LIITE 3

Söderskogenin tuulivoimapuiston varjon vilkuntamallinnus

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1 Johdanto

wpd Finland Oy suunnittelee kahdeksan tuulivoimalan rakentamista Vöyrin kuntaan Söderskogenin alueelle. Tässä selvityksessä on mallinnettu Söderskogenin tuulipuiston osayleiskaavan luonnoksessa tarkastellun toteuttamisvaihtoehdon mukaisesti tuulivoimalaitoksista ympäristöön aiheutuva varjovälke.

Välkemallinnus tehtiin WindPro 3.3- ohjelman SHADOW-moduulilla. Laitosmallina laskennassa on käytetty Nordex N163 laitosmallista johdettua Future F180-laitosta, jonka roottorin halkaisija on 180 metriä, napakorkeus 210 metriä ja nimellisteho 5,6 MW.

2 Tuulivoimaloiden välkevaikutus

Koska tuulivoimala on muusta ympäristöstä huomattavasti korkeammalle kohoava rakenne, se aiheuttaa myös pitkälle lankeavia varjoja. Tuulivoimalan lapojen pyöriminen aiheuttaa liikkuvaa varjoa joka voi aurinkoisella säällä aiheuttaa häiritsevää vilkuntaa, jota kutsutaan yleisesti varjon vilkunnaksi tai välkevaikutukseksi.

Vilkunnan esiintymiseen ja sen määrään vaikuttavat etäisyys tuulivoimalasta, auringon asema tuulivoimalaan ja katselupisteeseen nähden, sääolosuhteet sekä mahdolliset näköesteet kuten puut ja rakennukset.

3 Arviointimenetelmät ja lähtötiedot

Suomessa ei ole käytössä suunnitteluohjearvoja tuulivoimalan varjon vilkunnan määrälle tai kestolle. Ympäristöministeriö suosittelee hyödyntämään muiden maiden ohjeistuksia välkkeen rajoittamisesta. Worst case-tilanne kuvaa maksimivälketilannetta, jossa voimalat pyörivät jatkuvasti, voimalan roottori on aina kohtisuoraan katselupisteeseen nähden ja aurinko paistaa koko ajan auringonnoususta auringonlaskuun. Real case- tilanne kuvastaa todellista tilannetta jossa otetaan huomioon alueen auringonpaistetunnit ja tuulisuustiedot.

Saksassa ohjearvo worst case-tilanteessa 30 tuntia vuodessa ja 30 minuuttia päivässä. Tanskassa real case-tilanteessa ohjearvo on kymmenen tuntia vuodessa. Ruotsissa vastaava suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä. [Ympäristöhallinnon ohjeita 5/2016 Tuulivoimarakentamisen suunnittelu. Päivitys 2016].

Varjovälkemallinnuksessa on tarkasteltu yleiskaavan luonnoksen ohjeellisten voimalasijaintien mukaista tilannetta. Kaavaluonnoksessa on kahdeksan tuulivoimalaa joiden napakorkeus on 210 metriä ja roottorin halkaisija 180 metriä. Välkemallinnus on tehty WindPro 3.3 -ohjelman SHADOW-moduulilla kummankin tilanteen osalta. Mallinnus ottaa huomioon voimaloiden ja havaintopisteiden sijainnin, alueen korkeusmallin ja auringon aseman sekä real case-laskennassa myös tuulen nopeus- ja suuntajakauman sekä auringonpaistetiedot. Ohjelma laskee

voimaloiden kuhunkin havaintopisteeseen aiheuttaman varjon koko kalenterivuodelle minuutin tarkkuudella. Mikäli voimala ei korkeusmallin perusteella näkyisi jollekin alueelle, ei välkevaikutusta silloin katsota syntyvän. Varjonvälkemallinnuksessa ei ole huomioitu puuston aiheuttamaa estevaikutusta. Todellisuudessa puusto muodostaa monin paikoin näköesteen tuulivoimalalle. Mikäli voimala ei näy, ei siitä aiheudu myöskään varjon välkettä katselupisteeseen. Tämän vuoksi myös real case-laskenta liioittelee välkevaikutusta jonkin verran.

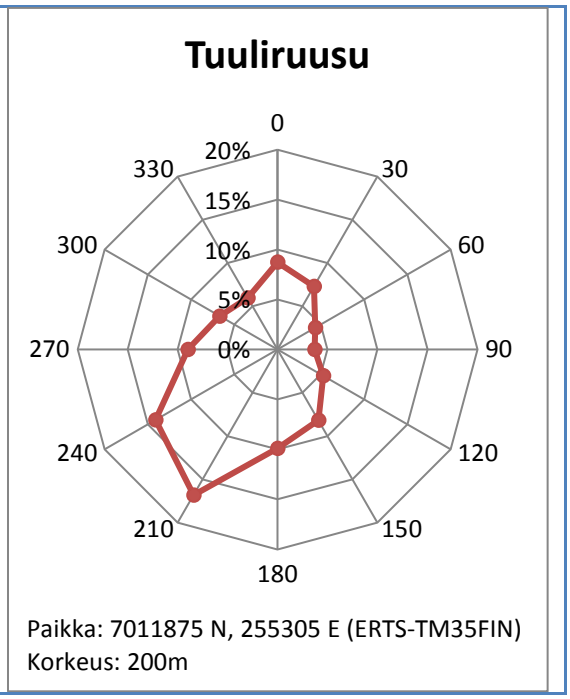
Real case laskennassa käytetyt auringonpaistetunnit ovat Seinäjoen ilmatieteellisen tutkimuskeskuksen normaalijaksolta vuosilta 1981-2011 (Taulukko 1). Taulukko 2 esittää real case tilanteessa käytetyt tuuliatlaksen tuulitilastot 200 metrin korkeudella maanpinnasta pisteessä 7011875 N, 255305 E. Laskenta rajoitetaan niihin aikoihin, kun auringon kulma horisontin yläpuolella on vähintään kolme astetta. Tätä matalammalla valon taittuminen ilmakehässä on niin suurta, että varjoa ei voida katsoa syntyvän. Laskentaetäisyys voimalasta häiriintyvään kohteeseen määritellään puolestaan siten, että lavan tulee peittää vähintään 20 % auringon pintaalasta, jotta varjon voidaan katsoa syntyvän. Mallinnuksessa käytetyt parametrit on esitetty alla olevassa taulukossa 3.

Taulukko 1. Keskimääräiset päivittäiset auringonpaistetunnit Seinäjoen ilmatieteellisessä tutkimuskeskuksessa normaalikaudella 1981-2011.

Kuukausi	1	2	3	4	5	6	7	8	9	10	11	12
h/vrk	1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Taulukko 2. Tuuliatlaksen tuulitilastot 200 metrin korkeudella maanpinnasta (7011875 N, 255305 E)

Tuulen suunta	Osuus (%)	Tuulen nopeus (m/s)
0	8,8	8,1
30	7,3	7,8
60	4,4	6,5
90	3,7	6,5
120	5,3	7,6
150	8,2	8,9
180	9,9	9,1
210	16,8	9,9
240	14,1	9,1
270	9,0	8,7
300	6,7	7,2
330	6,0	7,5
Keskiarvo		8,5



Taulukko 3. Laskennan parametrit

Parametri	Arvo
Auringon vähimmäiskulma horisontin yläpuolella	3 °
Laskentaetäisyys (lavan pituudesta riippuvainen)	2102 m
Laskentaverkon vaakaresoluutio	10 m
Korkeusmalli	10 m (maanmittauslaitos)
Katselukorkeus	1,5 m

Tarkasteluun on valittu ne lähimmät asuin- ja lomarakennukset (havaintopisteet) jotka sijaitsevat noin 1,4 – 2,6 km säteellä kaavaluonnoksen ohjeellisista voimalasijainneista. Asuinrakennukset RH01-14 (RH = residential house) ja lomarakennukset HH01-02 (HH = holiday house) on nimetty satunnaisessa järjestyksessä (Kuva 1). Lähin asuinrakennus (RH 04) sijaitsee 1,4 km päässä lähimmästä voimalasta 4. Talot on mallinnettu nk. ”kasvihuoneina”, eli laskennassa ei ole huomioitu talojen ikkunoiden kokoa ja suuntauksia. Tällöin välkevaikutuksen katsotaan syntyvän aina varjon ulottuessa reseptoripisteen kohdalle.

Söderskogenin osalta on tärkeää tuoda esiin yhteisvaikutukset Merkkikallion, Lotlaxin ja Lålaxin tuulivoimaloiden kanssa. Kaikki nämä suunnitellut tuulivoimapuistot sijaitsevat n. 10 km säteellä Söderskogenin alueelta ja siitä syystä niitä on analysoitava yhdessä. Merkkikallion, Lotlaxin ja Lålaxin tuulivoimaloiden tiedot on otettu hankkeiden kaavoitus- tai rakennuslupa-asiakirjosta riippuen siitä, missä vaiheessa ko. hanke on (Taulukko 4).

Taulukko 4. Merkkikallion, Lotlaxin ja Lålaxin tuulivoimapuistot

Hanke	Malli	Roottorin halkaisija	Napakorkeus
Merkkikallio, 15 tuulivoimalaa	Vestas V136 3,45 MW	136 m	172 m
Lålax, 4 tuulivoimalaa	Prokon P3000 3 MW	116,7 m	142 m
Lotlax, 3 tuulivoimalaa	Prokon P3000 3 MW	116,7 m	122 m

4 Tulokset ja yhteenveto

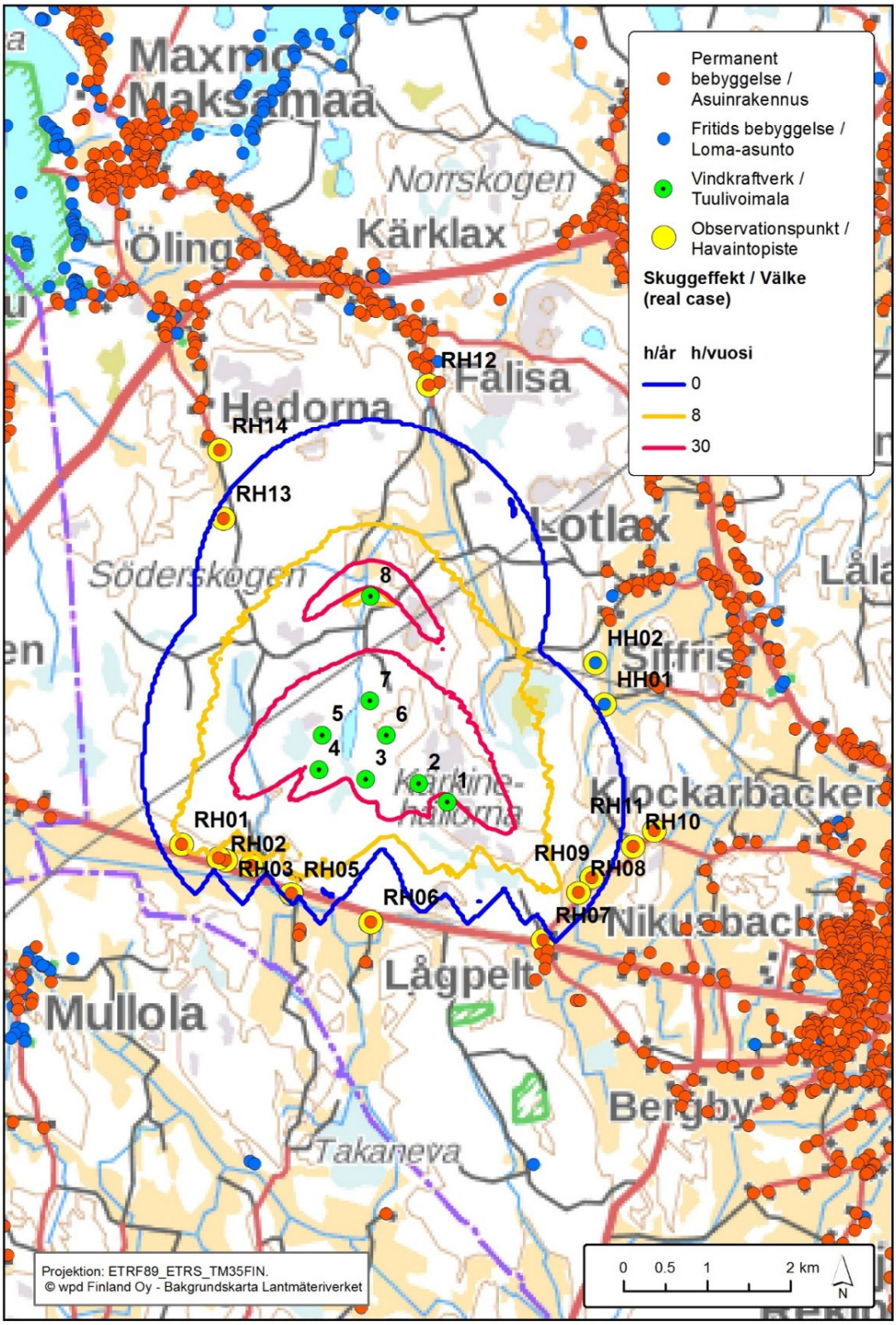
Tulokset on esitetty karttapohjalla kuvassa 1 ja liitteessä 1 (real case) ja varjon välkkeen tuntimääräisiä tuloksia lähimmissä asuin- ja lomarakennuksissa taulukossa 5. Mallinnuksen tulokset worst case tilanteessa on esitetty liitteessä 2. Yhteisvaikutusten tulokset on esitetty ohjearvoihin verrannollisina karttapohjalla kuvassa 2 ja liitteessä 3. Yhteisvaikutusten tulokset tulokset worst case tilanteessa on esitetty liitteessä 4.

Tuulivoimaloiden välittömässä läheisyydessä välkevaikutusta esiintyy runsaasti. Vaikutus vähenee, kun siirrytään kauemmas voimaloista. Vaikutus painottuu etenkin voimaloiden itä-, pohjois- ja länsipuolille johtuen auringon asemasta pohjoisella pallonpuoliskolla. Välkelaskennan tuloksista voidaan nähdä, että välkevaikutukset kohdistuvat pisimmälle tuulivoimaloiden kaakkois- ja lounaispuolelle, kuten ilmenee RH01-RH05 reseptoreiden kohdalla. Asuinrakennusten osalta eniten välkettä esiintyy kohteilla RH01-RH04, noin 5 – 6 tuntia per vuosi real case-tilanteessa. Tarkemmista laskentatuloksista (liite 1, sivu 19) voidaan huomata, että esimerkiksi RH02 osalta välkevaikutusta esiintyy ainoastaan kesäkuukausilla kello 5.00 – 6.00 välisellä ajalla.

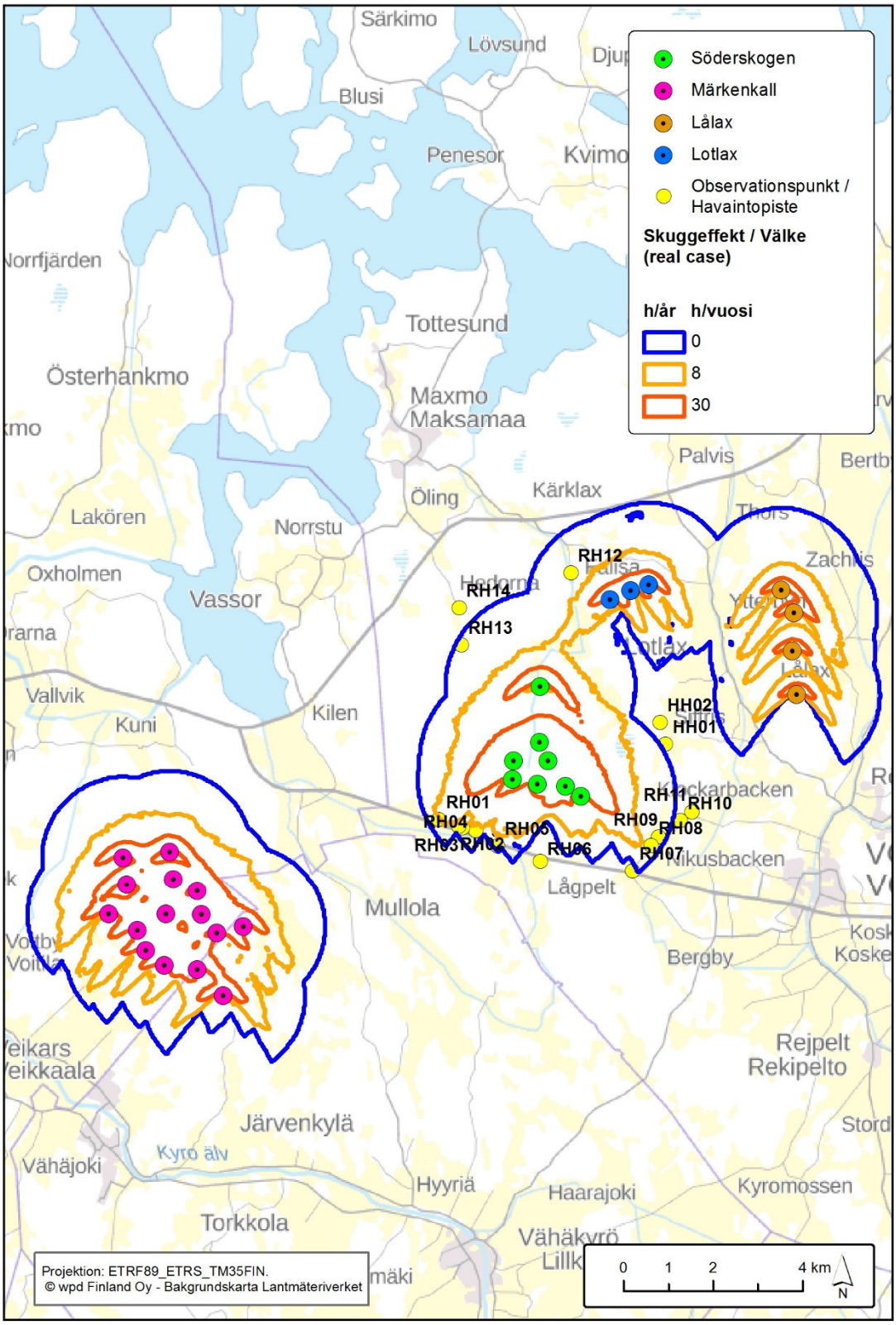
Yhteenvetona tuloksista voidaan todeta, että ohjearvot välkkeelle eivät ylity yhdenkään asuin- tai lomarakennuksen kohdalla. Ohjearvot ovat worst case-tilanteessa 30 tuntia vuodessa ja 30 minuuttia päivässä ja real case-tilanteessa ohjearvo on kahdeksan tuntia vuodessa. Yhteisvaikutuksista voidaan todeta, että tarkasteltujen välkkeelle altistuvien kohteiden välkelaskennan tulokset eivät muutu yhteisvaikutusten seurauksena. Yhteisvaikutuksissa ainut ero syntyy kauempaan RH12 taloon, joka jää Söderskogenin varjovaikutusten ulkopuolelle, mutta johon syntyy välkettä Lotlax tuulipuistosta.

Taulukko 5. Välkelaskennan tulokset lähimpien rakennusten kohdalla.

Asunto	todennäköisellä todellisella tilanteella (real case) (h/vuosi)	teoreettisella maksimimäärällä (worst case) (min/päivä)	teoreettisella maksimimäärällä (worst case) (h/vuosi)
HH01	0:00	0:00	0:00
HH02	0:00	0:00	0:00
RH01	5:34	0:24	18:38
RH02	5:44	0:22	19:14
RH03	5:46	0:23	19:17
RH04	5:36	0:26	19:03
RH05	1:58	0:17	6:44
RH06	0:00	0:00	0:00
RH07	0:00	0:00	0:00
RH08	4:12	0:23	15:43
RH09	2:45	0:22	11:01
RH10	0:00	0:00	0:00
RH11	0:00	0:00	0:00
RH12	0:00	0:00	0:00
RH13	1:14	0:21	7:13
RH14	0:00	0:00	0:00



Kuva 1. Varjovälkekartta, real case



Kuva 2. Varjovälkekartta, yhteisvaikutukset, real case

5 Liitteet

Liite 1 - Mallinnuksen lähtötiedot ja tulokset, real case Söderskogen

Liite 2 - Mallinnuksen lähtötiedot ja tulokset, worst case Söderskogen

Liite 3 - Mallinnuksen lähtötiedot ja tulokset, real case yhteisvaikutukset

Liite 4 - Mallinnuksen lähtötiedot ja tulokset, worst case yhteisvaikutukset

Liite 1

Mallinnuksen lähtötiedot ja tulokset,

real case Söderskogen

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Söderskogen

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18.11.2019 10:23/3.3.247

SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Real case

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) [SEINAJOKI]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational hours are calculated from WTGs in calculation and wind distribution:
Finnish Wind Atlas (gp=30279, lat=63.153, lon=22.140)

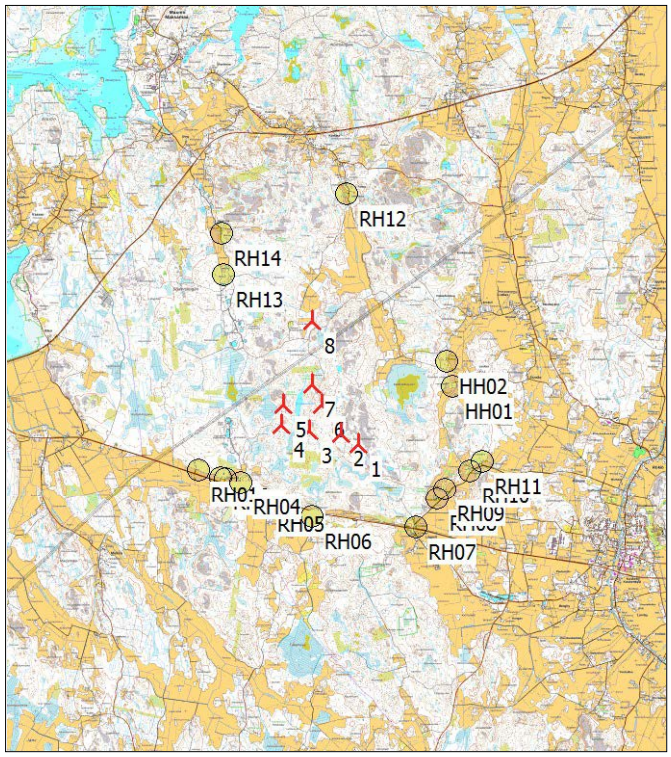
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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: DEM 10m
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 1:150 000
New WTG Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	255445	7011327	46,5	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
2	255108	7011549	50,2	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
3	254469	7011599	26,6	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
4	253911	7011714	27,9	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
5	253946	7012128	33,9	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
6	254714	7012124	38,4	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
7	254523	7012536	35,6	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
8	254528	7013790	19,2	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1

Shadow receptor-Input

No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
HH01	HH01	257331	7012499	17,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
HH02	HH02	257219	7012995	17,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH01	RH01	252257	7010823	13,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH02	RH02	252700	7010660	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH03	RH03	252789	7010635	14,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH04	RH04	253090	7010568	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH05	RH05	253574	7010222	14,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH06	RH06	254528	7009881	18,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH07	RH07	256594	7009667	21,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH08	RH08	257015	7010236	19,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH09	RH09	257177	7010423	17,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH10	RH10	257669	7010798	18,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH11	RH11	257929	7010986	18,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH12	RH12	255219	7016333	14,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH13	RH13	252762	7014727	25,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH14	RH14	252714	7015547	21,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0

