2)	22.24	33	20.58 (3)	20.56			19.17	17.43	15.23	14.57
24	09.01	07.37	06.09	05.31			04.09		20.16 (3)	03.35		21.32 (2)	04.24		20.25 (3)	05.45			07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02			22.21	33	21.34 (2)	23.04	22	21.54 (2)	22.21	34	20.59 (3)	20.53			19.14	17.40	15.21	14.57
25	08.59	07.34	06.06	05.28			04.06		20.17 (3)	03.35		21.32 (2)	04.27		20.24 (3)	05.48			07.06	07.24	08.49	09.36
	16.01	17.28	18.43	21.05			22.24	35	21.36 (2)	23.04	22	21.54 (2)	22.19	35	20.59 (3)	20.50			19.11	16.37	15.19	14.58
26	08.57	07.31	06.03	05.25			04.04		20.17 (3)	03.36		21.32 (2)	04.29		20.24 (3)	05.50			07.09	07.27	08.51	09.36
	16.04	17.31	18.45	21.07			22.26	38	21.38 (2)	23.04	23	21.55 (2)	22.16	35	20.59 (3)	20.47			19.08	16.35	15.17	14.59
27	08.54	07.28	05.59	05.22			04.02		20.18 (3)	03.36		21.32 (2)	04.32		20.24 (3)	05.53			07.11	07.30	08.54	09.36
	16.06	17.34	18.48	21.10			22.28	39	21.40 (2)	23.03	23	21.55 (2)	22.14	35	20.59 (3)	20.44			19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19			04.00		20.19 (3)	03.37		21.32 (2)	04.34		20.24 (3)	05.55			07.14	07.33	08.56	09.36
	16.09	17.36	18.51	21.13			22.30	39	21.42 (2)	23.03	23	21.55 (2)	22.11	35	20.59 (3)	20.40			19.01	16.29	15.13	15.01
29	08.49		06.53	05.16			03.58		20.20 (3)	03.38		21.33 (2)	04.37		20.23 (3)	05.58			07.16	07.35	08.59	09.36
	16.12		19.53	21.16			22.33	40	21.44 (2)	23.02	22	21.55 (2)	22.09	36	20.59 (3)	20.37			18.58	16.26	15.11	15.02
30	08.47		06.50	05.13		20.25 (3)	03.56		20.20 (3)	03.39		21.33 (2)	04.40		20.24 (3)	06.00			07.19	07.38	09.01	09.36
	16.15		19.56	21.18	13	20.38 (3)	22.35	41	21.45 (2)	23.02	23	21.56 (2)	22.06	36	21.00 (3)	20.34			18.55	16.23	15.10	15.03
31	08.44		06.47				03.54		20.22 (3)				04.42		20.24 (3)	06.03				07.41		09.35
	16.18		19.59				22.37	41	21.47 (2)				22.03	35	20.59 (3)	20.31				16.20		15.05
Potential sun hours	199	249	364	441			543		579		573		492		390	312	219	172
Total, worst case					13			1033		779		1054		357				
Sun reduction					0,39			0,49		0,47		0,44		0,42				
Oper. time red.					0,98			0,98		0,98		0,98		0,98				
Wind dir. red.					0,62			0,62		0,62		0,62		0,62				
Total reduction					0,24			0,30		0,28		0,27		0,26				
Total, real					3			311		221		283		92				

Table 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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: L - Asuinrakennus L (Mäntymäki)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May		June		July		August		September	October	November	December
1	09.35	08.42	07.22	06.44	05.10		03.53		05.07 (3)	03.40	05.15 (3)	04.45	05.27 (3)	06.06	07.22	07.44	09.03
	15.07	16.21	17.39	20.01	21.21		22.39	26	05.33 (3)	23.01	05.36 (3)	22.01	05.32 (3)	20.28	18.52	16.17	15.08
2	09.34	08.40	07.19	06.40	05.07		03.51		05.07 (3)	03.42	05.15 (3)	04.48		06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24		22.41	25	05.32 (3)	23.00	05.36 (3)	21.58		20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04		03.49		05.07 (3)	03.43	05.15 (3)	04.50		06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27		22.43	25	05.32 (3)	22.59	05.37 (3)	21.55		20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01		03.48		05.08 (3)	03.44	05.15 (3)	04.53		06.13	07.29	07.52	09.10
	15.12	16.29	17.48	20.09	21.29		22.45	24	05.32 (3)	22.58	05.37 (3)	21.53		20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58		03.46		05.08 (3)	03.46	05.14 (3)	04.55		06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32		22.47	24	05.32 (3)	22.57	05.37 (3)	21.50		20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56		03.45		05.09 (3)	03.47	05.14 (3)	04.58		06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35		22.49	23	05.32 (3)	22.56	05.38 (3)	21.47		20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53		03.43		05.09 (3)	03.49	05.15 (3)	05.01		06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37		22.50	23	05.32 (3)	22.54	05.39 (3)	21.44		20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50		03.42		05.09 (3)	03.50	05.14 (3)	05.03		06.24	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40		22.52	23	05.32 (3)	22.53	05.39 (3)	21.41		20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47		03.41		05.09 (3)	03.52	05.15 (3)	05.06		06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43		22.53	23	05.32 (3)	22.52	05.40 (3)	21.38		20.02	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44		03.40		05.11 (3)	03.54	05.14 (3)	05.08		06.29	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45		22.55	21	05.32 (3)	22.50	05.40 (3)	21.35		19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42		03.39		05.11 (3)	03.56	05.15 (3)	05.11		06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48		22.56	21	05.32 (3)	22.48	05.40 (3)	21.33		19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.09	04.39	05.16 (3)	03.38		05.11 (3)	03.58	05.14 (3)	05.14		06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	7 05.23 (3)	22.57	20	05.31 (3)	22.47	05.40 (3)	21.30		19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	05.14 (3)	03.37		05.12 (3)	04.00	05.14 (3)	05.16		06.36	07.52	08.17	09.26
	15.30	16.55	18.12	20.33	21.53	12 05.26 (3)	22.58	20	05.32 (3)	22.45	05.41 (3)	21.27		19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	05.11 (3)	03.36		05.11 (3)	04.02	05.15 (3)	05.19		06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.36	21.56	15 05.26 (3)	22.59	20	05.31 (3)	22.43	05.41 (3)	21.24		19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	05.09 (3)	03.36		05.12 (3)	04.04	05.14 (3)	05.22		06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59	19 05.28 (3)	23.00	19	05.31 (3)	22.41	05.41 (3)	21.21		19.43	18.08	15.41	14.55
16	09.17	08.01	06.35	05.56	04.28	05.07 (3)	03.35		05.13 (3)	04.06	05.14 (3)	05.24		06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	22 05.29 (3)	23.01	19	05.32 (3)	22.39	05.41 (3)	21.18		19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	05.07 (3)	03.35		05.13 (3)	04.08	05.14 (3)	05.27		06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	22 05.29 (3)	23.02	19	05.32 (3)	22.37	05.42 (3)	21.15		19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	05.06 (3)	03.34		05.14 (3)	04.11	05.14 (3)	05.29		06.49	08.06	08.31	09.32
	15.43	17.09	18.25	20.46	22.06	24 05.30 (3)	23.03	18	05.32 (3)	22.35	05.42 (3)	21.12		19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	05.06 (3)	03.34		05.14 (3)	04.13	05.15 (3)	05.32		06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	25 05.31 (3)	23.03	18	05.32 (3)	22.33	05.42 (3)	21.09		19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	05.06 (3)	03.34		05.14 (3)	04.15	05.15 (3)	05.35		06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11	25 05.31 (3)	23.04	18	05.32 (3)	22.31	05.42 (3)	21.05		19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	05.05 (3)	03.34		05.14 (3)	04.17	05.15 (3)	05.37		06.56	08.14	08.39	09.34
	15.50	17.17	18.33	20.54	22.14	27 05.32 (3)	23.04	18	05.32 (3)	22.28	05.42 (3)	21.02		19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	05.05 (3)	03.34		05.14 (3)	04.20	05.15 (3)	05.40		06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	27 05.32 (3)	23.04	18	05.32 (3)	22.26	05.42 (3)	20.59		19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	05.05 (3)	03.35		05.14 (3)	04.22	05.16 (3)	05.43		07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	27 05.32 (3)	23.04	18	05.32 (3)	22.24	05.41 (3)	20.56		19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	05.05 (3)	03.35		05.15 (3)	04.25	05.16 (3)	05.45		07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21	27 05.32 (3)	23.04	18	05.33 (3)	22.21	05.41 (3)	20.53		19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	05.05 (3)	03.35		05.14 (3)	04.27	05.16 (3)	05.48		07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	27 05.32 (3)	23.04	19	05.33 (3)	22.19	05.41 (3)	20.50		19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	05.05 (3)	03.36		05.15 (3)	04.30	05.17 (3)	05.50		07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	28 05.33 (3)	23.04	19	05.34 (3)	22.16	05.40 (3)	20.47		19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	05.05 (3)	03.37		05.15 (3)	04.32	05.17 (3)	05.53		07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	27 05.32 (3)	23.03	19	05.34 (3)	22.14	05.39 (3)	20.44		19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	05.05 (3)	03.37		05.15 (3)	04.35	05.18 (3)	05.55		07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31	27 05.32 (3)	23.03	19	05.34 (3)	22.11	05.38 (3)	20.41		19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	05.06 (3)	03.38		05.15 (3)	04.37	05.21 (3)	05.58		07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	27 05.33 (3)	23.02	20	05.35 (3)	22.09	05.38 (3)	20.37		18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	05.05 (3)	03.39		05.15 (3)	04.40	05.23 (3)	06.01		07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	27 05.32 (3)	23.02	20	05.35 (3)	22.06	05.37 (3)	20.34		18.55	16.23	15.10	15.03
31	08.45		06.47		03.54	05.06 (3)				04.42	05.25 (3)	06.03			07.41		09.36
	16.18		19.59		22.37	26 05.32 (3)				22.03	10 05.35 (3)	20.31			16.20		15.05
Potential sun hours	199	249	364	441	543		579		573		492		390	312	219	172	
Total, worst case						468		617		736		5					
Sun reduction						0,49		0,47		0,44		0,42					
Oper. time red.						0,98		0,98		0,98		0,98					
Wind dir. red.						0,64		0,64		0,64		0,64					
Total reduction						0,31		0,29		0,28		0,26					
Total, real						145		180		203		1					

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:
22.2.2021 18.46/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204Shadow receptor: M - Lomarakennus M (Mäntymäki)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.53	05.04 (3)	03.40	05.12 (3)	04.45	06.06	07.22	07.44	09.03
	15.07	16.21	17.39	20.01	21.21	22.39 24	05.28 (3)	23.01 19	05.31 (3)	22.01	20.28	18.52	16.17	15.08
2	09.34	08.40	07.19	06.40	05.07	03.51	05.03 (3)	03.42	05.12 (3)	04.48	06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24	22.41 25	05.28 (3)	23.00 20	05.32 (3)	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	05.04 (3)	03.43	05.12 (3)	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43 24	05.28 (3)	22.59 20	05.32 (3)	21.55	20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01	03.48	05.05 (3)	03.44	05.12 (3)	04.53	06.13	07.29	07.52	09.10
	15.12	16.29	17.48	20.09	21.29	22.45 23	05.28 (3)	22.58 21	05.33 (3)	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	05.05 (3)	03.46	05.11 (3)	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47 23	05.28 (3)	22.57 22	05.33 (3)	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56	03.45	05.05 (3)	03.47	05.11 (3)	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49 23	05.28 (3)	22.56 22	05.33 (3)	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	05.06 (3)	03.49	05.12 (3)	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37	22.50 22	05.28 (3)	22.54 22	05.34 (3)	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	05.06 (3)	03.50	05.11 (3)	05.03	06.24	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52 21	05.27 (3)	22.53 23	05.34 (3)	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	05.06 (3)	03.52	05.12 (3)	05.06	06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43	22.53 21	05.27 (3)	22.52 23	05.35 (3)	21.38	20.02	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44	03.40	05.08 (3)	03.54	05.11 (3)	05.09	06.29	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45	22.55 20	05.28 (3)	22.50 24	05.35 (3)	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	05.08 (3)	03.56	05.12 (3)	05.11	06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48	22.56 19	05.27 (3)	22.48 24	05.36 (3)	21.33	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.09	04.39	05.16 (3) 03.38	05.08 (3)	03.58	05.11 (3)	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51 1	05.17 (3) 22.57 19	05.27 (3)	22.47 25	05.36 (3)	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	05.14 (3) 03.37	05.09 (3)	04.00	05.11 (3)	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.12	20.33	21.53 6	05.20 (3) 22.58 18	05.27 (3)	22.45 25	05.36 (3)	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.34	05.11 (3) 03.36	05.08 (3)	04.02	05.11 (3)	05.19	06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.36	21.56 10	05.21 (3) 22.59 19	05.27 (3)	22.43 26	05.37 (3)	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	05.09 (3) 03.36	05.09 (3)	04.04	05.11 (3)	05.22	06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59 14	05.23 (3) 23.00 18	05.27 (3)	22.41 25	05.36 (3)	21.21	19.43	18.08	15.41	14.56
16	09.17	08.01	06.35	05.56	04.28	05.07 (3) 03.35	05.10 (3)	04.06	05.11 (3)	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01 17	05.24 (3) 23.01 17	05.27 (3)	22.39 26	05.37 (3)	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	05.05 (3) 03.35	05.10 (3)	04.08	05.11 (3)	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04 20	05.25 (3) 23.02 17	05.27 (3)	22.37 26	05.37 (3)	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	05.04 (3) 03.34	05.11 (3)	04.11	05.11 (3)	05.30	06.49	08.06	08.31	09.32
	15.43	17.09	18.25	20.46	22.06 22	05.26 (3) 23.03 16	05.27 (3)	22.35 26	05.37 (3)	21.12	19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	05.03 (3) 03.34	05.11 (3)	04.13	05.12 (3)	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09 23	05.26 (3) 23.03 17	05.28 (3)	22.33 26	05.38 (3)	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	05.03 (3) 03.34	05.11 (3)	04.15	05.12 (3)	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11 24	05.27 (3) 23.04 17	05.28 (3)	22.31 26	05.38 (3)	21.05	19.27	17.53	15.29	14.56
21	09.08	07.46	06.19	05.40	04.16	05.02 (3) 03.34	05.11 (3)	04.17	05.12 (3)	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.33	20.54	22.14 25	05.27 (3) 23.04 17	05.28 (3)	22.28 25	05.37 (3)	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	05.02 (3) 03.34	05.11 (3)	04.20	05.12 (3)	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16 25	05.27 (3) 23.04 17	05.28 (3)	22.26 25	05.37 (3)	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	05.02 (3) 03.35	05.11 (3)	04.22	05.13 (3)	05.43	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19 26	05.28 (3) 23.04 17	05.28 (3)	22.24 24	05.37 (3)	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	05.02 (3) 03.35	05.12 (3)	04.25	05.13 (3)	05.45	07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21 26	05.28 (3) 23.04 17	05.29 (3)	22.21 24	05.37 (3)	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	05.02 (3) 03.35	05.11 (3)	04.27	05.13 (3)	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24 25	05.27 (3) 23.04 17	05.28 (3)	22.19 23	05.36 (3)	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	05.02 (3) 03.36	05.12 (3)	04.30	05.14 (3)	05.50	07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26 26	05.28 (3) 23.04 17	05.29 (3)	22.16 21	05.35 (3)	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	05.02 (3) 03.37	05.12 (3)	04.32	05.16 (3)	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28 26	05.28 (3) 23.03 18	05.30 (3)	22.14 19	05.35 (3)	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	05.02 (3) 03.38	05.12 (3)	04.35	05.18 (3)	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31 26	05.28 (3) 23.03 18	05.30 (3)	22.11 16	05.34 (3)	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	05.03 (3) 03.38	05.12 (3)	04.37	05.21 (3)	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33 25	05.28 (3) 23.02 18	05.30 (3)	22.09 12	05.33 (3)	20.37	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	05.02 (3) 03.39	05.12 (3)	04.40	05.23 (3)	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35 26	05.28 (3) 23.02 19	05.31 (3)	22.06 9	05.32 (3)	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54	05.03 (3)		04.42	05.25 (3)	06.03		07.41		09.36
	16.18		19.59		22.37 25	05.28 (3)		22.03 5	05.30 (3)	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579		573		492	390	312	219	172
Total, worst case					418	578		674						
Sun reduction					0,49	0,47		0,44						
Oper. time red.					0,98	0,98		0,98						
Wind dir. red.					0,64	0,64		0,64						
Total reduction					0,31	0,29		0,28						
Total, real					129	168		186						

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

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

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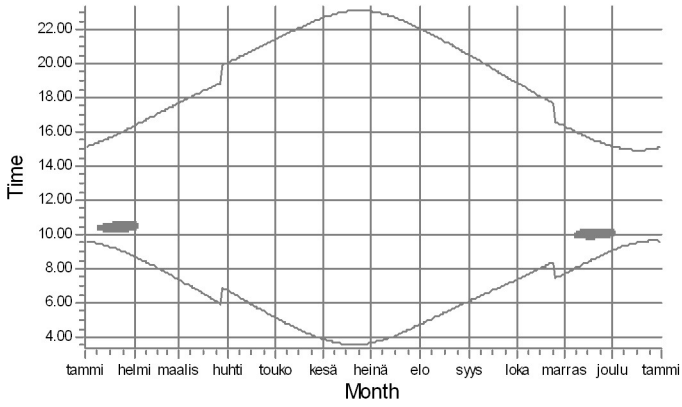
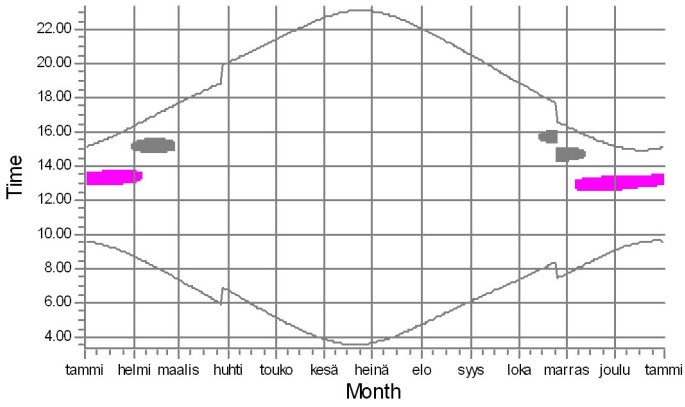
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

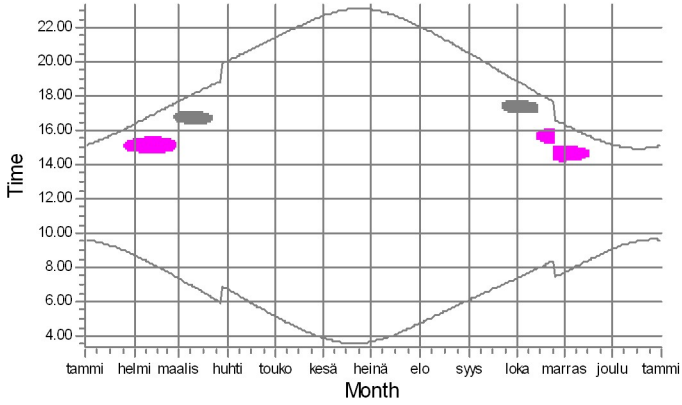
A: Asuinrakennus B (Oksjärventie 150)



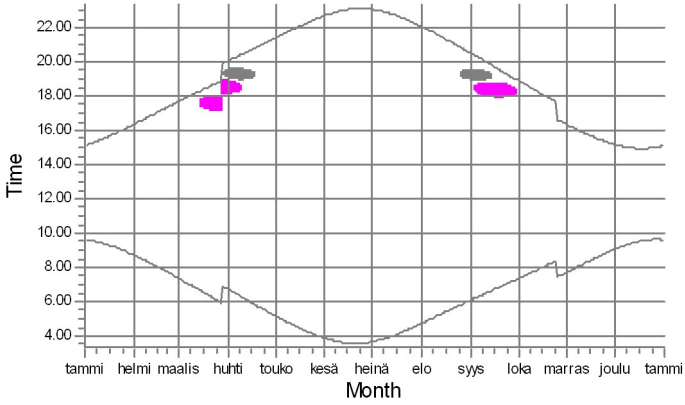
B: Lomarakennus C (Uusjoutsjärventie 312)



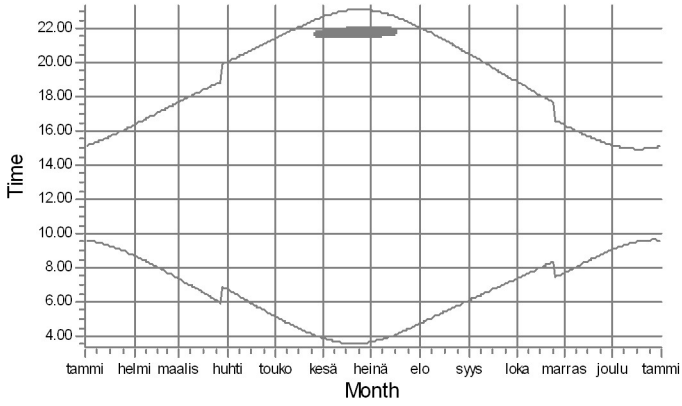
C: Asuinrakennus D (Uusjoutsjärventie 362)



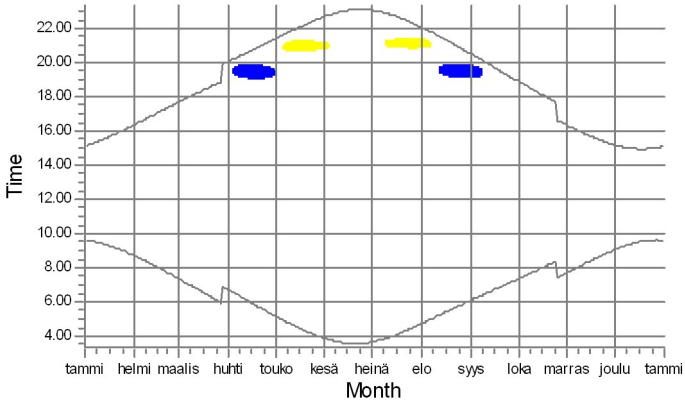
D: Lomarakennus E (Uusjoutsjärventie 450)



E: Asuinrakennus F (Ahorajantie 64)



F: Asuinrakennus G (Uutelantie 82)



WTGs

- 2: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)
- 3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)
- 4: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)
- 5: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

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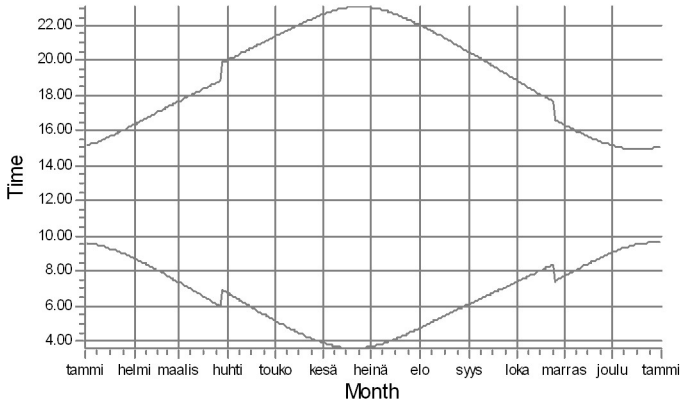
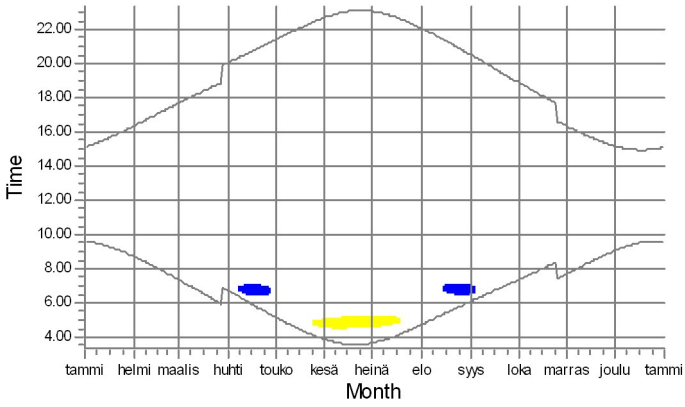
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

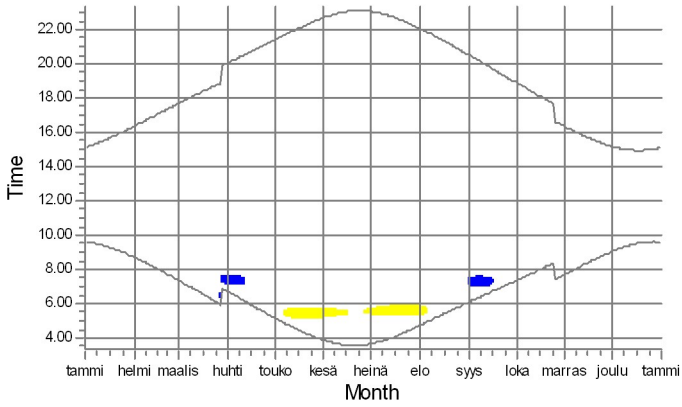
G: Lomarakennus I (Mikkolanmäentie 24)



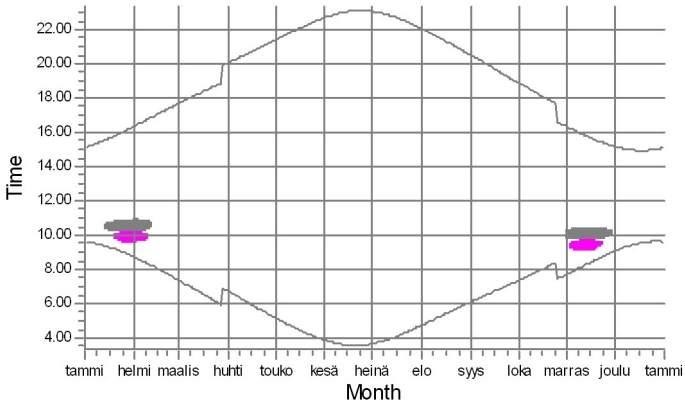
H: Asuinrakennus J (Työlammentie 24)



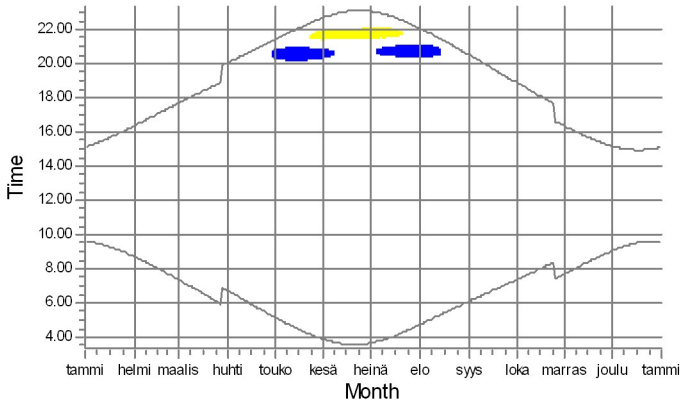
I: Lomarakennus K (Viitostie 31)



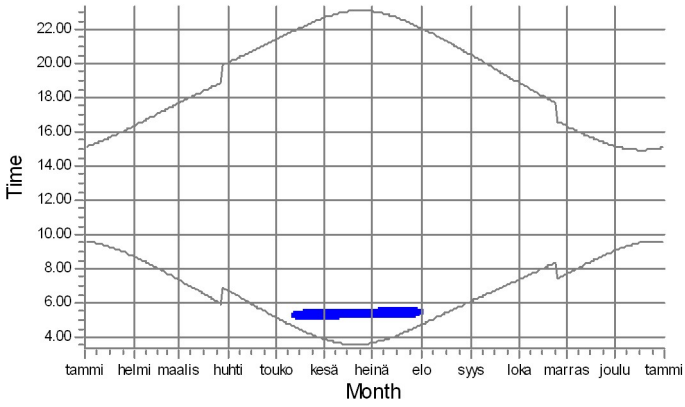
J: Kaavoitettu asunto/loma-asunto A (Okslampi)



K: Lomarakennus H (Nurmela)



L: Asuinrakennus L (Mäntymäki)



WTGs

- 2: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)
- 3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)
- 4: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)
- 5: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

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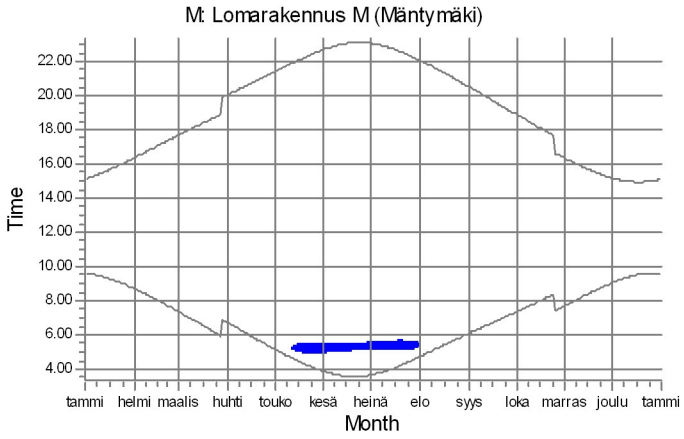
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204



WTGs

3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 1 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (6)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.52	03.40	04.45	06.06	07.22	07.44	09.04
	15.06	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.51	03.41	04.47	06.08	07.24	07.47	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43	22.59	21.55	20.22	18.46	16.12	15.05
4	09.33	08.34	07.13	06.34	05.01	03.47	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.48	05.00	06.21	07.37	08.01	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.54	22.52	21.38	20.03	18.27	15.55	14.59
10	09.27	08.18	06.54	06.15	04.44	03.39	03.54	05.08	06.28	07.45	08.09	09.22
	15.23	16.46	18.04	20.25	21.46	22.55	22.50	21.36	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.41	03.38	03.56	05.11	06.31	07.47	08.12	09.23
	15.25	16.49	18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20	15.50	14.57
12	09.24	08.13	06.47	06.08	04.39	03.37	03.58	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48	14.56
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.53	08.17	09.26
	15.30	16.55	18.12	20.33	21.54	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.28
	15.32	16.58	18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.35	04.04	05.22	06.41	07.58	08.23	09.29
	15.35	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.16	07.58	06.32	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.33	20.54	22.14	23.04	22.29	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.04	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.24	05.45	07.04	08.22	08.47	09.36
	15.58	17.26	18.40	21.02	22.22	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.29	05.50	07.09	07.27	08.52	09.37
	16.04	17.31	18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.37
	16.07	17.34	18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.37
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 2 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.43	05.10	03.52 21.27-21.48/21 04.39-04.59/20
	15.06	16.21	17.39	20.01	21.21	22.39 05.19-05.41/22 20.52-21.03/11
2	09.35	08.40	07.19	06.40	05.07	03.51 21.28-21.49/21 04.38-04.59/21
	15.08	16.23	17.42	20.04	21.24	22.41 05.19-05.40/21 20.54-21.02/8
3	09.34	08.37	07.16	06.37	05.04	03.49 21.28-21.50/22 04.38-05.00/22
	15.10	16.26	17.45	20.06	21.27	22.43 05.20-05.40/20 20.57-21.00/3
4	09.33	08.34	07.13	06.34	05.01	03.47 21.28-21.50/22 04.38-05.00/22
	15.11	16.29	17.47	20.09	21.29	22.45 05.21-05.40/19
5	09.32	08.32	07.09	06.31	04.58	03.46 21.28-21.51/23 04.38-05.01/23
	15.13	16.32	17.50	20.12	21.32	22.47 05.21-05.40/19
6	09.31	08.29	07.06	06.27	04.55 20.53-20.54/1	03.44 21.28-21.51/23 04.38-05.01/23
	15.15	16.35	17.53	20.14	21.35	22.49 05.22-05.39/17
7	09.30	08.26	07.03	06.24	04.53 05.28-05.31/3	03.43 21.28-21.51/23 04.37-05.02/25
	15.17	16.38	17.56	20.17	21.37 20.50-20.57/7	22.50 05.23-05.39/16
8	09.29	08.24	07.00	06.21	04.50 05.26-05.35/9	03.42 21.28-21.51/23 04.37-05.02/25
	15.19	16.41	17.58	20.20	21.40 20.48-20.59/11	22.52 05.23-05.38/15
9	09.28	08.21	06.57	06.18	04.47 05.23-05.36/13	03.41 21.28-21.51/23 04.37-05.02/25
	15.21	16.43	18.01	20.22	21.43 20.47-21.02/15	22.53 05.24-05.37/13
10	09.27	08.18	06.54	06.15	04.44 05.21-05.38/17	03.39 21.28-21.51/23 04.37-05.02/25
	15.23	16.46	18.04	20.25	21.45 20.46-21.03/17	22.55 05.25-05.37/12
11	09.25	08.15	06.51	06.12	04.41 05.18-05.39/21	03.38 21.29-21.52/23 04.38-05.03/25
	15.25	16.49	18.06	20.28	21.48 20.45-21.06/21	22.56 05.26-05.37/11
12	09.24	08.12	06.47	06.08	04.39 05.17-05.40/23	03.38 21.29-21.52/23 04.37-05.03/26
	15.28	16.52	18.09	20.30	21.51 20.45-21.08/23	22.57 05.27-05.36/9
13	09.22	08.10	06.44	06.05	04.36 05.17-05.41/24	03.37 21.29-21.52/23 04.38-05.04/26
	15.30	16.55	18.11	20.33	21.53 20.44-21.08/24	22.59 05.28-05.36/8
14	09.21	08.07	06.41	06.02	04.33 05.16-05.40/24	03.36 21.29-21.52/23 04.37-05.04/27
	15.32	16.58	18.14	20.35	21.56 20.44-21.08/24	23.00 05.29-05.34/5
15	09.19	08.04	06.38	05.59	04.31 05.15-05.41/26	03.35 21.30-21.52/22 04.38-05.04/26
	15.35	17.00	18.17	20.38	21.59 20.44-21.09/25	23.01 05.30-05.33/3
16	09.17	08.01	06.35	05.56	04.28 05.15-05.42/27	03.35 21.30-21.53/23
	15.37	17.03	18.19	20.41	22.01 20.44-21.09/25	23.01 04.38-05.05/27
17	09.15	07.58	06.31	05.53	04.25 05.15-05.42/27	03.34 21.30-21.53/23
	15.40	17.06	18.22	20.43	22.04 20.44-21.09/25	23.02 04.39-05.05/26
18	09.14	07.55	06.28	05.50	04.23 05.15-05.43/28	03.34 21.30-21.52/22
	15.42	17.09	18.25	20.46	22.06 20.43-21.08/25	23.03 04.39-05.05/26
19	09.12	07.52	06.25	05.46	04.20 05.15-05.43/28	03.34 21.30-21.53/23
	15.45	17.12	18.27	20.49	22.09 20.43-21.08/25	23.03 04.39-05.06/27
20	09.10	07.49	06.22	05.43	04.18 05.15-05.43/28	03.34 21.31-21.54/23
	15.48	17.14	18.30	20.51	22.12 20.44-21.08/24	23.04 04.39-05.06/27
21	09.08	07.46	06.19	05.40	04.16 05.15-05.43/28	03.34 21.31-21.54/23
	15.50	17.17	18.33	20.54	22.14 20.44-21.08/24	23.04 04.39-05.06/27
22	09.06	07.43	06.16	05.37	04.13 05.15-05.43/28	03.34 21.31-21.54/23
	15.53	17.20	18.35	20.57	22.17 20.44-21.08/24	23.04 04.39-05.06/27
23	09.03	07.40	06.12	05.34	04.11 05.15-05.43/28	03.34 21.31-21.54/23
	15.56	17.23	18.38	21.00	22.19 20.45-21.08/23	23.04 04.39-05.06/27
24	09.01	07.37	06.09	05.31	04.09 21.32-21.34/2 20.46-21.08/22	03.35 21.32-21.54/22
	15.58	17.26	18.40	21.02	22.21 05.15-05.43/28	23.04 04.40-05.07/27
25	08.59	07.34	06.06	05.28	04.06 21.30-21.36/6 20.46-21.07/21	03.35 21.32-21.54/22
	16.01	17.28	18.43	21.05	22.24 05.15-05.42/27	23.04 04.40-05.06/26
26	08.57	07.31	06.03	05.25	04.04 21.29-21.38/9 04.48-04.51/3	03.36 21.32-21.55/23
	16.04	17.31	18.46	21.08	22.26 05.16-05.43/27 20.46-21.07/21	23.04 04.40-05.07/27
27	08.54	07.28	05.59	05.22	04.02 21.29-21.40/11 04.46-04.53/7	03.36 21.32-21.55/23 04.41-05.07/26
	16.07	17.34	18.48	21.10	22.28 05.16-05.42/26 20.48-21.07/19	23.04 05.35-05.36/1
28	08.52	07.25	05.56	05.19	04.00 21.29-21.42/13 04.44-04.54/10	03.37 21.32-21.55/23 04.41-05.07/26
	16.09	17.37	18.51	21.13	22.31 05.16-05.42/26 20.48-21.06/18	23.03 05.32-05.37/5
29	08.50		06.53	05.16	03.58 21.29-21.44/15 04.43-04.56/13	03.38 21.33-21.55/22 04.41-05.07/26
	16.12		19.53	21.16	22.33 05.17-05.42/25 20.49-21.06/17	23.03 05.32-05.38/6
30	08.47		06.50	05.13	03.56 21.28-21.45/17 04.41-04.57/16	03.39 21.33-21.56/23 04.41-05.07/26
	16.15		19.56	21.18	22.35 05.17-05.41/24 20.50-21.05/15	23.02 05.31-05.40/9
31	08.45		06.47		03.54 21.28-21.47/19 04.40-04.58/18	
	16.18		19.59		22.37 05.18-05.41/23 20.51-21.04/13	
Potential sun hours	199	249	364	441	543	579
Sum of minutes with flicker	0	0	0	0	1256	1691

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 2 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40 21.33-21.56/23 04.42-05.08/26	04.45 05.28-05.50/22	06.06	07.21	07.44	09.04
	23.01 05.31-05.41/10	22.01 20.56-21.18/22	20.28	18.52	16.17	15.08
2	03.41 21.33-21.56/23 04.42-05.08/26	04.47 05.30-05.49/19	06.08	07.24	07.47	09.06
	23.00 05.30-05.42/12	21.58 20.56-21.15/19	20.25	18.49	16.14	15.07
3	03.43 21.34-21.56/22 04.42-05.08/26	04.50 05.32-05.48/16	06.11	07.27	07.49	09.08
	22.59 05.30-05.42/12	21.55 20.57-21.14/17	20.22	18.45	16.12	15.05
4	03.44 21.34-21.57/23 04.43-05.08/25	04.53 05.34-05.46/12	06.13	07.29	07.52	09.10
	22.58 05.29-05.43/14	21.53 20.58-21.11/13	20.18	18.42	16.09	15.04
5	03.45 21.34-21.56/22 04.43-05.07/24	04.55 05.36-05.43/7	06.16	07.32	07.55	09.12
	22.57 05.29-05.44/15	21.50 20.59-21.08/9	20.15	18.39	16.06	15.03
6	03.47 21.34-21.56/22 04.43-05.07/24	04.58 21.01-21.06/5	06.18	07.34	07.58	09.14
	22.56 05.28-05.44/16	21.47	20.12	18.36	16.03	15.02
7	03.49 21.35-21.57/22 04.44-05.08/24	05.00	06.21	07.37	08.00	09.16
	22.55 05.28-05.46/18	21.44	20.09	18.33	16.01	15.01
8	03.50 21.35-21.57/22 04.44-05.07/23	05.03	06.23	07.39	08.03	09.18
	22.53 05.27-05.46/19	21.41	20.06	18.30	15.58	15.00
9	03.52 21.34-21.56/22 04.45-05.08/23	05.06	06.26	07.42	08.06	09.20
	22.52 05.28-05.48/20	21.38	20.02	18.27	15.55	14.59
10	03.54 21.35-21.57/22 04.45-05.07/22	05.08	06.28	07.45	08.09	09.22
	22.50 05.27-05.48/21 21.02-21.09/7	21.35	19.59	18.23	15.53	14.58
11	03.56 21.35-21.56/21 04.46-05.07/21	05.11	06.31	07.47	08.12	09.23
	22.48 05.27-05.49/22 21.00-21.10/10	21.33	19.56	18.20	15.50	14.57
12	03.58 21.36-21.56/20 04.47-05.06/19	05.14	06.33	07.50	08.14	09.25
	22.47 05.26-05.49/23 21.00-21.12/12	21.30	19.53	18.17	15.48	14.57
13	04.00 21.37-21.55/18 04.49-05.06/17	05.16	06.36	07.52	08.17	09.26
	22.45 05.26-05.50/24 20.59-21.13/14	21.27	19.50	18.14	15.45	14.56
14	04.02 21.36-21.52/16 04.51-05.05/14	05.19	06.39	07.55	08.20	09.28
	22.43 05.26-05.51/25 20.58-21.13/15	21.24	19.46	18.11	15.43	14.56
15	04.04 21.37-21.51/14 04.52-05.04/12	05.21	06.41	07.58	08.23	09.29
	22.41 05.25-05.50/25 20.57-21.14/17	21.21	19.43	18.08	15.40	14.55
16	04.06 21.38-21.50/12 04.54-05.03/9	05.24	06.44	08.00	08.25	09.30
	22.39 05.25-05.51/26 20.57-21.15/18	21.18	19.40	18.05	15.38	14.55
17	04.08 21.39-21.48/9 04.56-05.01/5	05.27	06.46	08.03	08.28	09.31
	22.37 05.25-05.52/27 20.56-21.16/20	21.15	19.37	18.02	15.36	14.55
18	04.10 21.40-21.47/7 20.56-21.17/21	05.29	06.49	08.06	08.31	09.32
	22.35 05.25-05.52/27	21.12	19.34	17.59	15.33	14.55
19	04.13 21.41-21.45/4 20.56-21.18/22	05.32	06.51	08.08	08.33	09.33
	22.33 05.25-05.52/27	21.09	19.30	17.56	15.31	14.55
20	04.15 21.42-21.43/1 20.55-21.18/23	05.35	06.54	08.11	08.36	09.34
	22.31 05.25-05.53/28	21.05	19.27	17.53	15.29	14.55
21	04.17 05.25-05.53/28	05.37	06.56	08.14	08.39	09.35
	22.28 20.55-21.19/24	21.02	19.24	17.49	15.27	14.56
22	04.20 05.25-05.53/28	05.40	06.59	08.16	08.41	09.35
	22.26 20.55-21.19/24	20.59	19.21	17.46	15.25	14.56
23	04.22 05.25-05.53/28	05.42	07.01	08.19	08.44	09.36
	22.24 20.55-21.19/24	20.56	19.17	17.43	15.23	14.57
24	04.24 05.25-05.53/28	05.45	07.04	08.22	08.47	09.36
	22.21 20.55-21.19/24	20.53	19.14	17.41	15.21	14.57
25	04.27 05.25-05.53/28	05.48	07.06	07.25	08.49	09.36
	22.19 20.54-21.19/25	20.50	19.11	16.38	15.19	14.58
26	04.29 05.25-05.53/28	05.50	07.09	07.27	08.52	09.36
	22.16 20.54-21.19/25	20.47	19.08	16.35	15.17	14.59
27	04.32 05.25-05.52/27	05.53	07.11	07.30	08.54	09.36
	22.14 20.54-21.19/25	20.44	19.05	16.32	15.15	15.00
28	04.34 05.25-05.52/27	05.55	07.14	07.33	08.56	09.36
	22.11 20.54-21.19/25	20.41	19.01	16.29	15.13	15.01
29	04.37 05.27-05.52/25	05.58	07.16	07.35	08.59	09.36
	22.09 20.54-21.19/25	20.37	18.58	16.26	15.11	15.02
30	04.40 05.27-05.51/24	06.00	07.19	07.38	09.01	09.36
	22.06 20.55-21.19/24	20.34	18.55	16.23	15.10	15.03
31	04.42 05.27-05.51/24	06.03		07.41		09.36
	22.04 20.55-21.18/23	20.31		16.20		15.05
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	1838	161	0	0	0	0

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 3 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.43 07.13-07.36/23	05.10 20.22-20.40/18	03.52 05.04-05.33/29
	15.06	16.21	17.39	20.01	21.21	22.39 20.22-20.43/21
2	09.34	08.40	07.19	06.40 07.12-07.36/24	05.07 20.21-20.43/22	03.51 05.03-05.32/29
	15.08	16.23	17.42	20.04	21.24	22.41 20.23-20.42/19
3	09.34	08.37	07.16	06.37 07.11-07.36/25	05.04 20.19-20.44/25	03.49 05.04-05.32/28
	15.10	16.26	17.45	20.06	21.26	22.43 20.25-20.42/17
4	09.33	08.34	07.13	06.34 07.11-07.36/25	05.01 20.19-20.45/26	03.47 05.05-05.32/27
	15.11	16.29	17.47	20.09	21.29	22.45 20.26-20.41/15
5	09.32	08.32	07.09	06.31 07.11-07.35/24	04.58 20.17-20.46/29	03.46 05.05-05.32/27
	15.13	16.32	17.50	20.12 19.23-19.34/11	21.32	22.47 20.28-20.40/12
6	09.31	08.29	07.06	06.27 07.11-07.35/24	04.55 20.16-20.46/30	03.44 05.05-05.32/27
	15.15	16.35	17.53	20.14 19.19-19.38/19	21.35	22.49 20.29-20.39/10
7	09.30	08.26	07.03	06.24 07.12-07.34/22	04.53 20.16-20.47/31	03.43 05.06-05.32/26
	15.17	16.38	17.55	20.17 19.17-19.40/23	21.37	22.50 20.31-20.37/6
8	09.29	08.24	07.00	06.21 07.12-07.33/21	04.50 20.15-20.47/32	03.42 05.06-05.32/26
	15.19	16.41	17.58	20.20 19.15-19.41/26	21.40	22.52
9	09.28	08.21	06.57	06.18 07.13-07.32/19 19.13-19.42/29	04.47 20.14-20.48/34	03.41 05.06-05.32/26
	15.21	16.43	18.01	20.22 06.48-06.52/4	21.43	22.53
10	09.27	08.18	06.54	06.15 07.14-07.30/16 19.11-19.42/31	04.44 20.14-20.49/35	03.39 05.08-05.32/24
	15.23	16.46	18.04	20.25 06.45-06.55/10	21.45	22.55
11	09.25	08.15	06.51	06.12 07.15-07.26/11 19.10-19.43/33	04.41 20.14-20.48/34	03.38 05.08-05.32/24
	15.25	16.49	18.06	20.27 06.41-06.56/15	21.48	22.56
12	09.24	08.12	06.47	06.08 06.38-06.57/19	04.39 05.16-05.23/7	03.38 05.08-05.31/23
	15.28	16.52	18.09	20.30 19.09-19.44/35	21.51 20.14-20.49/35	22.57
13	09.22	08.10	06.44	06.05 06.35-06.58/23	04.36 05.14-05.26/12	03.37 05.09-05.32/23
	15.30	16.55	18.11	20.33 19.09-19.44/35	21.53 20.13-20.48/35	22.58
14	09.21	08.07	06.41	06.02 06.34-06.58/24	04.33 05.11-05.26/15	03.36 05.08-05.31/23
	15.32	16.58	18.14	20.35 19.08-19.44/36	21.56 20.13-20.49/36	22.59
15	09.19	08.04	06.38	05.59 06.33-06.58/25	04.31 05.09-05.28/19	03.35 05.09-05.31/22
	15.35	17.00	18.17	20.38 19.07-19.44/37	21.59 20.13-20.49/36	23.00
16	09.17	08.01	06.35	05.56 06.33-06.59/26	04.28 05.07-05.29/22	03.35 05.10-05.32/22
	15.37	17.03	18.19	20.41 19.07-19.44/37	22.01 20.14-20.49/35	23.01
17	09.15	07.58	06.31	05.53 06.32-06.58/26	04.26 05.05-05.29/24	03.35 05.10-05.32/22
	15.40	17.06	18.22	20.43 19.07-19.44/37	22.04 20.14-20.49/35	23.02
18	09.13	07.55	06.28	05.50 06.32-06.58/26	04.23 05.04-05.30/26	03.34 05.11-05.32/21
	15.42	17.09	18.25	20.46 19.06-19.43/37	22.06 20.13-20.48/35	23.03
19	09.12	07.52	06.25	05.46 06.32-06.58/26	04.20 05.03-05.31/28	03.34 05.11-05.32/21
	15.45	17.12	18.27	20.49 19.06-19.43/37	22.09 20.14-20.48/34	23.03
20	09.10	07.49	06.22	05.43 06.33-06.58/25	04.18 05.03-05.31/28	03.34 05.11-05.32/21
	15.48	17.14	18.30	20.51 19.06-19.42/36	22.11 20.14-20.48/34	23.04
21	09.08	07.46	06.19	05.40 06.33-06.57/24	04.16 05.02-05.32/30	03.34 05.11-05.32/21
	15.50	17.17	18.32	20.54 19.07-19.41/34	22.14 20.14-20.47/33	23.04
22	09.05	07.43	06.15	05.37 06.33-06.56/23	04.13 05.02-05.32/30	03.34 05.11-05.32/21
	15.53	17.20	18.35	20.57 19.08-19.42/34	22.16 20.16-20.48/32	23.04
23	09.03	07.40	06.12	05.34 06.34-06.55/21	04.11 05.02-05.32/30	03.34 05.11-05.32/21
	15.56	17.23	18.38	20.59 19.08-19.41/33	22.19 20.16-20.47/31	23.04
24	09.01	07.37	06.09	05.31 06.35-06.53/18	04.09 05.02-05.32/30	03.35 05.12-05.33/21
	15.58	17.26	18.40	21.02 19.09-19.39/30	22.21 20.16-20.47/31	23.04
25	08.59	07.34	06.06	05.28 06.36-06.52/16	04.06 05.02-05.32/30	03.35 05.11-05.33/22
	16.01	17.28	18.43	21.05 19.09-19.38/29	22.24 20.17-20.46/29	23.04
26	08.57	07.31	06.03	05.25 06.37-06.49/12	04.04 05.02-05.33/31	03.36 05.12-05.34/22
	16.04	17.31	18.46	21.08 19.10-19.37/27	22.26 20.17-20.46/29	23.04
27	08.54	07.28	05.59	05.22 06.43-06.45/2	04.02 05.02-05.32/30	03.37 05.12-05.34/22
	16.07	17.34	18.48	21.10 19.11-19.35/24	22.28 20.18-20.46/28	23.03
28	08.52	07.25	05.56 06.25-06.32/7	05.19 19.14-19.34/20	04.00 05.02-05.32/30	03.37 05.12-05.34/22
	16.09	17.37	18.51	21.13	22.31 20.19-20.45/26	23.03
29	08.50		06.53 07.22-07.34/12	05.16 19.16-19.31/15	03.58 05.03-05.33/30	03.38 05.12-05.35/23
	16.12		19.53	21.16	22.33 20.20-20.45/25	23.02
30	08.47		06.50 07.19-07.35/16	05.13 20.25-20.38/13	03.56 05.02-05.32/30	03.39 05.12-05.35/23
	16.15		19.56	21.18 19.19-19.27/8	22.35 20.20-20.44/24	23.02
31	08.45		06.47 07.16-07.36/20		03.54 05.03-05.32/29	
	16.18		19.59		22.37 20.22-20.44/22	
Potential sun hours	199	249	364	441	543	579
Sum of minutes with flicker	0	0	55	1365	1452	809