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18.11.2019 10:23/3.3.247

SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Real case

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
HH01	HH01	0:00	0	0:00	0:00
HH02	HH02	0:00	0	0:00	0:00
RH01	RH01	18:38	64	0:24	5:34
RH02	RH02	19:14	75	0:22	5:44
RH03	RH03	19:17	70	0:23	5:46
RH04	RH04	19:03	53	0:26	5:36
RH05	RH05	6:44	31	0:17	1:58
RH06	RH06	0:00	0	0:00	0:00
RH07	RH07	0:00	0	0:00	0:00
RH08	RH08	15:43	53	0:23	4:12
RH09	RH09	11:01	38	0:22	2:45
RH10	RH10	0:00	0	0:00	0:00
RH11	RH11	0:00	0	0:00	0:00
RH12	RH12	0:00	0	0:00	0:00
RH13	RH13	7:13	26	0:21	1:14
RH14	RH14	0:00	0	0:00	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)	26:44	6:58
2	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)	6:44	1:58
3	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)	44:06	13:05
4	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)	23:26	6:59
5	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)	0:00	0:00
6	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)	0:00	0:00
7	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)	0:00	0:00
8	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)	7:13	1:14

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

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Söderskogen

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Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** HH01 - HH01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
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12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
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14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
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16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
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18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
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29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** HH02 - HH02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:13	18:31	15:54	14:51
12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	10:00
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:49
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:51
26	09:24	07:50	06:16	05:31	03:59	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
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	16:11	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH01 - RH01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May		June			July			August			September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:32 (4)	03:29			04:45		05:44 (4)	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46		23:16	18	05:50 (4)	23:42			22:29	12	05:56 (4)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:32 (4)	03:31		05:46 (4)	04:48		05:46 (4)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	17	05:49 (4)	23:40	3	05:49 (4)	22:26	8	05:54 (4)	20:45	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42		05:33 (4)	03:32		05:44 (4)	04:51			06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21	16	05:49 (4)	23:39	6	05:50 (4)	22:23			20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40		05:34 (4)	03:34		05:43 (4)	04:54			06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23	15	05:49 (4)	23:38	8	05:51 (4)	22:20			20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38		05:34 (4)	03:36		05:42 (4)	04:57			06:26	07:49	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25	14	05:48 (4)	23:36	10	05:52 (4)	22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36		05:35 (4)	03:37		05:42 (4)	05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27	12	05:47 (4)	23:35	12	05:54 (4)	22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34		05:36 (4)	03:39		05:41 (4)	05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29	11	05:47 (4)	23:33	13	05:54 (4)	22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32		05:37 (4)	03:41		05:41 (4)	05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31	9	05:46 (4)	23:31	14	05:55 (4)	22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		03:31		05:38 (4)	03:44		05:40 (4)	05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10		23:33	7	05:45 (4)	23:29	16	05:56 (4)	22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	05:39 (4)	03:29		05:39 (4)	03:46		05:40 (4)	05:12			06:40	08:03	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	2 05:41 (4)	23:35	5	05:44 (4)	23:27	17	05:57 (4)	22:01			20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	05:34 (4)	03:28			03:48		05:40 (4)	05:15			06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	10 05:44 (4)	23:36			23:25	18	05:58 (4)	21:58			20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	05:33 (4)	03:27			03:50		05:40 (4)	05:18			06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	14 05:47 (4)	23:38			23:23	18	05:58 (4)	21:55			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	05:31 (4)	03:26			03:53		05:39 (4)	05:21			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	16 05:47 (4)	23:39			23:21	20	05:59 (4)	21:51			20:07	18:25	15:48	14:51
14	09:52	08:29	06:57	06:11	04:34	05:31 (4)	03:25			03:55		05:38 (4)	05:24			06:51	08:14	08:47	10:03
	15:31	17:05	18:28	20:56	22:25	18 05:49 (4)	23:41			23:19	21	05:59 (4)	21:48			20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31	05:29 (4)	03:24			03:58		05:38 (4)	05:27			06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	20 05:49 (4)	23:42			23:16	21	05:59 (4)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:05	04:28	05:29 (4)	03:23			04:00		05:38 (4)	05:30			06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	21 05:50 (4)	23:43			23:14	22	06:00 (4)	21:42			19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	05:28 (4)	03:23			04:03		05:38 (4)	05:32			06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	22 05:50 (4)	23:44			23:11	22	06:00 (4)	21:38			19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	05:28 (4)	03:22			04:06		05:39 (4)	05:35			07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23 05:51 (4)	23:45			23:09	22	06:01 (4)	21:35			19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	05:28 (4)	03:22			04:08		05:38 (4)	05:38			07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23 05:51 (4)	23:45			23:06	23	06:01 (4)	21:32			19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16	05:27 (4)	03:22			04:11		05:38 (4)	05:41			07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	24 05:51 (4)	23:46			23:04	23	06:01 (4)	21:28			19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14	05:28 (4)	03:22			04:14		05:38 (4)	05:44			07:10	08:34	09:08	10:11
	15:51	17:26	18:48	21:17	22:46	23 05:51 (4)	23:46			23:01	23	06:01 (4)	21:25			19:40	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11	05:28 (4)	03:22			04:17		05:38 (4)	05:47			07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23 05:51 (4)	23:46			22:58	23	06:01 (4)	21:22			19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	05:28 (4)	03:22			04:19		05:39 (4)	05:50			07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23 05:51 (4)	23:46			22:56	23	06:02 (4)	21:18			19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	05:28 (4)	03:22			04:22		05:38 (4)	05:53			07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23 05:51 (4)	23:46			22:53	24	06:02 (4)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	05:28 (4)	03:23			04:25		05:38 (4)	05:55			07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23 05:51 (4)	23:46			22:50	23	06:01 (4)	21:12			19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	05:29 (4)	03:24			04:28		05:39 (4)	05:58			07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	22 05:51 (4)	23:46			22:47	22	06:01 (4)	21:08			19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	05:29 (4)	03:24			04:31		05:39 (4)	06:01			07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	22 05:51 (4)	23:45			22:44	22	06:01 (4)	21:05			19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	05:29 (4)	03:25			04:34		05:39 (4)	06:04			07:29	07:55	09:28	10:12
	16:12	17:47	19:08	21:37	23:06	21 05:50 (4)	23:44			22:41	21	06:00 (4)	21:01			19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	05:30 (4)	03:26			04:37		05:41 (4)	06:07			07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21 05:51 (4)	23:44			22:38	19	06:00 (4)	20:58			19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50	05:30 (4)	03:28			04:40		05:41 (4)	06:10			07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20 05:50 (4)	23:43			22:35	17	05:58 (4)	20:55			19:09	16:30	15:08	14:57
31	09:11		06:59		03:48	05:31 (4)				04:43		05:43 (4)	06:12				08:04		10:11
	16:21		20:16		23:13	19 05:50 (4)				22:32	15	05:58 (4)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559		605			594			502			392	308	206	151
Total, worst case						433		124			541			20					
Sun reduction						0,49		0,45			0,46			0,42					
Oper. time red.						0,98		0,98			0,98			0,98					
Wind dir. red.						0,65		0,65			0,65			0,65					
Total reduction						0,31		0,29			0,29			0,27					
Total, real						134		36			159			5					

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH02 - RH02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:37 (3)	03:29		04:53 (4)	04:45		05:42 (3)	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16	9	05:46 (3)	23:42	9	05:02 (4)	22:29	16	05:58 (3)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:38 (3)	03:30		04:55 (4)	04:48		05:44 (3)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	6	05:44 (3)	23:40	7	05:02 (4)	22:26	14	05:58 (3)	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42			03:32		04:57 (4)	04:51		05:45 (3)	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21			23:39	3	05:00 (4)	22:23	11	05:56 (3)	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40			03:34			04:54		05:47 (3)	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23			23:38			22:20	7	05:54 (3)	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38			03:36			04:57			06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25			23:36			22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36			03:37			05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27			23:35			22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34			03:39			05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29			23:33			22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31			23:31			22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		05:36 (3)	03:31		03:44			05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10	9	05:45 (3)	23:33		23:29			22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:34 (3)	03:29	04:50 (4)	03:46		05:47 (3)	05:12			06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	12	05:46 (3)	23:35	6	04:56 (4)	23:27	4	05:51 (3)	22:01		20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:32 (3)	03:28		04:50 (4)	03:48		05:45 (3)	05:15		06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	15	05:47 (3)	23:36	8	04:58 (4)	23:25	8	05:53 (3)	21:58		20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:32 (3)	03:27		04:49 (4)	03:50		05:44 (3)	05:18		06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	17	05:49 (3)	23:38	10	04:59 (4)	23:23	11	05:55 (3)	21:55		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:30 (3)	03:26		04:48 (4)	03:53		05:42 (3)	05:21		06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	19	05:49 (3)	23:39	11	04:59 (4)	23:21	13	05:55 (3)	21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:30 (3)	03:25		04:48 (4)	03:55		05:42 (3)	05:24		06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	20	05:50 (3)	23:41	12	05:00 (4)	23:19	14	05:56 (3)	21:48		20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (3)	03:24		04:47 (4)	03:58		05:41 (3)	05:27		06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	21	05:50 (3)	23:42	13	05:00 (4)	23:16	16	05:57 (3)	21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:29 (3)	03:23		04:47 (4)	04:00		05:41 (3)	05:30		06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	22	05:51 (3)	23:43	14	05:01 (4)	23:14	17	05:58 (3)	21:42		19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:29 (3)	03:23		04:48 (4)	04:03		05:40 (3)	05:32		06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	21	05:50 (3)	23:44	14	05:02 (4)	23:11	18	05:58 (3)	21:38		19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:29 (3)	03:22		04:48 (4)	04:06		05:41 (3)	05:35		07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	22	05:51 (3)	23:44	14	05:02 (4)	23:09	19	06:00 (3)	21:35		19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:29 (3)	03:22		04:48 (4)	04:08		05:40 (3)	05:38		07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	22	05:51 (3)	23:45	15	05:03 (4)	23:06	20	06:00 (3)	21:32		19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:29 (3)	03:22		04:48 (4)	04:11		05:40 (3)	05:41		07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	21	05:50 (3)	23:46	15	05:03 (4)	23:04	20	06:00 (3)	21:28		19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:29 (3)	03:22		04:48 (4)	04:14		05:40 (3)	05:44		07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:51 (3)	23:46	15	05:03 (4)	23:01	21	06:01 (3)	21:25		19:39	17:59	15:27	14:49
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28	09:19	07:44	06:09	05:24	03:55		05:32 (3)	03:25		04:51 (4)	04:34		05:40 (3)	06:04		07:29	07:55	09:27	10:12
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30	09:14		07:02	05:18	03:50		05:34 (3)	03:28		04:52 (4)	04:40		05:41 (3)	06:09		07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	13	05:47 (3)	23:43	10	05:02 (4)	22:35	19	06:00 (3)	20:55		19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:35 (3)				04:43		05:42 (3)	06:12			08:04		10:11
	16:21		20:16		23:13	11	05:46 (3)				22:32	18	06:00 (3)	20:51			16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502		392	308	206	151
Total, worst case						414			284			408			48				
Sun reduction						0,49			0,45			0,46			0,42				
Oper. time red.						0,98			0,98			0,98			0,98				
Wind dir. red.						0,65			0,66			0,65			0,65				
Total reduction						0,31			0,29			0,29			0,27				
Total, real						128			83			120			13				

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH03 - RH03

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:25 (3)	03:29		05:35 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:44 (3)	23:42	9	05:44 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:25 (3)	03:30		05:36 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	18	05:43 (3)	23:40	10	05:46 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:26 (3)	03:32		05:35 (3)	04:51	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	18	05:44 (3)	23:39	12	05:47 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		05:26 (3)	03:34		05:34 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	18	05:44 (3)	23:38	13	05:47 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		05:26 (3)	03:36		05:34 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	17	05:43 (3)	23:36	14	05:48 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		05:27 (3)	03:37		05:34 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	16	05:43 (3)	23:35	15	05:49 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		05:28 (3)	03:39		05:33 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	14	05:42 (3)	23:33	16	05:49 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		05:29 (3)	03:41		05:33 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	13	05:42 (3)	23:31	17	05:50 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		05:29 (3)	03:44		05:32 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	12	05:41 (3)	23:29	18	05:50 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		05:30 (3)	03:46		05:33 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	11	05:41 (3)	23:27	18	05:51 (3)	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43			03:28		05:32 (3)	03:48		05:33 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	9	05:41 (3)	23:25	19	05:52 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:30 (3)	03:27		05:32 (3)	03:50		05:33 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	6	05:36 (3)	23:38	8	05:40 (3)	23:23	20	05:53 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:27 (3)	03:26		05:33 (3)	03:53		05:32 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	11	05:38 (3)	23:39	6	05:39 (3)	23:21	20	05:52 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:26 (3)	03:25		05:34 (3)	03:55		05:32 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	14	05:40 (3)	23:41	5	05:39 (3)	23:19	21	05:53 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:25 (3)	03:24		05:35 (3)	03:58		05:31 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	16	05:41 (3)	23:42	3	05:38 (3)	23:16	22	05:53 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:24 (3)	03:23			04:00		05:31 (3)	05:30	06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	18	05:42 (3)	23:43			23:14	22	05:53 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:23 (3)	03:23			04:03		05:31 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	19	05:42 (3)	23:44			23:11	23	05:54 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:23 (3)	03:22			04:06		05:31 (3)	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	20	05:43 (3)	23:44			23:09	23	05:54 (3)	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:23 (3)	03:22			04:08		05:32 (3)	05:38	07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	21	05:44 (3)	23:45			23:06	23	05:55 (3)	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:22 (3)	03:22			04:11		05:32 (3)	05:41	07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	22	05:44 (3)	23:46			23:04	23	05:55 (3)	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:22 (3)	03:22			04:14		05:32 (3)	05:44	07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:44 (3)	23:46			23:01	23	05:55 (3)	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11		05:22 (3)	03:22			04:17		05:32 (3)	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:44 (3)	23:46			22:58	22	05:54 (3)	21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:22 (3)	03:22			04:19		05:33 (3)	05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23	05:45 (3)	23:46			22:56	22	05:55 (3)	21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:22 (3)	03:22			04:22		05:33 (3)	05:53	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23	05:45 (3)	23:46			22:53	21	05:54 (3)	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:22 (3)	03:23			04:25		05:33 (3)	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23	05:45 (3)	23:46			22:50	21	05:54 (3)	21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:22 (3)	03:24			04:28		05:33 (3)	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23	05:45 (3)	23:45			22:47	20	05:53 (3)	21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:22 (3)	03:24		05:39 (3)	04:31		05:34 (3)	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23	05:45 (3)	23:45	1	05:40 (3)	22:44	19	05:53 (3)	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:22 (3)	03:25		05:38 (3)	04:34		05:34 (3)	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	22	05:44 (3)	23:44	4	05:42 (3)	22:41	18	05:52 (3)	21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:24 (3)	03:26		05:36 (3)	04:37		05:36 (3)	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:45 (3)	23:44	6	05:42 (3)	22:38	16	05:52 (3)	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:24 (3)	03:28		05:36 (3)	04:40		05:37 (3)	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:44 (3)	23:43	7	05:43 (3)	22:35	13	05:50 (3)	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:24 (3)				04:43		05:39 (3)	06:12		08:04		10:11
	16:21		20:16		23:13	20	05:44 (3)				22:32	10	05:49 (3)	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						389			205			563						
Sun reduction						0,49			0,45			0,46						
Oper. time red.						0,98			0,98			0,98						
Wind dir. red.						0,65			0,65			0,65						
Total reduction						0,31			0,29			0,30						
Total, real						121			59			167						

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH04 - RH04

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May		June		July		August	September	October	November	December
1	10:10	09:08	07:41	06:55	05:15		03:46		04:59 (3)	03:29	05:01 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16	19	05:18 (3)	23:42	25 05:26 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		04:58 (3)	03:30	05:03 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	20	05:18 (3)	23:40	24 05:27 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:41		04:58 (3)	03:32	05:03 (3)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:25	21:52		23:21	21	05:19 (3)	23:39	24 05:27 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:39		04:58 (3)	03:34	05:03 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23	22	05:20 (3)	23:38	24 05:27 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38		04:57 (3)	03:35	05:03 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25	23	05:20 (3)	23:36	23 05:26 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36		04:57 (3)	03:37	05:04 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27	23	05:20 (3)	23:35	23 05:27 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34		04:57 (3)	03:39	05:04 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29	24	05:21 (3)	23:33	22 05:26 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32		04:57 (3)	03:41	05:05 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31	24	05:21 (3)	23:31	22 05:27 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		03:31		04:57 (3)	03:44	05:05 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10		23:33	24	05:21 (3)	23:29	21 05:26 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		03:29		04:57 (3)	03:46	05:05 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13		23:35	25	05:22 (3)	23:27	21 05:26 (3)	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43		03:28		04:58 (3)	03:48	05:06 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16		23:36	25	05:23 (3)	23:25	20 05:26 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		03:27		04:58 (3)	03:50	05:07 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19		23:38	25	05:23 (3)	23:23	19 05:26 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		03:26		04:58 (3)	03:53	05:07 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22		23:39	25	05:23 (3)	23:21	17 05:24 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		03:25		04:58 (3)	03:55	05:08 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25		23:41	25	05:23 (3)	23:19	16 05:24 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		03:24		04:58 (3)	03:58	05:09 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28		23:42	25	05:23 (3)	23:16	14 05:23 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		03:23		04:58 (3)	04:00	05:11 (3)	05:29	06:56	08:20	08:52	10:06
	15:36	17:11	18:34	21:02	22:31		23:43	26	05:24 (3)	23:14	11 05:22 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		03:23		04:59 (3)	04:03	05:13 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34		23:44	25	05:24 (3)	23:11	7 05:20 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		03:22		04:59 (3)	04:06		05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37		23:44	25	05:24 (3)	23:09		21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		03:22		04:59 (3)	04:08		05:38	07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40		23:45	26	05:25 (3)	23:06		21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16		03:22		04:59 (3)	04:11		05:41	07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43		23:46	26	05:25 (3)	23:04		21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13		03:22		04:59 (3)	04:14		05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46		23:46	26	05:25 (3)	23:01		21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11		03:22		04:59 (3)	04:17		05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49		23:46	26	05:25 (3)	22:58		21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		03:22		04:59 (3)	04:19		05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52		23:46	26	05:25 (3)	22:56		21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		03:22		05:00 (3)	04:22		05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55		23:46	26	05:26 (3)	22:53		21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		03:23		05:00 (3)	04:25		05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57		23:46	25	05:25 (3)	22:50		21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	05:05 (3)	03:24		05:00 (3)	04:28		05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	5 05:10 (3)	23:45	26	05:26 (3)	22:47		21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	05:03 (3)	03:24		05:01 (3)	04:31		06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	9 05:12 (3)	23:45	25	05:26 (3)	22:44		21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	05:01 (3)	03:25		05:01 (3)	04:34		06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	13 05:14 (3)	23:44	26	05:27 (3)	22:41		21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	05:01 (3)	03:26		05:01 (3)	04:37		06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	15 05:16 (3)	23:43	25	05:26 (3)	22:38		20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	05:00 (3)	03:28		05:01 (3)	04:40		06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	16 05:16 (3)	23:43	25	05:26 (3)	22:35		20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48	04:59 (3)				04:43		06:12		08:04		10:11
	16:21		20:16		23:13	18 05:17 (3)				22:32		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559		605			594		502	392	308	206	151
Total, worst case						76		734			333					
Sun reduction						0,49		0,45			0,46					
Oper. time red.						0,98		0,98			0,98					
Wind dir. red.						0,66		0,66			0,66					
Total reduction						0,31		0,29			0,30					
Total, real						24		213			99					

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH05 - RH05

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June			July			August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46			03:29		04:50 (2)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16			23:41	13	05:03 (2)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44			03:30		04:51 (2)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49	23:18			23:40	12	05:03 (2)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41			03:32		04:52 (2)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20			23:39	11	05:03 (2)	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39			03:34		04:53 (2)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23			23:38	9	05:02 (2)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38			03:35		04:53 (2)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25			23:36	8	05:01 (2)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59	03:36		04:50 (2)	03:37		04:56 (2)	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	3	04:53 (2)	23:35	5	05:01 (2)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34		04:48 (2)	03:39			05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	7	04:55 (2)	23:33			22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32		04:48 (2)	03:41			05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	9	04:57 (2)	23:31			22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31		04:47 (2)	03:44			05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	10	04:57 (2)	23:29			22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29		04:46 (2)	03:46			05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:44	22:13	23:35	12	04:58 (2)	23:27			22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28		04:46 (2)	03:48			05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	13	04:59 (2)	23:25			21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27		04:46 (2)	03:50			05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	14	05:00 (2)	23:23			21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	03:26		04:46 (2)	03:53			05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	14	05:00 (2)	23:21			21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25		04:46 (2)	03:55			05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:41	15	05:01 (2)	23:19			21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24		04:46 (2)	03:58			05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	15	05:01 (2)	23:16			21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23		04:46 (2)	04:00			05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:34	21:02	22:31	23:43	15	05:01 (2)	23:14			21:41	19:57	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23		04:46 (2)	04:03			05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	16	05:02 (2)	23:11			21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22		04:46 (2)	04:06			05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	16	05:02 (2)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22		04:47 (2)	04:08			05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	16	05:03 (2)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22		04:47 (2)	04:11			05:41	07:07	08:31	09:04	10:10
	15:48	17:23	18:45	21:13	22:43	23:45	16	05:03 (2)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22		04:47 (2)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	16	05:03 (2)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22		04:47 (2)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23:46	16	05:03 (2)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22		04:47 (2)	04:19			05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	16	05:03 (2)	22:55			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22		04:47 (2)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	17	05:04 (2)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23		04:47 (2)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	16	05:03 (2)	22:50			21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24		04:48 (2)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	16	05:04 (2)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:24		04:49 (2)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	15	05:04 (2)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25		04:49 (2)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	15	05:04 (2)	22:41			21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26		04:49 (2)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	14	05:03 (2)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28		04:49 (2)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	14	05:03 (2)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48				04:42			06:12		08:04		10:11
	16:21		20:16		23:13				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605			594			502	392	308	206	151
Total, worst case							346			58						
Sun reduction							0,45			0,46						
Oper. time red.							0,98			0,98						
Wind dir. red.							0,66			0,66						
Total reduction							0,29			0,30						
Total, real							101			17						

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH06 - RH06

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38	03:35	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:26	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:27	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23	04:03	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:43	23:11	21:38	19:53	18:12	15:38	14:49
18	09:43	08:16	06:43	05:58	04:22	03:22	04:06	05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22	04:11	05:41	07:07	08:31	09:04	10:09
	15:48	17:23	18:45	21:13	22:43	23:45	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22	04:14	05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22	04:17	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24	04:28	05:58	07:23	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:28	03:58	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26	04:37	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28	04:40	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH07 - RH07

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:46	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:22	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:13	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:20	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:23	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:42	23:13	21:41	19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:07
	15:42	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:08
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13	03:21	04:14	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:45	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:11	03:22	04:16	05:47	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:11
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:51
25	09:26	07:53	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:45	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:31	06:01	07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:02	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:00	09:32	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH08 - RH08