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

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

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SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 3 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40 05.12-05.36/24	04.45 05.27-05.32/5	06.06 07.15-07.26/11 19.09-19.42/33	07.21	07.44	09.03
	23.01	22.01 20.24-20.59/35	20.28 06.41-06.56/15	18.52	16.17	15.08
2	03.41 05.12-05.36/24	04.47 20.24-20.58/34	06.08 07.12-07.28/16 19.10-19.41/31	07.24	07.46	09.06
	23.00	21.58	20.25 06.43-06.53/10	18.49	16.14	15.07
3	03.43 05.12-05.37/25	04.50 20.25-20.59/34	06.11 07.10-07.29/19 19.11-19.40/29	07.27	07.49	09.08
	22.59	21.55	20.22 06.45-06.49/4	18.45	16.12	15.05
4	03.44 05.12-05.37/25	04.53 20.25-20.58/33	06.13 07.09-07.30/21	07.29	07.52	09.10
	22.58	21.53	20.18 19.12-19.38/26	18.42	16.09	15.04
5	03.45 05.11-05.37/26	04.55 20.25-20.57/32	06.16 07.08-07.30/22	07.32	07.55	09.12
	22.57 20.38-20.42/4	21.50	20.15 19.13-19.36/23	18.39	16.06	15.03
6	03.47 05.11-05.38/27	04.58 20.26-20.57/31	06.18 07.07-07.31/24	07.34	07.58	09.14
	22.56 20.35-20.44/9	21.47	20.12 19.14-19.33/19	18.36	16.03	15.02
7	03.49 05.12-05.39/27	05.00 20.26-20.56/30	06.21 07.06-07.30/24	07.37	08.00	09.16
	22.54 20.35-20.46/11	21.44	20.09 19.18-19.30/12	18.33	16.01	15.01
8	03.50 05.11-05.39/28	05.03 20.27-20.55/28	06.23 07.06-07.31/25	07.39	08.03	09.18
	22.53 20.33-20.47/14	21.41	20.06	18.30	15.58	15.00
9	03.52 05.12-05.40/28	05.06 20.28-20.54/26	06.26 07.06-07.30/24	07.42	08.06	09.20
	22.52 20.32-20.48/16	21.38	20.02	18.26	15.55	14.59
10	03.54 05.11-05.40/29	05.08 20.29-20.53/24	06.28 07.05-07.29/24	07.45	08.09	09.21
	22.50 20.32-20.49/17	21.35	19.59	18.23	15.53	14.58
11	03.56 05.12-05.40/28	05.11 20.30-20.51/21	06.31 07.06-07.29/23	07.47	08.11	09.23
	22.48 20.30-20.50/20	21.32	19.56	18.20	15.50	14.57
12	03.58 05.11-05.40/29	05.14 20.32-20.49/17	06.33 07.07-07.27/20	07.50	08.14	09.25
	22.47 20.30-20.51/21	21.30	19.53	18.17	15.48	14.57
13	04.00 05.11-05.41/30	05.16 20.34-20.46/12	06.36 07.10-07.26/16	07.52	08.17	09.26
	22.45 20.30-20.52/22	21.27 19.26-19.37/11	19.50	18.14	15.45	14.56
14	04.02 05.11-05.41/30	05.19 19.23-19.39/16	06.39 07.12-07.24/12	07.55	08.20	09.27
	22.43 20.28-20.53/25	21.24	19.46	18.11	15.43	14.56
15	04.04 05.11-05.41/30	05.21 19.21-19.42/21	06.41 07.15-07.23/8	07.58	08.22	09.29
	22.41 20.28-20.54/26	21.21	19.43	18.08	15.40	14.55
16	04.06 05.11-05.41/30	05.24 06.47-06.53/6	06.44 07.17-07.19/2	08.00	08.25	09.30
	22.39 20.28-20.54/26	21.18 19.18-19.43/25	19.40	18.05	15.38	14.55
17	04.08 05.11-05.42/31	05.27 06.44-06.57/13	06.46	08.03	08.28	09.31
	22.37 20.27-20.55/28	21.15 19.16-19.43/27	19.37	18.02	15.36	14.55
18	04.10 05.11-05.42/31	05.29 06.42-06.58/16	06.49	08.06	08.31	09.32
	22.35 20.27-20.56/29	21.12 19.16-19.45/29	19.33	17.59	15.33	14.55
19	04.13 05.12-05.42/30	05.32 06.40-06.59/19	06.51	08.08	08.33	09.33
	22.33 20.26-20.57/31	21.08 19.14-19.45/31	19.30	17.56	15.31	14.55
20	04.15 05.12-05.42/30	05.35 06.39-07.01/22	06.54	08.11	08.36	09.34
	22.31 20.26-20.57/31	21.05 19.14-19.46/32	19.27	17.53	15.29	14.55
21	04.17 05.12-05.42/30	05.37 06.38-07.01/23	06.56	08.14	08.39	09.34
	22.28 20.26-20.58/32	21.02 19.12-19.46/34	19.24	17.49	15.27	14.56
22	04.20 05.12-05.42/30	05.40 06.38-07.02/24	06.59	08.16	08.41	09.35
	22.26 20.25-20.58/33	20.59 19.11-19.46/35	19.21	17.46	15.25	14.56
23	04.22 05.13-05.41/28	05.42 06.36-07.02/26	07.01	08.19	08.44	09.36
	22.24 20.25-20.58/33	20.56 19.11-19.47/36	19.17	17.43	15.23	14.57
24	04.25 05.13-05.41/28	05.45 06.35-07.01/26	07.04	08.22	08.46	09.36
	22.21 20.25-20.59/34	20.53 19.10-19.46/36	19.14	17.41	15.21	14.57
25	04.27 05.13-05.41/28	05.48 06.36-07.02/26	07.06	07.24	08.49	09.36
	22.19 20.24-20.59/35	20.50 19.10-19.47/37	19.11	16.38	15.19	14.58
26	04.29 05.14-05.40/26	05.50 06.35-07.01/26	07.09	07.27	08.51	09.36
	22.16 20.24-20.59/35	20.47 19.09-19.46/37	19.08	16.35	15.17	14.59
27	04.32 05.16-05.39/23	05.53 06.35-07.01/26	07.11	07.30	08.54	09.36
	22.14 20.24-20.59/35	20.44 19.09-19.46/37	19.05	16.32	15.15	15.00
28	04.35 05.18-05.38/20	05.55 06.35-07.00/25	07.14	07.33	08.56	09.36
	22.11 20.24-20.59/35	20.41 19.09-19.46/37	19.01	16.29	15.13	15.01
29	04.37 05.21-05.38/17	05.58 06.35-06.59/24	07.16	07.35	08.59	09.36
	22.09 20.23-20.59/36	20.37 19.09-19.45/36	18.58	16.26	15.11	15.02
30	04.40 05.23-05.37/14	06.00 06.36-06.58/22	07.19	07.38	09.01	09.36
	22.06 20.24-21.00/36	20.34 19.10-19.45/35	18.55	16.23	15.10	15.03
31	04.42 05.25-05.35/10	06.03 06.38-06.57/19		07.41		09.36
	22.03 20.24-20.59/35	20.31 19.09-19.43/34		16.20		15.05
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	1525	1291	493	0	0	0

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 4 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June
1	09.35 15.06	08.42 10.18-10.50/32 16.20 15.02-15.17/15	07.22 16.35-16.55/20 17.39	06.43 19.09-19.26/17 20.01	05.10 21.21	03.52 21.29-21.47/18 22.39
2	09.35 15.08	08.40 10.18-10.50/32 16.23 15.00-15.20/20	07.19 16.32-16.56/24 17.42	06.40 19.07-19.28/21 20.04	05.07 21.24	03.50 21.29-21.48/19 22.41
3	09.34 15.09	08.37 10.19-10.49/30 16.26 14.58-15.22/24	07.16 16.30-16.57/27 17.45	06.37 19.06-19.29/23 20.06	05.04 21.27	03.49 21.29-21.49/20 22.43
4	09.33 15.11	08.34 10.20-10.49/29 16.29 14.57-15.24/27	07.12 16.29-16.59/30 17.47	06.34 19.05-19.30/25 20.09	05.01 21.29	03.47 21.29-21.50/21 22.45
5	09.32 15.13	08.32 10.20-10.49/29 16.32 14.56-15.25/29	07.09 16.29-17.00/31 17.50	06.31 19.04-19.30/26 20.12	04.58 21.32	03.46 21.28-21.50/22 22.47
6	09.31 15.15	08.29 10.21-10.48/27 16.35 14.55-15.26/31	07.06 16.27-16.59/32 17.53	06.27 19.03-19.30/27 20.14	04.55 21.35	03.44 21.28-21.50/22 22.49
7	09.30 15.17	08.26 10.22-10.48/26 16.38 14.55-15.27/32	07.03 16.26-17.00/34 17.55	06.24 19.03-19.30/27 20.17	04.52 21.37	03.43 21.28-21.51/23 22.50
8	09.29 15.19	08.24 10.24-10.47/23 16.40 14.54-15.28/34	07.00 16.26-17.00/34 17.58	06.21 19.01-19.29/28 20.20	04.50 21.40	03.41 21.28-21.52/24 22.52
9	09.28 15.21	08.21 10.25-10.45/20 16.43 14.54-15.29/35	06.57 16.26-17.01/35 18.01	06.18 19.01-19.29/28 20.22	04.47 21.43	03.40 21.28-21.52/24 22.53
10	09.27 10.21-10.26/5 15.23	08.18 10.27-10.43/16 16.46 14.54-15.30/36	06.54 16.25-17.00/35 18.03	06.15 19.01-19.29/28 20.25	04.44 21.45	03.39 21.28-21.52/24 22.55
11	09.25 10.19-10.28/9 15.25	08.15 10.31-10.40/9 16.49 14.53-15.29/36	06.50 16.25-17.00/35 18.06	06.11 19.02-19.28/26 20.27	04.41 21.48	03.38 21.28-21.52/24 22.56
12	09.24 10.17-10.29/12 15.27	08.12 14.52-15.30/38 16.52	06.47 16.25-16.59/34 18.09	06.08 19.02-19.27/25 20.30	04.39 21.51	03.37 21.28-21.53/25 22.57
13	09.22 10.16-10.31/15 15.30	08.10 14.52-15.30/38 16.55	06.44 16.25-16.59/34 18.11	06.05 19.03-19.26/23 20.33	04.36 21.53	03.36 21.28-21.53/25 22.59
14	09.21 10.16-10.33/17 15.32	08.07 14.53-15.30/37 16.57	06.41 16.25-16.57/32 18.14	06.02 19.03-19.25/22 20.35	04.33 21.56	03.36 21.28-21.54/26 23.00
15	09.19 10.15-10.35/20 15.35	08.04 14.53-15.30/37 17.00	06.38 16.25-16.57/32 18.17	05.59 19.05-19.23/18 20.38	04.30 21.59	03.35 21.29-21.54/25 23.01
16	09.17 10.15-10.38/23 15.37	08.01 14.53-15.30/37 17.03	06.35 16.26-16.56/30 18.19	05.56 19.06-19.21/15 20.41	04.28 22.01	03.35 21.29-21.55/26 23.01
17	09.15 10.15-10.39/24 15.40	07.58 14.52-15.29/37 17.06	06.31 16.27-16.55/28 18.22	05.53 19.09-19.18/9 20.43	04.25 22.04	03.34 21.29-21.54/25 23.02
18	09.14 10.15-10.40/25 15.42	07.55 14.53-15.29/36 17.09	06.28 16.28-16.52/24 18.25	05.49 20.46	04.23 22.06	03.34 21.29-21.54/25 23.03
19	09.12 10.15-10.42/27 15.45	07.52 14.54-15.29/35 17.12	06.25 16.30-16.51/21 18.27	05.46 20.49	04.20 22.09	03.34 21.29-21.55/26 23.03
20	09.10 10.14-10.43/29 15.47	07.49 14.54-15.28/34 17.14	06.22 16.33-16.48/15 18.30	05.43 20.51	04.18 22.12	03.34 21.29-21.55/26 23.04
21	09.08 10.14-10.44/30 15.50	07.46 14.55-15.28/33 17.17	06.19 16.38-16.43/5 18.32	05.40 20.54	04.15 22.14	03.34 21.30-21.56/26 23.04
22	09.06 10.15-10.46/31 15.53	07.43 14.56-15.26/30 17.20	06.15 18.35	05.37 20.57	04.13 22.17	03.34 21.30-21.56/26 23.04
23	09.03 10.15-10.46/31 15.55	07.40 14.57-15.25/28 17.23	06.12 18.38	05.34 20.59	04.11 22.19	03.34 21.30-21.56/26 23.04
24	09.01 10.15-10.47/32 15.58	07.37 14.59-15.23/24 17.25	06.09 18.40	05.31 21.02	04.08 22.21	03.34 21.30-21.55/25 23.04
25	08.59 10.15-10.47/32 16.01	07.34 15.01-15.21/20 17.28	06.06 18.43	05.28 21.05	04.06 22.24	03.35 21.31-21.56/25 23.04
26	08.57 10.16-10.48/32 16.04	07.31 15.04-15.17/13 17.31	06.03 18.46	05.25 21.08	04.04 22.26	03.36 21.31-21.57/26 23.04
27	08.54 10.16-10.48/32 16.06	07.28 16.42-16.47/5 17.34	05.59 18.48	05.22 21.10	04.02 21.37-21.40/3 22.28	03.36 21.31-21.56/25 23.04
28	08.52 10.17-10.49/32 16.09	07.25 16.37-16.52/15 17.36	05.56 18.51	05.19 21.13	04.00 21.33-21.42/9 22.31	03.37 21.32-21.57/25 23.03
29	08.50 10.17-10.49/32 16.12		06.53 19.53	05.16 21.16	03.58 21.31-21.43/12 22.33	03.38 21.32-21.57/25 23.03
30	08.47 10.17-10.49/32 16.15		06.50 19.18-19.20/2 19.56	05.13 21.18	03.56 21.31-21.45/14 22.35	03.39 21.33-21.57/24 23.02
31	08.45 10.18-10.49/31 16.18 15.05-15.14/9		06.47 19.12-19.25/13 19.59		03.54 21.31-21.47/16 22.37	
Potential sun hours	198	249	364	441	543	579
Sum of minutes with flicker	562	1089	607	388	54	723

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204 WTG: 4 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40 21.32-21.57/25	04.45	06.05 19.00-19.27/27	07.21 17.04-17.38/34	07.44 09.56-10.13/17	09.04 10.01-10.10/9
	23.01	22.01	20.28	18.52	16.17 14.23-14.59/36	15.08
2	03.41 21.32-21.57/25	04.47	06.08 19.00-19.28/28	07.24 17.03-17.38/35	07.47 09.54-10.15/21	09.06 10.04-10.09/5
	23.00	21.58	20.25	18.49	16.14 14.24-14.58/34	15.07
3	03.42 21.34-21.58/24	04.50	06.11 18.59-19.27/28	07.26 17.03-17.38/35	07.49 09.53-10.16/23	09.08
	22.59	21.55	20.22	18.45	16.12 14.24-14.58/34	15.05
4	03.44 21.34-21.57/23	04.52	06.13 18.59-19.27/28	07.29 17.03-17.38/35	07.52 09.52-10.17/25	09.10
	22.58	21.53	20.18	18.42	16.09 14.24-14.57/33	15.04
5	03.45 21.34-21.57/23	04.55	06.16 18.59-19.27/28	07.32 17.02-17.37/35	07.55 09.51-10.18/27	09.12
	22.57	21.50	20.15	18.39	16.06 14.25-14.56/31	15.03
6	03.47 21.34-21.57/23	04.58	06.18 18.58-19.26/28	07.34 17.03-17.37/34	07.58 09.51-10.20/29	09.14
	22.56	21.47	20.12	18.36	16.03 14.27-14.56/29	15.01
7	03.48 21.34-21.56/22	05.00	06.21 18.59-19.25/26	07.37 17.03-17.36/33	08.00 09.50-10.20/30	09.16
	22.55	21.44	20.09	18.33	16.01 14.28-14.54/26	15.00
8	03.50 21.35-21.57/22	05.03	06.23 18.59-19.24/25	07.39 17.03-17.34/31	08.03 09.50-10.20/30	09.18
	22.53	21.41	20.06	18.30	15.58 14.29-14.53/24	14.59
9	03.52 21.36-21.56/20	05.06	06.26 19.00-19.23/23	07.42 17.04-17.34/30	08.06 09.49-10.20/31	09.20
	22.52	21.38	20.02	18.26	15.55 14.31-14.51/20	14.58
10	03.54 21.37-21.56/19	05.08	06.28 19.00-19.21/21	07.45 17.04-17.33/29	08.09 09.50-10.21/31	09.22
	22.50	21.35	19.59	18.23	15.53 14.34-14.49/15	14.58
11	03.55 21.37-21.55/18	05.11	06.31 19.02-19.20/18	07.47 17.06-17.31/25	08.12 09.49-10.21/32	09.23
	22.49	21.33	19.56	18.20	15.50 14.37-14.45/8	14.57
12	03.57 21.38-21.55/17	05.13	06.33 19.03-19.17/14	07.50 17.06-17.29/23	08.14 09.49-10.21/32	09.25
	22.47	21.30	19.53	18.17	15.48	14.56
13	03.59 21.39-21.55/16	05.16	06.36 19.07-19.12/5	07.52 17.08-17.26/18	08.17 09.49-10.21/32	09.26
	22.45	21.27	19.50	18.14	15.45	14.56
14	04.01 21.40-21.53/13	05.19	06.38	07.55 17.11-17.23/12	08.20 09.50-10.22/32	09.28
	22.43	21.24	19.46	18.11	15.43	14.55
15	04.04 21.41-21.51/10	05.21	06.41	07.58 15.40-15.47/7	08.23 09.49-10.21/32	09.29
	22.41	21.21	19.43	18.08	15.40	14.55
16	04.06 21.44-21.50/6	05.24	06.43	08.00 15.35-15.52/17	08.25 09.49-10.21/32	09.30
	22.39	21.18	19.40	18.05	15.38	14.55
17	04.08	05.27	06.46	08.03 15.31-15.53/22	08.28 09.49-10.21/32	09.31
	22.37	21.15	19.37	18.02	15.35	14.55
18	04.10	05.29	06.48	08.06 15.29-15.55/26	08.31 09.49-10.21/32	09.32
	22.35	21.12	19.33	17.58	15.33	14.55
19	04.12	05.32	06.51	08.08 15.28-15.56/28	08.33 09.49-10.20/31	09.33
	22.33	21.09	19.30	17.55	15.31	14.55
20	04.15	05.34	06.54	08.11 15.26-15.57/31	08.36 09.50-10.21/31	09.34
	22.31	21.05	19.27	17.52	15.29	14.55
21	04.17	05.37	06.56	08.14 15.25-15.58/33	08.39 09.50-10.20/30	09.35
	22.28	21.02	19.24	17.49	15.27	14.55
22	04.19	05.40	06.59	08.16 15.24-15.58/34	08.41 09.50-10.19/29	09.35
	22.26	20.59	19.21	17.46	15.24	14.56
23	04.22	05.42	07.01 17.18-17.31/13	08.19 15.24-15.59/35	08.44 09.51-10.18/27	09.36
	22.24	20.56	19.17	17.43	15.22	14.56
24	04.24	05.45	07.04 17.15-17.34/19	08.22 15.23-15.59/36	08.47 09.52-10.19/27	09.36
	22.21	20.53	19.14	17.40	15.20	14.57
25	04.27	05.47	07.06 17.12-17.35/23	07.24 14.23-15.00/37	08.49 09.53-10.17/24	09.36
	22.19	20.50	19.11	16.37	15.18	14.58
26	04.29	05.50 19.12-19.21/9	07.09 17.10-17.36/26	07.27 14.22-15.00/38	08.52 09.53-10.16/23	09.36
	22.16	20.47	19.08	16.34	15.17	14.59
27	04.32	05.53 19.08-19.23/15	07.11 17.08-17.37/29	07.30 14.22-15.00/38	08.54 09.54-10.15/21	09.37
	22.14	20.44	19.05	16.32	15.15	15.00
28	04.34	05.55 19.06-19.25/19	07.14 17.07-17.38/31	07.33 14.22-15.00/38	08.57 09.55-10.12/17	09.36
	22.11	20.41	19.01	16.29	15.13	15.01
29	04.37	05.58 19.04-19.26/22	07.16 17.06-17.38/32	07.35 14.22-14.59/37	08.59 09.57-10.12/15	09.36
	22.09	20.37	18.58	16.26	15.11	15.02
30	04.39	06.00 19.02-19.26/24	07.19 17.05-17.38/33	07.38 14.22-14.59/37	09.01 09.59-10.11/12	09.36
	22.06	20.34	18.55	16.23	15.10	15.03
31	04.42	06.03 19.02-19.27/25		07.41 09.59-10.10/11		09.36
	22.04	20.31		16.20 14.22-14.59/37		15.04
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	306	114	505	951	1097	14

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

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

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SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204WTG: 5 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June
1	09.35 12.57-13.27/30 15.06	08.42 09.42-10.05/23 13.08-13.36/28 16.20 14.51-15.23/32	07.22 17.39	06.43 18.12-18.48/36 20.01	05.10 21.21	03.52 22.39
2	09.35 12.57-13.28/31 15.08	08.40 09.43-10.05/22 13.10-13.35/25 16.23 14.50-15.24/34	07.19 17.42	06.40 18.13-18.47/34 20.04	05.07 21.24	03.50 22.41
3	09.34 12.58-13.29/31 15.09	08.37 09.43-10.05/22 13.11-13.34/23 16.26 14.49-15.25/36	07.16 17.45	06.37 18.14-18.46/32 20.06	05.04 21.26	03.49 22.43
4	09.33 12.58-13.29/31 15.11	08.34 09.44-10.04/20 13.14-13.32/18 16.29 14.49-15.26/37	07.12 17.47	06.34 18.15-18.45/30 20.09	05.01 21.29	03.47 22.45
5	09.32 12.58-13.31/33 15.13	08.32 09.45-10.04/19 13.17-13.30/13 16.32 14.48-15.27/39	07.09 17.50	06.31 18.17-18.43/26 20.12	04.58 21.32	03.46 22.47
6	09.31 12.58-13.31/33 15.15	08.29 09.47-10.02/15 16.35 14.48-15.28/40	07.06 17.53	06.27 18.19-18.41/22 20.14	04.55 21.35	03.44 22.49
7	09.30 12.58-13.32/34 15.17	08.26 09.49-10.01/12 16.38 14.47-15.28/41	07.03 17.55	06.24 18.21-18.38/17 20.17	04.52 21.37	03.43 22.50
8	09.29 12.58-13.33/35 15.19	08.24 09.52-09.57/5 16.40 14.47-15.29/42	07.00 17.58	06.21 18.24-18.33/9 20.20	04.50 21.40	03.41 22.52
9	09.28 12.58-13.33/35 15.21	08.21 14.47-15.30/43 16.43	06.57 18.01	06.18 20.22	04.47 21.43	03.40 22.53
10	09.27 12.59-13.34/35 15.23	08.18 14.46-15.29/43 16.46	06.54 18.03	06.15 20.25	04.44 21.45	03.39 22.55
11	09.25 12.59-13.35/36 15.25	08.15 14.46-15.29/43 16.49	06.50 18.06	06.11 20.27	04.41 21.48	03.38 22.56
12	09.24 12.58-13.35/37 15.27	08.12 14.46-15.30/44 16.52	06.47 18.09	06.08 20.30	04.38 21.51	03.37 22.57
13	09.22 12.59-13.36/37 15.30	08.10 14.46-15.30/44 16.55	06.44 18.11	06.05 20.33	04.36 21.53	03.36 22.59
14	09.21 13.00-13.37/37 15.32	08.07 14.46-15.30/44 16.57	06.41 18.14	06.02 20.35	04.33 21.56	03.36 23.00
15	09.19 12.59-13.37/38 15.35	08.04 14.47-15.30/43 17.00	06.38 17.29-17.42/13 18.17	05.59 20.38	04.30 21.59	03.35 23.01
16	09.17 13.00-13.38/38 15.37	08.01 14.47-15.30/43 17.03	06.35 17.25-17.46/21 18.19	05.56 20.41	04.28 22.01	03.35 23.01
17	09.15 13.00-13.38/38 15.40	07.58 14.47-15.29/42 17.06	06.31 17.23-17.48/25 18.22	05.53 20.43	04.25 22.04	03.34 23.02
18	09.14 13.00-13.38/38 15.42	07.55 14.47-15.28/41 17.09	06.28 17.20-17.49/29 18.25	05.49 20.46	04.23 22.06	03.34 23.03
19	09.12 13.01-13.39/38 15.45	07.52 14.48-15.28/40 17.12	06.25 17.19-17.50/31 18.27	05.46 20.49	04.20 22.09	03.34 23.03
20	09.10 09.56-09.58/2 15.47 13.01-13.39/38	07.49 14.49-15.27/38 17.14	06.22 17.18-17.51/33 18.30	05.43 20.51	04.18 22.12	03.34 23.04
21	09.08 09.53-09.59/6 15.50 13.01-13.39/38	07.46 14.49-15.26/37 17.17	06.19 17.17-17.52/35 18.32	05.40 20.54	04.15 22.14	03.34 23.04
22	09.06 09.51-10.01/10 15.53 13.02-13.40/38	07.43 14.50-15.25/35 17.20	06.15 17.15-17.52/37 18.35	05.37 20.57	04.13 22.17	03.34 23.04
23	09.03 09.48-10.02/14 15.55 13.02-13.40/38	07.40 14.52-15.24/32 17.23	06.12 17.14-17.52/38 18.38	05.34 20.59	04.11 22.19	03.34 23.04
24	09.01 09.45-10.03/18 15.58 13.02-13.40/38	07.37 14.54-15.22/28 17.25	06.09 17.14-17.52/38 18.40	05.31 21.02	04.08 22.21	03.34 23.04
25	08.59 09.42-10.03/21 16.01 13.03-13.40/37	07.34 14.56-15.20/24 17.28	06.06 17.14-17.53/39 18.43	05.28 21.05	04.06 22.24	03.35 23.04
26	08.57 09.41-10.04/23 13.03-13.39/36 16.04 15.04-15.06/2	07.31 14.58-15.17/19 17.31	06.03 17.12-17.52/40 18.45	05.25 21.08	04.04 22.26	03.36 23.04
27	08.54 09.41-10.04/23 13.04-13.39/35 16.06 14.59-15.12/13	07.28 15.03-15.12/9 17.34	05.59 17.12-17.52/40 18.48	05.22 21.10	04.02 22.28	03.36 23.04
28	08.52 09.41-10.05/24 13.04-13.39/35 16.09 14.56-15.15/19	07.25 17.36	05.56 17.12-17.51/39 18.51	05.19 21.13	04.00 22.31	03.37 23.03
29	08.50 09.41-10.05/24 13.05-13.38/33 16.12 14.54-15.18/24		06.53 18.12-18.51/39 19.53	05.16 21.16	03.58 22.33	03.38 23.03
30	08.47 09.41-10.05/24 13.06-13.38/32 16.15 14.53-15.19/26		06.50 18.13-18.50/37 19.56	05.13 21.18	03.56 22.35	03.39 23.02
31	08.45 09.42-10.05/23 13.07-13.37/30 16.18 14.52-15.21/29		06.47 18.13-18.50/37 19.59		03.54 22.37	
Potential sun hours	198	249	364	441	543	579
Sum of minutes with flicker	1418	1238	571	206	0	0