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May		June			July		August			September	October	November	December
1	10:10	09:08	07:40	06:55	05:14		03:45		21:01 (1)	03:29		04:45		21:07 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46		23:15	11	21:12 (1)	23:41		22:29	18	21:25 (1)	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11		03:43		21:03 (1)	03:30		04:48		21:08 (1)	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49		23:18	8	21:11 (1)	23:40		22:26	16	21:24 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08		03:41		21:06 (1)	03:32		04:51		21:10 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52		23:20	4	21:10 (1)	23:39		22:23	13	21:23 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05		03:39			03:33		04:54		21:11 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55		23:23			23:37		22:20	10	21:21 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:01		03:37			03:35		04:57			06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58		23:25			23:36		22:17			20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58		03:35			03:37		05:00			06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01		23:27			23:34		22:13			20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55		03:34			03:39		05:03			06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04		23:29			23:33		22:10			20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52		03:32		21:03 (1)	03:41		05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	6	23:31		21:09 (1)	23:31		22:07			20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49		03:30		21:00 (1)	03:43		05:09			06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	11	23:33		21:11 (1)	23:29		22:04			20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46		03:29		20:59 (1)	03:45		05:12			06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	15	23:34		21:14 (1)	23:27	6	21:18 (1)		22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43		03:28		20:57 (1)	03:48		21:11 (1)		05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	17	23:36		21:14 (1)	23:25	9	21:20 (1)		21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40		03:26		20:56 (1)	03:50		21:09 (1)		05:18	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	19	23:38		21:15 (1)	23:23	12	21:21 (1)		21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37		03:25		20:56 (1)	03:52		21:08 (1)		05:20	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	20	23:39		21:16 (1)	23:21	14	21:22 (1)		21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33		03:24		20:55 (1)	03:55		21:08 (1)		05:23	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	21	23:40		21:16 (1)	23:18	15	21:23 (1)		21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31		03:24		20:55 (1)	03:57		21:07 (1)		05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	22	23:41		21:17 (1)	23:16	17	21:24 (1)		21:45	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28		03:23		20:54 (1)	04:00		21:07 (1)		05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23	23:42		21:17 (1)	23:14	18	21:25 (1)		21:41	19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25		03:22		20:54 (1)	04:03		21:06 (1)		05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23	23:43		21:17 (1)	23:11	19	21:25 (1)		21:38	19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22		03:22		20:55 (1)	04:05		21:06 (1)		05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23	23:44		21:18 (1)	23:09	20	21:26 (1)		21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19		03:21		20:54 (1)	04:08		21:05 (1)		05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23	23:45		21:17 (1)	23:06	21	21:26 (1)		21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16		03:21		20:54 (1)	04:11		21:05 (1)		05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23	23:45		21:17 (1)	23:03	21	21:26 (1)		21:28	19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13		03:21		20:55 (1)	04:13		21:05 (1)		05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	22	23:46		21:17 (1)	23:01	22	21:27 (1)		21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10		03:21		20:55 (1)	04:16		21:05 (1)		05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	22	23:46		21:17 (1)	22:58	22	21:27 (1)		21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08		03:22		20:56 (1)	04:19		21:05 (1)		05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	21	23:46		21:17 (1)	22:55	22	21:27 (1)		21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05		03:22		20:56 (1)	04:22		21:04 (1)		05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	21	23:46		21:17 (1)	22:52	23	21:27 (1)		21:15	19:29	17:49	15:20	14:51
25	09:27	07:53	06:19	05:34	04:02		03:23		20:56 (1)	04:25		21:05 (1)		05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	21	23:45		21:17 (1)	22:50	23	21:28 (1)		21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00		03:23		20:57 (1)	04:28		21:05 (1)		05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	19	23:45		21:16 (1)	22:47	22	21:27 (1)		21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57		03:24		20:57 (1)	04:31		21:05 (1)		06:01	07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:03	19	23:45		21:16 (1)	22:44	23	21:28 (1)		21:04	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55		03:25		20:58 (1)	04:33		21:05 (1)		06:04	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	17	23:44		21:15 (1)	22:41	22	21:27 (1)		21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52		03:26		20:59 (1)	04:36		21:05 (1)		06:06	07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	15	23:43		21:14 (1)	22:38	22	21:27 (1)		20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50		03:27		21:00 (1)	04:39		21:06 (1)		06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	14	23:42		21:14 (1)	22:35	21	21:27 (1)		20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48				21:01 (1)	04:42		21:06 (1)		06:12		08:03		10:10
	16:21		20:16		23:13	12			21:13 (1)	22:32	20	21:26 (1)		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559		605			594		502			392	308	206	151
Total, worst case						449			23		414			57				
Sun reduction						0,49			0,45		0,46			0,42				
Oper. time red.						0,98			0,98		0,98			0,98				
Wind dir. red.						0,58			0,58		0,58			0,58				
Total reduction						0,28			0,26		0,26			0,24				
Total, real						124			6		109			14				

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH09 - RH09

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April			May			June			July			August			September	October	November	December
1	10:10	09:08	07:40	06:55			05:14			20:31 (1)	03:45		03:29			04:45			20:40 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19			21:46	18		20:49 (1)	23:15		23:41			22:29	18		20:58 (1)	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52			05:11			20:30 (1)	03:43		03:30			04:48			20:39 (1)	06:18	07:40	08:09	09:38
	15:02	16:27	17:53	20:21			21:49	19		20:49 (1)	23:18		23:40			22:26	20		20:59 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48			05:08			20:29 (1)	03:41		03:32			04:51			20:39 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24			21:52	21		20:50 (1)	23:20		23:39			22:23	20		20:59 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45			05:05			20:28 (1)	03:39		03:33			04:54			20:38 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27			21:55	22		20:50 (1)	23:23		23:37			22:20	21		20:59 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41			05:01			20:28 (1)	03:37		03:35			04:57			20:38 (1)	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30			21:58	22		20:50 (1)	23:25		23:36			22:17	22		21:00 (1)	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38			04:58			20:28 (1)	03:35		03:37			05:00			20:37 (1)	06:29	07:51	08:22	09:47
	15:10	16:40	18:05	20:33			22:01	22		20:50 (1)	23:27		23:34			22:13	22		20:59 (1)	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35			04:55			20:28 (1)	03:34		03:39			05:03			20:38 (1)	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36			22:04	22		20:50 (1)	23:29		23:33			22:10	22		21:00 (1)	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31			04:52			20:28 (1)	03:32		03:41			05:06			20:37 (1)	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38			22:07	22		20:50 (1)	23:31		23:31			22:07	22		20:59 (1)	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28			04:49			20:28 (1)	03:30		03:43			05:09			20:38 (1)	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41			22:10	21		20:49 (1)	23:33		23:29			22:04	21		20:59 (1)	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24			04:46			20:29 (1)	03:29		03:45			05:12			20:38 (1)	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44			22:13	20		20:49 (1)	23:34		23:27			22:01	21		20:59 (1)	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21			04:43			20:29 (1)	03:28		03:48			05:15			20:38 (1)	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47			22:16	19		20:48 (1)	23:36		23:25			21:58	20		20:58 (1)	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18			04:40			20:29 (1)	03:26		03:50			05:17			20:39 (1)	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50			22:19	18		20:47 (1)	23:38		23:23			21:54	18		20:57 (1)	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14			04:36			20:31 (1)	03:25		03:52			05:20			20:40 (1)	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53			22:22	16		20:47 (1)	23:39		23:21			21:51	15		20:55 (1)	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11			04:33			20:32 (1)	03:24		03:55			05:23			20:41 (1)	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56			22:25	13		20:45 (1)	23:40		23:18			21:48	13		20:54 (1)	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:07			04:30			20:34 (1)	03:23		03:57			05:26			20:44 (1)	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59			22:28	10		20:44 (1)	23:41		23:16			21:44	7		20:51 (1)	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04			04:28			20:36 (1)	03:23		04:00			05:29				06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02			22:31	5		20:41 (1)	23:42		23:14			21:41				19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01			04:25				03:22		04:03			05:32				06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04			22:34				23:43		23:11			21:38				19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57			04:22				03:22		04:05			05:35				07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07			22:37				23:44		23:09			21:35				19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54			04:19				03:21		04:08			05:38				07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10			22:40				23:45		23:06			21:31				19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51			04:16				03:21		04:11			05:41				07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13			22:43				23:45		23:03			21:28				19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47			04:13				03:21		04:13			05:44				07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16			22:46				23:46		23:01			21:25				19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44			04:10				03:21		04:16			05:46				07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19			22:49				23:46		22:58			21:21				19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41			04:08				03:22		04:19			05:49				07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22			22:51				23:46		22:55			21:18				19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37			04:05				03:22		04:22			05:52				07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25			22:54				23:46		22:52			21:15				19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34			04:02				03:23		04:25			05:55				07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28			22:57				23:46		22:50			21:11				19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31			04:00				03:23		04:28			05:58				07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31			23:00				23:45		22:47			21:08				19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27			03:57				03:24		04:30			06:01				07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34			23:03				23:45		22:44			21:04				19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24		20:35 (1)	03:55				03:25		04:33		20:45 (1)	06:03				07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	9	20:44 (1)	23:05				23:44		22:41	8	20:53 (1)	21:01				19:15	16:36	15:11	14:54
29	09:16		07:05	05:21		20:33 (1)	03:52				03:26		04:36		20:43 (1)	06:06				07:32	07:57	09:30	10:11
	16:15		20:10	21:40	13	20:46 (1)	23:08				23:43		22:38	12	20:55 (1)	20:58				19:12	16:33	15:09	14:56
30	09:13		07:02	05:18		20:31 (1)	03:50				03:27		04:39		20:42 (1)	06:09				07:34	08:00	09:33	10:11
	16:18		20:13	21:43	16	20:47 (1)	23:10				23:42		22:35	15	20:57 (1)	20:54				19:08	16:30	15:07	14:57
31	09:10		06:59				03:48						04:42		20:41 (1)	06:12					08:03		10:10
	16:21		20:16				23:13						22:32	16	20:57 (1)	20:51					16:26		14:59
Potential sun hours	182	242	363	447			559			605	594					502			392	308	206	151
Total, worst case					38			290				51					282					
Sun reduction					0,44			0,49				0,46					0,42					
Oper. time red.					0,98			0,98				0,98					0,98					
Wind dir. red.					0,56			0,56				0,56					0,56					
Total reduction					0,24			0,27				0,26					0,23					
Total, real					9			78				13					66					

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH10 - RH10

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
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24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
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27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
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29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
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	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH11 - RH11

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:23	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:48	05:14	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
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13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
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15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:44	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:06
	15:38	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:47		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:30	20:48	19:05	16:23	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:29	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:19	23:41	22:27	20:44	19:02	16:20	15:03
3	10:09	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:02
4	10:08	08:59	07:31	06:45	05:04	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:24	23:38	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:34	04:57	06:26	07:48	08:19	09:46
	15:08	16:36	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:58
6	10:06	08:54	07:24	06:38	04:58	03:35	03:36	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:20	06:35	04:55	03:33	03:38	05:03	06:31	07:54	08:25	09:50
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	15:25	16:58	18:22	20:50	22:20	23:39	23:24	21:55	20:10	18:28	15:51	14:50
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	15:27	17:01	18:25	20:53	22:23	23:40	23:21	21:52	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:54	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:43	23:17	21:45	20:00	18:18	15:42	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:20	08:53	10:06
	15:35	17:11	18:33	21:02	22:32	23:44	23:14	21:42	19:56	18:15	15:40	14:48
17	09:46	08:20	06:47	06:01	04:24	03:21	04:02	05:32	06:59	08:22	08:56	10:07
	15:38	17:14	18:36	21:05	22:35	23:45	23:12	21:38	19:53	18:11	15:37	14:48
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	15:41	17:17	18:39	21:08	22:38	23:45	23:09	21:35	19:50	18:08	15:34	14:48
19	09:42	08:13	06:40	05:54	04:18	03:21	04:07	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:41	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:20	04:10	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:28	19:43	18:02	15:29	14:48
21	09:37	08:07	06:33	05:47	04:13	03:20	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:46	23:47	23:02	21:25	19:39	17:58	15:27	14:48
22	09:35	08:04	06:30	05:44	04:10	03:21	04:16	05:46	07:13	08:37	09:11	10:12
	15:53	17:29	18:50	21:20	22:49	23:47	22:59	21:22	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:52	15:22	14:49
24	09:30	07:57	06:23	05:37	04:05	03:21	04:21	05:52	07:18	08:43	09:17	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:24	05:55	07:21	07:46	09:19	10:13
	16:02	17:38	18:59	21:28	22:58	23:47	22:50	21:12	19:26	16:45	15:17	14:51
26	09:25	07:50	06:16	05:31	03:59	03:22	04:27	05:58	07:23	07:49	09:22	10:13
	16:05	17:41	19:02	21:31	23:01	23:46	22:48	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:12	05:27	03:57	03:23	04:30	06:01	07:26	07:52	09:25	10:13
	16:08	17:44	19:05	21:34	23:03	23:46	22:45	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:55	09:28	10:13
	16:11	17:47	19:07	21:37	23:06	23:45	22:42	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:25	04:36	06:06	07:32	07:58	09:31	10:12
	16:14		20:10	21:40	23:09	23:44	22:39	20:58	19:12	16:33	15:09	14:55
30	09:14		07:02	05:17	03:49	03:27	04:39	06:09	07:34	08:01	09:33	10:12
	16:18		20:13	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	606	595	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH13 - RH13

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March			April	May	June	July	August	September			October			November	December
1	10:11	09:08	07:41		08:16 (8)	06:55	05:14	03:45	03:28	04:45	06:15			07:37		08:49 (8)	08:07	09:36
	15:01	16:24	17:50	6	08:22 (8)	20:19	21:46	23:16	23:42	22:30	20:48			19:05	13	09:02 (8)	16:24	15:05
2	10:10	09:05	07:37		08:13 (8)	06:52	05:11	03:43	03:30	04:48	06:18			07:40		08:47 (8)	08:10	09:38
	15:02	16:27	17:53	12	08:25 (8)	20:22	21:49	23:19	23:41	22:27	20:45			19:02	17	09:04 (8)	16:20	15:04
3	10:09	09:02	07:34		08:11 (8)	06:49	05:08	03:41	03:31	04:51	06:21			07:43		08:46 (8)	08:13	09:41
	15:04	16:30	17:56	16	08:27 (8)	20:25	21:53	23:21	23:40	22:24	20:41			18:59	18	09:04 (8)	16:17	15:02
4	10:08	09:00	07:31		08:09 (8)	06:45	05:05	03:39	03:33	04:54	06:23			07:46		08:45 (8)	08:16	09:43
	15:06	16:34	17:59	18	08:27 (8)	20:27	21:56	23:23	23:38	22:20	20:38			18:55	20	09:05 (8)	16:14	15:00
5	10:07	08:57	07:27		08:09 (8)	06:42	05:02	03:37	03:35	04:57	06:26			07:49		08:44 (8)	08:19	09:46
	15:08	16:37	18:02	19	08:28 (8)	20:30	21:59	23:26	23:37	22:17	20:34			18:52	20	09:04 (8)	16:11	14:59
6	10:05	08:54	07:24		08:08 (8)	06:38	04:58	03:35	03:37	05:00	06:29			07:51		08:43 (8)	08:22	09:48
	15:10	16:40	18:05	20	08:28 (8)	20:33	22:02	23:28	23:35	22:14	20:31			18:48	21	09:04 (8)	16:08	14:57
7	10:04	08:51	07:21		08:08 (8)	06:35	04:55	03:33	03:39	05:03	06:32			07:54		08:43 (8)	08:25	09:50
	15:13	16:43	18:08	20	08:28 (8)	20:36	22:05	23:30	23:34	22:11	20:28			18:45	21	09:04 (8)	16:05	14:56
8	10:03	08:48	07:17		08:07 (8)	06:32	04:52	03:32	03:41	05:06	06:34			07:57		08:43 (8)	08:28	09:52
	15:15	16:46	18:11	21	08:28 (8)	20:39	22:08	23:32	23:32	22:08	20:24			18:42	20	09:03 (8)	16:02	14:55
9	10:01	08:45	07:14		08:08 (8)	06:28	04:49	03:30	03:43	05:09	06:37			08:00		08:44 (8)	08:31	09:54
	15:17	16:49	18:14	20	08:28 (8)	20:42	22:11	23:34	23:30	22:05	20:21			18:38	18	09:02 (8)	16:00	14:54
10	10:00	08:42	07:11		08:07 (8)	06:25	04:46	03:29	03:45	05:12	06:40			08:03		08:44 (8)	08:35	09:56
	15:20	16:52	18:16	19	08:26 (8)	20:45	22:14	23:35	23:28	22:01	20:17			18:35	17	09:01 (8)	15:57	14:53
11	09:58	08:39	07:07		08:08 (8)	06:21	04:43	03:27	03:47	05:15	06:43			08:05		08:45 (8)	08:38	09:58
	15:22	16:56	18:19	18	08:26 (8)	20:48	22:17	23:37	23:26	21:58	20:14			18:32	15	09:00 (8)	15:54	14:52
12	09:56	08:35	07:04		08:09 (8)	06:18	04:40	03:26	03:50	05:18	06:45			08:08		08:47 (8)	08:41	10:00
	15:25	16:59	18:22	15	08:24 (8)	20:50	22:20	23:39	23:24	21:55	20:10			18:28	10	08:57 (8)	15:51	14:51
13	09:54	08:32	07:00		08:11 (8)	06:15	04:37	03:25	03:52	05:21	06:48			08:11			08:44	10:02
	15:28	17:02	18:25	11	08:22 (8)	20:53	22:23	23:40	23:21	21:52	20:07			18:25			15:48	14:50
14	09:52	08:29	06:57			06:11	04:34	03:24	03:55	05:23	06:51			08:14			08:47	10:03
	15:30	17:05	18:28			20:56	22:26	23:41	23:19	21:48	20:04			18:22			15:45	14:49
15	09:50	08:26	06:54			06:08	04:31	03:23	03:57	05:26	06:54			08:17			08:50	10:05
	15:33	17:08	18:31			20:59	22:29	23:43	23:17	21:45	20:00			18:18			15:43	14:49
16	09:48	08:23	06:50			06:04	04:28	03:22	04:00	05:29	06:56			08:20			08:53	10:06
	15:36	17:11	18:34			21:02	22:32	23:44	23:14	21:42	19:57			18:15			15:40	14:49
17	09:46	08:20	06:47			06:01	04:25	03:22	04:02	05:32	06:59			08:23			08:56	10:07
	15:39	17:14	18:36			21:05	22:35	23:44	23:12	21:38	19:53			18:12			15:37	14:48
18	09:44	08:17	06:43			05:58	04:22	03:21	04:05	05:35	07:02			08:25			08:59	10:08
	15:41	17:17	18:39			21:08	22:38	23:45	23:09	21:35	19:50			18:08			15:35	14:48
19	09:42	08:13	06:40			05:54	04:19	03:21	04:08	05:38	07:05			08:28			09:02	10:09
	15:44	17:20	18:42			21:11	22:41	23:46	23:07	21:32	19:46			18:05			15:32	14:48
20	09:39	08:10	06:37			05:51	04:16	03:21	04:11	05:41	07:07			08:31			09:05	10:10
	15:47	17:23	18:45			21:14	22:44	23:46	23:04	21:29	19:43			18:02			15:30	14:48
21	09:37	08:07	06:33			05:48	04:13	03:21	04:13	05:44	07:10			08:34			09:08	10:11
	15:50	17:26	18:48			21:17	22:46	23:47	23:02	21:25	19:40			17:59			15:27	14:49
22	09:35	08:04	06:30			05:44	04:10	03:21	04:16	05:47	07:13			08:37			09:11	10:12
	15:53	17:29	18:51			21:20	22:49	23:47	22:59	21:22	19:36			17:55			15:25	14:49
23	09:32	08:00	06:26			05:41	04:08	03:21	04:19	05:50	07:15			08:40			09:14	10:12
	15:56	17:32	18:53			21:23	22:52	23:47	22:56	21:18	19:33			17:52			15:22	14:50
24	09:30	07:57	06:23			05:37	04:05	03:22	04:22	05:52	07:18			08:43			09:17	10:12
	15:59	17:35	18:56			21:26	22:55	23:47	22:53	21:15	19:29			17:49			15:20	14:50
25	09:27	07:54	06:19			05:34	04:02	03:22	04:25	05:55	07:21			07:46			09:20	10:13
	16:02	17:38	18:59			21:29	22:58	23:47	22:50	21:12	19:26			16:46			15:18	14:51
26	09:25	07:51	06:16			05:31	04:00	03:23	04:28	05:58	07:24			07:49			09:22	10:13
	16:05	17:41	19:02			21:31	23:01	23:46	22:48	21:08	19:22			16:42			15:16	14:52
27	09:22	07:47	06:13			05:28	03:57	03:24	04:30	06:01	07:26			07:52			09:25	10:13
	16:09	17:44	19:05			21:34	23:03	23:46	22:45	21:05	19:19			16:39			15:13	14:53
28	09:19	07:44	06:09			05:24	03:55	03:25	04:33	06:04	07:29			07:55			09:28	10:13
	16:12	17:47	19:08			21:37	23:06	23:45	22:42	21:02	19:16			16:36			15:11	14:54
29	09:17		07:06			05:21	03:52	03:26	04:36	06:07	07:32			07:58			09:31	10:12
	16:15		20:10			21:40	23:09	23:44	22:39	20:58	19:12			16:33			15:09	14:56
30	09:14		07:02			05:18	03:50	03:27	04:39	06:09	07:35		08:52 (8)	08:01			09:33	10:12
	16:18		20:13			21:43	23:11	23:43	22:36	20:55	19:09	8	09:00 (8)	16:30			15:07	14:57
31	09:11		06:59				03:47		04:42	06:12				08:04				10:11
	16:21		20:16				23:14		22:33	20:51				16:27				14:59
Potential sun hours	182	242	363			447	559	605	594	502	392			308			206	151
Total, worst case				215								8			210			
Sun reduction				0,36								0,36			0,25			
Oper. time red.				0,98								0,98			0,98			
Wind dir. red.				0,56								0,56			0,56			
Total reduction				0,20								0,20			0,14			
Total, real				43								2			30			

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case**Shadow receptor:** RH14 - RH14