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

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

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204WTG: 5 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40	04.45	06.05	07.21	07.44 14.16-14.59/43	09.04 12.40-13.16/36
	23.01	22.01	20.28	18.52	16.17	15.08
2	03.41	04.47	06.08	07.24	07.46 14.17-14.59/42	09.06 12.41-13.16/35
	23.00	21.58	20.25	18.49	16.14	15.07
3	03.42	04.50	06.11	07.26	07.49 09.21-09.28/7	09.08 12.42-13.17/35
	22.59	21.55	20.22	18.45	16.12 14.17-14.58/41	15.05
4	03.44	04.52	06.13 18.22-18.31/9	07.29	07.52 09.18-09.31/13	09.10 12.42-13.17/35
	22.58	21.53	20.18	18.42	16.09 14.17-14.58/41	15.04
5	03.45	04.55	06.16 18.17-18.34/17	07.32	07.55 09.16-09.32/16	09.12 12.43-13.17/34
	22.57	21.50	20.15	18.39	16.06 14.17-14.57/40	15.03
6	03.47	04.58	06.18 18.14-18.36/22	07.34	07.58 09.16-09.34/18 12.47-13.01/14	09.14 12.44-13.18/34
	22.56	21.47	20.12	18.36	16.03 14.18-14.56/38	15.01
7	03.48	05.00	06.21 18.12-18.38/26	07.37	08.00 09.15-09.35/20 12.44-13.03/19	09.16 12.45-13.17/32
	22.55	21.44	20.09	18.33	16.01 14.19-14.56/37	15.00
8	03.50	05.03	06.23 18.10-18.39/29	07.39	08.03 09.14-09.36/22 12.42-13.05/23	09.18 12.46-13.18/32
	22.53	21.41	20.06	18.30	15.58 14.20-14.56/36	14.59
9	03.52	05.06	06.26 18.08-18.40/32	07.42	08.06 09.13-09.36/23 12.40-13.06/26	09.20 12.46-13.17/31
	22.52	21.38	20.02	18.26	15.55 14.21-14.54/33	14.58
10	03.54	05.08	06.28 18.07-18.40/33	07.45	08.09 09.14-09.37/23 12.40-13.08/28	09.22 12.46-13.17/31
	22.50	21.35	19.59	18.23	15.53 14.22-14.53/31	14.58
11	03.55	05.11	06.31 18.06-18.41/35	07.47	08.11 09.13-09.37/24 12.39-13.09/30	09.23 12.48-13.18/30
	22.48	21.32	19.56	18.20	15.50 14.24-14.53/29	14.57
12	03.57	05.13	06.33 18.04-18.41/37	07.50	08.14 09.13-09.37/24 12.38-13.10/32	09.25 12.49-13.18/29
	22.47	21.30	19.53	18.17	15.48 14.25-14.51/26	14.56
13	03.59	05.16	06.36 18.03-18.41/38	07.52	08.17 09.13-09.37/24 12.37-13.10/33	09.26 12.49-13.18/29
	22.45	21.27	19.50	18.14	15.45 14.26-14.49/23	14.56
14	04.01	05.19	06.38 18.03-18.41/38	07.55	08.20 09.14-09.38/24 12.37-13.12/35	09.28 12.49-13.18/29
	22.43	21.24	19.46	18.11	15.43 14.29-14.48/19	14.55
15	04.03	05.21	06.41 18.02-18.41/39	07.58 15.34-15.47/13	08.23 09.14-09.37/23 12.36-13.12/36	09.29 12.50-13.18/28
	22.41	21.21	19.43	18.08	15.40 14.32-14.45/13	14.55
16	04.06	05.24	06.43 18.02-18.41/39	08.00 15.30-15.51/21	08.25 09.14-09.37/23	09.30 12.51-13.19/28
	22.39	21.18	19.40	18.05	15.38 12.36-13.12/36	14.55
17	04.08	05.27	06.46 18.01-18.40/39	08.03 15.26-15.52/26	08.28 09.16-09.37/21	09.31 12.52-13.19/27
	22.37	21.15	19.37	18.02	15.35 12.36-13.14/38	14.55
18	04.10	05.29	06.48 18.01-18.40/39	08.06 15.24-15.54/30	08.31 09.19-09.37/18	09.32 12.52-13.19/27
	22.35	21.12	19.33	17.58	15.33 12.36-13.14/38	14.55
19	04.12	05.32	06.51 18.01-18.39/38	08.08 15.22-15.55/33	08.33 09.22-09.36/14	09.33 12.53-13.19/26
	22.33	21.08	19.30	17.55	15.31 12.36-13.14/38	14.55
20	04.15	05.34	06.53 18.01-18.39/38	08.11 15.21-15.56/35	08.36 09.26-09.36/10	09.34 12.53-13.20/27
	22.31	21.05	19.27	17.52	15.29 12.36-13.14/38	14.55
21	04.17	05.37	06.56 18.01-18.38/37	08.14 15.20-15.57/37	08.39 09.29-09.35/6	09.35 12.54-13.21/27
	22.28	21.02	19.24	17.49	15.27 12.37-13.15/38	14.55
22	04.19	05.40	06.59 18.02-18.37/35	08.16 15.19-15.58/39	08.41 09.32-09.34/2	09.35 12.54-13.21/27
	22.26	20.59	19.21	17.46	15.24 12.37-13.15/38	14.56
23	04.22	05.42	07.01 18.02-18.35/33	08.19 15.18-15.58/40	08.44 12.37-13.15/38	09.36 12.54-13.21/27
	22.24	20.56	19.17	17.43	15.22	14.56
24	04.24	05.45	07.04 18.03-18.34/31	08.22 15.17-15.58/41	08.46 12.38-13.16/38	09.36 12.56-13.22/26
	22.21	20.53	19.14	17.40	15.20	14.57
25	04.27	05.47	07.06 18.03-18.32/29	07.24 14.17-14.59/42	08.49 12.38-13.16/38	09.36 12.56-13.23/27
	22.19	20.50	19.11	16.37	15.18	14.58
26	04.29	05.50	07.09 18.05-18.31/26	07.27 14.16-14.59/43	08.52 12.38-13.16/38	09.36 12.55-13.23/28
	22.16	20.47	19.08	16.34	15.17	14.59
27	04.32	05.53	07.11 18.06-18.28/22	07.30 14.16-14.59/43	08.54 12.38-13.16/38	09.36 12.56-13.24/28
	22.14	20.44	19.05	16.32	15.15	15.00
28	04.34	05.55	07.14 18.08-18.25/17	07.33 14.16-14.59/43	08.56 12.39-13.16/37	09.36 12.56-13.24/28
	22.11	20.41	19.01	16.29	15.13	15.01
29	04.37	05.58	07.16 18.12-18.19/7	07.35 14.15-14.59/44	08.59 12.39-13.16/37	09.36 12.57-13.25/28
	22.09	20.37	18.58	16.26	15.11	15.02
30	04.39	06.00	07.19	07.38 14.15-14.59/44	09.01 12.40-13.16/36	09.36 12.57-13.26/29
	22.06	20.34	18.55	16.23	15.10	15.03
31	04.42	06.03		07.41 14.15-14.59/44		09.36 12.57-13.26/29
	22.03	20.31		16.20		15.04
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	0	0	785	618	1687	919

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

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

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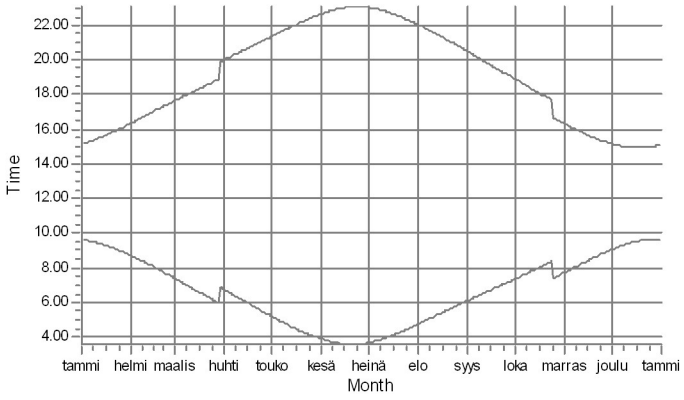
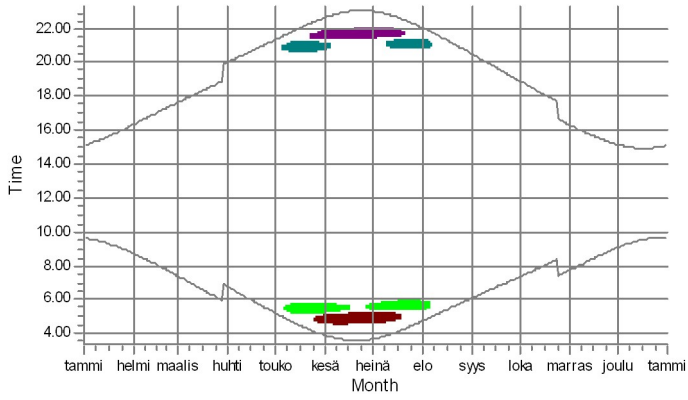
SHADOW - Calendar per WTG, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

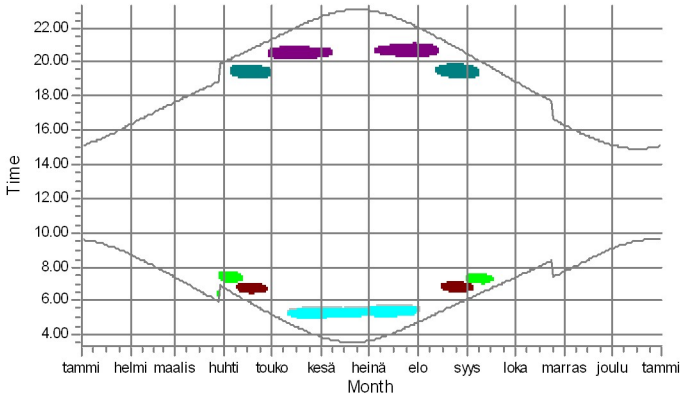
1: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



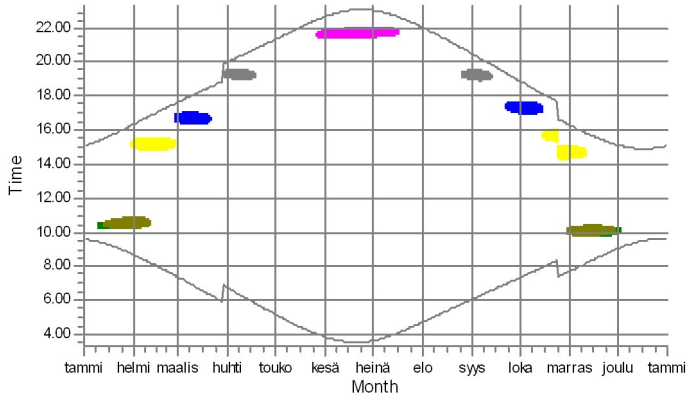
2: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



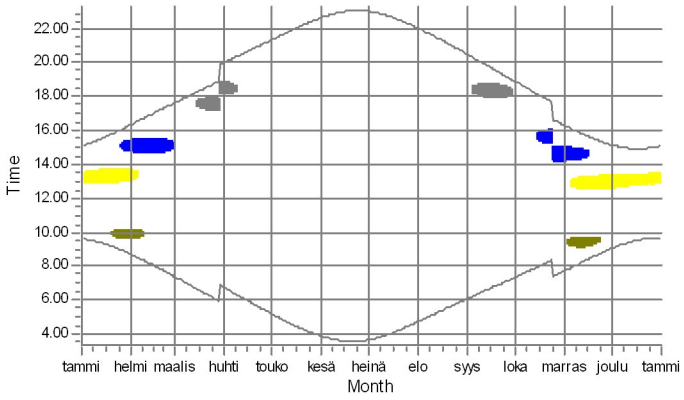
3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



4: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



5: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



Shadow receptors

- A: Asuinrakennus B (Oksjärventie 150)
- B: Lomarakennus C (Uusjoutsjärventie 312)
- C: Asuinrakennus D (Uusjoutsjärventie 362)
- D: Lomarakennus E (Uusjoutsjärventie 450)
- E: Asuinrakennus F (Ahorajantie 64)
- F: Asuinrakennus G (Uutelantie 82)
- H: Asuinrakennus J (Työlammentie 24)
- I: Lomarakennus K (Viitostie 31)
- J: Kaavoitettu asunto/loma-asunto A (Okslampi)
- K: Lomarakennus H (Nurmela)
- L: Asuinrakennus L (Mäntymäki)
- M: Lomarakennus M (Mäntymäki)

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Calculated:
22.2.2021 18.46/3.4.388

SHADOW - Map

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case no forest_20201204

0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 435 750 North: 6 818 190

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Sysmä Rekolanvuoret_20200912_0.wpo (1)

Liite 4: Rekolanvuorten tuulivoimahanke - Varjostusmallinnusten tulokset ”real case, Luke forest”

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

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) [JOKIOINEN]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational hours are calculated from WTGs in calculation and wind distribution:
Default Meteo data description (3)

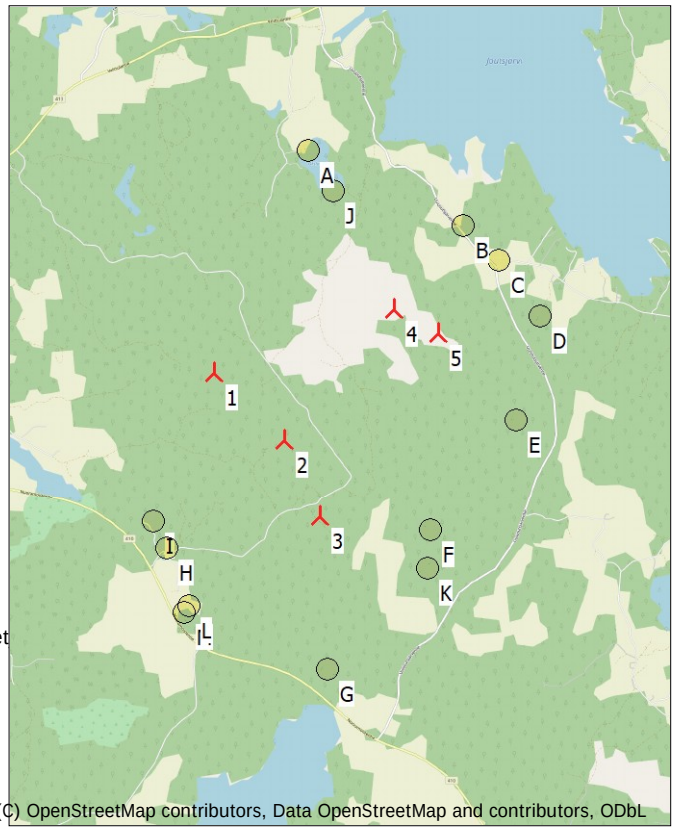
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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_Sysmä Rekolanvuoret
Area object(s) used in calculation:
Area object (Luke N): (1)
Area object (Luke_E): (2)
Obstacles used in calculation
Eye height for map: 1,5 m
Grid resolution: 1,0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:75 000
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	434 606	6 818 356	128,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
2	435 295	6 817 678	125,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
3	435 636	6 816 917	118,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
4	436 407	6 818 963	135,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8
5	436 851	6 818 708	110,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH135-6 200	6 200	170,0	135,0	2 040	8,8

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus B (Oksjärventie 150)	435 583	6 820 552	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Lomarakennus C (Uusjoutsjärventie 312)	437 112	6 819 785	92,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus D (Uusjoutsjärventie 362)	437 451	6 819 430	95,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Lomarakennus E (Uusjoutsjärventie 450)	437 855	6 818 864	97,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus F (Ahorajantie 64)	437 596	6 817 839	93,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus G (Uutelantie 82)	436 726	6 816 762	95,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus I (Mikkolanmäentie 24)	435 682	6 815 392	88,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus J (Työlammentie 24)	434 099	6 816 628	92,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Lomarakennus K (Viitostie 31)	433 982	6 816 894	95,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Kaavoitettu asunto/loma-asunto A (Okslampi)	435 818	6 820 141	90,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Lomarakennus H (Nurmela)	436 699	6 816 377	95,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Mäntymäki)	434 318	6 816 045	87,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Lomarakennus M (Mäntymäki)	434 265	6 815 982	89,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus B (Oksjärventie 150)	1:43
B	Lomarakennus C (Uusjoutsjärventie 312)	0:00
C	Asuinrakennus D (Uusjoutsjärventie 362)	9:46
D	Lomarakennus E (Uusjoutsjärventie 450)	0:00
E	Asuinrakennus F (Ahorajantie 64)	0:00
F	Asuinrakennus G (Uutelantie 82)	5:56
G	Lomarakennus I (Mikkolanmäentie 24)	0:00
H	Asuinrakennus J (Työlammentie 24)	0:00
I	Lomarakennus K (Viitostie 31)	0:00
J	Kaavoitettu asunto/loma-asunto A (Okslampi)	0:00
K	Lomarakennus H (Nurmela)	9:57
L	Asuinrakennus L (Mäntymäki)	8:48
M	Lomarakennus M (Mäntymäki)	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (6)	0:00	0:00
2	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)	0:00	0:00
3	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)	90:58	24:42
4	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)	35:46	5:36
5	Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)	36:56	5:53

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

Project:
Sysmä Rekolanvuoret_20200912

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204 Shadow receptor: A - Asuinrakennus B (Oksjärventie 150)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January		February		March	April	May	June	July	August	September	October	November		December	
1	09.35		08.42	10.22 (4)	07.22	06.43	05.10	03.52	03.40	04.45	06.06	07.21	07.44		09.04	10.01 (4)
	15.06		16.20 15	10.37 (4)	17.39	20.01	21.21	22.40	23.01	22.01	20.28	18.52	16.17		15.08 9	10.10 (4)
2	09.35		08.40	10.23 (4)	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.47		09.06	10.04 (4)
	15.08		16.23 11	10.34 (4)	17.42	20.04	21.24	22.42	23.01	21.58	20.25	18.49	16.14		15.06 5	10.09 (4)
3	09.34		08.37	10.26 (4)	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.27	07.49		09.08	
	15.09		16.26 5	10.31 (4)	17.45	20.07	21.27	22.44	23.00	21.56	20.22	18.45	16.12		15.05	
4	09.33		08.35		07.13	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52		09.10	
	15.11		16.29		17.47	20.09	21.29	22.45	22.59	21.53	20.18	18.42	16.09		15.04	
5	09.33		08.32		07.09	06.31	04.58	03.45	03.45	04.55	06.16	07.32	07.55		09.12	
	15.13		16.32		17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06		15.02	
6	09.32		08.29		07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58		09.14	
	15.15		16.35		17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03		15.01	
7	09.31		08.26		07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.01		09.16	
	15.17		16.38		17.55	20.17	21.38	22.51	22.55	21.44	20.09	18.33	16.01		15.00	
8	09.29		08.24		07.00	06.21	04.50	03.41	03.50	05.03	06.23	07.39	08.03	09.56 (4)	09.18	
	15.19		16.40		17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58 6	10.02 (4)	14.59	
9	09.28		08.21		06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.53 (4)	09.20	
	15.21		16.43		18.01	20.22	21.43	22.54	22.52	21.39	20.02	18.26	15.55 12	10.05 (4)	14.58	
10	09.27	10.21 (4)	08.18		06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45	08.09	09.52 (4)	09.22	
	15.23 5	10.26 (4)	16.46		18.03	20.25	21.46	22.55	22.50	21.36	19.59	18.23	15.53 16	10.08 (4)	14.58	
11	09.25	10.19 (4)	08.15		06.51	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.12	09.51 (4)	09.23	
	15.25 9	10.28 (4)	16.49		18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20	15.50 18	10.09 (4)	14.57	
12	09.24	10.17 (4)	08.13		06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.50 (4)	09.25	
	15.27 12	10.29 (4)	16.52		18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48 20	10.10 (4)	14.56	
13	09.22	10.16 (4)	08.10		06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17	09.50 (4)	09.26	
	15.30 15	10.31 (4)	16.55		18.11	20.33	21.54	22.59	22.45	21.27	19.50	18.14	15.45 21	10.11 (4)	14.56	
14	09.21	10.16 (4)	08.07		06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.50 (4)	09.28	
	15.32 16	10.32 (4)	16.57		18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43 22	10.12 (4)	14.55	
15	09.19	10.15 (4)	08.04		06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58	08.23	09.49 (4)	09.29	
	15.35 18	10.33 (4)	17.00		18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40 23	10.12 (4)	14.55	
16	09.17	10.15 (4)	08.01		06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.49 (4)	09.30	
	15.37 19	10.34 (4)	17.03		18.19	20.41	22.01	23.02	22.39	21.18	19.40	18.05	15.38 23	10.12 (4)	14.55	
17	09.16	10.15 (4)	07.58		06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.49 (4)	09.31	
	15.40 20	10.35 (4)	17.06		18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.35 24	10.13 (4)	14.55	
18	09.14	10.15 (4)	07.55		06.28	05.49	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.49 (4)	09.32	
	15.42 21	10.36 (4)	17.09		18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59	15.33 24	10.13 (4)	14.55	
19	09.12	10.15 (4)	07.52		06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.34	09.49 (4)	09.33	
	15.45 22	10.37 (4)	17.12		18.27	20.49	22.09	23.04	22.33	21.09	19.30	17.55	15.31 24	10.13 (4)	14.55	
20	09.10	10.14 (4)	07.49		06.22	05.43	04.18	03.34	04.15	05.34	06.54	08.11	08.36	09.50 (4)	09.34	
	15.47 23	10.37 (4)	17.14		18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.52	15.29 24	10.14 (4)	14.55	
21	09.08	10.14 (4)	07.46		06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.50 (4)	09.35	
	15.50 23	10.37 (4)	17.17		18.33	20.54	22.14	23.04	22.29	21.02	19.24	17.49	15.27 23	10.13 (4)	14.55	
22	09.06	10.15 (4)	07.43		06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16	08.42	09.50 (4)	09.35	
	15.53 24	10.39 (4)	17.20		18.35	20.57	22.17	23.05	22.26	20.59	19.21	17.46	15.24 23	10.13 (4)	14.56	
23	09.04	10.15 (4)	07.40		06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.51 (4)	09.36	
	15.55 24	10.39 (4)	17.23		18.38	21.00	22.19	23.05	22.24	20.56	19.17	17.43	15.22 22	10.13 (4)	14.56	
24	09.01	10.15 (4)	07.37		06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22	08.47	09.52 (4)	09.36	
	15.58 24	10.39 (4)	17.25		18.40	21.02	22.22	23.05	22.22	20.53	19.14	17.40	15.20 21	10.13 (4)	14.57	
25	08.59	10.15 (4)	07.34		06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.25	08.49	09.53 (4)	09.37	
	16.01 24	10.39 (4)	17.28		18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18 20	10.13 (4)	14.58	
26	08.57	10.16 (4)	07.31		06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27	08.52	09.53 (4)	09.37	
	16.04 23	10.39 (4)	17.31		18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.34	15.16 20	10.13 (4)	14.58	
27	08.55	10.16 (4)	07.28		05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.54 (4)	09.37	
	16.06 23	10.39 (4)	17.34		18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32	15.15 18	10.12 (4)	14.59	
28	08.52	10.17 (4)	07.25		05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.55 (4)	09.37	
	16.09 22	10.39 (4)	17.36		18.51	21.13	22.31	23.03	22.12	20.41	19.01	16.29	15.13 17	10.12 (4)	15.00	
29	08.50	10.18 (4)			06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.57 (4)	09.37	
	16.12 21	10.39 (4)			19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.11 15	10.12 (4)	15.02	
30	08.47	10.19 (4)			06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.59 (4)	09.36	
	16.15 20	10.39 (4)			19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23	15.10 12	10.11 (4)	15.03	
31	08.45	10.20 (4)			06.47		03.54		04.42	06.03		07.41			09.36	
	16.18 18	10.38 (4)			19.59		22.37		22.04	20.31		16.20			15.04	
Potential sun hours	198		249		364	441	543	579	573	493	390	312	218		172	
Total, worst case		426		31										448		14
Sun reduction		0,18		0,29										0,16		0,16
Oper. time red.		0,98		0,98										0,98		0,98
Wind dir. red.		0,66		0,66										0,66		0,66
Total reduction		0,12		0,19										0,10		0,10
Total, real		50		6										47		1

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: B - Lomarakennus C (Uusjoutsjärventie 312)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	03.40	04.44	06.05	07.21	07.44	09.04
	15.06	16.20	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.14	15.06
3	09.34	08.37	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.26	07.49	09.08
	15.09	16.26	17.45	20.06	21.27	22.43	22.59	21.55	20.22	18.45	16.11	15.05
4	09.33	08.34	07.12	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.30	04.58	03.45	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.02
6	09.31	08.29	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.00	09.16
	15.17	16.37	17.55	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.00
8	09.29	08.24	07.00	06.21	04.49	03.41	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.40	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.29	15.58	14.59
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.05	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.54	22.52	21.38	20.02	18.26	15.55	14.58
10	09.27	08.18	06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45	08.09	09.22
	15.23	16.46	18.03	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.57
11	09.25	08.15	06.50	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.12	09.23
	15.25	16.49	18.06	20.27	21.48	22.56	22.49	21.33	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.25
	15.27	16.52	18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48	14.56
13	09.22	08.10	06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.59	22.45	21.27	19.49	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.28
	15.32	16.57	18.14	20.35	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.55
15	09.19	08.04	06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58	08.23	09.29
	15.34	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.34	04.06	05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.52	04.25	03.34	04.08	05.26	06.46	08.03	08.28	09.31
	15.39	17.06	18.22	20.43	22.04	23.02	22.37	21.15	19.37	18.01	15.35	14.55
18	09.14	07.55	06.28	05.49	04.23	03.34	04.10	05.29	06.48	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.33	17.58	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.33	09.33
	15.45	17.11	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.34	06.53	08.11	08.36	09.34
	15.47	17.14	18.30	20.51	22.12	23.04	22.31	21.05	19.27	17.52	15.29	14.55
21	09.08	07.46	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.49	15.26	14.55
22	09.06	07.43	06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46	15.24	14.56
23	09.03	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.55	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.43	15.22	14.56
24	09.01	07.37	06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22	08.47	09.36
	15.58	17.25	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.40	15.20	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.47	07.06	08.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18	14.58
26	08.57	07.31	06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27	08.52	09.37
	16.03	17.31	18.45	21.08	22.26	23.04	22.16	20.47	19.08	16.34	15.16	14.58
27	08.54	07.28	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.37
	16.06	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.04	16.31	15.15	14.59
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.37
	16.09	17.36	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.00
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.09	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.17		19.59		22.37		22.04	20.31		16.20		15.04
Potential sun hours	198	249	364	441	543	579	573	493	390	312	219	172
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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: C - Asuinrakennus D (Uusjoutsjärventie 362)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January			February			March			April		May	June
1	09.35			08.42		14.51 (5)	07.22		16.35 (4)	06.43		05.10	03.52
	15.06			16.20	32	15.23 (5)	17.39	20	16.55 (4)	20.01		21.21	22.39
2	09.35			08.40		14.50 (5)	07.19		16.32 (4)	06.40		05.07	03.50
	15.08			16.23	34	15.24 (5)	17.42	24	16.56 (4)	20.04		21.24	22.41
3	09.34			08.37		14.49 (5)	07.16		16.30 (4)	06.37		05.04	03.49
	15.09			16.26	36	15.25 (5)	17.45	27	16.57 (4)	20.06		21.26	22.43
4	09.33			08.34		14.49 (5)	07.12		16.29 (4)	06.34		05.01	03.47
	15.11			16.29	37	15.26 (5)	17.47	30	16.59 (4)	20.09		21.29	22.45
5	09.32			08.32		14.48 (5)	07.09		16.29 (4)	06.30		04.58	03.45
	15.13			16.32	39	15.27 (5)	17.50	31	17.00 (4)	20.12		21.32	22.47
6	09.31			08.29		14.48 (5)	07.06		16.27 (4)	06.27		04.55	03.44
	15.15			16.35	40	15.28 (5)	17.53	32	16.59 (4)	20.14		21.35	22.49
7	09.30			08.26		14.47 (5)	07.03		16.26 (4)	06.24		04.52	03.43
	15.17			16.37	41	15.28 (5)	17.55	34	17.00 (4)	20.17		21.37	22.50
8	09.29			08.24		14.47 (5)	07.00		16.26 (4)	06.21		04.49	03.41
	15.19			16.40	42	15.29 (5)	17.58	34	17.00 (4)	20.20		21.40	22.52
9	09.28			08.21		14.47 (5)	06.57		16.26 (4)	06.18		04.47	03.40
	15.21			16.43	43	15.30 (5)	18.01	35	17.01 (4)	20.22		21.43	22.53
10	09.27			08.18		14.46 (5)	06.54		16.25 (4)	06.15		04.44	03.39
	15.23			16.46	43	15.29 (5)	18.03	35	17.00 (4)	20.25		21.45	22.55
11	09.25			08.15		14.46 (5)	06.50		16.25 (4)	06.11		04.41	03.38
	15.25			16.49	43	15.29 (5)	18.06	35	17.00 (4)	20.27		21.48	22.56
12	09.24			08.12		14.46 (5)	06.47		16.25 (4)	06.08		04.38	03.37
	15.27			16.52	44	15.30 (5)	18.09	34	16.59 (4)	20.30		21.51	22.57
13	09.22			08.10		14.46 (5)	06.44		16.25 (4)	06.05		04.36	03.36
	15.30			16.55	44	15.30 (5)	18.11	34	16.59 (4)	20.33		21.53	22.59
14	09.21			08.07		14.46 (5)	06.41		16.25 (4)	06.02		04.33	03.36
	15.32			16.57	44	15.30 (5)	18.14	32	16.57 (4)	20.35		21.56	23.00
15	09.19			08.04		14.47 (5)	06.38		16.25 (4)	05.59		04.30	03.35
	15.34			17.00	43	15.30 (5)	18.17	32	16.57 (4)	20.38		21.59	23.01
16	09.17			08.01		14.47 (5)	06.35		16.26 (4)	05.56		04.28	03.35
	15.37			17.03	43	15.30 (5)	18.19	30	16.56 (4)	20.41		22.01	23.01
17	09.15			07.58		14.47 (5)	06.31		16.27 (4)	05.52		04.25	03.34
	15.39			17.06	42	15.29 (5)	18.22	28	16.55 (4)	20.43		22.04	23.02
18	09.14			07.55		14.47 (5)	06.28		16.28 (4)	05.49		04.23	03.34
	15.42			17.09	41	15.28 (5)	18.24	24	16.52 (4)	20.46		22.06	23.03
19	09.12			07.52		14.48 (5)	06.25		16.30 (4)	05.46		04.20	03.34
	15.45			17.11	40	15.28 (5)	18.27	21	16.51 (4)	20.49		22.09	23.03
20	09.10			07.49		14.49 (5)	06.22		16.33 (4)	05.43		04.18	03.34
	15.47			17.14	38	15.27 (5)	18.30	15	16.48 (4)	20.51		22.12	23.04
21	09.08			07.46		14.49 (5)	06.19		16.38 (4)	05.40		04.15	03.34
	15.50			17.17	37	15.26 (5)	18.32	5	16.43 (4)	20.54		22.14	23.04
22	09.06			07.43		14.50 (5)	06.15			05.37		04.13	03.34
	15.53			17.20	35	15.25 (5)	18.35			20.57		22.17	23.04
23	09.03			07.40		14.52 (5)	06.12			05.34		04.11	03.34
	15.55			17.23	32	15.24 (5)	18.38			20.59		22.19	23.04
24	09.01			07.37		14.54 (5)	06.09			05.31		04.08	03.34
	15.58			17.25	28	15.22 (5)	18.40			21.02		22.21	23.04
25	08.59			07.34		14.56 (5)	06.06			05.28		04.06	03.35
	16.01			17.28	24	15.20 (5)	18.43			21.05		22.24	23.04
26	08.57		15.04 (5)	07.31		14.58 (5)	06.03			05.25		04.04	03.35
	16.03	2	15.06 (5)	17.31	19	15.17 (5)	18.45			21.08		22.26	23.04
27	08.54		14.59 (5)	07.28		15.03 (5)	05.59			05.22		04.02	03.36
	16.06	13	15.12 (5)	17.34	14	16.47 (4)	18.48			21.10		22.28	23.04
28	08.52		14.56 (5)	07.25		16.37 (4)	05.56			05.19		04.00	03.37
	16.09	19	15.15 (5)	17.36	15	16.52 (4)	18.51			21.13		22.31	23.03
29	08.50		14.54 (5)				06.53			05.16		03.58	03.38
	16.12	24	15.18 (5)				19.53			21.16		22.33	23.03
30	08.47		14.53 (5)				06.50			05.13		03.56	03.39
	16.15	26	15.19 (5)				19.56			21.18		22.35	23.02
31	08.45		14.52 (5)				06.46					03.54	
	16.17	29	15.21 (5)				19.58					22.37	
Potential sun hours	198			249			364			441		543	579
Total, worst case		113			1013			592					
Sun reduction		0,18			0,29			0,34					
Oper. time red.		0,98			0,98			0,98					
Wind dir. red.		0,65			0,65			0,62					
Total reduction		0,12			0,19			0,21					
Total, real		13			189			122					