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:47	23:16	23:42	22:30	20:48	19:05	16:24	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:39
	15:02	16:27	17:53	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:20	15:04
3	10:09	09:03	07:34	06:49	05:08	03:41	03:31	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:25	21:53	23:21	23:40	22:24	20:41	18:59	16:17	15:02
4	10:08	09:00	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:28	21:56	23:24	23:39	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:35	04:57	06:26	07:49	08:19	09:46
	15:08	16:37	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:59
6	10:06	08:54	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:21	06:35	04:55	03:33	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:05	23:30	23:34	22:11	20:28	18:45	16:05	14:56
8	10:03	08:48	07:17	06:32	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:53
	15:15	16:46	18:11	20:39	22:08	23:32	23:32	22:08	20:24	18:42	16:02	14:55
9	10:01	08:45	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:32	09:55
	15:17	16:49	18:14	20:42	22:11	23:34	23:30	22:05	20:21	18:38	16:00	14:53
10	10:00	08:42	07:11	06:25	04:46	03:29	03:45	05:12	06:40	08:03	08:35	09:57
	15:20	16:52	18:16	20:45	22:14	23:36	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:39	07:07	06:21	04:43	03:27	03:47	05:15	06:43	08:05	08:38	09:58
	15:22	16:55	18:19	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:54	14:51
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:41	10:00
	15:25	16:59	18:22	20:50	22:20	23:39	23:24	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:36	03:25	03:52	05:21	06:48	08:11	08:44	10:02
	15:27	17:02	18:25	20:53	22:23	23:40	23:22	21:52	20:07	18:25	15:48	14:50
14	09:53	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:45	14:49
15	09:51	08:26	06:54	06:08	04:30	03:23	03:57	05:26	06:54	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:43	23:17	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:32	23:44	23:15	21:42	19:57	18:15	15:40	14:48
17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:23	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:45	23:12	21:39	19:53	18:12	15:37	14:48
18	09:44	08:17	06:43	05:58	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:09
	15:41	17:17	18:39	21:08	22:38	23:45	23:10	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:05	08:28	09:02	10:10
	15:44	17:20	18:42	21:11	22:41	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:40	08:10	06:37	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:47	23:47	23:02	21:25	19:40	17:59	15:27	14:49
22	09:35	08:04	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:12
	15:53	17:29	18:51	21:20	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:23	22:52	23:47	22:56	21:19	19:33	17:52	15:22	14:50
24	09:30	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:17	10:13
	15:59	17:35	18:56	21:26	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:20	10:13
	16:02	17:38	18:59	21:29	22:58	23:47	22:50	21:12	19:26	16:46	15:18	14:51
26	09:25	07:51	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:32	23:01	23:46	22:48	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:13
	16:09	17:44	19:05	21:35	23:03	23:46	22:45	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:13
	16:12	17:47	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:36	15:11	14:54
29	09:17		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:31	10:12
	16:15		20:10	21:41	23:09	23:44	22:39	20:58	19:12	16:33	15:09	14:55
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:12
	16:18		20:13	21:44	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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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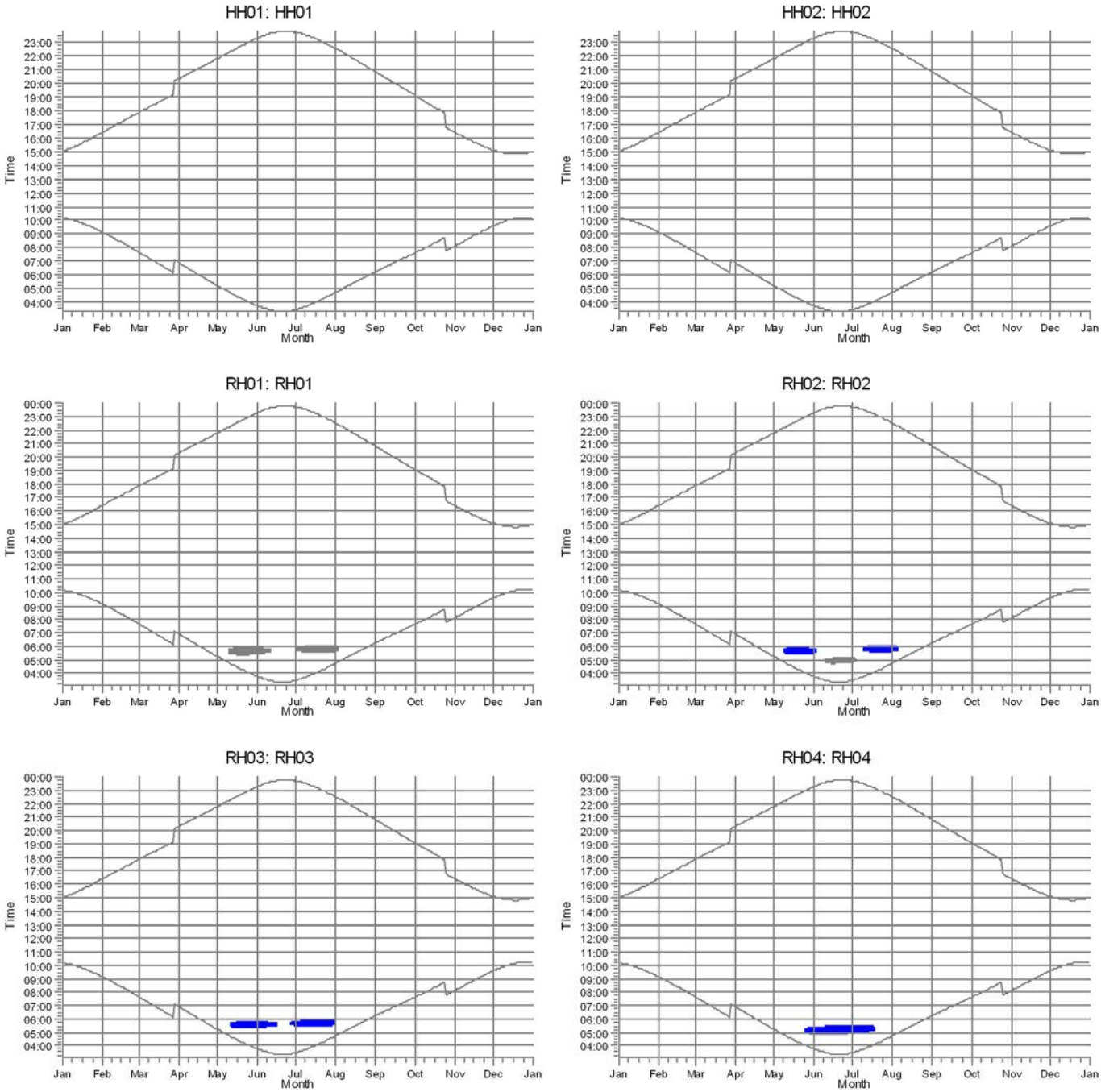
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case



WTGs

3: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)
4: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

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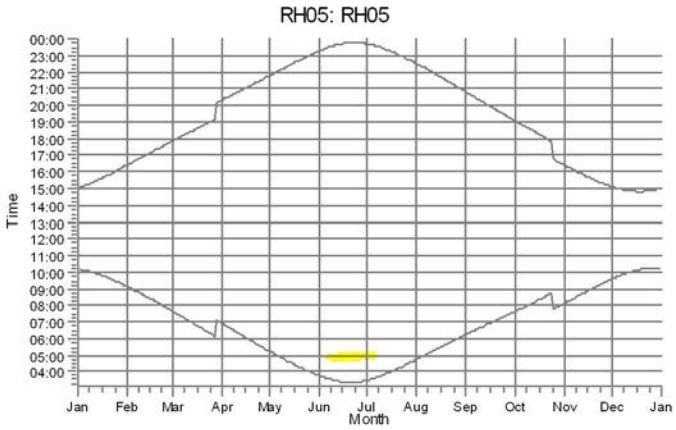
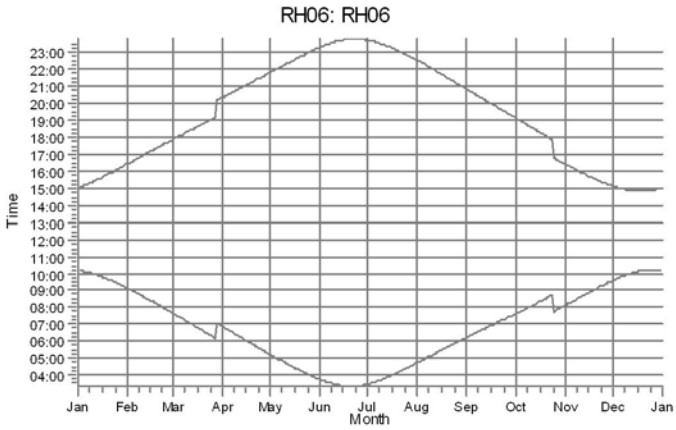
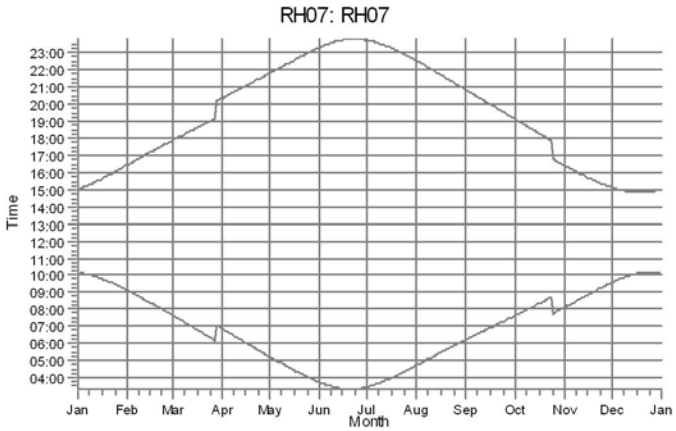
18.11.2019 10:23/3.3.247

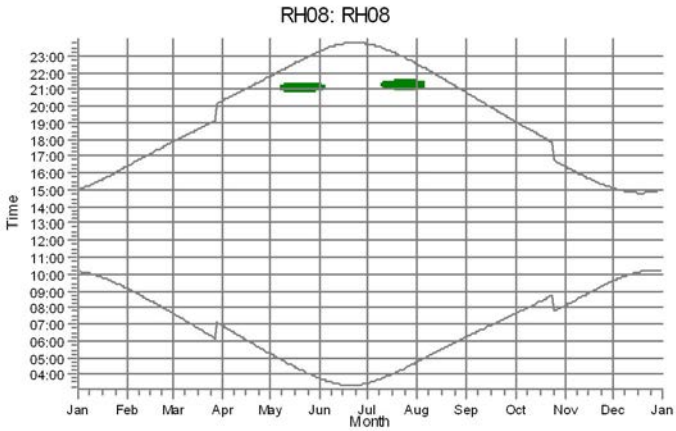
SHADOW - Calendar, graphical

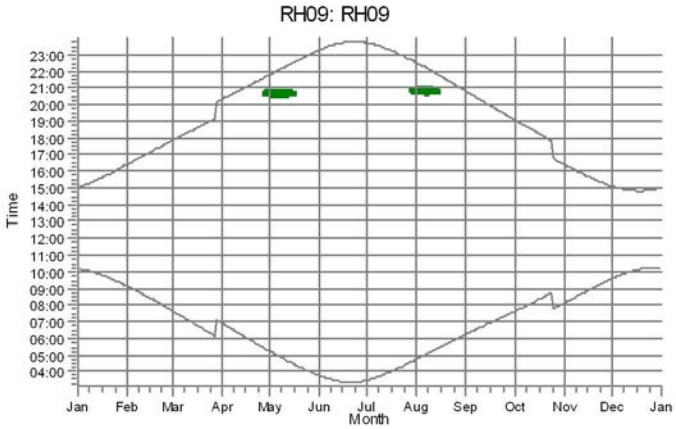
Calculation: MP Proposal, 8xF180 @210m, Real case

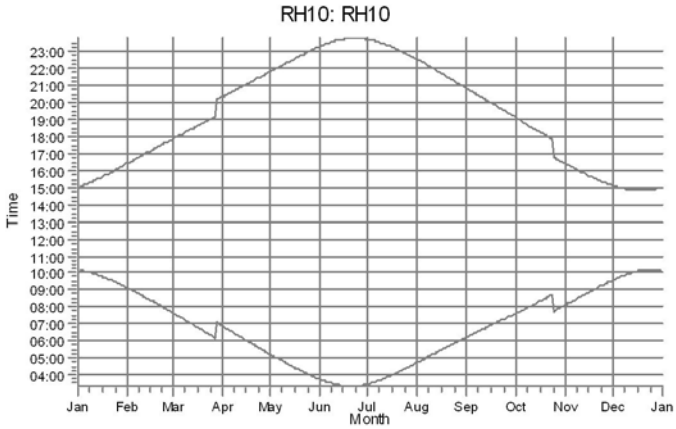












WTGs

1: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)
2: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

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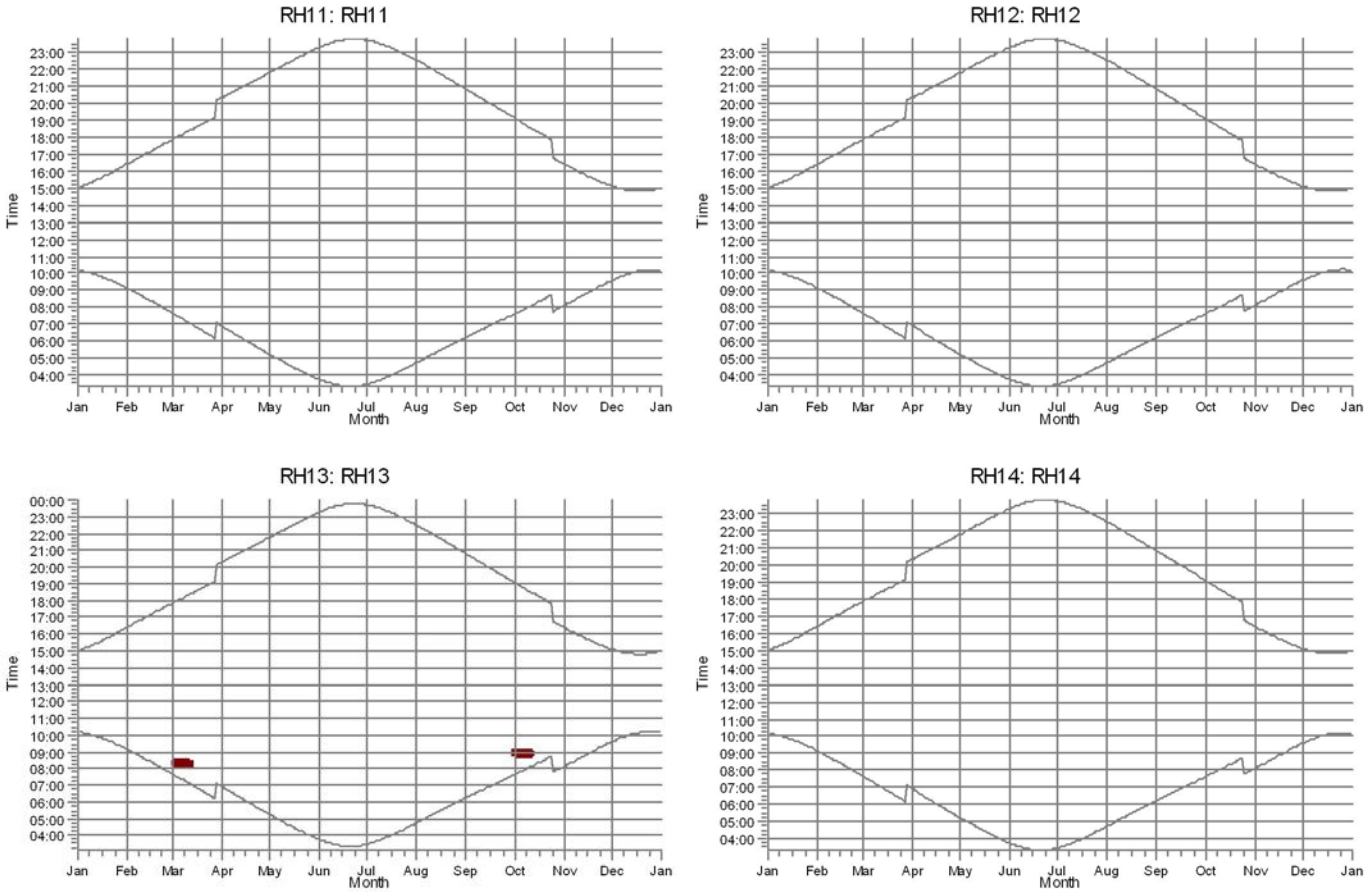
18.11.2019 10:23/3.3.247

SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case



WTGs

8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

Project:

Söderskogen

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Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 1 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14 20:31-20:49/18	03:45 21:01-21:12/11	03:29	04:45 20:40-20:58/18	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29 21:07-21:25/18	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11 20:30-20:49/19	03:43 21:03-21:11/8	03:30	04:48 20:39-20:59/20	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26 21:08-21:24/16	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08 20:29-20:50/21	03:41 21:06-21:10/4	03:32	04:51 20:39-20:59/20	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23 21:10-21:23/13	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05 20:28-20:50/22	03:39	03:33	04:54 20:38-20:59/21	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20 21:11-21:21/10	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02 20:28-20:50/22	03:37	03:35	04:57 20:38-21:00/22	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58 20:28-20:50/22	03:35	03:37	05:00 20:37-20:59/22	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55 20:28-20:50/22	03:34	03:39	05:03 20:38-21:00/22	06:31	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52 20:28-20:50/22	03:32	03:41	05:06 20:37-20:59/22	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07 21:03-21:09/6	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 20:28-20:49/21	03:30	03:43	05:09 20:38-20:59/21	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10 21:00-21:11/11	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 20:29-20:49/20	03:29	03:45 21:12-21:18/6	05:12 20:38-20:59/21	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13 20:59-21:14/15	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 20:29-20:48/19	03:28	03:48 21:11-21:20/9	05:15 20:38-20:58/20	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16 20:57-21:14/17	23:36	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:03	06:18	04:40 20:29-20:47/18	03:26	03:50 21:09-21:21/12	05:18 20:39-20:57/18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19 20:56-21:15/19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 20:31-20:47/16	03:25	03:52 21:08-21:22/14	05:21 20:40-20:55/15	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22 20:56-21:16/20	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 20:32-20:45/13	03:24	03:55 21:08-21:23/15	05:23 20:41-20:54/13	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25 20:55-21:16/21	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 20:34-20:44/10	03:24	03:57 21:07-21:24/17	05:26 20:44-20:51/7	06:53	08:16	08:49	10:04
	15:33	17:08	18:31	20:59	22:28 20:55-21:17/22	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 20:36-20:41/5	03:23	04:00 21:07-21:25/18	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31 20:54-21:17/23	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25 20:54-21:17/23	03:22	04:03 21:06-21:25/19	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:49
18	09:44	08:16	06:43	05:57	04:22 20:55-21:18/23	03:22	04:05 21:06-21:26/20	05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 20:54-21:17/23	03:21	04:08 21:05-21:26/21	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16 20:54-21:17/23	03:21	04:11 21:05-21:26/21	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 20:55-21:17/22	03:21	04:13 21:05-21:27/22	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10 20:55-21:17/22	03:21	04:16 21:05-21:27/22	05:47	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 20:56-21:17/21	03:22	04:19 21:05-21:27/22	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 20:56-21:17/21	03:22	04:22 21:04-21:27/23	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 20:56-21:17/21	03:23	04:25 21:05-21:28/23	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 20:57-21:16/19	03:23	04:28 21:05-21:27/22	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57 20:57-21:16/19	03:24	04:31 21:05-21:28/23	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24 20:35-20:44/9	03:55 20:58-21:15/17	03:25	04:33 20:45-20:53/8	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41 21:05-21:27/22	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21 20:33-20:46/13	03:52 20:59-21:14/15	03:26	04:36 20:43-20:55/12	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	22:38 21:05-21:27/22	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18 20:31-20:47/16	03:50 21:00-21:14/14	03:27	04:39 20:42-20:57/15	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35 21:06-21:27/21	20:54	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 21:01-21:13/12		04:42 20:41-20:57/16	06:12		08:04		10:11
	16:21		20:16		23:13		22:32 21:06-21:26/20	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	38	739	23	465	339	0	0	0	0

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

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

Project:
Söderskogen

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Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 2 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June		July		August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45		03:29	04:50-05:03/13	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16		23:42		22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43		03:30	04:51-05:03/12	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18		23:40		22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41		03:32	04:52-05:03/11	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21		23:39		22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39		03:33	04:53-05:02/9	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23		23:38		22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37		03:35	04:53-05:01/8	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25		23:36		22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	04:50-04:53/3	03:37	04:56-05:01/5	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27		23:35		22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	04:48-04:55/7	03:39		05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29		23:33		22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	04:48-04:57/9	03:41		05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31		23:31		22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	04:47-04:57/10	03:43		05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33		23:29		22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	04:46-04:58/12	03:45		05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35		23:27		22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	04:46-04:59/13	03:48		05:15	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36		23:25		21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	04:46-05:00/14	03:50		05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38		23:23		21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	04:46-05:00/14	03:52		05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39		23:21		21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	04:46-05:01/15	03:55		05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41		23:19		21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	04:46-05:01/15	03:57		05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42		23:16		21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:46-05:01/15	04:00		05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43		23:14		21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:46-05:02/16	04:03		05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44		23:11		21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:46-05:02/16	04:05		05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44		23:09		21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:47-05:03/16	04:08		05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45		23:06		21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:47-05:03/16	04:11		05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46		23:04		21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:47-05:03/16	04:14		05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46		23:01		21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:47-05:03/16	04:16		05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46		22:58		21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:47-05:03/16	04:19		05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46		22:56		21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:47-05:04/17	04:22		05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46		22:53		21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:47-05:03/16	04:25		05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46		22:50		21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:48-05:04/16	04:28		05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45		22:47		21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:49-05:04/15	04:31		06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45		22:44		21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:49-05:04/15	04:33		06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44		22:41		21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:49-05:03/14	04:36		06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44		22:38		20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:49-05:03/14	04:39		06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43		22:35		20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48			04:42		06:12		08:04		10:11
	16:21		20:16		23:13			22:32		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605		594		502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0		346		58	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 3 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45 04:59-05:18/19	03:29 05:01-05:26/25	04:45 05:42-05:58/16	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16 05:25-05:46/21	23:42 05:35-05:44/9	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 04:58-05:18/20	03:30 05:03-05:27/24	04:48 05:44-05:58/14	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18 05:25-05:44/19	23:40 05:36-05:46/10	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 04:58-05:19/21	03:32 05:03-05:27/24	04:51 05:45-05:56/11	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21 05:26-05:44/18	23:39 05:35-05:47/12	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39 04:58-05:20/22	03:33 05:03-05:27/24	04:54 05:47-05:54/7	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23 05:26-05:44/18	23:38 05:34-05:47/13	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37 04:57-05:20/23	03:35 05:03-05:26/23	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25 05:26-05:43/17	23:36 05:34-05:48/14	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 04:57-05:20/23	03:37 05:04-05:27/23	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27 05:27-05:43/16	23:35 05:34-05:49/15	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 04:57-05:21/24	03:39 05:04-05:26/22	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29 05:28-05:42/14	23:33 05:33-05:49/16	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32 04:57-05:21/24	03:41 05:05-05:27/22	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31 05:29-05:42/13	23:31 05:33-05:50/17	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 05:36-05:45/9	03:30 04:57-05:21/24	03:43 05:05-05:26/21	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33 05:29-05:41/12	23:29 05:32-05:50/18	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:34-05:46/12	03:29 04:57-05:22/25	03:45 05:05-05:26/21	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:30-05:41/11	23:27 05:33-05:51/18	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 05:32-05:47/15	03:28 04:58-05:23/25	03:48 05:06-05:26/20	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:36 05:32-05:41/9	23:25 05:33-05:53/20	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:30-05:49/19	03:26 04:58-05:23/25	03:50 05:07-05:26/19	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38 05:32-05:40/8	23:23 05:33-05:55/22	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 05:27-05:49/22	03:25 04:58-05:23/25	03:53 05:07-05:24/17	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39 05:33-05:39/6	23:21 05:32-05:55/23	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:26-05:50/24	03:24 04:58-05:23/25	03:55 05:08-05:24/16	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41 05:34-05:39/5	23:19 05:32-05:56/24	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 05:25-05:50/25	03:24 04:58-05:23/25	03:58 05:09-05:23/14	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42 05:35-05:38/3	23:16 05:31-05:57/26	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:24-05:51/27	03:23 04:58-05:24/26	04:00 05:11-05:22/11	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14 05:31-05:58/27	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25 05:23-05:50/27	03:22 04:59-05:24/25	04:03 05:13-05:20/7	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11 05:31-05:58/27	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22 05:23-05:51/28	03:22 04:59-05:24/25	04:05 05:31-06:00/29	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 05:23-05:51/28	03:21 04:59-05:25/26	04:08 05:32-06:00/28	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:22-05:50/28	03:21 04:59-05:25/26	04:11 05:32-06:00/28	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 05:22-05:51/29	03:21 04:59-05:25/26	04:14 05:32-06:01/29	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10 05:22-05:51/29	03:21 04:59-05:25/26	04:16 05:32-06:01/29	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:22-05:50/28	03:22 04:59-05:25/26	04:19 05:33-06:02/29	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 05:22-05:50/28	03:22 05:00-05:26/26	04:22 05:33-06:01/28	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:22-05:50/28	03:23 05:00-05:25/25	04:25 05:33-06:01/28	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:05-05:10/5	03:23 05:00-05:26/26	04:28 05:33-06:02/29	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00 05:22-05:50/28	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57 05:03-05:12/9	03:24 05:01-05:26/25	04:31 05:34-06:01/27	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03 05:22-05:49/27	23:45 05:39-05:40/1	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:01-05:14/13	03:25 05:01-05:27/26	04:34 05:34-06:01/27	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06 05:22-05:48/26	23:44 05:38-05:42/4	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:01-05:16/15	03:26 05:01-05:26/25	04:36 05:36-06:01/25	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08 05:24-05:48/24	23:44 05:36-05:42/6	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:00-05:16/16	03:27 05:01-05:26/25	04:39 05:37-06:00/23	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11 05:24-05:47/23	23:43 05:36-05:43/7	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 04:59-05:17/18		04:42 05:39-06:00/21	06:12		08:04		10:11
	16:21		20:16		23:13 05:24-05:46/22		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	632	942	1024	48	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
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DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 4 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46 05:32-05:50/18	03:29 04:53-05:02/9	04:45 05:44-05:56/12	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 05:32-05:49/17	03:30 04:55-05:02/7	04:48 05:46-05:54/8	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40 05:46-05:49/3	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 05:33-05:49/16	03:32 04:57-05:00/3	04:51	06:21	07:43	08:13	09:41
	15:04	16:31	17:56	20:24	21:52	23:21	23:39 05:44-05:50/6	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39 05:34-05:49/15	03:33 05:43-05:51/8	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37 05:34-05:48/14	03:35 05:42-05:52/10	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 05:35-05:47/12	03:37 05:42-05:54/12	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 05:36-05:47/11	03:39 05:41-05:54/13	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32 05:37-05:46/9	03:41 05:41-05:55/14	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31 05:38-05:45/7	03:43 05:40-05:56/16	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:39-05:41/2	03:29 04:50-04:56/6	03:46 05:40-05:57/17	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:39-05:44/5	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43 05:34-05:44/10	03:28 04:50-04:58/8	03:48 05:40-05:58/18	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:33-05:47/14	03:27 04:49-04:59/10	03:50 05:40-05:58/18	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37 05:31-05:47/16	03:25 04:48-04:59/11	03:53 05:39-05:59/20	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:31-05:49/18	03:24 04:48-05:00/12	03:55 05:38-05:59/21	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31 05:29-05:49/20	03:24 04:47-05:00/13	03:58 05:38-05:59/21	05:26	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:29-05:50/21	03:23 04:47-05:01/14	04:00 05:38-06:00/22	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25 05:28-05:50/22	03:22 04:48-05:02/14	04:03 05:38-06:00/22	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22 05:28-05:51/23	03:22 04:48-05:02/14	04:05 05:39-06:01/22	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19 05:28-05:51/23	03:22 04:48-05:03/15	04:08 05:38-06:01/23	05:38	07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:27-05:51/24	03:21 04:48-05:03/15	04:11 05:38-06:01/23	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13 05:28-05:51/23	03:21 04:48-05:03/15	04:14 05:38-06:01/23	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11 05:28-05:51/23	03:21 04:48-05:03/15	04:16 05:38-06:01/23	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:28-05:51/23	03:22 04:49-05:04/15	04:19 05:39-06:02/23	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05 05:28-05:51/23	03:22 04:49-05:04/15	04:22 05:38-06:02/24	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:28-05:51/23	03:23 04:49-05:03/14	04:25 05:38-06:01/23	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:29-05:51/22	03:23 04:50-05:04/14	04:28 05:39-06:01/22	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57 05:29-05:51/22	03:24 04:50-05:04/14	04:31 05:39-06:01/22	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:29-05:50/21	03:25 04:51-05:04/13	04:34 05:39-06:00/21	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:30-05:51/21	03:26 04:51-05:03/12	04:36 05:41-06:00/19	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:30-05:50/20	03:27 04:52-05:02/10	04:39 05:41-05:58/17	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48 05:31-05:50/19		04:42 05:43-05:58/15	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	433	393	560	20	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 5 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:57	05:26	06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:21	04:14	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 6 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 7 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:42	19:56	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 10:23/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case**WTG:** 8 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
753	723	338	253	460	781	838	1300	1347	793	537	467	8589

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40 08:16-08:22/6	06:55	05:14	03:45	03:28	04:45	06:15	07:37 08:49-09:02/13	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:10	09:05	07:37 08:13-08:25/12	06:52	05:11	03:43	03:30	04:48	06:18	07:40 08:47-09:04/17	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:19	23:41	22:26	20:44	19:02	16:20	15:04
3	10:09	09:02	07:34 08:11-08:27/16	06:49	05:08	03:41	03:31	04:51	06:20	07:43 08:46-09:04/18	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:02
4	10:08	08:59	07:31 08:09-08:27/18	06:45	05:05	03:39	03:33	04:54	06:23	07:46 08:45-09:05/20	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27 08:09-08:28/19	06:42	05:01	03:37	03:35	04:57	06:26	07:48 08:44-09:04/20	08:19	09:46
	15:08	16:37	18:02	20:30	21:58	23:25	23:37	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24 08:08-08:28/20	06:38	04:58	03:35	03:37	05:00	06:29	07:51 08:43-09:04/21	08:22	09:48
	15:10	16:40	18:05	20:33	22:01	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:20 08:08-08:28/20	06:35	04:55	03:33	03:39	05:03	06:32	07:54 08:43-09:04/21	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:30	23:33	22:11	20:27	18:45	16:05	14:56
8	10:03	08:47	07:17 08:07-08:28/21	06:31	04:52	03:32	03:41	05:06	06:34	07:57 08:43-09:03/20	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:32	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14 08:08-08:28/20	06:28	04:49	03:30	03:43	05:09	06:37	08:00 08:44-09:02/18	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:30	22:04	20:21	18:38	15:59	14:54
10	09:59	08:41	07:10 08:07-08:26/19	06:25	04:46	03:29	03:45	05:12	06:40	08:02 08:44-09:01/17	08:34	09:56
	15:20	16:52	18:16	20:45	22:14	23:35	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:38	07:07 08:08-08:26/18	06:21	04:43	03:27	03:47	05:15	06:43	08:05 08:45-09:00/15	08:37	09:58
	15:22	16:55	18:19	20:47	22:17	23:37	23:26	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04 08:09-08:24/15	06:18	04:40	03:26	03:50	05:18	06:45	08:08 08:47-08:57/10	08:40	10:00
	15:25	16:59	18:22	20:50	22:20	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00 08:11-08:22/11	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:44	10:01
	15:27	17:02	18:25	20:53	22:23	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:08	04:30	03:23	03:57	05:26	06:53	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:42	23:17	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:32	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:57	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:08
	15:41	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:35	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:11
	15:53	17:29	18:50	21:19	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:33	17:52	15:22	14:50
24	09:30	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:58	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
	16:08	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:39	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35 08:52-09:00/8	08:01	09:33	10:12
	16:18		20:13	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	215	0	0	0	0	0	8	210	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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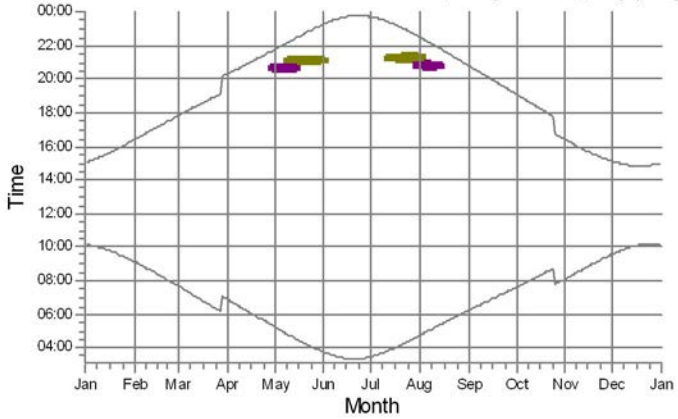
18.11.2019 10:23/3.3.247

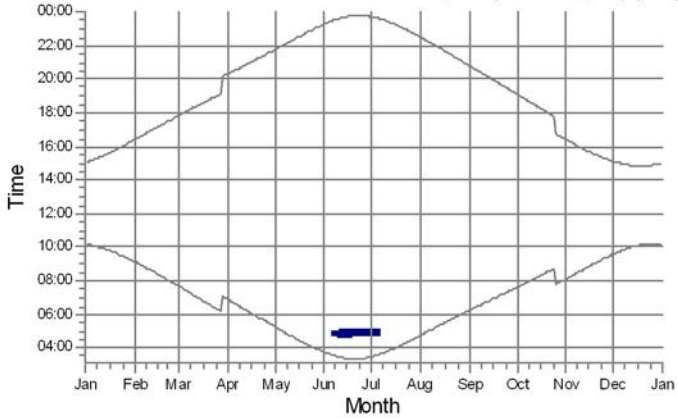
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case

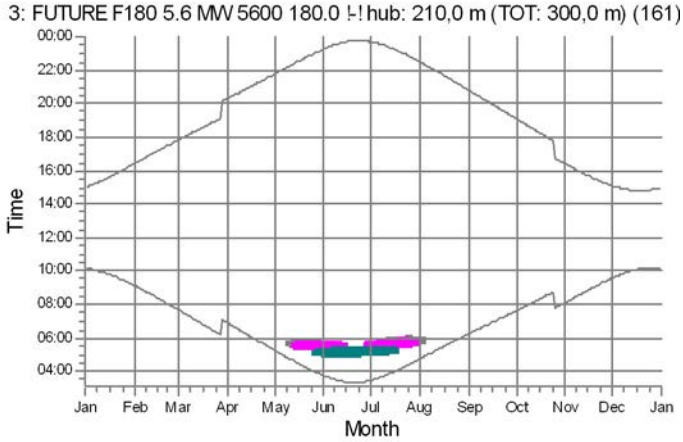
1: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (156)



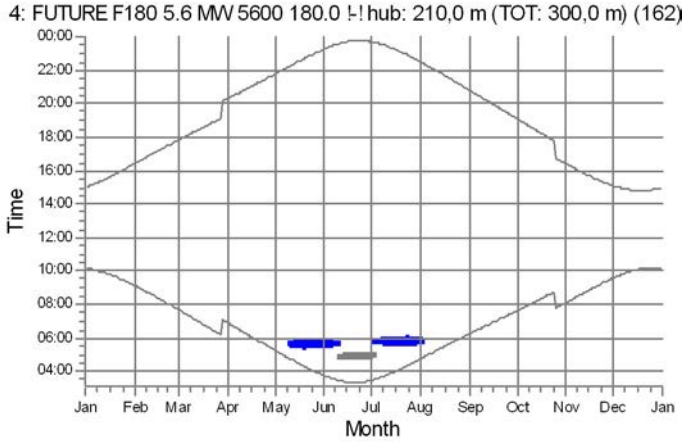
2: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (160)



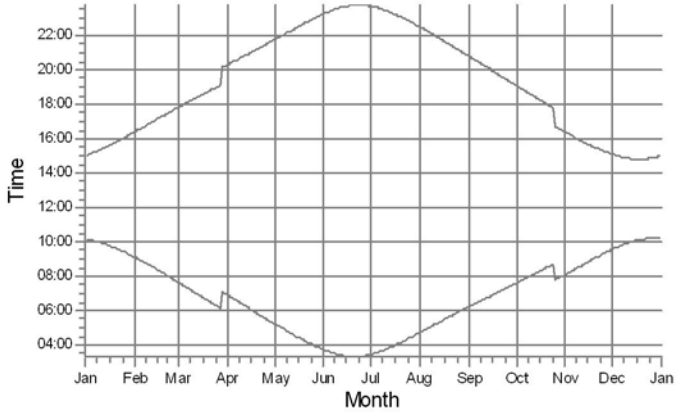
3: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (161)



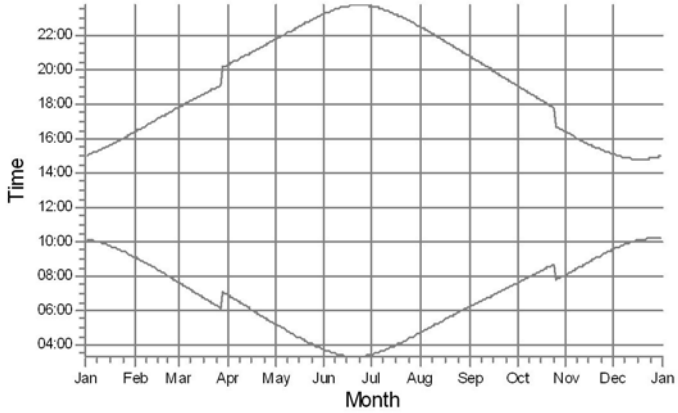
4: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (162)



5: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (155)



6: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (158)



Shadow receptors

RH01: RH01	RH03: RH03	RH05: RH05	RH09: RH09
RH02: RH02	RH04: RH04	RH08: RH08	

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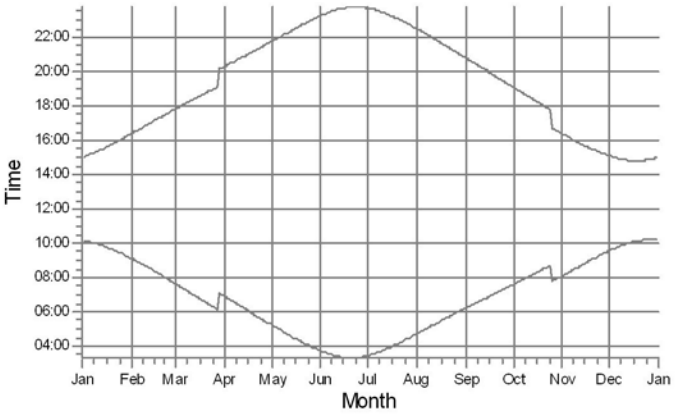
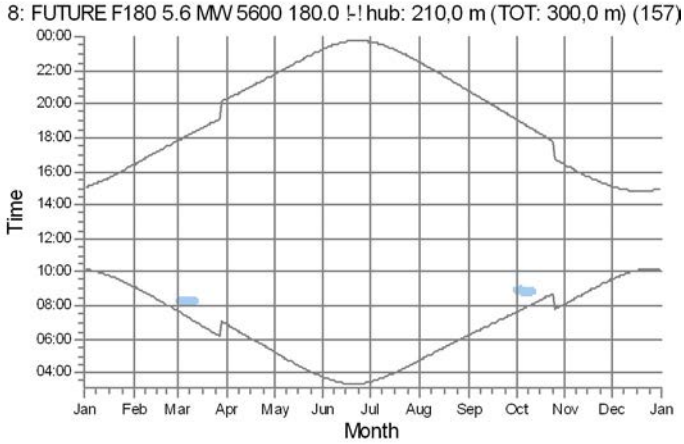
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case

7: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)



8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)



Shadow receptors

RH13: RH13

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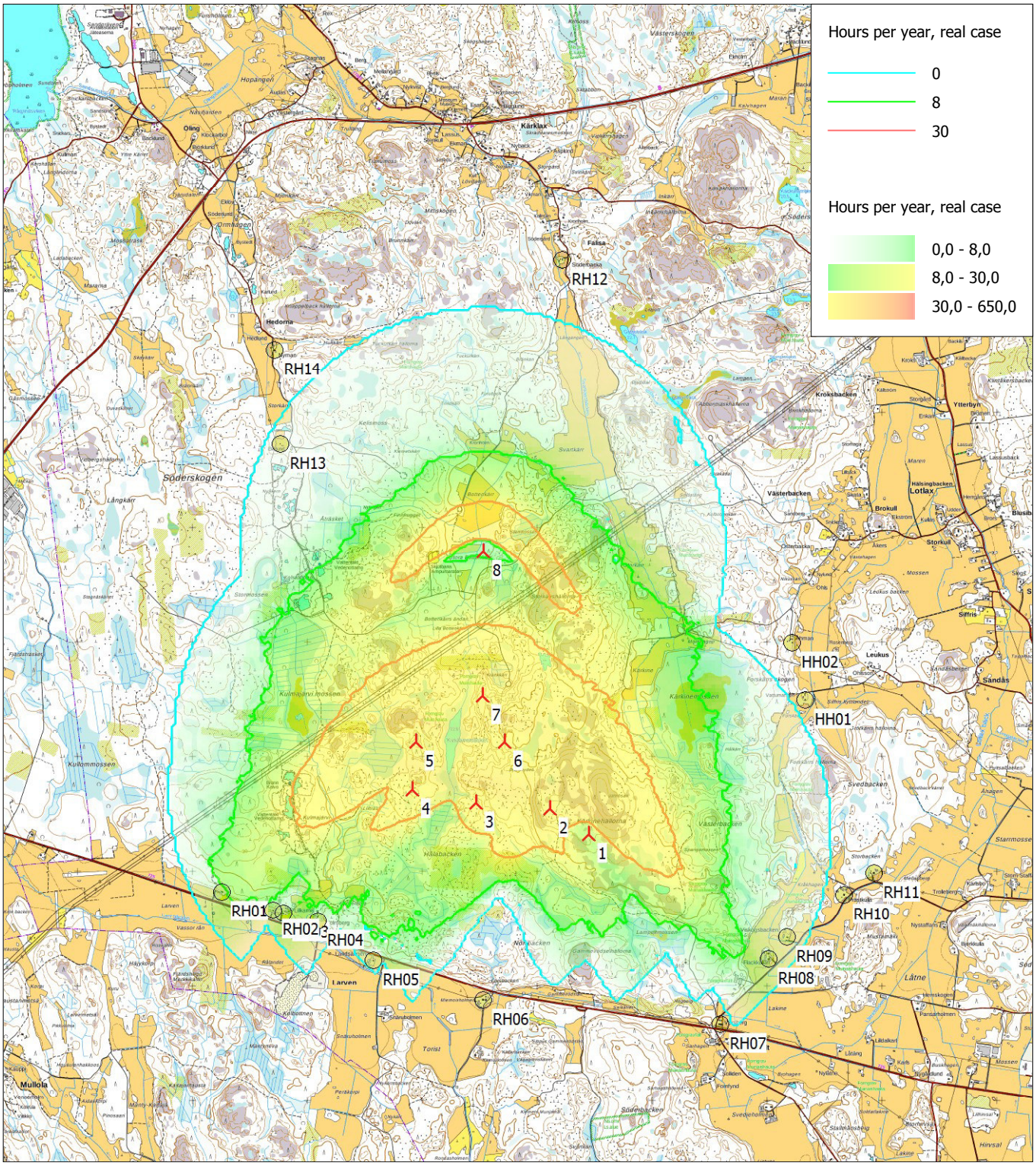
SHADOW - Map

Calculation: MP Proposal, 8xF180 @210m, Real case



0 500 1000 1500 2000 m

Map: Söde_Background map , Print scale 1:50 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 254 335 North: 7 013 130

New WTG Shadow receptor

Flicker map level: DEM 10m

Liite 2

Mallinnuksen lähtötiedot ja tulokset,

worst case Söderskogen

Project:
Söderskogen

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SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Worst case

Assumptions for shadow calculations

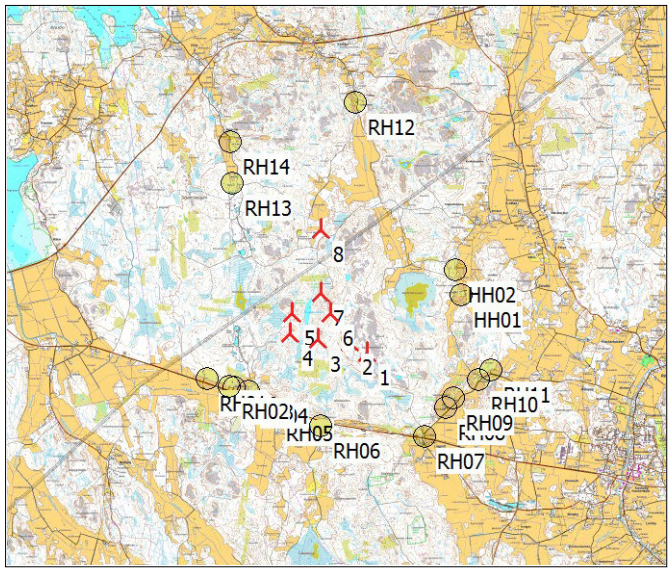
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

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

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

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: DEM 10m
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 1:150 000
New WTG
Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	255445	7011327	46,5	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
2	255108	7011549	50,2	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
3	254469	7011599	26,6	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
4	253911	7011714	27,9	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
5	253946	7012128	33,9	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
6	254714	7012124	38,4	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
7	254523	7012536	35,6	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
8	254528	7013790	19,2	FUTURE F180 5.6 MW 5600 180....	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1

Shadow receptor-Input

No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
HH01	HH01	257331	7012499	17,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
HH02	HH02	257219	7012995	17,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH01	RH01	252257	7010823	13,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH02	RH02	252700	7010660	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH03	RH03	252789	7010635	14,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH04	RH04	253090	7010568	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH05	RH05	253574	7010222	14,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH06	RH06	254528	7009881	18,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH07	RH07	256594	7009667	21,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH08	RH08	257015	7010236	19,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH09	RH09	257177	7010423	17,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH10	RH10	257669	7010798	18,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH11	RH11	257929	7010986	18,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH12	RH12	255219	7016333	14,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH13	RH13	252762	7014727	25,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH14	RH14	252714	7015547	21,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0

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18.11.2019 11:15/3.3.247

SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Worst case

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case: Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
HH01	HH01	0:00	0	0:00
HH02	HH02	0:00	0	0:00
RH01	RH01	18:38	64	0:24
RH02	RH02	19:14	75	0:22
RH03	RH03	19:17	70	0:23
RH04	RH04	19:03	53	0:26
RH05	RH05	6:44	31	0:17
RH06	RH06	0:00	0	0:00
RH07	RH07	0:00	0	0:00
RH08	RH08	15:43	53	0:23
RH09	RH09	11:01	38	0:22
RH10	RH10	0:00	0	0:00
RH11	RH11	0:00	0	0:00
RH12	RH12	0:00	0	0:00
RH13	RH13	7:13	26	0:21
RH14	RH14	0:00	0	0:00

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

No.	Name	Worst case [h/year]
1	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)	26:44
2	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)	6:44
3	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)	44:06
4	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)	23:26
5	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)	0:00
6	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)	0:00
7	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)	0:00
8	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)	7:13

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:
Söderskogen

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Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** HH01 - HH01

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
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13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
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15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
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	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
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19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
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	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:54	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** HH02 - HH02

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:13	18:31	15:54	14:51
12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	10:00
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
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23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:49
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
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26	09:24	07:50	06:16	05:31	03:59	03:23	04:27	05:58	07:23	07:49	09:22	10:12
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27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
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28	09:19	07:44	06:09	05:24	03:54	03:25	04:33	06:03	07:29	07:55	09:27	10:12
	16:11	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
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	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH01 - RH01