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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: C - Asuinrakennus D (Uusjoutsjärventie 362)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September		October		November		December
1	03.40	04.44	06.05		07.21		17.04 (4)	07.44	14.16 (5)	09.04
	23.01	22.01	20.28		18.52	34	17.38 (4)	16.17	43	14.59 (5)	15.08
2	03.41	04.47	06.08		07.24		17.03 (4)	07.46	14.17 (5)	09.06
	23.00	21.58	20.25		18.48	35	17.38 (4)	16.14	42	14.59 (5)	15.06
3	03.42	04.50	06.11		07.26		17.03 (4)	07.49	14.17 (5)	09.08
	22.59	21.55	20.21		18.45	35	17.38 (4)	16.11	41	14.58 (5)	15.05
4	03.44	04.52	06.13		07.29		17.03 (4)	07.52	14.17 (5)	09.10
	22.58	21.53	20.18		18.42	35	17.38 (4)	16.09	41	14.58 (5)	15.04
5	03.45	04.55	06.16		07.32		17.02 (4)	07.55	14.17 (5)	09.12
	22.57	21.50	20.15		18.39	35	17.37 (4)	16.06	40	14.57 (5)	15.02
6	03.47	04.58	06.18		07.34		17.03 (4)	07.58	14.18 (5)	09.14
	22.56	21.47	20.12		18.36	34	17.37 (4)	16.03	38	14.56 (5)	15.01
7	03.48	05.00	06.21		07.37		17.03 (4)	08.00	14.19 (5)	09.16
	22.55	21.44	20.09		18.33	33	17.36 (4)	16.01	37	14.56 (5)	15.00
8	03.50	05.03	06.23		07.39		17.03 (4)	08.03	14.20 (5)	09.18
	22.53	21.41	20.06		18.29	31	17.34 (4)	15.58	36	14.56 (5)	14.59
9	03.52	05.05	06.26		07.42		17.04 (4)	08.06	14.21 (5)	09.20
	22.52	21.38	20.02		18.26	30	17.34 (4)	15.55	33	14.54 (5)	14.58
10	03.53	05.08	06.28		07.44		17.04 (4)	08.09	14.22 (5)	09.22
	22.50	21.35	19.59		18.23	29	17.33 (4)	15.53	31	14.53 (5)	14.57
11	03.55	05.11	06.31		07.47		17.06 (4)	08.11	14.24 (5)	09.23
	22.49	21.32	19.56		18.20	25	17.31 (4)	15.50	29	14.53 (5)	14.57
12	03.57	05.13	06.33		07.50		17.06 (4)	08.14	14.25 (5)	09.25
	22.47	21.30	19.53		18.17	23	17.29 (4)	15.48	26	14.51 (5)	14.56
13	03.59	05.16	06.36		07.52		17.08 (4)	08.17	14.26 (5)	09.26
	22.45	21.27	19.49		18.14	18	17.26 (4)	15.45	23	14.49 (5)	14.56
14	04.01	05.19	06.38		07.55		17.11 (4)	08.20	14.29 (5)	09.28
	22.43	21.24	19.46		18.11	12	17.23 (4)	15.43	19	14.48 (5)	14.55
15	04.03	05.21	06.41		07.58		15.34 (5)	08.23	14.32 (5)	09.29
	22.41	21.21	19.43		18.08	13	15.47 (5)	15.40	13	14.45 (5)	14.55
16	04.06	05.24	06.43		08.00		15.30 (5)	08.25			09.30
	22.39	21.18	19.40		18.05	21	15.51 (5)	15.38			14.55
17	04.08	05.26	06.46		08.03		15.26 (5)	08.28			09.31
	22.37	21.15	19.37		18.01	26	15.52 (5)	15.35			14.55
18	04.10	05.29	06.48		08.06		15.24 (5)	08.31			09.32
	22.35	21.12	19.33		17.58	30	15.54 (5)	15.33			14.55
19	04.12	05.32	06.51		08.08		15.22 (5)	08.33			09.33
	22.33	21.08	19.30		17.55	33	15.55 (5)	15.31			14.55
20	04.15	05.34	06.53		08.11		15.21 (5)	08.36			09.34
	22.31	21.05	19.27		17.52	35	15.56 (5)	15.29			14.55
21	04.17	05.37	06.56		08.14		15.20 (5)	08.39			09.35
	22.28	21.02	19.24		17.49	37	15.57 (5)	15.26			14.55
22	04.19	05.40	06.58		08.16		15.19 (5)	08.41			09.35
	22.26	20.59	19.21		17.46	39	15.58 (5)	15.24			14.56
23	04.22	05.42	07.01	17.18 (4)	08.19		15.18 (5)	08.44			09.36
	22.24	20.56	19.17	13	17.31 (4)	17.43	40	15.58 (5)	15.22			14.56
24	04.24	05.45	07.04	17.15 (4)	08.22		15.17 (5)	08.47			09.36
	22.21	20.53	19.14	19	17.34 (4)	17.40	41	15.58 (5)	15.20			14.57
25	04.27	05.47	07.06	17.12 (4)	07.24		14.17 (5)	08.49			09.36
	22.19	20.50	19.11	23	17.35 (4)	16.37	42	14.59 (5)	15.18			14.58
26	04.29	05.50	07.09	17.10 (4)	07.27		14.16 (5)	08.52			09.36
	22.16	20.47	19.08	26	17.36 (4)	16.34	43	14.59 (5)	15.16			14.58
27	04.32	05.53	07.11	17.08 (4)	07.30		14.16 (5)	08.54			09.37
	22.14	20.44	19.04	29	17.37 (4)	16.31	43	14.59 (5)	15.15			14.59
28	04.34	05.55	07.14	17.07 (4)	07.33		14.16 (5)	08.56			09.36
	22.11	20.40	19.01	31	17.38 (4)	16.29	43	14.59 (5)	15.13			15.00
29	04.37	05.58	07.16	17.06 (4)	07.35		14.15 (5)	08.59			09.36
	22.09	20.37	18.58	32	17.38 (4)	16.26	44	14.59 (5)	15.11			15.02
30	04.39	06.00	07.19	17.05 (4)	07.38		14.15 (5)	09.01			09.36
	22.06	20.34	18.55	33	17.38 (4)	16.23	44	14.59 (5)	15.09			15.03
31	04.42	06.03				07.41		14.15 (5)				09.36
	22.03	20.31				16.20	44	14.59 (5)				15.04
Potential sun hours	573	492	390			312			219			172
Total, worst case				206			1027			492		
Sun reduction				0,32			0,27			0,16		
Oper. time red.				0,98			0,98			0,98		
Wind dir. red.				0,62			0,64			0,65		
Total reduction				0,20			0,17			0,10		
Total, real				40			171			51		

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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: D - Lomarakennus E (Uusjoutsjärventie 450)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	03.40	04.44	06.05	07.21	07.44	09.03
	15.06	16.20	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.39	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.48	16.14	15.06
3	09.34	08.37	07.15	06.37	05.04	03.49	03.42	04.50	06.10	07.26	07.49	09.08
	15.09	16.26	17.45	20.06	21.26	22.43	22.59	21.55	20.21	18.45	16.11	15.05
4	09.33	08.34	07.12	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.52	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.30	04.58	03.45	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.02
6	09.31	08.29	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.00	09.16
	15.17	16.37	17.55	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.00
8	09.29	08.24	07.00	06.21	04.49	03.41	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.40	17.58	20.19	21.40	22.52	22.53	21.41	20.05	18.29	15.58	14.59
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.05	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.52	21.38	20.02	18.26	15.55	14.58
10	09.27	08.18	06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.44	08.09	09.21
	15.23	16.46	18.03	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.50	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.11	09.23
	15.25	16.49	18.06	20.27	21.48	22.56	22.48	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.25
	15.27	16.52	18.09	20.30	21.51	22.57	22.47	21.29	19.53	18.17	15.48	14.56
13	09.22	08.09	06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.58	22.45	21.27	19.49	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.27
	15.32	16.57	18.14	20.35	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.55
15	09.19	08.04	06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.59	23.00	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.34	05.56	04.28	03.35	04.06	05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.52	04.25	03.34	04.08	05.26	06.46	08.03	08.28	09.31
	15.39	17.06	18.22	20.43	22.04	23.02	22.37	21.14	19.37	18.01	15.35	14.55
18	09.13	07.55	06.28	05.49	04.23	03.34	04.10	05.29	06.48	08.05	08.31	09.32
	15.42	17.09	18.24	20.46	22.06	23.03	22.35	21.11	19.33	17.58	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.33	09.33
	15.45	17.11	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.34	06.53	08.11	08.36	09.34
	15.47	17.14	18.30	20.51	22.11	23.04	22.31	21.05	19.27	17.52	15.29	14.55
21	09.08	07.46	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.49	15.26	14.55
22	09.05	07.43	06.15	05.37	04.13	03.34	04.19	05.40	06.58	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04	22.26	20.59	19.20	17.46	15.24	14.56
23	09.03	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.55	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.43	15.22	14.56
24	09.01	07.37	06.09	05.31	04.08	03.34	04.24	05.45	07.03	08.22	08.46	09.36
	15.58	17.25	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.40	15.20	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.47	07.06	08.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18	14.58
26	08.57	07.31	06.02	05.25	04.04	03.35	04.29	05.50	07.09	07.27	08.51	09.36
	16.03	17.31	18.45	21.07	22.26	23.04	22.16	20.47	19.08	16.34	15.16	14.58
27	08.54	07.28	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.36
	16.06	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.04	16.31	15.15	14.59
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.56	09.36
	16.09	17.36	18.51	21.13	22.31	23.03	22.11	20.40	19.01	16.29	15.13	15.00
29	08.49		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.46		03.54		04.42	06.03		07.41		09.36
	16.17		19.58		22.37		22.03	20.31		16.20		15.04
Potential sun hours	198	249	364	441	543	579	573	492	390	312	219	172
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: E - Asuinrakennus F (Ahorajantie 64)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	03.40	04.45	06.05	07.21	07.44	09.03
	15.06	16.20	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.48	16.14	15.07
3	09.34	08.37	07.15	06.37	05.04	03.49	03.42	04.50	06.11	07.26	07.49	09.08
	15.09	16.26	17.45	20.06	21.26	22.43	22.59	21.55	20.21	18.45	16.12	15.05
4	09.33	08.34	07.12	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.52	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.30	04.58	03.46	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.57	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	21.37	22.50	22.54	21.44	20.09	18.33	16.01	15.00
8	09.29	08.23	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.40	17.58	20.19	21.40	22.52	22.53	21.41	20.05	18.29	15.58	14.59
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.52	21.38	20.02	18.26	15.55	14.58
10	09.26	08.18	06.54	06.15	04.44	03.39	03.54	05.08	06.28	07.44	08.09	09.21
	15.23	16.46	18.03	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.50	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.11	09.23
	15.25	16.49	18.06	20.27	21.48	22.56	22.48	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.25
	15.27	16.52	18.09	20.30	21.51	22.57	22.47	21.29	19.53	18.17	15.48	14.56
13	09.22	08.09	06.44	06.05	04.36	03.37	03.59	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.58	22.45	21.26	19.49	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.27
	15.32	16.57	18.14	20.35	21.56	22.59	22.43	21.23	19.46	18.11	15.43	14.55
15	09.19	08.04	06.38	05.59	04.30	03.35	04.04	05.21	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.59	23.00	22.41	21.20	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.17	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.14	19.37	18.01	15.35	14.55
18	09.13	07.55	06.28	05.49	04.23	03.34	04.10	05.29	06.48	08.05	08.31	09.32
	15.42	17.09	18.24	20.46	22.06	23.03	22.35	21.11	19.33	17.58	15.33	14.55
19	09.11	07.52	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.34	06.53	08.11	08.36	09.34
	15.47	17.14	18.30	20.51	22.11	23.04	22.31	21.05	19.27	17.52	15.29	14.55
21	09.07	07.46	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.49	15.27	14.55
22	09.05	07.43	06.15	05.37	04.13	03.34	04.19	05.40	06.58	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04	22.26	20.59	19.20	17.46	15.24	14.56
23	09.03	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.35
	15.55	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.43	15.22	14.56
24	09.01	07.37	06.09	05.31	04.08	03.35	04.24	05.45	07.04	08.22	08.46	09.36
	15.58	17.25	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.40	15.20	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.29	05.50	07.09	07.27	08.51	09.36
	16.04	17.31	18.45	21.07	22.26	23.04	22.16	20.47	19.08	16.34	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.36
	16.06	17.34	18.48	21.10	22.28	23.03	22.14	20.44	19.04	16.31	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.56	09.36
	16.09	17.36	18.51	21.13	22.31	23.03	22.11	20.40	19.01	16.29	15.13	15.01
29	08.49		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.02	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.44		06.46		03.54		04.42	06.03		07.41		09.36
	16.18		19.58		22.37		22.03	20.31		16.20		15.04
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: F - Asuinrakennus G (Uutelantie 82)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April		May	June	July	August		September		October	November	December
1	09.35	08.42	07.22	06.43		05.10	03.52	03.40	04.45		06.06	19.09 (3)	07.21	07.44	09.03
	15.06	16.21	17.39	20.01		21.21	22.39	23.01	22.01		20.28	19.42 (3)	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40		05.07	03.51	03.41	04.47		06.08	19.10 (3)	07.24	07.46	09.06
	15.08	16.23	17.42	20.04		21.24	22.41	23.00	21.58		20.25	19.41 (3)	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37		05.04	03.49	03.43	04.50		06.11	19.11 (3)	07.26	07.49	09.08
	15.10	16.26	17.45	20.06		21.26	22.43	22.59	21.55		20.21	19.40 (3)	18.45	16.12	15.05
4	09.33	08.34	07.12	06.34		05.01	03.47	03.44	04.53		06.13	19.12 (3)	07.29	07.52	09.10
	15.11	16.29	17.47	20.09		21.29	22.45	22.58	21.52		20.18	19.38 (3)	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	19.23 (3)	04.58	03.46	03.45	04.55		06.16	19.13 (3)	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	11 19.34 (3)	21.32	22.47	22.57	21.50		20.15	23 19.36 (3)	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	19.19 (3)	04.55	03.44	03.47	04.58		06.18	19.14 (3)	07.34	07.57	09.14
	15.15	16.35	17.53	20.14	19 19.38 (3)	21.34	22.48	22.56	21.47		20.12	19 19.33 (3)	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24	19.17 (3)	04.53	03.43	03.49	05.00		06.21	19.18 (3)	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	23 19.40 (3)	21.37	22.50	22.54	21.44		20.09	12 19.30 (3)	18.33	16.01	15.01
8	09.29	08.23	07.00	06.21	19.15 (3)	04.50	03.42	03.50	05.03		06.23		07.39	08.03	09.18
	15.19	16.40	17.58	20.19	26 19.41 (3)	21.40	22.52	22.53	21.41		20.06		18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	19.13 (3)	04.47	03.41	03.52	05.06		06.26		07.42	08.06	09.20
	15.21	16.43	18.01	20.22	29 19.42 (3)	21.43	22.53	22.51	21.38		20.02		18.26	15.55	14.59
10	09.26	08.18	06.54	06.15	19.11 (3)	04.44	03.39	03.54	05.08		06.28		07.44	08.09	09.21
	15.23	16.46	18.03	20.25	31 19.42 (3)	21.45	22.55	22.50	21.35		19.59		18.23	15.53	14.58
11	09.25	08.15	06.50	06.12	19.10 (3)	04.41	03.38	03.56	05.11		06.31		07.47	08.11	09.23
	15.25	16.49	18.06	20.27	33 19.43 (3)	21.48	22.56	22.48	21.32		19.56		18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	19.09 (3)	04.39	03.38	03.58	05.14		06.33		07.50	08.14	09.25
	15.28	16.52	18.09	20.30	35 19.44 (3)	21.51	22.57	22.47	21.29		19.53		18.17	15.48	14.56
13	09.22	08.09	06.44	06.05	19.09 (3)	04.36	03.37	04.00	05.16	19.26 (3)	06.36		07.52	08.17	09.26
	15.30	16.55	18.11	20.33	35 19.44 (3)	21.53	22.58	22.45	21.26	11 19.37 (3)	19.49		18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	19.08 (3)	04.33	03.36	04.02	05.19	19.23 (3)	06.38		07.55	08.20	09.27
	15.32	16.58	18.14	20.35	36 19.44 (3)	21.56	22.59	22.43	21.23	16 19.39 (3)	19.46		18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	19.07 (3)	04.31	03.35	04.04	05.21	19.21 (3)	06.41		07.58	08.22	09.29
	15.35	17.00	18.17	20.38	37 19.44 (3)	21.59	23.00	22.41	21.21	21 19.42 (3)	19.43		18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	19.07 (3)	04.28	03.35	04.06	05.24	19.18 (3)	06.43		08.00	08.25	09.30
	15.37	17.03	18.19	20.41	37 19.44 (3)	22.01	23.01	22.39	21.17	25 19.43 (3)	19.40		18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	19.07 (3)	04.25	03.34	04.08	05.27	19.16 (3)	06.46		08.03	08.28	09.31
	15.40	17.06	18.22	20.43	37 19.44 (3)	22.04	23.02	22.37	21.14	27 19.43 (3)	19.37		18.02	15.36	14.55
18	09.13	07.55	06.28	05.49	19.06 (3)	04.23	03.34	04.10	05.29	19.16 (3)	06.48		08.06	08.31	09.32
	15.42	17.09	18.25	20.46	37 19.43 (3)	22.06	23.03	22.35	21.11	29 19.45 (3)	19.33		17.59	15.33	14.55
19	09.11	07.52	06.25	05.46	19.06 (3)	04.20	03.34	04.13	05.32	19.14 (3)	06.51		08.08	08.33	09.33
	15.45	17.12	18.27	20.49	37 19.43 (3)	22.09	23.03	22.33	21.08	31 19.45 (3)	19.30		17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	19.06 (3)	04.18	03.34	04.15	05.35	19.14 (3)	06.54		08.11	08.36	09.34
	15.47	17.14	18.30	20.51	36 19.42 (3)	22.11	23.03	22.30	21.05	32 19.46 (3)	19.27		17.52	15.29	14.55
21	09.07	07.46	06.19	05.40	19.07 (3)	04.16	03.34	04.17	05.37	19.12 (3)	06.56		08.14	08.39	09.34
	15.50	17.17	18.32	20.54	34 19.41 (3)	22.14	23.04	22.28	21.02	34 19.46 (3)	19.24		17.49	15.27	14.56
22	09.05	07.43	06.15	05.37	19.08 (3)	04.13	03.34	04.20	05.40	19.11 (3)	06.59		08.16	08.41	09.35
	15.53	17.20	18.35	20.57	34 19.42 (3)	22.16	23.04	22.26	20.59	35 19.46 (3)	19.21		17.46	15.25	14.56
23	09.03	07.40	06.12	05.34	19.08 (3)	04.11	03.34	04.22	05.42	19.11 (3)	07.01		08.19	08.44	09.35
	15.55	17.23	18.38	20.59	33 19.41 (3)	22.19	23.04	22.24	20.56	36 19.47 (3)	19.17		17.43	15.23	14.57
24	09.01	07.37	06.09	05.31	19.09 (3)	04.09	03.35	04.24	05.45	19.10 (3)	07.04		08.22	08.46	09.36
	15.58	17.25	18.40	21.02	30 19.39 (3)	22.21	23.04	22.21	20.53	36 19.46 (3)	19.14		17.40	15.21	14.57
25	08.59	07.34	06.06	05.28	19.09 (3)	04.06	03.35	04.27	05.48	19.10 (3)	07.06		07.24	08.49	09.36
	16.01	17.28	18.43	21.05	29 19.38 (3)	22.24	23.04	22.19	20.50	37 19.47 (3)	19.11		16.37	15.19	14.58
26	08.57	07.31	06.03	05.25	19.10 (3)	04.04	03.36	04.29	05.50	19.09 (3)	07.09		07.27	08.51	09.36
	16.04	17.31	18.45	21.07	27 19.37 (3)	22.26	23.04	22.16	20.47	37 19.46 (3)	19.08		16.35	15.17	14.59
27	08.54	07.28	05.59	05.22	19.11 (3)	04.02	03.36	04.32	05.53	19.09 (3)	07.11		07.30	08.54	09.36
	16.06	17.34	18.48	21.10	24 19.35 (3)	22.28	23.03	22.14	20.44	37 19.46 (3)	19.05		16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	19.14 (3)	04.00	03.37	04.34	05.55	19.09 (3)	07.14		07.33	08.56	09.36
	16.09	17.36	18.51	21.13	20 19.34 (3)	22.30	23.03	22.11	20.40	37 19.46 (3)	19.01		16.29	15.13	15.01
29	08.49		06.53	05.16	19.16 (3)	03.58	03.38	04.37	05.58	19.09 (3)	07.16		07.35	08.59	09.36
	16.12		19.53	21.16	15 19.31 (3)	22.33	23.02	22.09	20.37	36 19.45 (3)	18.58		16.26	15.11	15.02
30	08.47		06.50	05.13	19.19 (3)	03.56	03.39	04.40	06.00	19.10 (3)	07.19		07.38	09.01	09.36
	16.15		19.56	21.18	8 19.27 (3)	22.35	23.02	22.06	20.34	35 19.45 (3)	18.55		16.23	15.10	15.03
31	08.44		06.47			03.54		04.42	06.03	19.09 (3)			07.41		09.36
	16.18		19.59			22.37		22.03	20.31	34 19.43 (3)			16.20		15.05
Potential sun hours	199	249	364	441		543	579	573	492		390		312	219	172
Total, worst case					753					586		173			
Sun reduction					0,39					0,42		0,32			
Oper. time red.					0,98					0,98		0,98			
Wind dir. red.					0,60					0,60		0,60			
Total reduction					0,23					0,25		0,19			
Total, real					177					147		33			

Table 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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