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August			September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:32 (4)	03:29			04:45		05:44 (4)	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46			23:16	18	05:50 (4)	23:42			22:29	12	05:56 (4)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:32 (4)	03:31		05:46 (4)	04:48		05:46 (4)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	17	05:49 (4)	23:40	3	05:49 (4)	22:26	8	05:54 (4)	20:45	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:33 (4)	03:32		05:44 (4)	04:51			06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	16	05:49 (4)	23:39	6	05:50 (4)	22:23			20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:40		05:34 (4)	03:34		05:43 (4)	04:54			06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	15	05:49 (4)	23:38	8	05:51 (4)	22:20			20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		05:34 (4)	03:36		05:42 (4)	04:57			06:26	07:49	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	14	05:48 (4)	23:36	10	05:52 (4)	22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		05:35 (4)	03:37		05:42 (4)	05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	12	05:47 (4)	23:35	12	05:54 (4)	22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		05:36 (4)	03:39		05:41 (4)	05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	11	05:47 (4)	23:33	13	05:54 (4)	22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		05:37 (4)	03:41		05:41 (4)	05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	9	05:46 (4)	23:31	14	05:55 (4)	22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		05:38 (4)	03:44		05:40 (4)	05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	7	05:45 (4)	23:29	16	05:56 (4)	22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:39 (4)	03:29		05:39 (4)	03:46		05:40 (4)	05:12			06:40	08:03	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	2	05:41 (4)	23:35	5	05:44 (4)	23:27	17	05:57 (4)	22:01			20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:34 (4)	03:28			03:48		05:40 (4)	05:15			06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	10	05:44 (4)	23:36			23:25	18	05:58 (4)	21:58			20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:33 (4)	03:27			03:50		05:40 (4)	05:18			06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	14	05:47 (4)	23:38			23:23	18	05:58 (4)	21:55			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:31 (4)	03:26			03:53		05:39 (4)	05:21			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	16	05:47 (4)	23:39			23:21	20	05:59 (4)	21:51			20:07	18:25	15:48	14:51
14	09:52	08:29	06:57	06:11	04:34		05:31 (4)	03:25			03:55		05:38 (4)	05:24			06:51	08:14	08:47	10:03
	15:31	17:05	18:28	20:56	22:25	18	05:49 (4)	23:41			23:19	21	05:59 (4)	21:48			20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (4)	03:24			03:58		05:38 (4)	05:27			06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	20	05:49 (4)	23:42			23:16	21	05:59 (4)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:05	04:28		05:29 (4)	03:23			04:00		05:38 (4)	05:30			06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	21	05:50 (4)	23:43			23:14	22	06:00 (4)	21:42			19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:28 (4)	03:23			04:03		05:38 (4)	05:32			06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	22	05:50 (4)	23:44			23:11	22	06:00 (4)	21:38			19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:28 (4)	03:22			04:06		05:39 (4)	05:35			07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23	05:51 (4)	23:45			23:09	22	06:01 (4)	21:35			19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:28 (4)	03:22			04:08		05:38 (4)	05:38			07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23	05:51 (4)	23:45			23:06	23	06:01 (4)	21:32			19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:27 (4)	03:22			04:11		05:38 (4)	05:41			07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	24	05:51 (4)	23:46			23:04	23	06:01 (4)	21:28			19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:28 (4)	03:22			04:14		05:38 (4)	05:44			07:10	08:34	09:08	10:11
	15:51	17:26	18:48	21:17	22:46	23	05:51 (4)	23:46			23:01	23	06:01 (4)	21:25			19:40	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11		05:28 (4)	03:22			04:17		05:38 (4)	05:47			07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23	05:51 (4)	23:46			22:58	23	06:01 (4)	21:22			19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:28 (4)	03:22			04:19		05:39 (4)	05:50			07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23	05:51 (4)	23:46			22:56	23	06:02 (4)	21:18			19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:28 (4)	03:22			04:22		05:38 (4)	05:53			07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23	05:51 (4)	23:46			22:53	24	06:02 (4)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:28 (4)	03:23			04:25		05:38 (4)	05:55			07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23	05:51 (4)	23:46			22:50	23	06:01 (4)	21:12			19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:29 (4)	03:24			04:28		05:39 (4)	05:58			07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	22	05:51 (4)	23:46			22:47	22	06:01 (4)	21:08			19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:29 (4)	03:24			04:31		05:39 (4)	06:01			07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	22	05:51 (4)	23:45			22:44	22	06:01 (4)	21:05			19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:29 (4)	03:25			04:34		05:39 (4)	06:04			07:29	07:55	09:28	10:12
	16:12	17:47	19:08	21:37	23:06	21	05:50 (4)	23:44			22:41	21	06:00 (4)	21:01			19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:30 (4)	03:26			04:37		05:41 (4)	06:07			07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:51 (4)	23:44			22:38	19	06:00 (4)	20:58			19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50		05:30 (4)	03:28			04:40		05:41 (4)	06:10			07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:50 (4)	23:43			22:35	17	05:58 (4)	20:55			19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:31 (4)				04:43		05:43 (4)	06:12				08:04		10:11
	16:21		20:16		23:13	19	05:50 (4)				22:32	15	05:58 (4)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502			392	308	206	151
Total, worst case						433			124			541			20					

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH02 - RH02

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:37 (3)	03:29		04:53 (4)	04:45		05:42 (3)	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16	9	05:46 (3)	23:42	9	05:02 (4)	22:29	16	05:58 (3)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:38 (3)	03:30		04:55 (4)	04:48		05:44 (3)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	6	05:44 (3)	23:40	7	05:02 (4)	22:26	14	05:58 (3)	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42			03:32		04:57 (4)	04:51		05:45 (3)	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21			23:39	3	05:00 (4)	22:23	11	05:56 (3)	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40			03:34			04:54		05:47 (3)	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23			23:38			22:20	7	05:54 (3)	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38			03:36			04:57			06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25			23:36			22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36			03:37			05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27			23:35			22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34			03:39			05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29			23:33			22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31			23:31			22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		05:36 (3)	03:31		03:44			05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10	9	05:45 (3)	23:33		23:29			22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:34 (3)	03:29	04:50 (4)	03:46		05:47 (3)	05:12			06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	12	05:46 (3)	23:35	6 04:56 (4)	23:27	4	05:51 (3)	22:01			20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:32 (3)	03:28	04:50 (4)	03:48		05:45 (3)	05:15			06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	15	05:47 (3)	23:36	8 04:58 (4)	23:25	8	05:53 (3)	21:58			20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:32 (3)	03:27	04:49 (4)	03:50		05:44 (3)	05:18			06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	17	05:49 (3)	23:38	10 04:59 (4)	23:23	11	05:55 (3)	21:55			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:30 (3)	03:26	04:48 (4)	03:53		05:42 (3)	05:21			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	19	05:49 (3)	23:39	11 04:59 (4)	23:21	13	05:55 (3)	21:51			20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:30 (3)	03:25	04:48 (4)	03:55		05:42 (3)	05:24			06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	20	05:50 (3)	23:41	12 05:00 (4)	23:19	14	05:56 (3)	21:48			20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (3)	03:24	04:47 (4)	03:58		05:41 (3)	05:27			06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	21	05:50 (3)	23:42	13 05:00 (4)	23:16	16	05:57 (3)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:29 (3)	03:23	04:47 (4)	04:00		05:41 (3)	05:30			06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	22	05:51 (3)	23:43	14 05:01 (4)	23:14	17	05:58 (3)	21:42			19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:29 (3)	03:23	04:48 (4)	04:03		05:40 (3)	05:32			06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	21	05:50 (3)	23:44	14 05:02 (4)	23:11	18	05:58 (3)	21:38			19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:29 (3)	03:22	04:48 (4)	04:06		05:41 (3)	05:35			07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	22	05:51 (3)	23:44	14 05:02 (4)	23:09	19	06:00 (3)	21:35			19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:29 (3)	03:22	04:48 (4)	04:08		05:40 (3)	05:38			07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	22	05:51 (3)	23:45	15 05:03 (4)	23:06	20	06:00 (3)	21:32			19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:29 (3)	03:22	04:48 (4)	04:11		05:40 (3)	05:41			07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	21	05:50 (3)	23:46	15 05:03 (4)	23:04	20	06:00 (3)	21:28			19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:29 (3)	03:22	04:48 (4)	04:14		05:40 (3)	05:44			07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:51 (3)	23:46	15 05:03 (4)	23:01	21	06:01 (3)	21:25			19:39	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11		05:29 (3)	03:22	04:48 (4)	04:17		05:39 (3)	05:47			07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:51 (3)	23:46	15 05:03 (4)	22:58	22	06:01 (3)	21:22			19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:30 (3)	03:22	04:49 (4)	04:19		05:40 (3)	05:50			07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	20	05:50 (3)	23:46	15 05:04 (4)	22:56	22	06:02 (3)	21:18			19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:30 (3)	03:22	04:49 (4)	04:22		05:40 (3)	05:53			07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	20	05:50 (3)	23:46	15 05:04 (4)	22:53	21	06:01 (3)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:31 (3)	03:23	04:49 (4)	04:25		05:39 (3)	05:55			07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	19	05:50 (3)	23:46	14 05:03 (4)	22:50	22	06:01 (3)	21:12			19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:31 (3)	03:24	04:50 (4)	04:28		05:40 (3)	05:58			07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	19	05:50 (3)	23:45	14 05:04 (4)	22:47	22	06:02 (3)	21:08			19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:32 (3)	03:24	04:50 (4)	04:31		05:40 (3)	06:01			07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	17	05:49 (3)	23:45	14 05:04 (4)	22:44	21	06:01 (3)	21:05			19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:32 (3)	03:25	04:51 (4)	04:34		05:40 (3)	06:04			07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	16	05:48 (3)	23:44	13 05:04 (4)	22:41	21	06:01 (3)	21:01			19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:34 (3)	03:26	04:51 (4)	04:37		05:41 (3)	06:07			07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	14	05:48 (3)	23:44	12 05:03 (4)	22:38	20	06:01 (3)	20:58			19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50		05:34 (3)	03:28	04:52 (4)	04:40		05:41 (3)	06:09			07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	13	05:47 (3)	23:43	10 05:02 (4)	22:35	19	06:00 (3)	20:55			19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:35 (3)			04:43		05:42 (3)	06:12				08:04		10:11
	16:21		20:16		23:13	11	05:46 (3)			22:32	18	06:00 (3)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559			605		594			502			392	308	206	151
Total, worst case						414			284		408			48					

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH03 - RH03

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:25 (3)	03:29		05:35 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:44 (3)	23:42	9	05:44 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:25 (3)	03:30		05:36 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	18	05:43 (3)	23:40	10	05:46 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:26 (3)	03:32		05:35 (3)	04:51	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	18	05:44 (3)	23:39	12	05:47 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		05:26 (3)	03:34		05:34 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	18	05:44 (3)	23:38	13	05:47 (3)	22:20	20:38	18:55	16:15	15:01
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	15:09	16:37	18:02	20:30	21:58			23:25	17	05:43 (3)	23:36	14	05:48 (3)	22:17	20:34	18:52	16:12	14:59
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	15:11	16:40	18:05	20:33	22:01			23:27	16	05:43 (3)	23:35	15	05:49 (3)	22:14	20:31	18:48	16:09	14:58
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	15:15	16:46	18:11	20:39	22:07			23:31	13	05:42 (3)	23:31	17	05:50 (3)	22:07	20:24	18:42	16:03	14:55
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	15:18	16:49	18:14	20:42	22:10			23:33	12	05:41 (3)	23:29	18	05:50 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		05:30 (3)	03:46		05:33 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	11	05:41 (3)	23:27	18	05:51 (3)	22:01	20:17	18:35	15:57	14:53
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	15:23	16:56	18:19	20:47	22:16			23:36	9	05:41 (3)	23:25	19	05:52 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:30 (3)	03:27		05:32 (3)	03:50		05:33 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	6	05:36 (3)	23:38	8	05:40 (3)	23:23	20	05:53 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:27 (3)	03:26		05:33 (3)	03:53		05:32 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	11	05:38 (3)	23:39	6	05:39 (3)	23:21	20	05:52 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:26 (3)	03:25		05:34 (3)	03:55		05:32 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	14	05:40 (3)	23:41	5	05:39 (3)	23:19	21	05:53 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:25 (3)	03:24		05:35 (3)	03:58		05:31 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	16	05:41 (3)	23:42	3	05:38 (3)	23:16	22	05:53 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:24 (3)	03:23			04:00		05:31 (3)	05:30	06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	18	05:42 (3)	23:43			23:14	22	05:53 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:23 (3)	03:23			04:03		05:31 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	19	05:42 (3)	23:44			23:11	23	05:54 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:23 (3)	03:22			04:06		05:31 (3)	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	20	05:43 (3)	23:44			23:09	23	05:54 (3)	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:23 (3)	03:22			04:08		05:32 (3)	05:38	07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	21	05:44 (3)	23:45			23:06	23	05:55 (3)	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:22 (3)	03:22			04:11		05:32 (3)	05:41	07:07	08:31	09:05	10:10
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21	09:37	08:07	06:33	05:48	04:14		05:22 (3)	03:22			04:14		05:32 (3)	05:44	07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:44 (3)	23:46			23:01	23	05:55 (3)	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11		05:22 (3)	03:22			04:17		05:32 (3)	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:44 (3)	23:46			22:58	22	05:54 (3)	21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:22 (3)	03:22			04:19		05:33 (3)	05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23	05:45 (3)	23:46			22:56	22	05:55 (3)	21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:22 (3)	03:22			04:22		05:33 (3)	05:53	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23	05:45 (3)	23:46			22:53	21	05:54 (3)	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:22 (3)	03:23			04:25		05:33 (3)	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23	05:45 (3)	23:46			22:50	21	05:54 (3)	21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:22 (3)	03:24			04:28		05:33 (3)	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23	05:45 (3)	23:45			22:47	20	05:53 (3)	21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:22 (3)	03:24		05:39 (3)	04:31		05:34 (3)	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23	05:45 (3)	23:45	1	05:40 (3)	22:44	19	05:53 (3)	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:22 (3)	03:25		05:38 (3)	04:34		05:34 (3)	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	22	05:44 (3)	23:44	4	05:42 (3)	22:41	18	05:52 (3)	21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:24 (3)	03:26		05:36 (3)	04:37		05:36 (3)	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:45 (3)	23:44	6	05:42 (3)	22:38	16	05:52 (3)	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:24 (3)	03:28		05:36 (3)	04:40		05:37 (3)	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:44 (3)	23:43	7	05:43 (3)	22:35	13	05:50 (3)	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:24 (3)				04:43		05:39 (3)	06:12		08:04		10:11
	16:21		20:16		23:13	20	05:44 (3)				22:32	10	05:49 (3)	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						389			205			563						

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH04 - RH04

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:55	05:15			03:46		04:59 (3)	03:29		05:01 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:18 (3)	23:42	25	05:26 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		04:58 (3)	03:30		05:03 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	20	05:18 (3)	23:40	24	05:27 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:41		04:58 (3)	03:32		05:03 (3)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:25	21:52			23:21	21	05:19 (3)	23:39	24	05:27 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		04:58 (3)	03:34		05:03 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	22	05:20 (3)	23:38	24	05:27 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		04:57 (3)	03:35		05:03 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	23	05:20 (3)	23:36	23	05:26 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		04:57 (3)	03:37		05:04 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	23	05:20 (3)	23:35	23	05:27 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		04:57 (3)	03:39		05:04 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	24	05:21 (3)	23:33	22	05:26 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		04:57 (3)	03:41		05:05 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	24	05:21 (3)	23:31	22	05:27 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		04:57 (3)	03:44		05:05 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	24	05:21 (3)	23:29	21	05:26 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		04:57 (3)	03:46		05:05 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	25	05:22 (3)	23:27	21	05:26 (3)	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43			03:28		04:58 (3)	03:48		05:06 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	25	05:23 (3)	23:25	20	05:26 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40			03:27		04:58 (3)	03:50		05:07 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19			23:38	25	05:23 (3)	23:23	19	05:26 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37			03:26		04:58 (3)	03:53		05:07 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22			23:39	25	05:23 (3)	23:21	17	05:24 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34			03:25		04:58 (3)	03:55		05:08 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25			23:41	25	05:23 (3)	23:19	16	05:24 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31			03:24		04:58 (3)	03:58		05:09 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28			23:42	25	05:23 (3)	23:16	14	05:23 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28			03:23		04:58 (3)	04:00		05:11 (3)	05:29	06:56	08:20	08:52	10:06
	15:36	17:11	18:34	21:02	22:31			23:43	26	05:24 (3)	23:14	11	05:22 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25			03:23		04:59 (3)	04:03		05:13 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34			23:44	25	05:24 (3)	23:11	7	05:20 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22			03:22		04:59 (3)	04:06			05:35	07:02	08:25	08:59	10:08
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19	09:41	08:13	06:40	05:54	04:19			03:22		04:59 (3)	04:08			05:38	07:04	08:28	09:02	10:09
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	15:51	17:26	18:48	21:16	22:46			23:46	26	05:25 (3)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11			03:22		04:59 (3)	04:17			05:47	07:13	08:37	09:10	10:11
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26	09:24	07:50	06:16	05:31	04:00		05:05 (3)	03:24		05:00 (3)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	5	05:10 (3)	23:45	26	05:26 (3)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:03 (3)	03:24		05:01 (3)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	9	05:12 (3)	23:45	25	05:26 (3)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:01 (3)	03:25		05:01 (3)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	13	05:14 (3)	23:44	26	05:27 (3)	22:41			21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:01 (3)	03:26		05:01 (3)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	15	05:16 (3)	23:43	25	05:26 (3)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:00 (3)	03:28		05:01 (3)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	16	05:16 (3)	23:43	25	05:26 (3)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:59 (3)				04:43			06:12		08:04		10:11
	16:21		20:16		23:13	18	05:17 (3)				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						76			734			333						

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH05 - RH05

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June			July			August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46			03:29		04:50 (2)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16			23:41	13	05:03 (2)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44			03:30		04:51 (2)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49	23:18			23:40	12	05:03 (2)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41			03:32		04:52 (2)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20			23:39	11	05:03 (2)	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39			03:34		04:53 (2)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23			23:38	9	05:02 (2)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38			03:35		04:53 (2)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25			23:36	8	05:01 (2)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59	03:36		04:50 (2)	03:37		04:56 (2)	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	3	04:53 (2)	23:35	5	05:01 (2)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34		04:48 (2)	03:39			05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	7	04:55 (2)	23:33			22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32		04:48 (2)	03:41			05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	9	04:57 (2)	23:31			22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31		04:47 (2)	03:44			05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	10	04:57 (2)	23:29			22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29		04:46 (2)	03:46			05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:44	22:13	23:35	12	04:58 (2)	23:27			22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28		04:46 (2)	03:48			05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	13	04:59 (2)	23:25			21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27		04:46 (2)	03:50			05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	14	05:00 (2)	23:23			21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	03:26		04:46 (2)	03:53			05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	14	05:00 (2)	23:21			21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25		04:46 (2)	03:55			05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:41	15	05:01 (2)	23:19			21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24		04:46 (2)	03:58			05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	15	05:01 (2)	23:16			21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23		04:46 (2)	04:00			05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:34	21:02	22:31	23:43	15	05:01 (2)	23:14			21:41	19:57	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23		04:46 (2)	04:03			05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	16	05:02 (2)	23:11			21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22		04:46 (2)	04:06			05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	16	05:02 (2)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22		04:47 (2)	04:08			05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	16	05:03 (2)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22		04:47 (2)	04:11			05:41	07:07	08:31	09:04	10:10
	15:48	17:23	18:45	21:13	22:43	23:45	16	05:03 (2)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22		04:47 (2)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	16	05:03 (2)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22		04:47 (2)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23:46	16	05:03 (2)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22		04:47 (2)	04:19			05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	16	05:03 (2)	22:55			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22		04:47 (2)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	17	05:04 (2)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23		04:47 (2)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	16	05:03 (2)	22:50			21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24		04:48 (2)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	16	05:04 (2)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:24		04:49 (2)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	15	05:04 (2)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25		04:49 (2)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	15	05:04 (2)	22:41			21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26		04:49 (2)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	14	05:03 (2)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28		04:49 (2)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	14	05:03 (2)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48				04:42			06:12		08:04		10:11
	16:21		20:16		23:13				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605			594			502	392	308	206	151
Total, worst case							346			58						

Table 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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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH06 - RH06

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38	03:35	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:26	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:27	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23	04:03	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:43	23:11	21:38	19:53	18:12	15:38	14:49
18	09:43	08:16	06:43	05:58	04:22	03:22	04:06	05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22	04:11	05:41	07:07	08:31	09:04	10:09
	15:48	17:23	18:45	21:13	22:43	23:45	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22	04:14	05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22	04:17	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24	04:28	05:58	07:23	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:28	03:58	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26	04:37	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28	04:40	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH07 - RH07

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:46	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:22	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:13	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:20	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:23	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:42	23:13	21:41	19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:07
	15:42	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:08
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13	03:21	04:14	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:45	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:11	03:22	04:16	05:47	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:11
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:51
25	09:26	07:53	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:45	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:31	06:01	07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:02	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:00	09:32	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH08 - RH08

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August			September	October	November	December
1	10:10	09:08	07:40	06:55	05:14			03:45		21:01 (1)	03:29			04:45		21:07 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46			23:15	11	21:12 (1)	23:41			22:29	18	21:25 (1)	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11			03:43		21:03 (1)	03:30			04:48		21:08 (1)	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49			23:18	8	21:11 (1)	23:40			22:26	16	21:24 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08			03:41		21:06 (1)	03:32			04:51		21:10 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52			23:20	4	21:10 (1)	23:39			22:23	13	21:23 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05			03:39			03:33			04:54		21:11 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55			23:23			23:37			22:20	10	21:21 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:01			03:37			03:35			04:57			06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58			23:25			23:36			22:17			20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58			03:35			03:37			05:00			06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01			23:27			23:34			22:13			20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55			03:34			03:39			05:03			06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04			23:29			23:33			22:10			20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52		21:03 (1)	03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	6	21:09 (1)	23:31			23:31			22:07			20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49		21:00 (1)	03:30			03:43			05:09			06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	11	21:11 (1)	23:33			23:29			22:04			20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46		20:59 (1)	03:29			03:45		21:12 (1)	05:12			06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	15	21:14 (1)	23:34			23:27	6	21:18 (1)	22:01			20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43		20:57 (1)	03:28			03:48		21:11 (1)	05:15			06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	17	21:14 (1)	23:36			23:25	9	21:20 (1)	21:58			20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40		20:56 (1)	03:26			03:50		21:09 (1)	05:18			06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	19	21:15 (1)	23:38			23:23	12	21:21 (1)	21:54			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37		20:56 (1)	03:25			03:52		21:08 (1)	05:20			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	20	21:16 (1)	23:39			23:21	14	21:22 (1)	21:51			20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33		20:55 (1)	03:24			03:55		21:08 (1)	05:23			06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	21	21:16 (1)	23:40			23:18	15	21:23 (1)	21:48			20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31		20:55 (1)	03:24			03:57		21:07 (1)	05:26			06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	22	21:17 (1)	23:41			23:16	17	21:24 (1)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28		20:54 (1)	03:23			04:00		21:07 (1)	05:29			06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23	21:17 (1)	23:42			23:14	18	21:25 (1)	21:41			19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25		20:54 (1)	03:22			04:03		21:06 (1)	05:32			06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23	21:17 (1)	23:43			23:11	19	21:25 (1)	21:38			19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22		20:55 (1)	03:22			04:05		21:06 (1)	05:35			07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23	21:18 (1)	23:44			23:09	20	21:26 (1)	21:35			19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19		20:54 (1)	03:21			04:08		21:05 (1)	05:38			07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23	21:17 (1)	23:45			23:06	21	21:26 (1)	21:31			19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16		20:54 (1)	03:21			04:11		21:05 (1)	05:41			07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23	21:17 (1)	23:45			23:03	21	21:26 (1)	21:28			19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13		20:55 (1)	03:21			04:13		21:05 (1)	05:44			07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	22	21:17 (1)	23:46			23:01	22	21:27 (1)	21:25			19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10		20:55 (1)	03:21			04:16		21:05 (1)	05:46			07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	22	21:17 (1)	23:46			22:58	22	21:27 (1)	21:21			19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08		20:56 (1)	03:22			04:19		21:05 (1)	05:49			07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	21	21:17 (1)	23:46			22:55	22	21:27 (1)	21:18			19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05		20:56 (1)	03:22			04:22		21:04 (1)	05:52			07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	21	21:17 (1)	23:46			22:52	23	21:27 (1)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:53	06:19	05:34	04:02		20:56 (1)	03:23			04:25		21:05 (1)	05:55			07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	21	21:17 (1)	23:45			22:50	23	21:28 (1)	21:11			19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00		20:57 (1)	03:23			04:28		21:05 (1)	05:58			07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	19	21:16 (1)	23:45			22:47	22	21:27 (1)	21:08			19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57		20:57 (1)	03:24			04:31		21:05 (1)	06:01			07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:03	19	21:16 (1)	23:45			22:44	23	21:28 (1)	21:04			19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55		20:58 (1)	03:25			04:33		21:05 (1)	06:04			07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	17	21:15 (1)	23:44			22:41	22	21:27 (1)	21:01			19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52		20:59 (1)	03:26			04:36		21:05 (1)	06:06			07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	15	21:14 (1)	23:43			22:38	22	21:27 (1)	20:58			19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50		21:00 (1)	03:27			04:39		21:06 (1)	06:09			07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	14	21:14 (1)	23:42			22:35	21	21:27 (1)	20:54			19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		21:01 (1)				04:42		21:06 (1)	06:12				08:03		10:10
	16:21		20:16		23:13	12	21:13 (1)				22:32	20	21:26 (1)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502			392	308	206	151
Total, worst case						449			23			414			57					