Shadow receptor: G - Lomarakennus I (Mikkolanmäentie 24)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.53	03.40	04.45	06.06	07.21	07.44	09.03
	15.07	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40	05.07	03.51	03.42	04.47	06.08	07.24	07.46	09.06
	15.08	16.24	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.06	21.26	22.43	22.59	21.55	20.22	18.45	16.12	15.06
4	09.33	08.34	07.12	06.34	05.01	03.48	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.52	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.46	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.56	03.45	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.34	22.48	22.56	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	21.37	22.50	22.54	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.51	21.38	20.02	18.27	15.56	14.59
10	09.26	08.18	06.54	06.15	04.44	03.40	03.54	05.08	06.28	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	03.56	05.11	06.31	07.47	08.11	09.23
	15.26	16.49	18.06	20.27	21.48	22.56	22.48	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.39	03.38	03.58	05.14	06.34	07.50	08.14	09.24
	15.28	16.52	18.09	20.30	21.51	22.57	22.46	21.29	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.58	22.45	21.26	19.50	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.35	21.56	22.59	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	04.04	05.22	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.58	23.00	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.26	03.35	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.14	19.37	18.02	15.36	14.55
18	09.13	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.02	22.35	21.11	19.33	17.59	15.33	14.55
19	09.11	07.52	06.25	05.47	04.21	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.56	15.31	14.55
20	09.09	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11	23.03	22.30	21.05	19.27	17.53	15.29	14.55
21	09.07	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.50	15.27	14.56
22	09.05	07.43	06.15	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	04.22	05.42	07.01	08.19	08.44	09.35
	15.56	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.25	05.45	07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	04.27	05.48	07.06	08.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.30	05.50	07.09	07.27	08.51	09.36
	16.04	17.31	18.46	21.07	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02	03.37	04.32	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	23.03	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.35	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.30	23.03	22.11	20.40	19.01	16.29	15.13	15.01
29	08.49		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.02	22.09	20.37	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.44		06.47		03.54		04.42	06.03		07.41		09.35
	16.18		19.59		22.37		22.03	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: H - Asuinrakennus J (Työlammentie 24)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.53	03.40	04.45	06.06	07.22	07.44	09.04
	15.07	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.51	03.42	04.48	06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43	22.59	21.55	20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01	03.48	03.44	04.53	06.13	07.29	07.52	09.10
	15.12	16.29	17.48	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.10	06.31	04.58	03.46	03.46	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56	03.45	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.24	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43	22.53	22.52	21.38	20.03	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44	03.40	03.54	05.08	06.29	07.45	08.09	09.22
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	03.56	05.11	06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48	22.56	22.48	21.33	19.56	18.20	15.50	14.57
12	09.24	08.13	06.47	06.09	04.39	03.38	03.58	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.57	22.47	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.53	08.17	09.26
	15.30	16.55	18.12	20.33	21.53	22.58	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.28
	15.33	16.58	18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	04.04	05.22	06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59	23.00	22.41	21.21	19.43	18.08	15.41	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	03.35	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.33	20.54	22.14	23.04	22.28	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	04.22	05.43	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.25	05.45	07.04	08.22	08.47	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.30	05.50	07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.37	04.32	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.35	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.02	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: I - Lomarakennus K (Viitostie 31)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.53	03.40	04.45	06.06	07.22	07.44	09.04
	15.07	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.51	03.42	04.48	06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43	22.59	21.55	20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01	03.48	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.48	20.09	21.29	22.45	22.58	21.53	20.19	18.42	16.09	15.04
5	09.32	08.32	07.10	06.31	04.58	03.46	03.46	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56	03.45	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.24	07.40	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43	22.53	22.52	21.38	20.03	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44	03.40	03.54	05.08	06.29	07.45	08.09	09.22
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.36	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	03.56	05.11	06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48	22.56	22.48	21.33	19.56	18.20	15.50	14.57
12	09.24	08.13	06.47	06.09	04.39	03.38	03.58	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.57	22.47	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.53	08.17	09.26
	15.30	16.55	18.12	20.33	21.53	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.28
	15.33	16.58	18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	04.04	05.22	06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.41	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.20	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	03.35	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.34	17.59	15.33	14.55
19	09.12	07.52	06.25	05.47	04.21	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.33	20.54	22.14	23.04	22.28	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	04.22	05.43	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.25	05.45	07.04	08.22	08.47	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.30	05.50	07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.37	04.32	05.53	07.11	07.30	08.54	09.37
	16.07	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.35	05.55	07.14	07.33	08.57	09.36
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.02	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204 Shadow receptor: J - Kaavoitettu asunto/loma-asunto A (Okslampi)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	03.40	04.45	06.05	07.21	07.44	09.04
	15.06	16.20	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.47	09.06
	15.08	16.23	17.42	20.04	21.24	22.42	23.01	21.58	20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.27	07.49	09.08
	15.09	16.26	17.45	20.06	21.27	22.43	23.00	21.55	20.22	18.45	16.12	15.05
4	09.33	08.34	07.13	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.59	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.45	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.01	09.16
	15.17	16.38	17.55	20.17	21.37	22.51	22.55	21.44	20.09	18.33	16.01	15.00
8	09.29	08.24	07.00	06.21	04.50	03.41	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.40	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	14.59
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.54	22.52	21.38	20.02	18.26	15.55	14.58
10	09.27	08.18	06.54	06.15	04.44	03.39	03.53	05.08	06.28	07.45	08.09	09.22
	15.23	16.46	18.03	20.25	21.46	22.55	22.50	21.36	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.12	09.23
	15.25	16.49	18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20	15.50	14.57
12	09.24	08.13	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14	09.25
	15.27	16.52	18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48	14.56
13	09.22	08.10	06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.54	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20	09.28
	15.32	16.57	18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.55
15	09.19	08.04	06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58	08.23	09.29
	15.35	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.02	22.39	21.18	19.40	18.05	15.38	14.55
17	09.16	07.58	06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.35	14.55
18	09.14	07.55	06.28	05.49	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08	08.34	09.33
	15.45	17.12	18.27	20.49	22.09	23.04	22.33	21.09	19.30	17.55	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.34	06.54	08.11	08.36	09.34
	15.47	17.14	18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.52	15.29	14.55
21	09.08	07.46	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.32	20.54	22.14	23.04	22.29	21.02	19.24	17.49	15.27	14.55
22	09.06	07.43	06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46	15.24	14.56
23	09.04	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.55	17.23	18.38	21.00	22.19	23.05	22.24	20.56	19.17	17.43	15.22	14.56
24	09.01	07.37	06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22	08.47	09.36
	15.58	17.25	18.40	21.02	22.22	23.05	22.22	20.53	19.14	17.40	15.20	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18	14.58
26	08.57	07.31	06.03	05.25	04.04	03.35	04.29	05.50	07.09	07.27	08.52	09.37
	16.04	17.31	18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.34	15.16	14.58
27	08.54	07.28	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.37
	16.06	17.34	18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32	15.15	14.59
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.37
	16.09	17.36	18.51	21.13	22.31	23.03	22.12	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.37
	16.12		19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.04
Potential sun hours	198	249	364	441	543	579	573	493	390	312	218	172
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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: K - Lomarakennus H (Nurmela)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	20.22 (3) 03.52	20.22 (3) 03.40	04.45	20.24 (3) 06.06	07.21	07.44	09.03
	15.06	16.21	17.39	20.01	21.21 18	20.40 (3) 22.39 21	20.43 (3) 23.01	22.01 35	20.59 (3) 20.28	18.52	16.17	15.08
2	09.34	08.39	07.19	06.40	05.07	20.21 (3) 03.51	20.23 (3) 03.41	04.47	20.24 (3) 06.08	07.24	07.46	09.06
	15.08	16.23	17.42	20.04	21.24 22	20.43 (3) 22.41 19	20.42 (3) 23.00	21.58 34	20.58 (3) 20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37	05.04	20.19 (3) 03.49	20.25 (3) 03.43	04.50	20.25 (3) 06.11	07.26	07.49	09.08
	15.10	16.26	17.45	20.06	21.26 25	20.44 (3) 22.43 17	20.42 (3) 22.59	21.55 34	20.59 (3) 20.21	18.45	16.12	15.05
4	09.33	08.34	07.12	06.34	05.01	20.19 (3) 03.47	20.26 (3) 03.44	04.53	20.25 (3) 06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29 26	20.45 (3) 22.45 15	20.41 (3) 22.58	21.52 33	20.58 (3) 20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	20.17 (3) 03.46	20.28 (3) 03.45	20.38 (3) 04.55	20.25 (3) 06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32 29	20.46 (3) 22.47 12	20.40 (3) 22.57 4	20.42 (3) 21.50 32	20.57 (3) 20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.55	20.16 (3) 03.44	20.29 (3) 03.47	20.35 (3) 04.58	20.26 (3) 06.18	07.34	07.57	09.14
	15.15	16.35	17.53	20.14	21.34 30	20.46 (3) 22.48 10	20.39 (3) 22.56 9	20.44 (3) 21.47 31	20.57 (3) 20.12	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24	04.53	20.16 (3) 03.43	20.31 (3) 03.49	20.35 (3) 05.00	20.26 (3) 06.21	07.37	08.00	09.16
	15.17	16.38	17.55	20.17	21.37 31	20.47 (3) 22.50 6	20.37 (3) 22.54 11	20.46 (3) 21.44 30	20.56 (3) 20.09	18.33	16.01	15.01
8	09.29	08.23	07.00	06.21	04.50	20.15 (3) 03.42	03.50	20.33 (3) 05.03	20.27 (3) 06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.19	21.40 32	20.47 (3) 22.52	22.53 14	20.47 (3) 21.41 28	20.55 (3) 20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	20.14 (3) 03.41	03.52	20.32 (3) 05.06	20.28 (3) 06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43 34	20.48 (3) 22.53	22.51 16	20.48 (3) 21.38 26	20.54 (3) 20.02	18.26	15.55	14.59
10	09.26	08.18	06.54	06.15	04.44	20.14 (3) 03.39	03.54	20.32 (3) 05.08	20.29 (3) 06.28	07.44	08.09	09.21
	15.23	16.46	18.03	20.25	21.45 35	20.49 (3) 22.55	22.50 17	20.49 (3) 21.35 24	20.53 (3) 19.59	18.23	15.53	14.58
11	09.25	08.15	06.50	06.12	04.41	20.14 (3) 03.38	03.56	20.30 (3) 05.11	20.30 (3) 06.31	07.47	08.11	09.23
	15.25	16.49	18.06	20.27	21.48 34	20.48 (3) 22.56	22.48 20	20.50 (3) 21.32 21	20.51 (3) 19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.39	20.14 (3) 03.38	03.58	20.30 (3) 05.14	20.32 (3) 06.33	07.50	08.14	09.24
	15.28	16.52	18.09	20.30	21.51 35	20.49 (3) 22.57	22.47 21	20.51 (3) 21.29 17	20.49 (3) 19.53	18.17	15.48	14.57
13	09.22	08.09	06.44	06.05	04.36	20.13 (3) 03.37	04.00	20.30 (3) 05.16	20.34 (3) 06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53 35	20.48 (3) 22.58	22.45 22	20.52 (3) 21.26 12	20.46 (3) 19.49	18.14	15.45	14.56
14	09.20	08.07	06.41	06.02	04.33	20.13 (3) 03.36	04.02	20.28 (3) 05.19	06.38	07.55	08.20	09.27
	15.32	16.58	18.14	20.35	21.56 36	20.49 (3) 22.59	22.43 25	20.53 (3) 21.23	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	20.13 (3) 03.35	04.04	20.28 (3) 05.21	06.41	07.58	08.22	09.29
	15.35	17.00	18.17	20.38	21.58 36	20.49 (3) 23.00	22.41 26	20.54 (3) 21.20	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	20.14 (3) 03.35	04.06	20.28 (3) 05.24	06.43	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01 35	20.49 (3) 23.01	22.39 26	20.54 (3) 21.17	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.25	20.14 (3) 03.35	04.08	20.27 (3) 05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04 35	20.49 (3) 23.02	22.37 28	20.55 (3) 21.14	19.37	18.02	15.36	14.55
18	09.13	07.55	06.28	05.50	04.23	20.13 (3) 03.34	04.10	20.27 (3) 05.29	06.48	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06 35	20.48 (3) 23.02	22.35 29	20.56 (3) 21.11	19.33	17.59	15.33	14.55
19	09.11	07.52	06.25	05.46	04.20	20.14 (3) 03.34	04.13	20.26 (3) 05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09 34	20.48 (3) 23.03	22.33 31	20.57 (3) 21.08	19.30	17.55	15.31	14.55
20	09.09	07.49	06.22	05.43	04.18	20.14 (3) 03.34	04.15	20.26 (3) 05.35	06.54	08.11	08.36	09.34
	15.47	17.14	18.30	20.51	22.11 34	20.48 (3) 23.03	22.30 31	20.57 (3) 21.05	19.27	17.52	15.29	14.55
21	09.07	07.46	06.19	05.40	04.16	20.14 (3) 03.34	04.17	20.26 (3) 05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.32	20.54	22.14 33	20.47 (3) 23.04	22.28 32	20.58 (3) 21.02	19.24	17.49	15.27	14.56
22	09.05	07.43	06.15	05.37	04.13	20.16 (3) 03.34	04.20	20.25 (3) 05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16 32	20.48 (3) 23.04	22.26 33	20.58 (3) 20.59	19.21	17.46	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	20.16 (3) 03.34	04.22	20.25 (3) 05.42	07.01	08.19	08.44	09.35
	15.55	17.23	18.38	20.59	22.19 31	20.47 (3) 23.04	22.24 33	20.58 (3) 20.56	19.17	17.43	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	20.16 (3) 03.35	04.24	20.25 (3) 05.45	07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21 31	20.47 (3) 23.04	22.21 34	20.59 (3) 20.53	19.14	17.40	15.21	14.57
25	08.59	07.34	06.06	05.28	04.06	20.17 (3) 03.35	04.27	20.24 (3) 05.48	07.06	07.24	08.49	09.36
	16.01	17.28	18.43	21.05	22.24 29	20.46 (3) 23.04	22.19 35	20.59 (3) 20.50	19.11	16.37	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	20.17 (3) 03.36	04.29	20.24 (3) 05.50	07.09	07.27	08.51	09.36
	16.04	17.31	18.45	21.07	22.26 29	20.46 (3) 23.04	22.16 35	20.59 (3) 20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02	20.18 (3) 03.36	04.32	20.24 (3) 05.53	07.11	07.30	08.54	09.36
	16.06	17.34	18.48	21.10	22.28 28	20.46 (3) 23.03	22.14 35	20.59 (3) 20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	20.19 (3) 03.37	04.34	20.24 (3) 05.55	07.14	07.33	08.56	09.36
	16.09	17.36	18.51	21.13	22.30 26	20.45 (3) 23.03	22.11 35	20.59 (3) 20.40	19.01	16.29	15.13	15.01
29	08.49		06.53	05.16	03.58	20.20 (3) 03.38	04.37	20.23 (3) 05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33 25	20.45 (3) 23.02	22.09 36	20.59 (3) 20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13 20.25 (3)	03.56	20.20 (3) 03.39	04.40	20.24 (3) 06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18 13 20.38 (3)	22.35 24	20.44 (3) 23.02	22.06 36	21.00 (3) 20.34	18.55	16.23	15.10	15.03
31	08.44		06.47		03.54	20.22 (3)	04.42	20.24 (3) 06.03		07.41		09.35
	16.18		19.59		22.37 22	20.44 (3)	22.03 35	20.59 (3) 20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case				13	941	100	709	357				
Sun reduction				0,39	0,49	0,47	0,44	0,42				
Oper. time red.				0,98	0,98	0,98	0,98	0,98				
Wind dir. red.				0,62	0,62	0,62	0,62	0,62				
Total reduction				0,24	0,30	0,28	0,27	0,26				
Total, real				3	283	28	190	92				

Table 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:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: L - Asuinrakennus L (Mäntymäki)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May		June		July		August		September	October	November	December
1	09.35	08.42	07.22	06.44	05.10		03.53		05.07 (3)	03.40	05.15 (3)	04.45	05.27 (3)	06.06	07.22	07.44	09.03
	15.07	16.21	17.39	20.01	21.21		22.39	26	05.33 (3)	23.01	05.36 (3)	22.01	05.32 (3)	20.28	18.52	16.17	15.08
2	09.34	08.40	07.19	06.40	05.07		03.51		05.07 (3)	03.42	05.15 (3)	04.48		06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24		22.41	25	05.32 (3)	23.00	05.36 (3)	21.58		20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04		03.49		05.07 (3)	03.43	05.15 (3)	04.50		06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27		22.43	25	05.32 (3)	22.59	05.37 (3)	21.55		20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01		03.48		05.08 (3)	03.44	05.15 (3)	04.53		06.13	07.29	07.52	09.10
	15.12	16.29	17.48	20.09	21.29		22.45	24	05.32 (3)	22.58	05.37 (3)	21.53		20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58		03.46		05.08 (3)	03.46	05.14 (3)	04.55		06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32		22.47	24	05.32 (3)	22.57	05.37 (3)	21.50		20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56		03.45		05.09 (3)	03.47	05.14 (3)	04.58		06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35		22.49	23	05.32 (3)	22.56	05.38 (3)	21.47		20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53		03.43		05.09 (3)	03.49	05.15 (3)	05.01		06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37		22.50	23	05.32 (3)	22.54	05.39 (3)	21.44		20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50		03.42		05.09 (3)	03.50	05.14 (3)	05.03		06.24	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40		22.52	23	05.32 (3)	22.53	05.39 (3)	21.41		20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47		03.41		05.09 (3)	03.52	05.15 (3)	05.06		06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43		22.53	23	05.32 (3)	22.52	05.40 (3)	21.38		20.02	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44		03.40		05.11 (3)	03.54	05.14 (3)	05.08		06.29	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45		22.55	21	05.32 (3)	22.50	05.40 (3)	21.35		19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42		03.39		05.11 (3)	03.56	05.15 (3)	05.11		06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48		22.56	21	05.32 (3)	22.48	05.40 (3)	21.33		19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.09	04.39	05.16 (3)	03.38		05.11 (3)	03.58	05.14 (3)	05.14		06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	7 05.23 (3)	22.57	20	05.31 (3)	22.47	05.40 (3)	21.30		19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	05.14 (3)	03.37		05.12 (3)	04.00	05.14 (3)	05.16		06.36	07.52	08.17	09.26
	15.30	16.55	18.12	20.33	21.53	12 05.26 (3)	22.58	20	05.32 (3)	22.45	05.41 (3)	21.27		19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	05.11 (3)	03.36		05.11 (3)	04.02	05.15 (3)	05.19		06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.36	21.56	15 05.26 (3)	22.59	20	05.31 (3)	22.43	05.41 (3)	21.24		19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	05.09 (3)	03.36		05.12 (3)	04.04	05.14 (3)	05.22		06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59	19 05.28 (3)	23.00	19	05.31 (3)	22.41	05.41 (3)	21.21		19.43	18.08	15.41	14.55
16	09.17	08.01	06.35	05.56	04.28	05.07 (3)	03.35		05.13 (3)	04.06	05.14 (3)	05.24		06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	22 05.29 (3)	23.01	19	05.32 (3)	22.39	05.41 (3)	21.18		19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	05.07 (3)	03.35		05.13 (3)	04.08	05.14 (3)	05.27		06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	22 05.29 (3)	23.02	19	05.32 (3)	22.37	05.42 (3)	21.15		19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	05.06 (3)	03.34		05.14 (3)	04.11	05.14 (3)	05.29		06.49	08.06	08.31	09.32
	15.43	17.09	18.25	20.46	22.06	24 05.30 (3)	23.03	18	05.32 (3)	22.35	05.42 (3)	21.12		19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	05.06 (3)	03.34		05.14 (3)	04.13	05.15 (3)	05.32		06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	25 05.31 (3)	23.03	18	05.32 (3)	22.33	05.42 (3)	21.09		19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	05.06 (3)	03.34		05.14 (3)	04.15	05.15 (3)	05.35		06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11	25 05.31 (3)	23.04	18	05.32 (3)	22.31	05.42 (3)	21.05		19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	05.05 (3)	03.34		05.14 (3)	04.17	05.15 (3)	05.37		06.56	08.14	08.39	09.34
	15.50	17.17	18.33	20.54	22.14	27 05.32 (3)	23.04	18	05.32 (3)	22.28	05.42 (3)	21.02		19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	05.05 (3)	03.34		05.14 (3)	04.20	05.15 (3)	05.40		06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	27 05.32 (3)	23.04	18	05.32 (3)	22.26	05.42 (3)	20.59		19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	05.05 (3)	03.35		05.14 (3)	04.22	05.16 (3)	05.43		07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	27 05.32 (3)	23.04	18	05.32 (3)	22.24	05.41 (3)	20.56		19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	05.05 (3)	03.35		05.15 (3)	04.25	05.16 (3)	05.45		07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21	27 05.32 (3)	23.04	18	05.33 (3)	22.21	05.41 (3)	20.53		19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	05.05 (3)	03.35		05.14 (3)	04.27	05.16 (3)	05.48		07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	27 05.32 (3)	23.04	19	05.33 (3)	22.19	05.41 (3)	20.50		19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	05.05 (3)	03.36		05.15 (3)	04.30	05.17 (3)	05.50		07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	28 05.33 (3)	23.04	19	05.34 (3)	22.16	05.40 (3)	20.47		19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	05.05 (3)	03.37		05.15 (3)	04.32	05.17 (3)	05.53		07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	27 05.32 (3)	23.03	19	05.34 (3)	22.14	05.39 (3)	20.44		19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	05.05 (3)	03.37		05.15 (3)	04.35	05.18 (3)	05.55		07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31	27 05.32 (3)	23.03	19	05.34 (3)	22.11	05.38 (3)	20.41		19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	05.06 (3)	03.38		05.15 (3)	04.37	05.21 (3)	05.58		07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	27 05.33 (3)	23.02	20	05.35 (3)	22.09	05.38 (3)	20.37		18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	05.05 (3)	03.39		05.15 (3)	04.40	05.23 (3)	06.01		07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	27 05.32 (3)	23.02	20	05.35 (3)	22.06	05.37 (3)	20.34		18.55	16.23	15.10	15.03
31	08.45		06.47		03.54	05.06 (3)				04.42	05.25 (3)	06.03			07.41		09.36
	16.18		19.59		22.37	26 05.32 (3)				22.03	10 05.35 (3)	20.31			16.20		15.05
Potential sun hours	199	249	364	441	543		579		573		492		390	312	219	172	
Total, worst case						468		617		736		5					
Sun reduction						0,49		0,47		0,44		0,42					
Oper. time red.						0,98		0,98		0,98		0,98					
Wind dir. red.						0,64		0,64		0,64		0,64					
Total reduction						0,31		0,29		0,28		0,26					
Total, real						145		180		203		1					

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

Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204Shadow receptor: M - Lomarakennus M (Mäntymäki)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.53	03.40	04.45	06.06	07.22	07.44	09.03
	15.07	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.34	08.40	07.19	06.40	05.07	03.51	03.42	04.48	06.08	07.24	07.47	09.06
	15.08	16.24	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43	22.59	21.55	20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01	03.48	03.44	04.53	06.13	07.29	07.52	09.10
	15.12	16.29	17.48	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.46	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56	03.45	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.01	06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.54	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.24	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.44	18.01	20.22	21.43	22.53	22.52	21.38	20.02	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44	03.40	03.54	05.09	06.29	07.45	08.09	09.21
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	03.56	05.11	06.31	07.47	08.12	09.23
	15.26	16.49	18.06	20.28	21.48	22.56	22.48	21.33	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.09	04.39	03.38	03.58	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.57	22.47	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.12	20.33	21.53	22.58	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.34	03.36	04.02	05.19	06.39	07.55	08.20	09.27
	15.33	16.58	18.14	20.36	21.56	22.59	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	04.04	05.22	06.41	07.58	08.23	09.29
	15.35	17.01	18.17	20.38	21.59	23.00	22.41	21.21	19.43	18.08	15.41	14.56
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	03.35	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.11	05.30	06.49	08.06	08.31	09.32
	15.43	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.51	22.11	23.04	22.31	21.05	19.27	17.53	15.29	14.56
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.34
	15.50	17.17	18.33	20.54	22.14	23.04	22.28	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.16	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	04.22	05.43	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.25	05.45	07.04	08.22	08.46	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.30	05.50	07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.37	04.32	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	23.03	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.38	04.35	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.02	22.09	20.37	18.58	16.26	15.12	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.03	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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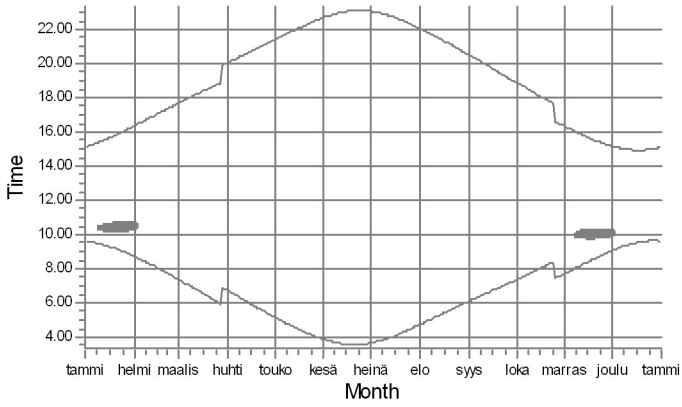
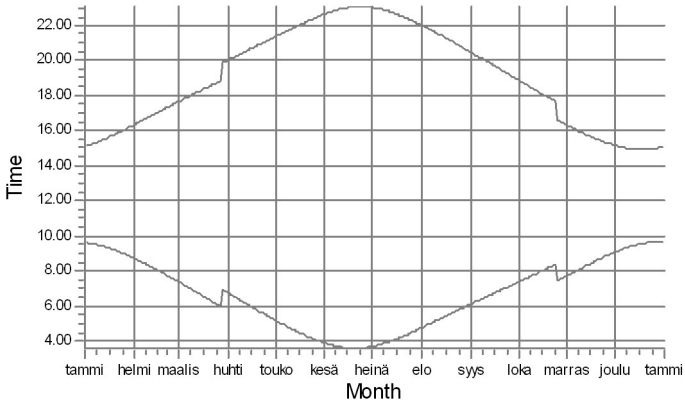
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

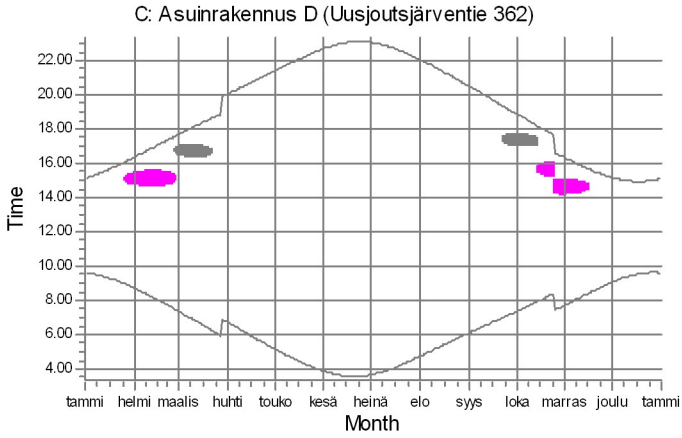
A: Asuinrakennus B (Oksjärventie 150)



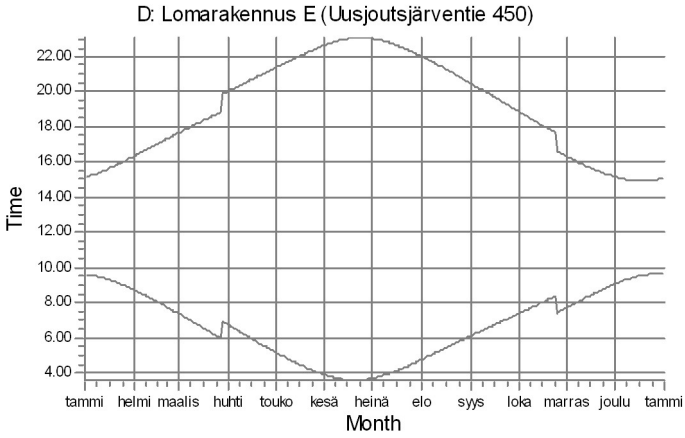
B: Lomarakennus C (Uusjoutsjärventie 312)



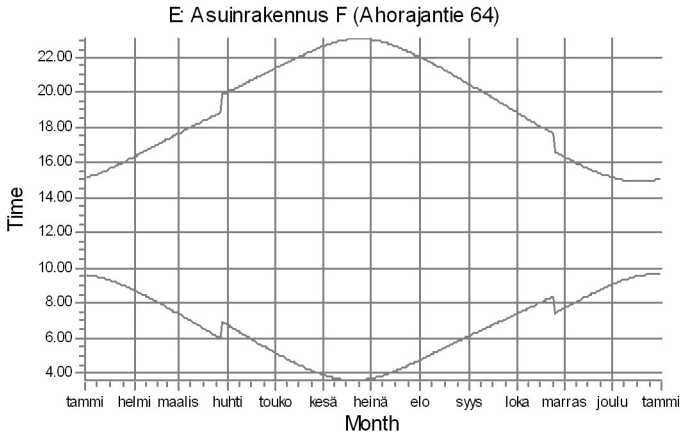
C: Asuinrakennus D (Uusjoutsjärventie 362)



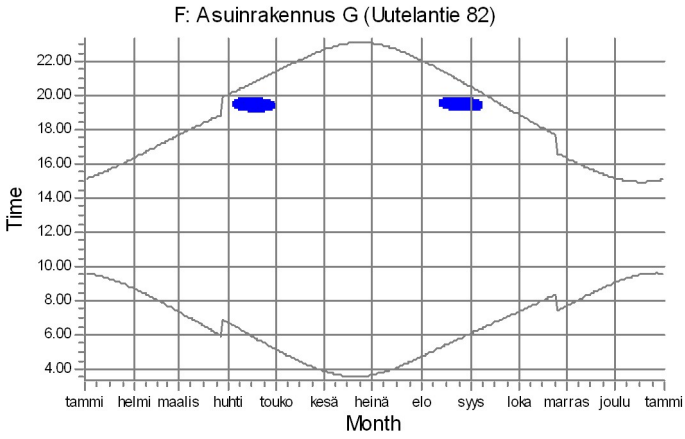
D: Lomarakennus E (Uusjoutsjärventie 450)



E: Asuinrakennus F (Ahorajantie 64)



F: Asuinrakennus G (Uutelantie 82)



WTGs

3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

4: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)

5: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

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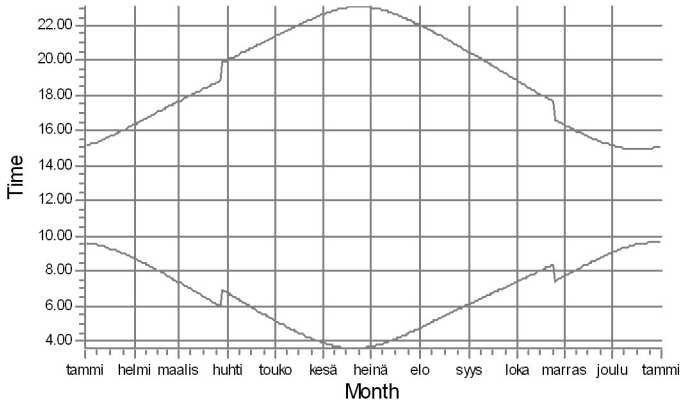
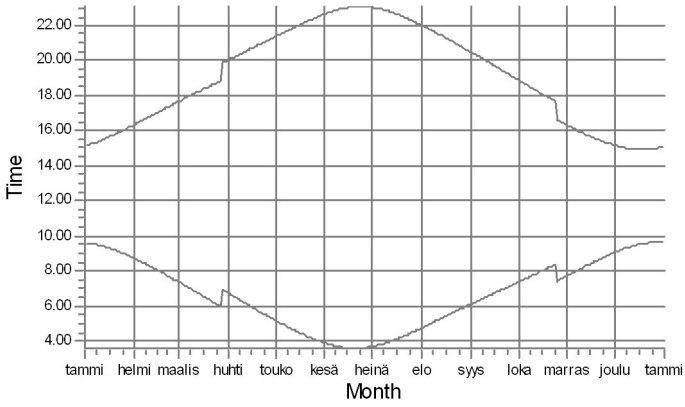
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

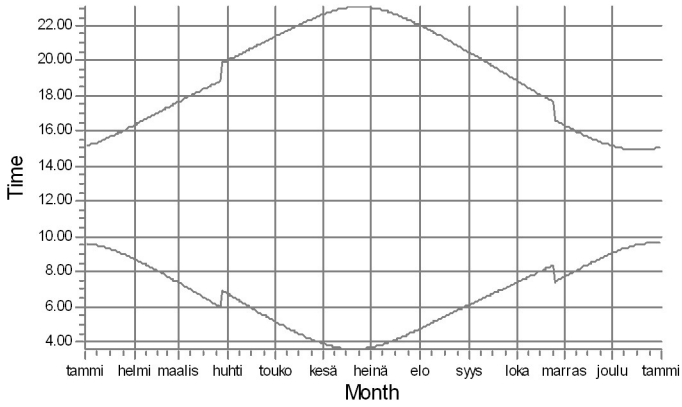
G: Lomarakennus I (Mikkolanmäentie 24)



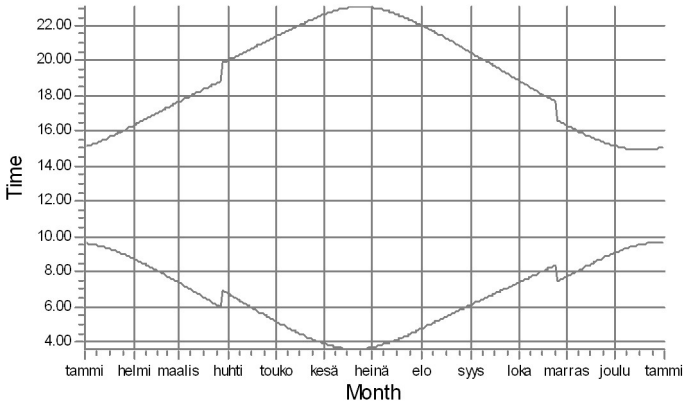
H: Asuinrakennus J (Työlammentie 24)



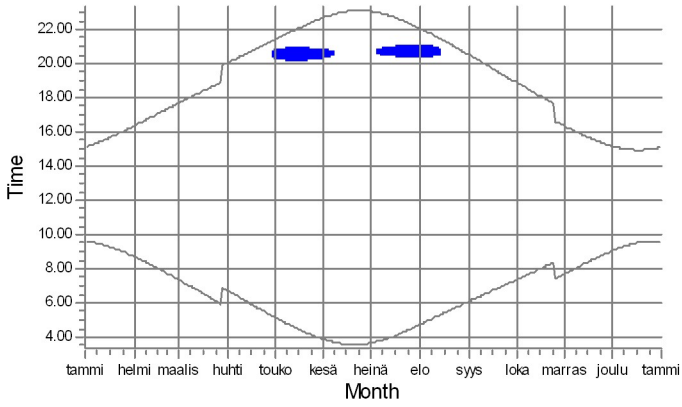
I: Lomarakennus K (Viitostie 31)



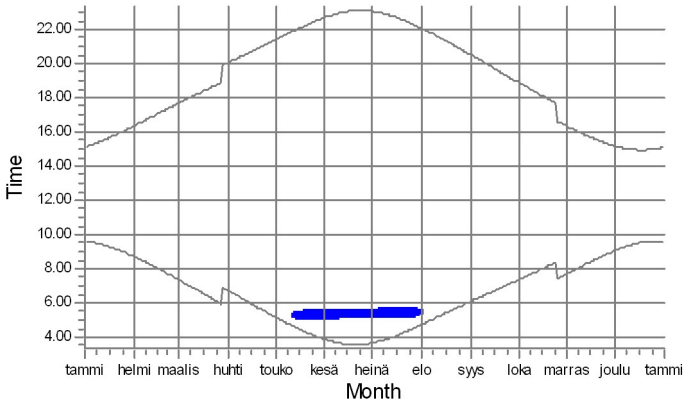
J: Kaavoitettu asunto/loma-asunto A (Okslampi)



K: Lomarakennus H (Nurmela)



L: Asuinrakennus L (Mäntymäki)



WTGs

3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

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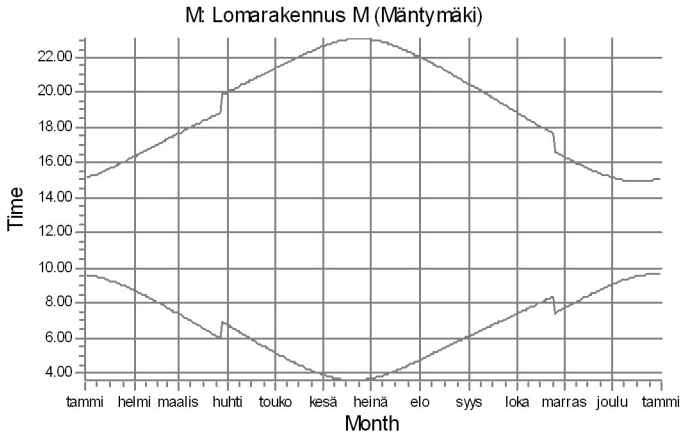
SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204



WTGs

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 1 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (6)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.44	05.10	03.52	03.40	04.45	06.06	07.22	07.44	09.04
	15.06	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.51	03.41	04.47	06.08	07.24	07.47	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.07	21.27	22.43	22.59	21.55	20.22	18.46	16.12	15.05
4	09.33	08.34	07.13	06.34	05.01	03.47	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.48	05.00	06.21	07.37	08.01	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.54	22.52	21.38	20.03	18.27	15.55	14.59
10	09.27	08.18	06.54	06.15	04.44	03.39	03.54	05.08	06.28	07.45	08.09	09.22
	15.23	16.46	18.04	20.25	21.46	22.55	22.50	21.36	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.41	03.38	03.56	05.11	06.31	07.47	08.12	09.23
	15.25	16.49	18.06	20.28	21.48	22.56	22.49	21.33	19.56	18.20	15.50	14.57
12	09.24	08.13	06.47	06.08	04.39	03.37	03.58	05.14	06.34	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.58	22.47	21.30	19.53	18.17	15.48	14.56
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.53	08.17	09.26
	15.30	16.55	18.12	20.33	21.54	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.28
	15.32	16.58	18.14	20.36	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.35	04.04	05.22	06.41	07.58	08.23	09.29
	15.35	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.16	07.58	06.32	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.44	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.07	23.03	22.35	21.12	19.34	17.59	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.15	18.30	20.52	22.12	23.04	22.31	21.06	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.33	20.54	22.14	23.04	22.29	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.47	15.25	14.56
23	09.04	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.24	05.45	07.04	08.22	08.47	09.36
	15.58	17.26	18.40	21.02	22.22	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.29	05.50	07.09	07.27	08.52	09.37
	16.04	17.31	18.46	21.08	22.26	23.04	22.17	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.37
	16.07	17.34	18.48	21.10	22.29	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.57	09.37
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.36	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.38	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.01	07.19	07.38	09.01	09.36
	16.15		19.56	21.19	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 2 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (7)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42	07.22	06.43	05.10	03.52	03.40	04.45	06.06	07.21	07.44	09.04
	15.06	16.21	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40	07.19	06.40	05.07	03.51	03.41	04.47	06.08	07.24	07.47	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.14	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	03.43	04.50	06.11	07.27	07.49	09.08
	15.10	16.26	17.45	20.06	21.27	22.43	22.59	21.55	20.22	18.45	16.12	15.05
4	09.33	08.34	07.13	06.34	05.01	03.47	03.44	04.53	06.13	07.29	07.52	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	03.45	04.55	06.16	07.32	07.55	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	03.49	05.00	06.21	07.37	08.00	09.16
	15.17	16.38	17.56	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	03.50	05.03	06.23	07.39	08.03	09.18
	15.19	16.41	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	03.52	05.06	06.26	07.42	08.06	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.52	21.38	20.02	18.27	15.55	14.59
10	09.27	08.18	06.54	06.15	04.44	03.39	03.54	05.08	06.28	07.45	08.09	09.22
	15.23	16.46	18.04	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.41	03.38	03.56	05.11	06.31	07.47	08.12	09.23
	15.25	16.49	18.06	20.28	21.48	22.56	22.48	21.33	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.08	04.39	03.38	03.58	05.14	06.33	07.50	08.14	09.25
	15.28	16.52	18.09	20.30	21.51	22.57	22.47	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	04.00	05.16	06.36	07.52	08.17	09.26
	15.30	16.55	18.11	20.33	21.53	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	04.02	05.19	06.39	07.55	08.20	09.28
	15.32	16.58	18.14	20.35	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.35	04.04	05.21	06.41	07.58	08.23	09.29
	15.35	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	04.06	05.24	06.44	08.00	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	04.10	05.29	06.49	08.06	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.34	17.59	15.33	14.55
19	09.12	07.52	06.25	05.46	04.20	03.34	04.13	05.32	06.51	08.08	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	04.15	05.35	06.54	08.11	08.36	09.34
	15.48	17.14	18.30	20.51	22.12	23.04	22.31	21.05	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	04.17	05.37	06.56	08.14	08.39	09.35
	15.50	17.17	18.33	20.54	22.14	23.04	22.28	21.02	19.24	17.49	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	04.20	05.40	06.59	08.16	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19	08.44	09.36
	15.56	17.23	18.38	21.00	22.19	23.04	22.24	20.56	19.17	17.43	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	04.24	05.45	07.04	08.22	08.47	09.36
	15.58	17.26	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.06	03.35	04.27	05.48	07.06	07.25	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	04.29	05.50	07.09	07.27	08.52	09.36
	16.04	17.31	18.46	21.08	22.26	23.04	22.16	20.47	19.08	16.35	15.17	14.59
27	08.54	07.28	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30	08.54	09.36
	16.07	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33	08.56	09.36
	16.09	17.37	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.01
29	08.50		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47		06.50	05.13	03.56	03.39	04.40	06.00	07.19	07.38	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45		06.47		03.54		04.42	06.03		07.41		09.36
	16.18		19.59		22.37		22.04	20.31		16.20		15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 3 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April		May		June	
1	09.35	08.42	07.22	06.43		05.10	20.22-20.40/18	03.52	05.07-05.33/26
	15.06	16.21	17.39	20.01		21.21		22.39	20.22-20.43/21
2	09.34	08.40	07.19	06.40		05.07	20.21-20.43/22	03.51	05.07-05.32/25
	15.08	16.23	17.42	20.04		21.24		22.41	20.23-20.42/19
3	09.34	08.37	07.16	06.37		05.04	20.19-20.44/25	03.49	05.07-05.32/25
	15.10	16.26	17.45	20.06		21.26		22.43	20.25-20.42/17
4	09.33	08.34	07.13	06.34		05.01	20.19-20.45/26	03.47	05.08-05.32/24
	15.11	16.29	17.47	20.09		21.29		22.45	20.26-20.41/15
5	09.32	08.32	07.09	06.31	19.23-19.34/11	04.58	20.17-20.46/29	03.46	05.08-05.32/24
	15.13	16.32	17.50	20.12		21.32		22.47	20.28-20.40/12
6	09.31	08.29	07.06	06.27	19.19-19.38/19	04.55	20.16-20.46/30	03.44	05.09-05.32/23
	15.15	16.35	17.53	20.14		21.35		22.49	20.29-20.39/10
7	09.30	08.26	07.03	06.24	19.17-19.40/23	04.53	20.16-20.47/31	03.43	05.09-05.32/23
	15.17	16.38	17.55	20.17		21.37		22.50	20.31-20.37/6
8	09.29	08.24	07.00	06.21	19.15-19.41/26	04.50	20.15-20.47/32	03.42	05.09-05.32/23
	15.19	16.41	17.58	20.20		21.40		22.52	
9	09.28	08.21	06.57	06.18	19.13-19.42/29	04.47	20.14-20.48/34	03.41	05.09-05.32/23
	15.21	16.43	18.01	20.22		21.43		22.53	
10	09.27	08.18	06.54	06.15	19.11-19.42/31	04.44	20.14-20.49/35	03.39	05.11-05.32/21
	15.23	16.46	18.04	20.25		21.45		22.55	
11	09.25	08.15	06.51	06.12	19.10-19.43/33	04.41	20.14-20.48/34	03.38	05.11-05.32/21
	15.25	16.49	18.06	20.27		21.48		22.56	
12	09.24	08.12	06.47	06.08	19.09-19.44/35	04.39	05.16-05.23/7	03.38	05.11-05.31/20
	15.28	16.52	18.09	20.30		21.51	20.14-20.49/35	22.57	
13	09.22	08.10	06.44	06.05	19.09-19.44/35	04.36	05.14-05.26/12	03.37	05.12-05.32/20
	15.30	16.55	18.11	20.33		21.53	20.13-20.48/35	22.58	
14	09.21	08.07	06.41	06.02	19.08-19.44/36	04.33	05.11-05.26/15	03.36	05.11-05.31/20
	15.32	16.58	18.14	20.35		21.56	20.13-20.49/36	22.59	
15	09.19	08.04	06.38	05.59	19.07-19.44/37	04.31	05.09-05.28/19	03.35	05.12-05.31/19
	15.35	17.00	18.17	20.38		21.59	20.13-20.49/36	23.00	
16	09.17	08.01	06.35	05.56	19.07-19.44/37	04.28	05.07-05.29/22	03.35	05.13-05.32/19
	15.37	17.03	18.19	20.41		22.01	20.14-20.49/35	23.01	
17	09.15	07.58	06.31	05.53	19.07-19.44/37	04.26	05.07-05.29/22	03.35	05.13-05.32/19
	15.40	17.06	18.22	20.43		22.04	20.14-20.49/35	23.02	
18	09.13	07.55	06.28	05.50	19.06-19.43/37	04.23	05.06-05.30/24	03.34	05.14-05.32/18
	15.42	17.09	18.25	20.46		22.06	20.13-20.48/35	23.03	
19	09.12	07.52	06.25	05.46	19.06-19.43/37	04.20	05.06-05.31/25	03.34	05.14-05.32/18
	15.45	17.12	18.27	20.49		22.09	20.14-20.48/34	23.03	
20	09.10	07.49	06.22	05.43	19.06-19.42/36	04.18	05.06-05.31/25	03.34	05.14-05.32/18
	15.48	17.14	18.30	20.51		22.11	20.14-20.48/34	23.04	
21	09.08	07.46	06.19	05.40	19.07-19.41/34	04.16	05.05-05.32/27	03.34	05.14-05.32/18
	15.50	17.17	18.32	20.54		22.14	20.14-20.47/33	23.04	
22	09.05	07.43	06.15	05.37	19.08-19.42/34	04.13	05.05-05.32/27	03.34	05.14-05.32/18
	15.53	17.20	18.35	20.57		22.16	20.16-20.48/32	23.04	
23	09.03	07.40	06.12	05.34	19.08-19.41/33	04.11	05.05-05.32/27	03.34	05.14-05.32/18
	15.56	17.23	18.38	20.59		22.19	20.16-20.47/31	23.04	
24	09.01	07.37	06.09	05.31	19.09-19.39/30	04.09	05.05-05.32/27	03.35	05.15-05.33/18
	15.58	17.26	18.40	21.02		22.21	20.16-20.47/31	23.04	
25	08.59	07.34	06.06	05.28	19.09-19.38/29	04.06	05.05-05.32/27	03.35	05.14-05.33/19
	16.01	17.28	18.43	21.05		22.24	20.17-20.46/29	23.04	
26	08.57	07.31	06.03	05.25	19.10-19.37/27	04.04	05.05-05.33/28	03.36	05.15-05.34/19
	16.04	17.31	18.46	21.08		22.26	20.17-20.46/29	23.04	
27	08.54	07.28	05.59	05.22	19.11-19.35/24	04.02	05.05-05.32/27	03.37	05.15-05.34/19
	16.07	17.34	18.48	21.10		22.28	20.18-20.46/28	23.03	
28	08.52	07.25	05.56	05.19	19.14-19.34/20	04.00	05.05-05.32/27	03.37	05.15-05.34/19
	16.09	17.37	18.51	21.13		22.31	20.19-20.45/26	23.03	
29	08.50		06.53	05.16	19.16-19.31/15	03.58	05.06-05.33/27	03.38	05.15-05.35/20
	16.12		19.53	21.16		22.33	20.20-20.45/25	23.02	
30	08.47		06.50	05.13	20.25-20.38/13	03.56	05.05-05.32/27	03.39	05.15-05.35/20
	16.15		19.56	21.18	19.19-19.27/8	22.35	20.20-20.44/24	23.02	
31	08.45		06.47			03.54	05.06-05.32/26		
	16.18		19.59			22.37	20.22-20.44/22		
Potential sun hours	199	249	364	441		543		579	
Sum of minutes with flicker	0	0	0	766		1409		717	

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 3 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (8)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40 05.15-05.36/21	04.45 05.27-05.32/5	06.06 19.09-19.42/33	07.21	07.44	09.03
	23.01	22.01 20.24-20.59/35	20.28	18.52	16.17	15.08
2	03.41 05.15-05.36/21	04.47 20.24-20.58/34	06.08 19.10-19.41/31	07.24	07.46	09.06
	23.00	21.58	20.25	18.49	16.14	15.07
3	03.43 05.15-05.37/22	04.50 20.25-20.59/34	06.11 19.11-19.40/29	07.27	07.49	09.08
	22.59	21.55	20.22	18.45	16.12	15.05
4	03.44 05.15-05.37/22	04.53 20.25-20.58/33	06.13 19.12-19.38/26	07.29	07.52	09.10
	22.58	21.53	20.18	18.42	16.09	15.04
5	03.45 05.14-05.37/23	04.55 20.25-20.57/32	06.16 19.13-19.36/23	07.32	07.55	09.12
	22.57 20.38-20.42/4	21.50	20.15	18.39	16.06	15.03
6	03.47 05.14-05.38/24	04.58 20.26-20.57/31	06.18 19.14-19.33/19	07.34	07.58	09.14
	22.56 20.35-20.44/9	21.47	20.12	18.36	16.03	15.02
7	03.49 05.15-05.39/24	05.00 20.26-20.56/30	06.21 19.18-19.30/12	07.37	08.00	09.16
	22.54 20.35-20.46/11	21.44	20.09	18.33	16.01	15.01
8	03.50 05.14-05.39/25	05.03 20.27-20.55/28	06.23	07.39	08.03	09.18
	22.53 20.33-20.47/14	21.41	20.06	18.30	15.58	15.00
9	03.52 05.15-05.40/25	05.06 20.28-20.54/26	06.26	07.42	08.06	09.20
	22.52 20.32-20.48/16	21.38	20.02	18.26	15.55	14.59
10	03.54 05.14-05.40/26	05.08 20.29-20.53/24	06.28	07.45	08.09	09.21
	22.50 20.32-20.49/17	21.35	19.59	18.23	15.53	14.58
11	03.56 05.15-05.40/25	05.11 20.30-20.51/21	06.31	07.47	08.11	09.23
	22.48 20.30-20.50/20	21.32	19.56	18.20	15.50	14.57
12	03.58 05.14-05.40/26	05.14 20.32-20.49/17	06.33	07.50	08.14	09.25
	22.47 20.30-20.51/21	21.30	19.53	18.17	15.48	14.57
13	04.00 05.14-05.41/27	05.16 20.34-20.46/12	06.36	07.52	08.17	09.26
	22.45 20.30-20.52/22	21.27 19.26-19.37/11	19.50	18.14	15.45	14.56
14	04.02 05.15-05.41/26	05.19 19.23-19.39/16	06.39	07.55	08.20	09.27
	22.43 20.28-20.53/25	21.24	19.46	18.11	15.43	14.56
15	04.04 05.14-05.41/27	05.21 19.21-19.42/21	06.41	07.58	08.22	09.29
	22.41 20.28-20.54/26	21.21	19.43	18.08	15.40	14.55
16	04.06 05.14-05.41/27	05.24 19.18-19.43/25	06.44	08.00	08.25	09.30
	22.39 20.28-20.54/26	21.18	19.40	18.05	15.38	14.55
17	04.08 05.14-05.42/28	05.27 19.16-19.43/27	06.46	08.03	08.28	09.31
	22.37 20.27-20.55/28	21.15	19.37	18.02	15.36	14.55
18	04.10 05.14-05.42/28	05.29 19.16-19.45/29	06.49	08.06	08.31	09.32
	22.35 20.27-20.56/29	21.12	19.33	17.59	15.33	14.55
19	04.13 05.15-05.42/27	05.32 19.14-19.45/31	06.51	08.08	08.33	09.33
	22.33 20.26-20.57/31	21.08	19.30	17.56	15.31	14.55
20	04.15 05.15-05.42/27	05.35 19.14-19.46/32	06.54	08.11	08.36	09.34
	22.31 20.26-20.57/31	21.05	19.27	17.53	15.29	14.55
21	04.17 05.15-05.42/27	05.37 19.12-19.46/34	06.56	08.14	08.39	09.34
	22.28 20.26-20.58/32	21.02	19.24	17.49	15.27	14.56
22	04.20 05.15-05.42/27	05.40 19.11-19.46/35	06.59	08.16	08.41	09.35
	22.26 20.25-20.58/33	20.59	19.21	17.46	15.25	14.56
23	04.22 05.16-05.41/25	05.42 19.11-19.47/36	07.01	08.19	08.44	09.36
	22.24 20.25-20.58/33	20.56	19.17	17.43	15.23	14.57
24	04.25 05.16-05.41/25	05.45 19.10-19.46/36	07.04	08.22	08.46	09.36
	22.21 20.25-20.59/34	20.53	19.14	17.41	15.21	14.57
25	04.27 05.16-05.41/25	05.48 19.10-19.47/37	07.06	07.24	08.49	09.36
	22.19 20.24-20.59/35	20.50	19.11	16.38	15.19	14.58
26	04.29 05.17-05.40/23	05.50 19.09-19.46/37	07.09	07.27	08.51	09.36
	22.16 20.24-20.59/35	20.47	19.08	16.35	15.17	14.59
27	04.32 05.17-05.39/22	05.53 19.09-19.46/37	07.11	07.30	08.54	09.36
	22.14 20.24-20.59/35	20.44	19.05	16.32	15.15	15.00
28	04.35 05.18-05.38/20	05.55 19.09-19.46/37	07.14	07.33	08.56	09.36
	22.11 20.24-20.59/35	20.41	19.01	16.29	15.13	15.01
29	04.37 05.21-05.38/17	05.58 19.09-19.45/36	07.16	07.35	08.59	09.36
	22.09 20.23-20.59/36	20.37	18.58	16.26	15.11	15.02
30	04.40 05.23-05.37/14	06.00 19.10-19.45/35	07.19	07.38	09.01	09.36
	22.06 20.24-21.00/36	20.34	18.55	16.23	15.10	15.03
31	04.42 05.25-05.35/10	06.03 19.09-19.43/34		07.41		09.36
	22.03 20.24-20.59/35	20.31		16.20		15.05
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	1445	948	173	0	0	0