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

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

Project:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH09 - RH09

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April			May			June			July			August			September	October	November	December
1	10:10	09:08	07:40	06:55			05:14		20:31 (1)	03:45			03:29			04:45		20:40 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19			21:46	18	20:49 (1)	23:15			23:41			22:29	18	20:58 (1)	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52			05:11		20:30 (1)	03:43			03:30			04:48		20:39 (1)	06:18	07:40	08:09	09:38
	15:02	16:27	17:53	20:21			21:49	19	20:49 (1)	23:18			23:40			22:26	20	20:59 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48			05:08		20:29 (1)	03:41			03:32			04:51		20:39 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24			21:52	21	20:50 (1)	23:20			23:39			22:23	20	20:59 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45			05:05		20:28 (1)	03:39			03:33			04:54		20:38 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27			21:55	22	20:50 (1)	23:23			23:37			22:20	21	20:59 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41			05:01		20:28 (1)	03:37			03:35			04:57		20:38 (1)	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30			21:58	22	20:50 (1)	23:25			23:36			22:17	22	21:00 (1)	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38			04:58		20:28 (1)	03:35			03:37			05:00		20:37 (1)	06:29	07:51	08:22	09:47
	15:10	16:40	18:05	20:33			22:01	22	20:50 (1)	23:27			23:34			22:13	22	20:59 (1)	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35			04:55		20:28 (1)	03:34			03:39			05:03		20:38 (1)	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36			22:04	22	20:50 (1)	23:29			23:33			22:10	22	21:00 (1)	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31			04:52		20:28 (1)	03:32			03:41			05:06		20:37 (1)	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38			22:07	22	20:50 (1)	23:31			23:31			22:07	22	20:59 (1)	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28			04:49		20:28 (1)	03:30			03:43			05:09		20:38 (1)	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41			22:10	21	20:49 (1)	23:33			23:29			22:04	21	20:59 (1)	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24			04:46		20:29 (1)	03:29			03:45			05:12		20:38 (1)	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44			22:13	20	20:49 (1)	23:34			23:27			22:01	21	20:59 (1)	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21			04:43		20:29 (1)	03:28			03:48			05:15		20:38 (1)	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47			22:16	19	20:48 (1)	23:36			23:25			21:58	20	20:58 (1)	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18			04:40		20:29 (1)	03:26			03:50			05:17		20:39 (1)	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50			22:19	18	20:47 (1)	23:38			23:23			21:54	18	20:57 (1)	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14			04:36		20:31 (1)	03:25			03:52			05:20		20:40 (1)	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53			22:22	16	20:47 (1)	23:39			23:21			21:51	15	20:55 (1)	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11			04:33		20:32 (1)	03:24			03:55			05:23		20:41 (1)	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56			22:25	13	20:45 (1)	23:40			23:18			21:48	13	20:54 (1)	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:07			04:30		20:34 (1)	03:23			03:57			05:26		20:44 (1)	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59			22:28	10	20:44 (1)	23:41			23:16			21:44	7	20:51 (1)	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04			04:28		20:36 (1)	03:23			04:00			05:29			06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02			22:31	5	20:41 (1)	23:42			23:14			21:41			19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01			04:25			03:22			04:03			05:32			06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04			22:34			23:43			23:11			21:38			19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57			04:22			03:22			04:05			05:35			07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07			22:37			23:44			23:09			21:35			19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54			04:19			03:21			04:08			05:38			07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10			22:40			23:45			23:06			21:31			19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51			04:16			03:21			04:11			05:41			07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13			22:43			23:45			23:03			21:28			19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47			04:13			03:21			04:13			05:44			07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16			22:46			23:46			23:01			21:25			19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44			04:10			03:21			04:16			05:46			07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19			22:49			23:46			22:58			21:21			19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41			04:08			03:22			04:19			05:49			07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22			22:51			23:46			22:55			21:18			19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37			04:05			03:22			04:22			05:52			07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25			22:54			23:46			22:52			21:15			19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34			04:02			03:23			04:25			05:55			07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28			22:57			23:46			22:50			21:11			19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31			04:00			03:23			04:28			05:58			07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31			23:00			23:45			22:47			21:08			19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27			03:57			03:24			04:30			06:01			07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34			23:03			23:45			22:44			21:04			19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24		20:35 (1)	03:55			03:25			04:33		20:45 (1)	06:03			07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	9	20:44 (1)	23:05			23:44			22:41	8	20:53 (1)	21:01			19:15	16:36	15:11	14:54
29	09:16		07:05	05:21		20:33 (1)	03:52			03:26			04:36		20:43 (1)	06:06			07:32	07:57	09:30	10:11
	16:15		20:10	21:40	13	20:46 (1)	23:08			23:43			22:38	12	20:55 (1)	20:58			19:12	16:33	15:09	14:56
30	09:13		07:02	05:18		20:31 (1)	03:50			03:27			04:39		20:42 (1)	06:09			07:34	08:00	09:33	10:11
	16:18		20:13	21:43	16	20:47 (1)	23:10			23:42			22:35	15	20:57 (1)	20:54			19:08	16:30	15:07	14:57
31	09:10		06:59				03:48						04:42		20:41 (1)	06:12				08:03		10:10
	16:21		20:16				23:13						22:32	16	20:57 (1)	20:51				16:26		14:59
Potential sun hours	182	242	363	447			559			605			594			502			392	308	206	151
Total, worst case					38			290				51					282					

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH10 - RH10

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH11 - RH11

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
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15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
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	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:06
	15:38	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
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	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:47		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:30	20:48	19:05	16:23	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:29	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:19	23:41	22:27	20:44	19:02	16:20	15:03
3	10:09	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:02
4	10:08	08:59	07:31	06:45	05:04	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:24	23:38	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:34	04:57	06:26	07:48	08:19	09:46
	15:08	16:36	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:58
6	10:06	08:54	07:24	06:38	04:58	03:35	03:36	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:20	06:35	04:55	03:33	03:38	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:08	20:36	22:05	23:30	23:34	22:11	20:27	18:45	16:05	14:56
8	10:03	08:48	07:17	06:31	04:52	03:31	03:40	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:08	23:32	23:32	22:08	20:24	18:41	16:02	14:54
9	10:01	08:45	07:14	06:28	04:49	03:30	03:43	05:08	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:11	23:34	23:30	22:05	20:21	18:38	15:59	14:53
10	10:00	08:42	07:10	06:24	04:45	03:28	03:45	05:11	06:40	08:02	08:34	09:56
	15:19	16:52	18:16	20:45	22:14	23:36	23:28	22:01	20:17	18:35	15:56	14:52
11	09:58	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:38	09:58
	15:22	16:55	18:19	20:47	22:17	23:37	23:26	21:58	20:14	18:31	15:54	14:51
12	09:56	08:35	07:04	06:18	04:39	03:26	03:49	05:17	06:45	08:08	08:41	10:00
	15:25	16:58	18:22	20:50	22:20	23:39	23:24	21:55	20:10	18:28	15:51	14:50
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:44	10:02
	15:27	17:01	18:25	20:53	22:23	23:40	23:21	21:52	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:54	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:43	23:17	21:45	20:00	18:18	15:42	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:20	08:53	10:06
	15:35	17:11	18:33	21:02	22:32	23:44	23:14	21:42	19:56	18:15	15:40	14:48
17	09:46	08:20	06:47	06:01	04:24	03:21	04:02	05:32	06:59	08:22	08:56	10:07
	15:38	17:14	18:36	21:05	22:35	23:45	23:12	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:02	08:25	08:59	10:08
	15:41	17:17	18:39	21:08	22:38	23:45	23:09	21:35	19:50	18:08	15:34	14:48
19	09:42	08:13	06:40	05:54	04:18	03:21	04:07	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:41	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:20	04:10	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:28	19:43	18:02	15:29	14:48
21	09:37	08:07	06:33	05:47	04:13	03:20	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:46	23:47	23:02	21:25	19:39	17:58	15:27	14:48
22	09:35	08:04	06:30	05:44	04:10	03:21	04:16	05:46	07:13	08:37	09:11	10:12
	15:53	17:29	18:50	21:20	22:49	23:47	22:59	21:22	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:52	15:22	14:49
24	09:30	07:57	06:23	05:37	04:05	03:21	04:21	05:52	07:18	08:43	09:17	10:12
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29	09:16		07:06	05:21	03:52	03:25	04:36	06:06	07:32	07:58	09:31	10:12
	16:14		20:10	21:40	23:09	23:44	22:39	20:58	19:12	16:33	15:09	14:55
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	16:18		20:13	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	606	595	502	392	308	206	151
Total, worst case												

Table 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:

Söderskogen

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Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH13 - RH13

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March			April	May	June	July	August	September			October			November	December
1	10:11	09:08	07:41		08:16 (8)	06:55	05:14	03:45	03:28	04:45	06:15			07:37		08:49 (8)	08:07	09:36
	15:01	16:24	17:50	6	08:22 (8)	20:19	21:46	23:16	23:42	22:30	20:48			19:05	13	09:02 (8)	16:24	15:05
2	10:10	09:05	07:37		08:13 (8)	06:52	05:11	03:43	03:30	04:48	06:18			07:40		08:47 (8)	08:10	09:38
	15:02	16:27	17:53	12	08:25 (8)	20:22	21:49	23:19	23:41	22:27	20:45			19:02	17	09:04 (8)	16:20	15:04
3	10:09	09:02	07:34		08:11 (8)	06:49	05:08	03:41	03:31	04:51	06:21			07:43		08:46 (8)	08:13	09:41
	15:04	16:30	17:56	16	08:27 (8)	20:25	21:53	23:21	23:40	22:24	20:41			18:59	18	09:04 (8)	16:17	15:02
4	10:08	09:00	07:31		08:09 (8)	06:45	05:05	03:39	03:33	04:54	06:23			07:46		08:45 (8)	08:16	09:43
	15:06	16:34	17:59	18	08:27 (8)	20:27	21:56	23:23	23:38	22:20	20:38			18:55	20	09:05 (8)	16:14	15:00
5	10:07	08:57	07:27		08:09 (8)	06:42	05:02	03:37	03:35	04:57	06:26			07:49		08:44 (8)	08:19	09:46
	15:08	16:37	18:02	19	08:28 (8)	20:30	21:59	23:26	23:37	22:17	20:34			18:52	20	09:04 (8)	16:11	14:59
6	10:05	08:54	07:24		08:08 (8)	06:38	04:58	03:35	03:37	05:00	06:29			07:51		08:43 (8)	08:22	09:48
	15:10	16:40	18:05	20	08:28 (8)	20:33	22:02	23:28	23:35	22:14	20:31			18:48	21	09:04 (8)	16:08	14:57
7	10:04	08:51	07:21		08:08 (8)	06:35	04:55	03:33	03:39	05:03	06:32			07:54		08:43 (8)	08:25	09:50
	15:13	16:43	18:08	20	08:28 (8)	20:36	22:05	23:30	23:34	22:11	20:28			18:45	21	09:04 (8)	16:05	14:56
8	10:03	08:48	07:17		08:07 (8)	06:32	04:52	03:32	03:41	05:06	06:34			07:57		08:43 (8)	08:28	09:52
	15:15	16:46	18:11	21	08:28 (8)	20:39	22:08	23:32	23:32	22:08	20:24			18:42	20	09:03 (8)	16:02	14:55
9	10:01	08:45	07:14		08:08 (8)	06:28	04:49	03:30	03:43	05:09	06:37			08:00		08:44 (8)	08:31	09:54
	15:17	16:49	18:14	20	08:28 (8)	20:42	22:11	23:34	23:30	22:05	20:21			18:38	18	09:02 (8)	16:00	14:54
10	10:00	08:42	07:11		08:07 (8)	06:25	04:46	03:29	03:45	05:12	06:40			08:03		08:44 (8)	08:35	09:56
	15:20	16:52	18:16	19	08:26 (8)	20:45	22:14	23:35	23:28	22:01	20:17			18:35	17	09:01 (8)	15:57	14:53
11	09:58	08:39	07:07		08:08 (8)	06:21	04:43	03:27	03:47	05:15	06:43			08:05		08:45 (8)	08:38	09:58
	15:22	16:56	18:19	18	08:26 (8)	20:48	22:17	23:37	23:26	21:58	20:14			18:32	15	09:00 (8)	15:54	14:52
12	09:56	08:35	07:04		08:09 (8)	06:18	04:40	03:26	03:50	05:18	06:45			08:08		08:47 (8)	08:41	10:00
	15:25	16:59	18:22	15	08:24 (8)	20:50	22:20	23:39	23:24	21:55	20:10			18:28	10	08:57 (8)	15:51	14:51
13	09:54	08:32	07:00		08:11 (8)	06:15	04:37	03:25	03:52	05:21	06:48			08:11			08:44	10:02
	15:28	17:02	18:25	11	08:22 (8)	20:53	22:23	23:40	23:21	21:52	20:07			18:25			15:48	14:50
14	09:52	08:29	06:57			06:11	04:34	03:24	03:55	05:23	06:51			08:14			08:47	10:03
	15:30	17:05	18:28			20:56	22:26	23:41	23:19	21:48	20:04			18:22			15:45	14:49
15	09:50	08:26	06:54			06:08	04:31	03:23	03:57	05:26	06:54			08:17			08:50	10:05
	15:33	17:08	18:31			20:59	22:29	23:43	23:17	21:45	20:00			18:18			15:43	14:49
16	09:48	08:23	06:50			06:04	04:28	03:22	04:00	05:29	06:56			08:20			08:53	10:06
	15:36	17:11	18:34			21:02	22:32	23:44	23:14	21:42	19:57			18:15			15:40	14:49
17	09:46	08:20	06:47			06:01	04:25	03:22	04:02	05:32	06:59			08:23			08:56	10:07
	15:39	17:14	18:36			21:05	22:35	23:44	23:12	21:38	19:53			18:12			15:37	14:48
18	09:44	08:17	06:43			05:58	04:22	03:21	04:05	05:35	07:02			08:25			08:59	10:08
	15:41	17:17	18:39			21:08	22:38	23:45	23:09	21:35	19:50			18:08			15:35	14:48
19	09:42	08:13	06:40			05:54	04:19	03:21	04:08	05:38	07:05			08:28			09:02	10:09
	15:44	17:20	18:42			21:11	22:41	23:46	23:07	21:32	19:46			18:05			15:32	14:48
20	09:39	08:10	06:37			05:51	04:16	03:21	04:11	05:41	07:07			08:31			09:05	10:10
	15:47	17:23	18:45			21:14	22:44	23:46	23:04	21:29	19:43			18:02			15:30	14:48
21	09:37	08:07	06:33			05:48	04:13	03:21	04:13	05:44	07:10			08:34			09:08	10:11
	15:50	17:26	18:48			21:17	22:46	23:47	23:02	21:25	19:40			17:59			15:27	14:49
22	09:35	08:04	06:30			05:44	04:10	03:21	04:16	05:47	07:13			08:37			09:11	10:12
	15:53	17:29	18:51			21:20	22:49	23:47	22:59	21:22	19:36			17:55			15:25	14:49
23	09:32	08:00	06:26			05:41	04:08	03:21	04:19	05:50	07:15			08:40			09:14	10:12
	15:56	17:32	18:53			21:23	22:52	23:47	22:56	21:18	19:33			17:52			15:22	14:50
24	09:30	07:57	06:23			05:37	04:05	03:22	04:22	05:52	07:18			08:43			09:17	10:12
	15:59	17:35	18:56			21:26	22:55	23:47	22:53	21:15	19:29			17:49			15:20	14:50
25	09:27	07:54	06:19			05:34	04:02	03:22	04:25	05:55	07:21			07:46			09:20	10:13
	16:02	17:38	18:59			21:29	22:58	23:47	22:50	21:12	19:26			16:46			15:18	14:51
26	09:25	07:51	06:16			05:31	04:00	03:23	04:28	05:58	07:24			07:49			09:22	10:13
	16:05	17:41	19:02			21:31	23:01	23:46	22:48	21:08	19:22			16:42			15:16	14:52
27	09:22	07:47	06:13			05:28	03:57	03:24	04:30	06:01	07:26			07:52			09:25	10:13
	16:09	17:44	19:05			21:34	23:03	23:46	22:45	21:05	19:19			16:39			15:13	14:53
28	09:19	07:44	06:09			05:24	03:55	03:25	04:33	06:04	07:29			07:55			09:28	10:13
	16:12	17:47	19:08			21:37	23:06	23:45	22:42	21:02	19:16			16:36			15:11	14:54
29	09:17		07:06			05:21	03:52	03:26	04:36	06:07	07:32			07:58			09:31	10:12
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30	09:14		07:02			05:18	03:50	03:27	04:39	06:09	07:35		08:52 (8)	08:01			09:33	10:12
	16:18		20:13			21:43	23:11	23:43	22:36	20:55	19:09	8	09:00 (8)	16:30			15:07	14:57
31	09:11		06:59				03:47		04:42	06:12				08:04				10:11
	16:21		20:16				23:14		22:33	20:51				16:27				14:59
Potential sun hours	182	242	363			447	559	605	594	502	392			308			206	151
Total, worst case				215								8			210			

Table 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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case**Shadow receptor:** RH14 - RH14

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:47	23:16	23:42	22:30	20:48	19:05	16:24	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:39
	15:02	16:27	17:53	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:20	15:04
3	10:09	09:03	07:34	06:49	05:08	03:41	03:31	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:25	21:53	23:21	23:40	22:24	20:41	18:59	16:17	15:02
4	10:08	09:00	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:28	21:56	23:24	23:39	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:35	04:57	06:26	07:49	08:19	09:46
	15:08	16:37	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:59
6	10:06	08:54	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:21	06:35	04:55	03:33	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:05	23:30	23:34	22:11	20:28	18:45	16:05	14:56
8	10:03	08:48	07:17	06:32	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:53
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	15:17	16:49	18:14	20:42	22:11	23:34	23:30	22:05	20:21	18:38	16:00	14:53
10	10:00	08:42	07:11	06:25	04:46	03:29	03:45	05:12	06:40	08:03	08:35	09:57
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	15:39	17:14	18:36	21:05	22:35	23:45	23:12	21:39	19:53	18:12	15:37	14:48
18	09:44	08:17	06:43	05:58	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:09
	15:41	17:17	18:39	21:08	22:38	23:45	23:10	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:05	08:28	09:02	10:10
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	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:30	14:48
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23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
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26	09:25	07:51	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:32	23:01	23:46	22:48	21:08	19:22	16:42	15:15	14:52
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29	09:17		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:31	10:12
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31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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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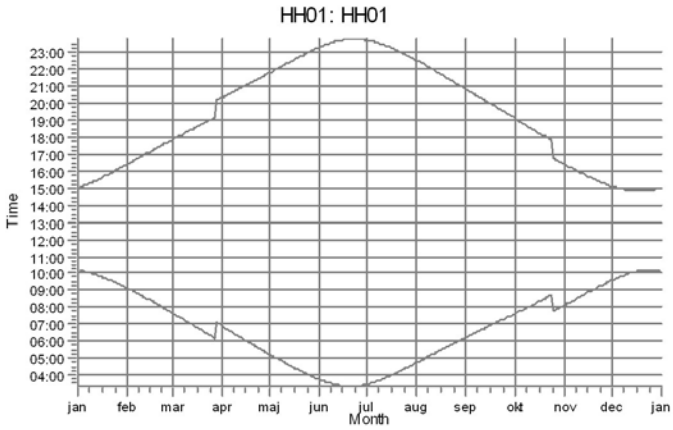
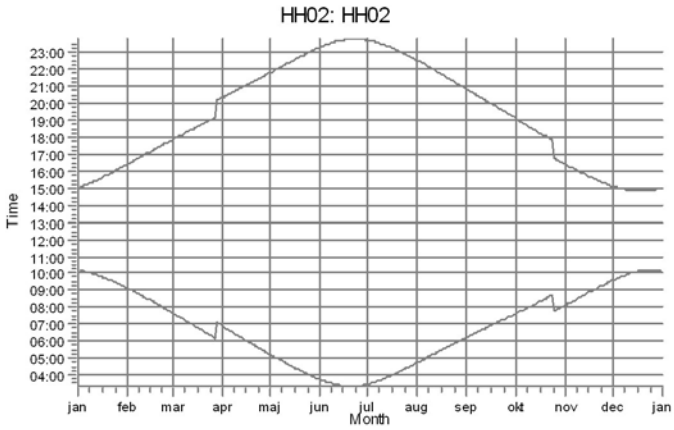
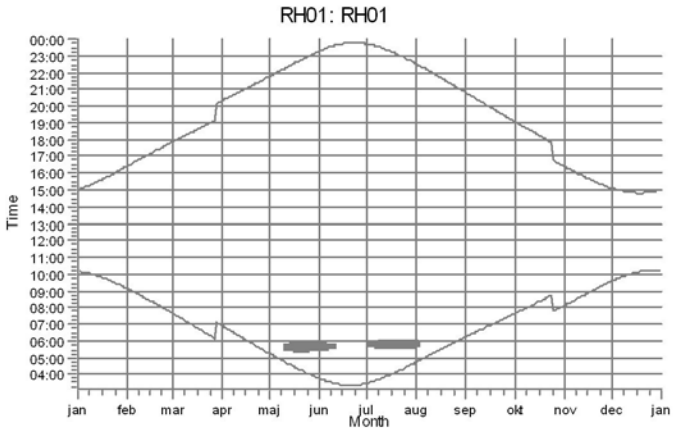
Calculated:
18.11.2019 11:15/3.3.247

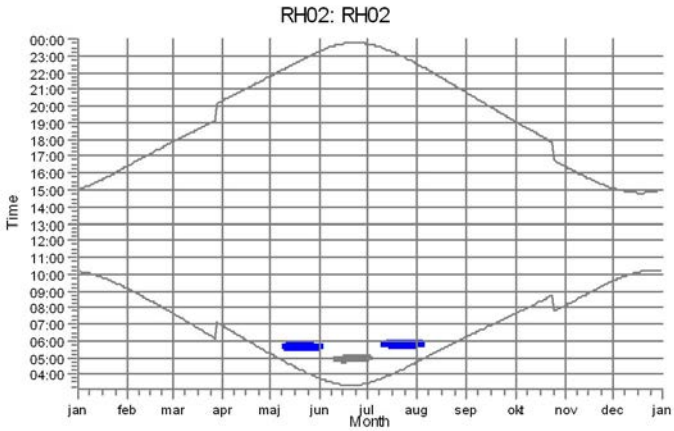
SHADOW - Calendar, graphical

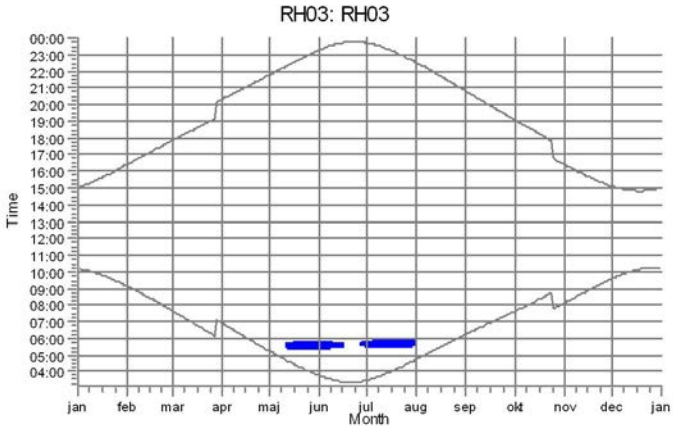
Calculation: MP Proposal, 8xF180 @210m, Worst case