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 4 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January		February		March		April	May	June
1	09.35		08.42	10.22-10.37/15	07.22	16.35-16.55/20	06.43	05.10	03.52
	15.06		16.20		17.39		20.01	21.21	22.39
2	09.35		08.40	10.23-10.34/11	07.19	16.32-16.56/24	06.40	05.07	03.50
	15.08		16.23		17.42		20.04	21.24	22.41
3	09.34		08.37	10.26-10.31/5	07.16	16.30-16.57/27	06.37	05.04	03.49
	15.09		16.26		17.45		20.06	21.27	22.43
4	09.33		08.34		07.12	16.29-16.59/30	06.34	05.01	03.47
	15.11		16.29		17.47		20.09	21.29	22.45
5	09.32		08.32		07.09	16.29-17.00/31	06.31	04.58	03.46
	15.13		16.32		17.50		20.12	21.32	22.47
6	09.31		08.29		07.06	16.27-16.59/32	06.27	04.55	03.44
	15.15		16.35		17.53		20.14	21.35	22.49
7	09.30		08.26		07.03	16.26-17.00/34	06.24	04.52	03.43
	15.17		16.38		17.55		20.17	21.37	22.50
8	09.29		08.24		07.00	16.26-17.00/34	06.21	04.50	03.41
	15.19		16.40		17.58		20.20	21.40	22.52
9	09.28		08.21		06.57	16.26-17.01/35	06.18	04.47	03.40
	15.21		16.43		18.01		20.22	21.43	22.53
10	09.27	10.21-10.26/5	08.18		06.54	16.25-17.00/35	06.15	04.44	03.39
	15.23		16.46		18.03		20.25	21.45	22.55
11	09.25	10.19-10.28/9	08.15		06.50	16.25-17.00/35	06.11	04.41	03.38
	15.25		16.49		18.06		20.27	21.48	22.56
12	09.24	10.17-10.29/12	08.12		06.47	16.25-16.59/34	06.08	04.39	03.37
	15.27		16.52		18.09		20.30	21.51	22.57
13	09.22	10.16-10.31/15	08.10		06.44	16.25-16.59/34	06.05	04.36	03.36
	15.30		16.55		18.11		20.33	21.53	22.59
14	09.21	10.16-10.32/16	08.07		06.41	16.25-16.57/32	06.02	04.33	03.36
	15.32		16.57		18.14		20.35	21.56	23.00
15	09.19	10.15-10.33/18	08.04		06.38	16.25-16.57/32	05.59	04.30	03.35
	15.35		17.00		18.17		20.38	21.59	23.01
16	09.17	10.15-10.34/19	08.01		06.35	16.26-16.56/30	05.56	04.28	03.35
	15.37		17.03		18.19		20.41	22.01	23.01
17	09.15	10.15-10.35/20	07.58		06.31	16.27-16.55/28	05.53	04.25	03.34
	15.40		17.06		18.22		20.43	22.04	23.02
18	09.14	10.15-10.36/21	07.55		06.28	16.28-16.52/24	05.49	04.23	03.34
	15.42		17.09		18.25		20.46	22.06	23.03
19	09.12	10.15-10.37/22	07.52		06.25	16.30-16.51/21	05.46	04.20	03.34
	15.45		17.12		18.27		20.49	22.09	23.03
20	09.10	10.14-10.37/23	07.49		06.22	16.33-16.48/15	05.43	04.18	03.34
	15.47		17.14		18.30		20.51	22.12	23.04
21	09.08	10.14-10.37/23	07.46		06.19	16.38-16.43/5	05.40	04.15	03.34
	15.50		17.17		18.32		20.54	22.14	23.04
22	09.06	10.15-10.39/24	07.43		06.15		05.37	04.13	03.34
	15.53		17.20		18.35		20.57	22.17	23.04
23	09.03	10.15-10.39/24	07.40		06.12		05.34	04.11	03.34
	15.55		17.23		18.38		20.59	22.19	23.04
24	09.01	10.15-10.39/24	07.37		06.09		05.31	04.08	03.34
	15.58		17.25		18.40		21.02	22.21	23.04
25	08.59	10.15-10.39/24	07.34		06.06		05.28	04.06	03.35
	16.01		17.28		18.43		21.05	22.24	23.04
26	08.57	10.16-10.39/23	07.31		06.03		05.25	04.04	03.36
	16.04		17.31		18.46		21.08	22.26	23.04
27	08.54	10.16-10.39/23	07.28	16.42-16.47/5	05.59		05.22	04.02	03.36
	16.06		17.34		18.48		21.10	22.28	23.04
28	08.52	10.17-10.39/22	07.25	16.37-16.52/15	05.56		05.19	04.00	03.37
	16.09		17.36		18.51		21.13	22.31	23.03
29	08.50	10.18-10.39/21			06.53		05.16	03.58	03.38
	16.12				19.53		21.16	22.33	23.03
30	08.47	10.19-10.39/20			06.50		05.13	03.56	03.39
	16.15				19.56		21.18	22.35	23.02
31	08.45	10.20-10.38/18			06.47			03.54	
	16.18				19.59			22.37	
Potential sun hours	198		249		364		441	543	579
Sum of minutes with flicker	426		51		592		0	0	0

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 4 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (9)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	July	August	September	October	November	December
1	03.40	04.45	06.05	07.21 17.04-17.38/34	07.44	09.04 10.01-10.10/9
	23.01	22.01	20.28	18.52	16.17	15.08
2	03.41	04.47	06.08	07.24 17.03-17.38/35	07.47	09.06 10.04-10.09/5
	23.00	21.58	20.25	18.49	16.14	15.07
3	03.42	04.50	06.11	07.26 17.03-17.38/35	07.49	09.08
	22.59	21.55	20.22	18.45	16.12	15.05
4	03.44	04.52	06.13	07.29 17.03-17.38/35	07.52	09.10
	22.58	21.53	20.18	18.42	16.09	15.04
5	03.45	04.55	06.16	07.32 17.02-17.37/35	07.55	09.12
	22.57	21.50	20.15	18.39	16.06	15.03
6	03.47	04.58	06.18	07.34 17.03-17.37/34	07.58	09.14
	22.56	21.47	20.12	18.36	16.03	15.01
7	03.48	05.00	06.21	07.37 17.03-17.36/33	08.00	09.16
	22.55	21.44	20.09	18.33	16.01	15.00
8	03.50	05.03	06.23	07.39 17.03-17.34/31	08.03 09.56-10.02/6	09.18
	22.53	21.41	20.06	18.30	15.58	14.59
9	03.52	05.06	06.26	07.42 17.04-17.34/30	08.06 09.53-10.05/12	09.20
	22.52	21.38	20.02	18.26	15.55	14.58
10	03.54	05.08	06.28	07.45 17.04-17.33/29	08.09 09.52-10.08/16	09.22
	22.50	21.35	19.59	18.23	15.53	14.58
11	03.55	05.11	06.31	07.47 17.06-17.31/25	08.12 09.51-10.09/18	09.23
	22.49	21.33	19.56	18.20	15.50	14.57
12	03.57	05.13	06.33	07.50 17.06-17.29/23	08.14 09.50-10.10/20	09.25
	22.47	21.30	19.53	18.17	15.48	14.56
13	03.59	05.16	06.36	07.52 17.08-17.26/18	08.17 09.50-10.11/21	09.26
	22.45	21.27	19.50	18.14	15.45	14.56
14	04.01	05.19	06.38	07.55 17.11-17.23/12	08.20 09.50-10.12/22	09.28
	22.43	21.24	19.46	18.11	15.43	14.55
15	04.04	05.21	06.41	07.58	08.23 09.49-10.12/23	09.29
	22.41	21.21	19.43	18.08	15.40	14.55
16	04.06	05.24	06.43	08.00	08.25 09.49-10.12/23	09.30
	22.39	21.18	19.40	18.05	15.38	14.55
17	04.08	05.27	06.46	08.03	08.28 09.49-10.13/24	09.31
	22.37	21.15	19.37	18.02	15.35	14.55
18	04.10	05.29	06.48	08.06	08.31 09.49-10.13/24	09.32
	22.35	21.12	19.33	17.58	15.33	14.55
19	04.12	05.32	06.51	08.08	08.33 09.49-10.13/24	09.33
	22.33	21.09	19.30	17.55	15.31	14.55
20	04.15	05.34	06.54	08.11	08.36 09.50-10.14/24	09.34
	22.31	21.05	19.27	17.52	15.29	14.55
21	04.17	05.37	06.56	08.14	08.39 09.50-10.13/23	09.35
	22.28	21.02	19.24	17.49	15.27	14.55
22	04.19	05.40	06.59	08.16	08.41 09.50-10.13/23	09.35
	22.26	20.59	19.21	17.46	15.24	14.56
23	04.22	05.42	07.01 17.18-17.31/13	08.19	08.44 09.51-10.13/22	09.36
	22.24	20.56	19.17	17.43	15.22	14.56
24	04.24	05.45	07.04 17.15-17.34/19	08.22	08.47 09.52-10.13/21	09.36
	22.21	20.53	19.14	17.40	15.20	14.57
25	04.27	05.47	07.06 17.12-17.35/23	07.24	08.49 09.53-10.13/20	09.36
	22.19	20.50	19.11	16.37	15.18	14.58
26	04.29	05.50	07.09 17.10-17.36/26	07.27	08.52 09.53-10.13/20	09.36
	22.16	20.47	19.08	16.34	15.17	14.59
27	04.32	05.53	07.11 17.08-17.37/29	07.30	08.54 09.54-10.12/18	09.37
	22.14	20.44	19.05	16.32	15.15	15.00
28	04.34	05.55	07.14 17.07-17.38/31	07.33	08.57 09.55-10.12/17	09.36
	22.11	20.41	19.01	16.29	15.13	15.01
29	04.37	05.58	07.16 17.06-17.38/32	07.35	08.59 09.57-10.12/15	09.36
	22.09	20.37	18.58	16.26	15.11	15.02
30	04.39	06.00	07.19 17.05-17.38/33	07.38	09.01 09.59-10.11/12	09.36
	22.06	20.34	18.55	16.23	15.10	15.03
31	04.42	06.03		07.41		09.36
	22.04	20.31		16.20		15.04
Potential sun hours	573	492	390	312	219	172
Sum of minutes with flicker	0	0	206	409	448	14

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

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

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Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Calendar per WTG

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204WTG: 5 - Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT: 220,0 m) (10)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,16	2,61	3,94	5,80	8,65	8,98	8,14	6,70	4,15	2,67	1,18	0,89

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
649	536	458	474	498	718	968	1 126	964	856	707	661	8 613

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35	08.42 14.51-15.23/32	07.22	06.43	05.10	03.52	03.40	04.45	06.05	07.21	07.44 14.16-14.59/43	09.04
	15.06	16.20	17.39	20.01	21.21	22.39	23.01	22.01	20.28	18.52	16.17	15.08
2	09.35	08.40 14.50-15.24/34	07.19	06.40	05.07	03.50	03.41	04.47	06.08	07.24	07.46 14.17-14.59/42	09.06
	15.08	16.23	17.42	20.04	21.24	22.41	23.00	21.58	20.25	18.49	16.14	15.07
3	09.34	08.37 14.49-15.25/36	07.16	06.37	05.04	03.49	03.42	04.50	06.11	07.26	07.49 14.17-14.58/41	09.08
	15.09	16.26	17.45	20.06	21.26	22.43	22.59	21.55	20.22	18.45	16.12	15.05
4	09.33	08.34 14.49-15.26/37	07.12	06.34	05.01	03.47	03.44	04.52	06.13	07.29	07.52 14.17-14.58/41	09.10
	15.11	16.29	17.47	20.09	21.29	22.45	22.58	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32 14.48-15.27/39	07.09	06.31	04.58	03.46	03.45	04.55	06.16	07.32	07.55 14.17-14.57/40	09.12
	15.13	16.32	17.50	20.12	21.32	22.47	22.57	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29 14.48-15.28/40	07.06	06.27	04.55	03.44	03.47	04.58	06.18	07.34	07.58 14.18-14.56/38	09.14
	15.15	16.35	17.53	20.14	21.35	22.49	22.56	21.47	20.12	18.36	16.03	15.01
7	09.30	08.26 14.47-15.28/41	07.03	06.24	04.52	03.43	03.48	05.00	06.21	07.37	08.00 14.19-14.56/37	09.16
	15.17	16.38	17.55	20.17	21.37	22.50	22.55	21.44	20.09	18.33	16.01	15.00
8	09.29	08.24 14.47-15.29/42	07.00	06.21	04.50	03.41	03.50	05.03	06.23	07.39	08.03 14.20-14.56/36	09.18
	15.19	16.40	17.58	20.20	21.40	22.52	22.53	21.41	20.06	18.30	15.58	14.59
9	09.28	08.21 14.47-15.30/43	06.57	06.18	04.47	03.40	03.52	05.06	06.26	07.42	08.06 14.21-14.54/33	09.20
	15.21	16.43	18.01	20.22	21.43	22.53	22.52	21.38	20.02	18.26	15.55	14.58
10	09.27	08.18 14.46-15.29/43	06.54	06.15	04.44	03.39	03.54	05.08	06.28	07.45	08.09 14.22-14.53/31	09.22
	15.23	16.46	18.03	20.25	21.45	22.55	22.50	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15 14.46-15.29/43	06.50	06.11	04.41	03.38	03.55	05.11	06.31	07.47	08.11 14.24-14.53/29	09.23
	15.25	16.49	18.06	20.27	21.48	22.56	22.48	21.32	19.56	18.20	15.50	14.57
12	09.24	08.12 14.46-15.30/44	06.47	06.08	04.38	03.37	03.57	05.13	06.33	07.50	08.14 14.25-14.51/26	09.25
	15.27	16.52	18.09	20.30	21.51	22.57	22.47	21.30	19.53	18.17	15.48	14.56
13	09.22	08.10 14.46-15.30/44	06.44	06.05	04.36	03.36	03.59	05.16	06.36	07.52	08.17 14.26-14.49/23	09.26
	15.30	16.55	18.11	20.33	21.53	22.59	22.45	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07 14.46-15.30/44	06.41	06.02	04.33	03.36	04.01	05.19	06.38	07.55	08.20 14.29-14.48/19	09.28
	15.32	16.57	18.14	20.35	21.56	23.00	22.43	21.24	19.46	18.11	15.43	14.55
15	09.19	08.04 14.47-15.30/43	06.38	05.59	04.30	03.35	04.03	05.21	06.41	07.58 15.34-15.47/13	08.23 14.32-14.45/13	09.29
	15.35	17.00	18.17	20.38	21.59	23.01	22.41	21.21	19.43	18.08	15.40	14.55
16	09.17	08.01 14.47-15.30/43	06.35	05.56	04.28	03.35	04.06	05.24	06.43	08.00 15.30-15.51/21	08.25	09.30
	15.37	17.03	18.19	20.41	22.01	23.01	22.39	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58 14.47-15.29/42	06.31	05.53	04.25	03.34	04.08	05.27	06.46	08.03 15.26-15.52/26	08.28	09.31
	15.40	17.06	18.22	20.43	22.04	23.02	22.37	21.15	19.37	18.02	15.35	14.55
18	09.14	07.55 14.47-15.28/41	06.28	05.49	04.23	03.34	04.10	05.29	06.48	08.06 15.24-15.54/30	08.31	09.32
	15.42	17.09	18.25	20.46	22.06	23.03	22.35	21.12	19.33	17.58	15.33	14.55
19	09.12	07.52 14.48-15.28/40	06.25	05.46	04.20	03.34	04.12	05.32	06.51	08.08 15.22-15.55/33	08.33	09.33
	15.45	17.12	18.27	20.49	22.09	23.03	22.33	21.08	19.30	17.55	15.31	14.55
20	09.10	07.49 14.49-15.27/38	06.22	05.43	04.18	03.34	04.15	05.34	06.53	08.11 15.21-15.56/35	08.36	09.34
	15.47	17.14	18.30	20.51	22.12	23.04	22.31	21.05	19.27	17.52	15.29	14.55
21	09.08	07.46 14.49-15.26/37	06.19	05.40	04.15	03.34	04.17	05.37	06.56	08.14 15.20-15.57/37	08.39	09.35
	15.50	17.17	18.32	20.54	22.14	23.04	22.28	21.02	19.24	17.49	15.27	14.55
22	09.06	07.43 14.50-15.25/35	06.15	05.37	04.13	03.34	04.19	05.40	06.59	08.16 15.19-15.58/39	08.41	09.35
	15.53	17.20	18.35	20.57	22.17	23.04	22.26	20.59	19.21	17.46	15.24	14.56
23	09.03	07.40 14.52-15.24/32	06.12	05.34	04.11	03.34	04.22	05.42	07.01	08.19 15.18-15.58/40	08.44	09.36
	15.55	17.23	18.38	20.59	22.19	23.04	22.24	20.56	19.17	17.43	15.22	14.56
24	09.01	07.37 14.54-15.22/28	06.09	05.31	04.08	03.34	04.24	05.45	07.04	08.22 15.17-15.58/41	08.46	09.36
	15.58	17.25	18.40	21.02	22.21	23.04	22.21	20.53	19.14	17.40	15.20	14.57
25	08.59	07.34 14.56-15.20/24	06.06	05.28	04.06	03.35	04.27	05.47	07.06	07.24 14.17-14.59/42	08.49	09.36
	16.01	17.28	18.43	21.05	22.24	23.04	22.19	20.50	19.11	16.37	15.18	14.58
26	08.57 15.04-15.06/2	07.31 14.58-15.17/19	06.03	05.25	04.04	03.36	04.29	05.50	07.09	07.27 14.16-14.59/43	08.52	09.36
	16.04	17.31	18.45	21.08	22.26	23.04	22.16	20.47	19.08	16.34	15.17	14.59
27	08.54 14.59-15.12/13	07.28 15.03-15.12/9	05.59	05.22	04.02	03.36	04.32	05.53	07.11	07.30 14.16-14.59/43	08.54	09.36
	16.06	17.34	18.48	21.10	22.28	23.04	22.14	20.44	19.05	16.32	15.15	15.00
28	08.52 14.56-15.15/19	07.25	05.56	05.19	04.00	03.37	04.34	05.55	07.14	07.33 14.16-14.59/43	08.56	09.36
	16.09	17.36	18.51	21.13	22.31	23.03	22.11	20.41	19.01	16.29	15.13	15.01
29	08.50 14.54-15.18/24		06.53	05.16	03.58	03.38	04.37	05.58	07.16	07.35 14.15-14.59/44	08.59	09.36
	16.12		19.53	21.16	22.33	23.03	22.09	20.37	18.58	16.26	15.11	15.02
30	08.47 14.53-15.19/26		06.50	05.13	03.56	03.39	04.39	06.00	07.19	07.38 14.15-14.59/44	09.01	09.36
	16.15		19.56	21.18	22.35	23.02	22.06	20.34	18.55	16.23	15.10	15.03
31	08.45 14.52-15.21/29		06.47		03.54		04.42	06.03		07.41 14.15-14.59/44		09.36
	16.18		19.59		22.37		22.03	20.31		16.20		15.04
Potential sun hours	198	249	364	441	543	579	573	492	390	312	219	172
Sum of minutes with flicker	113	993	0	0	0	0	0	0	0	618	492	0

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

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

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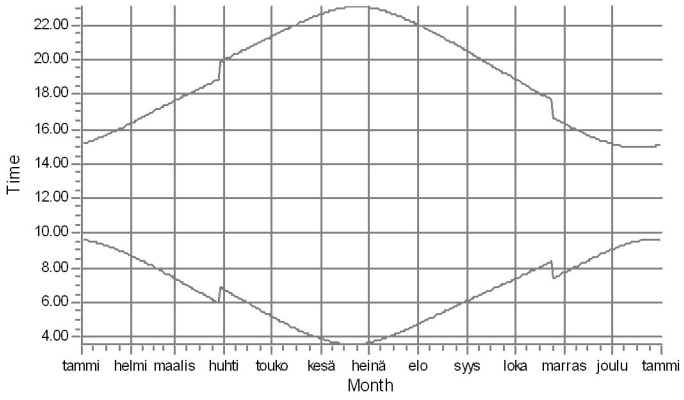
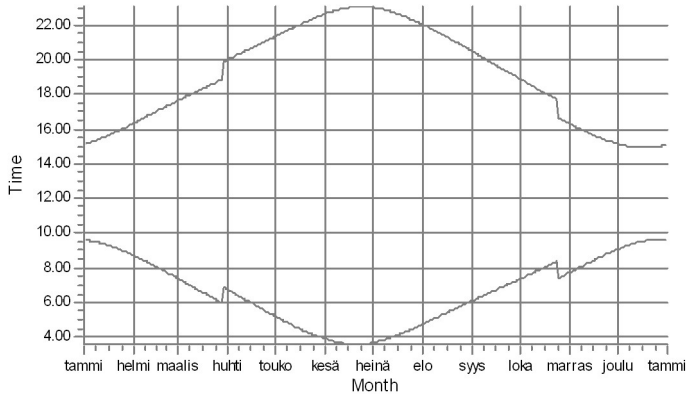
SHADOW - Calendar per WTG, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204

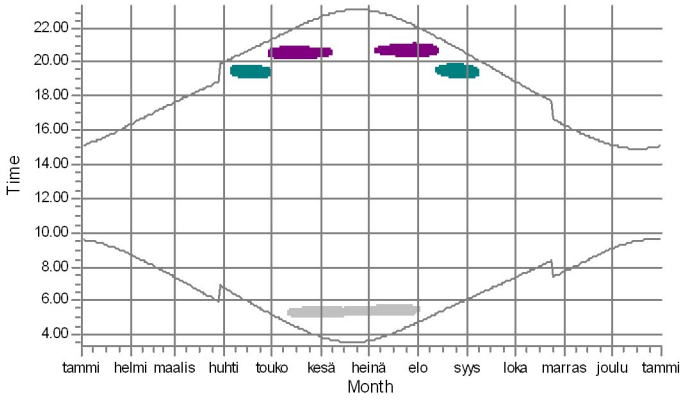
1: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



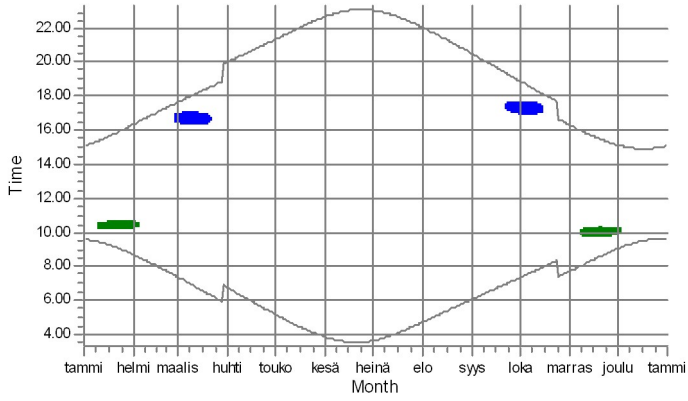
2: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



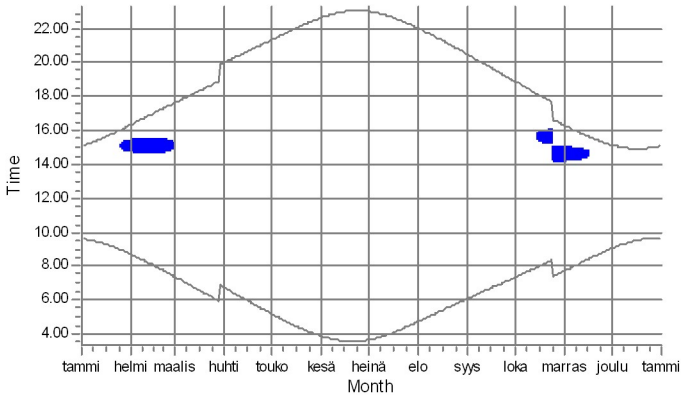
3: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



4: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



5: Siemens Gamesa SG 6.0-170 HH135 6200 170.0 !O! hub: 135,0 m (TOT



Shadow receptors

- A: Asuinrakennus B (Oksjärventie 150)
- C: Asuinrakennus D (Uusjoutsjärventie 362)
- F: Asuinrakennus G (Uutelantie 82)
- K: Lomarakennus H (Nurmela)
- L: Asuinrakennus L (Mäntymäki)

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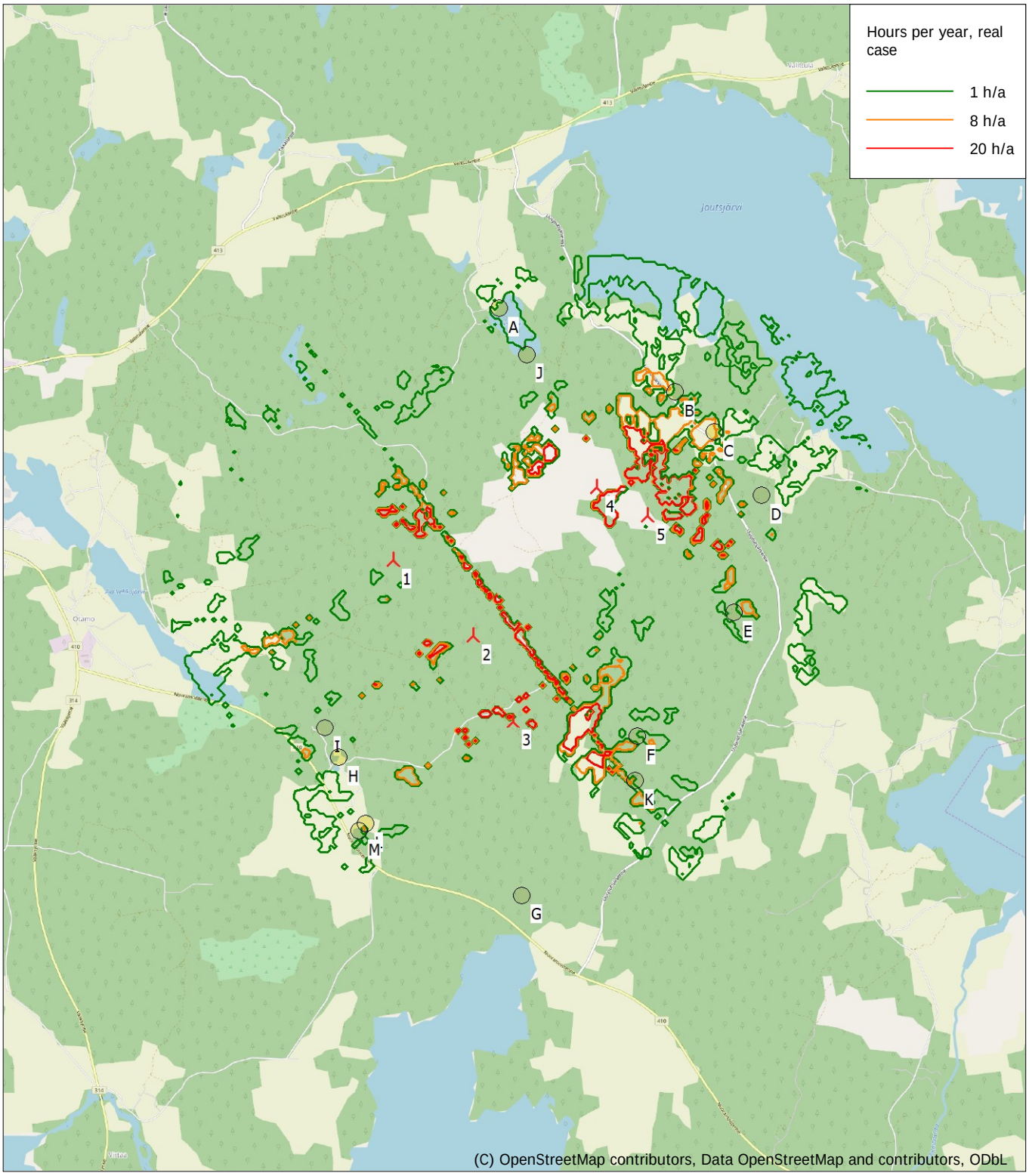
Calculated:
22.2.2021 18.48/3.4.388

SHADOW - Map

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH135_real case Luke forest_20201204



0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:50 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 435 750 North: 6 818 190

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_Sysmä Rekolanvuoret_20200912_0.wpo (1)