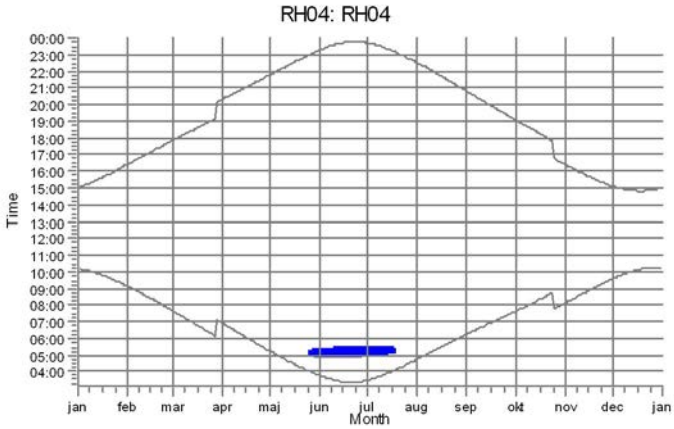












WTGs

3: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)
4: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

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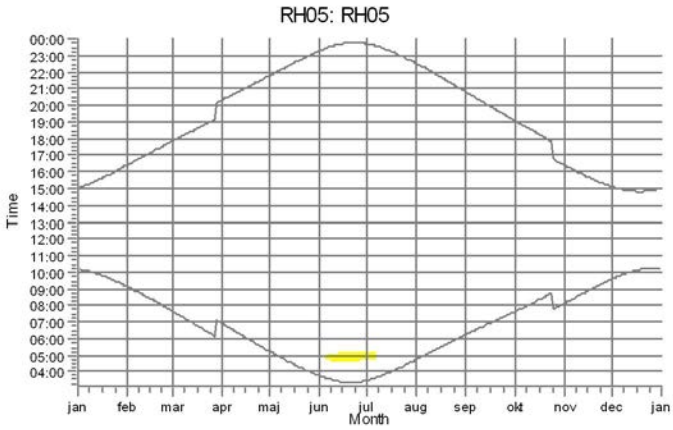
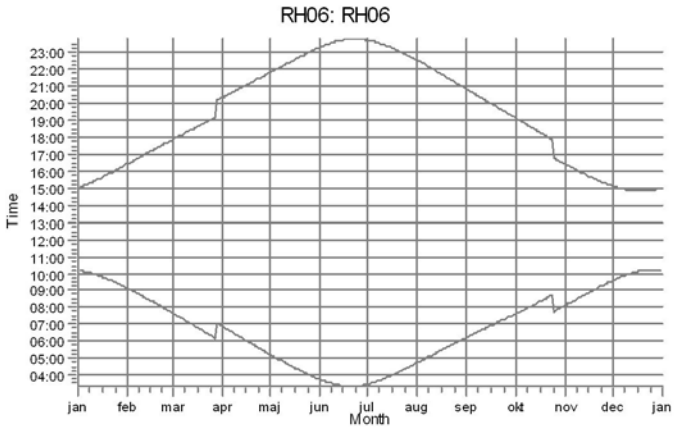
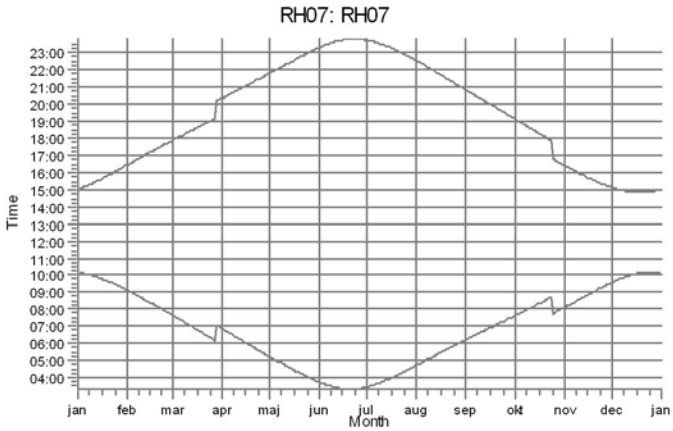
18.11.2019 11:15/3.3.247

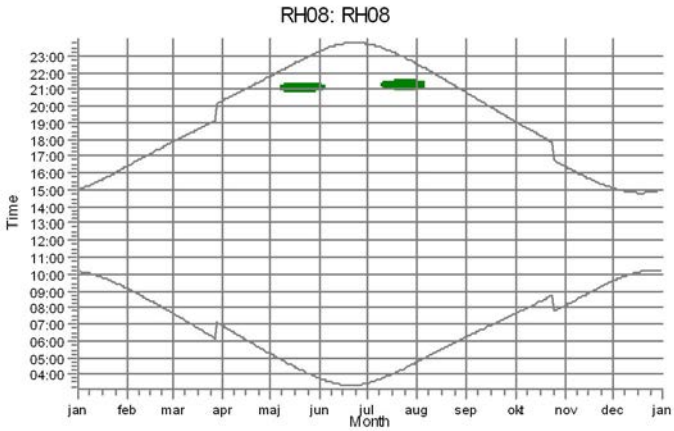
SHADOW - Calendar, graphical

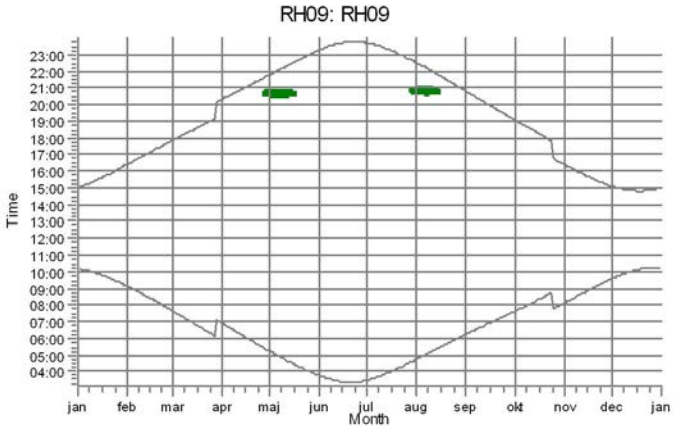
Calculation: MP Proposal, 8xF180 @210m, Worst case

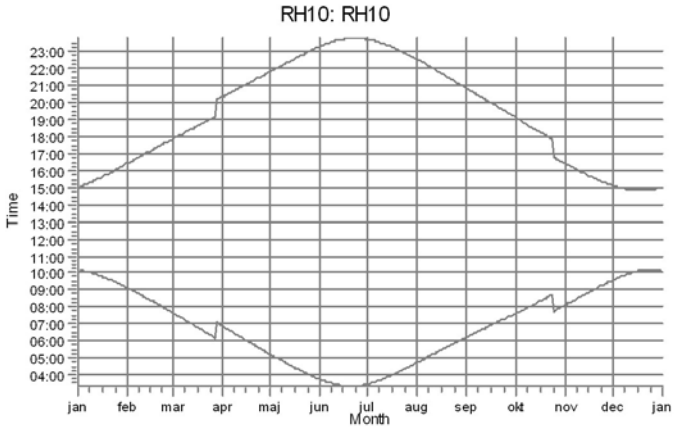












WTGs

1: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)
2: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

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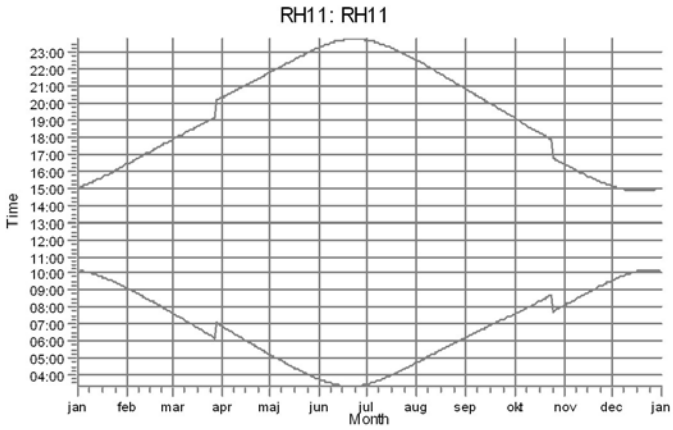
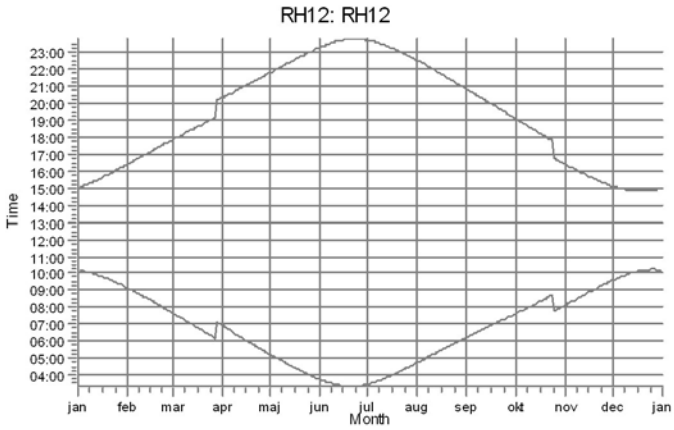
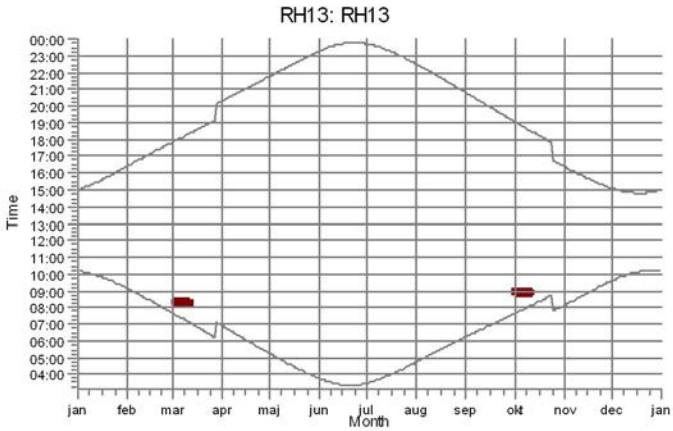
Calculated:
18.11.2019 11:15/3.3.247

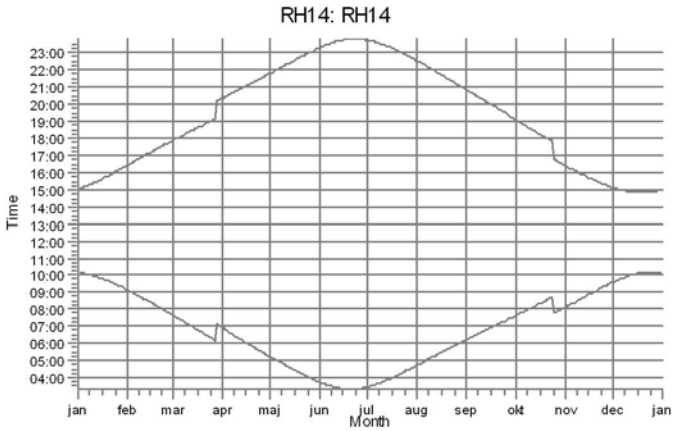
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case









WTGs

8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

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Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 1 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April		May		June		July		August		September	October	November	December
1	10:10	09:08	07:40	06:55		05:14	20:31-20:49/18	03:45	21:01-21:12/11	03:29		04:45	20:40-20:58/18	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19		21:46		23:16		23:41		22:29	21:07-21:25/18	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52		05:11	20:30-20:49/19	03:43	21:03-21:11/8	03:30		04:48	20:39-20:59/20	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22		21:49		23:18		23:40		22:26	21:08-21:24/16	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48		05:08	20:29-20:50/21	03:41	21:06-21:10/4	03:32		04:51	20:39-20:59/20	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24		21:52		23:20		23:39		22:23	21:10-21:23/13	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45		05:05	20:28-20:50/22	03:39		03:33		04:54	20:38-20:59/21	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27		21:55		23:23		23:38		22:20	21:11-21:21/10	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42		05:02	20:28-20:50/22	03:37		03:35		04:57	20:38-21:00/22	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30		21:58		23:25		23:36		22:17		20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38		04:58	20:28-20:50/22	03:35		03:37		05:00	20:37-20:59/22	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33		22:01		23:27		23:35		22:14		20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35		04:55	20:28-20:50/22	03:34		03:39		05:03	20:38-21:00/22	06:31	07:54	08:25	09:50
	15:13	16:43	18:08	20:36		22:04		23:29		23:33		22:11		20:27	18:45	16:05	14:56
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	15:15	16:46	18:10	20:39		22:07	21:03-21:09/6	23:31		23:31		22:07		20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28		04:49	20:28-20:49/21	03:30		03:43		05:09	20:38-20:59/21	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41		22:10	21:00-21:11/11	23:33		23:29		22:04		20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25		04:46	20:29-20:49/20	03:29		03:45	21:12-21:18/6	05:12	20:38-20:59/21	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44		22:13	20:59-21:14/15	23:35		23:27		22:01		20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21		04:43	20:29-20:48/19	03:28		03:48	21:11-21:20/9	05:15	20:38-20:58/20	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47		22:16	20:57-21:14/17	23:36		23:25		21:58		20:14	18:31	15:54	14:52
12	09:56	08:35	07:03	06:18		04:40	20:29-20:47/18	03:26		03:50	21:09-21:21/12	05:18	20:39-20:57/18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50		22:19	20:56-21:15/19	23:38		23:23		21:54		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14		04:37	20:31-20:47/16	03:25		03:52	21:08-21:22/14	05:21	20:40-20:55/15	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53		22:22	20:56-21:16/20	23:39		23:21		21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11		04:34	20:32-20:45/13	03:24		03:55	21:08-21:23/15	05:23	20:41-20:54/13	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56		22:25	20:55-21:16/21	23:41		23:19		21:48		20:03	18:21	15:45	14:50
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	15:33	17:08	18:31	20:59		22:28	20:55-21:17/22	23:42		23:16		21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04		04:28	20:36-20:41/5	03:23		04:00	21:07-21:25/18	05:29		06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02		22:31	20:54-21:17/23	23:43		23:14		21:41		19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01		04:25	20:54-21:17/23	03:22		04:03	21:06-21:25/19	05:32		06:59	08:22	08:55	10:07
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18	09:44	08:16	06:43	05:57		04:22	20:55-21:18/23	03:22		04:05	21:06-21:26/20	05:35		07:02	08:25	08:58	10:08
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22	09:34	08:03	06:29	05:44		04:10	20:55-21:17/22	03:21		04:16	21:05-21:27/22	05:47		07:12	08:37	09:10	10:11
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23	09:32	08:00	06:26	05:41		04:08	20:56-21:17/21	03:22		04:19	21:05-21:27/22	05:49		07:15	08:40	09:13	10:11
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	16:02	17:38	18:59	21:28		22:57		23:46		22:50		21:11		19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31		04:00	20:57-21:16/19	03:23		04:28	21:05-21:27/22	05:58		07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31		23:00		23:45		22:47		21:08		19:22	16:42	15:16	14:52
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	16:09	17:44	19:05	21:34		23:03		23:45		22:44		21:05		19:19	16:39	15:13	14:53
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29	09:16		07:06	05:21	20:33-20:46/13	03:52	20:59-21:14/15	03:26		04:36	20:43-20:55/12	06:06		07:32	07:58	09:30	10:12
	16:15		20:10	21:40		23:08		23:43		22:38	21:05-21:27/22	20:58		19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	20:31-20:47/16	03:50	21:00-21:14/14	03:27		04:39	20:42-20:57/15	06:09		07:34	08:01	09:33	10:11
	16:18		20:13	21:43		23:11		23:43		22:35	21:06-21:27/21	20:54		19:09	16:30	15:07	14:57
31	09:11		06:59			03:48	21:01-21:13/12			04:42	20:41-20:57/16	06:12			08:04		10:11
	16:21		20:16			23:13				22:32	21:06-21:26/20	20:51			16:27		14:59
Potential sun hours	182	242	363	447		559		605		594		502		392	308	206	151
Sum of minutes with flicker	0	0	0	38		739		23		465		339		0	0	0	0

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

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

Project:
Söderskogen

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Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 2 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June		July		August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45		03:29	04:50-05:03/13	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16		23:42		22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43		03:30	04:51-05:03/12	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18		23:40		22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41		03:32	04:52-05:03/11	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21		23:39		22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39		03:33	04:53-05:02/9	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23		23:38		22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37		03:35	04:53-05:01/8	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25		23:36		22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	04:50-04:53/3	03:37	04:56-05:01/5	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27		23:35		22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	04:48-04:55/7	03:39		05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29		23:33		22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	04:48-04:57/9	03:41		05:06	06:34	07:57	08:28	09:52
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9	10:01	08:44	07:14	06:28	04:49	03:30	04:47-04:57/10	03:43		05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33		23:29		22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	04:46-04:58/12	03:45		05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35		23:27		22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	04:46-04:59/13	03:48		05:15	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36		23:25		21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	04:46-05:00/14	03:50		05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38		23:23		21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	04:46-05:00/14	03:52		05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39		23:21		21:51	20:07	18:25	15:48	14:50
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	15:30	17:05	18:28	20:56	22:25	23:41		23:19		21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	04:46-05:01/15	03:57		05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42		23:16		21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:46-05:01/15	04:00		05:29	06:56	08:19	08:52	10:06
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17	09:46	08:19	06:47	06:01	04:25	03:22	04:46-05:02/16	04:03		05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44		23:11		21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:46-05:02/16	04:05		05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44		23:09		21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:47-05:03/16	04:08		05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45		23:06		21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:47-05:03/16	04:11		05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46		23:04		21:28	19:43	18:02	15:30	14:49
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23	09:32	08:00	06:26	05:41	04:08	03:22	04:47-05:03/16	04:19		05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46		22:56		21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:47-05:04/17	04:22		05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46		22:53		21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:47-05:03/16	04:25		05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46		22:50		21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:48-05:04/16	04:28		05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45		22:47		21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:49-05:04/15	04:31		06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45		22:44		21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:49-05:04/15	04:33		06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44		22:41		21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:49-05:03/14	04:36		06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44		22:38		20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:49-05:03/14	04:39		06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43		22:35		20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48			04:42		06:12		08:04		10:11
	16:21		20:16		23:13			22:32		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605		594		502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0		346		58	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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 3 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45 04:59-05:18/19	03:29 05:01-05:26/25	04:45 05:42-05:58/16	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16 05:25-05:46/21	23:42 05:35-05:44/9	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 04:58-05:18/20	03:30 05:03-05:27/24	04:48 05:44-05:58/14	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18 05:25-05:44/19	23:40 05:36-05:46/10	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 04:58-05:19/21	03:32 05:03-05:27/24	04:51 05:45-05:56/11	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21 05:26-05:44/18	23:39 05:35-05:47/12	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39 04:58-05:20/22	03:33 05:03-05:27/24	04:54 05:47-05:54/7	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23 05:26-05:44/18	23:38 05:34-05:47/13	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37 04:57-05:20/23	03:35 05:03-05:26/23	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25 05:26-05:43/17	23:36 05:34-05:48/14	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 04:57-05:20/23	03:37 05:04-05:27/23	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27 05:27-05:43/16	23:35 05:34-05:49/15	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 04:57-05:21/24	03:39 05:04-05:26/22	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29 05:28-05:42/14	23:33 05:33-05:49/16	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32 04:57-05:21/24	03:41 05:05-05:27/22	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31 05:29-05:42/13	23:31 05:33-05:50/17	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 05:36-05:45/9	03:30 04:57-05:21/24	03:43 05:05-05:26/21	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33 05:29-05:41/12	23:29 05:32-05:50/18	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:34-05:46/12	03:29 04:57-05:22/25	03:45 05:05-05:26/21	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:30-05:41/11	23:27 05:33-05:51/18	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 05:32-05:47/15	03:28 04:58-05:23/25	03:48 05:06-05:26/20	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:36 05:32-05:41/9	23:25 05:33-05:53/20	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:30-05:49/19	03:26 04:58-05:23/25	03:50 05:07-05:26/19	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38 05:32-05:40/8	23:23 05:33-05:55/22	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 05:27-05:49/22	03:25 04:58-05:23/25	03:53 05:07-05:24/17	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39 05:33-05:39/6	23:21 05:32-05:55/23	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:26-05:50/24	03:24 04:58-05:23/25	03:55 05:08-05:24/16	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41 05:34-05:39/5	23:19 05:32-05:56/24	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 05:25-05:50/25	03:24 04:58-05:23/25	03:58 05:09-05:23/14	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42 05:35-05:38/3	23:16 05:31-05:57/26	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:24-05:51/27	03:23 04:58-05:24/26	04:00 05:11-05:22/11	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14 05:31-05:58/27	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25 05:23-05:50/27	03:22 04:59-05:24/25	04:03 05:13-05:20/7	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11 05:31-05:58/27	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22 05:23-05:51/28	03:22 04:59-05:24/25	04:05 05:31-06:00/29	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 05:23-05:51/28	03:21 04:59-05:25/26	04:08 05:32-06:00/28	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:22-05:50/28	03:21 04:59-05:25/26	04:11 05:32-06:00/28	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 05:22-05:51/29	03:21 04:59-05:25/26	04:14 05:32-06:01/29	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10 05:22-05:51/29	03:21 04:59-05:25/26	04:16 05:32-06:01/29	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:22-05:50/28	03:22 04:59-05:25/26	04:19 05:33-06:02/29	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 05:22-05:50/28	03:22 05:00-05:26/26	04:22 05:33-06:01/28	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:22-05:50/28	03:23 05:00-05:25/25	04:25 05:33-06:01/28	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:05-05:10/5	03:23 05:00-05:26/26	04:28 05:33-06:02/29	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00 05:22-05:50/28	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57 05:03-05:12/9	03:24 05:01-05:26/25	04:31 05:34-06:01/27	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03 05:22-05:49/27	23:45 05:39-05:40/1	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:01-05:14/13	03:25 05:01-05:27/26	04:34 05:34-06:01/27	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06 05:22-05:48/26	23:44 05:38-05:42/4	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:01-05:16/15	03:26 05:01-05:26/25	04:36 05:36-06:01/25	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08 05:24-05:48/24	23:44 05:36-05:42/6	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:00-05:16/16	03:27 05:01-05:26/25	04:39 05:37-06:00/23	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11 05:24-05:47/23	23:43 05:36-05:43/7	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 04:59-05:17/18		04:42 05:39-06:00/21	06:12		08:04		10:11
	16:21		20:16		23:13 05:24-05:46/22		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	632	942	1024	48	0	0	0	0

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

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

Project:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 4 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:40	06:55	05:15		03:46	05:32-05:50/18	03:29	04:53-05:02/9	04:45	05:44-05:56/12	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16		23:42		22:29		20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:43	05:32-05:49/17	03:30	04:55-05:02/7	04:48	05:46-05:54/8	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49		23:18		23:40	05:46-05:49/3	22:26		20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:41	05:33-05:49/16	03:32	04:57-05:00/3	04:51		06:21	07:43	08:13	09:41
	15:04	16:31	17:56	20:24	21:52		23:21		23:39	05:44-05:50/6	22:23		20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05		03:39	05:34-05:49/15	03:33	05:43-05:51/8	04:54		06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55		23:23		23:38		22:20		20:38	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02		03:37	05:34-05:48/14	03:35	05:42-05:52/10	04:57		06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25		23:36		22:17		20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58		03:35	05:35-05:47/12	03:37	05:42-05:54/12	05:00		06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27		23:35		22:14		20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55		03:34	05:36-05:47/11	03:39	05:41-05:54/13	05:03		06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29		23:33		22:11		20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32	05:37-05:46/9	03:41	05:41-05:55/14	05:06		06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31		23:31		22:07		20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		03:31	05:38-05:45/7	03:43	05:40-05:56/16	05:09		06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10		23:33		23:29		22:04		20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	05:39-05:41/2	03:29	04:50-04:56/6	03:46	05:40-05:57/17	05:12		06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13		23:35	05:39-05:44/5	23:27		22:01		20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	05:34-05:44/10	03:28	04:50-04:58/8	03:48	05:40-05:58/18	05:15		06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16		23:37		23:25		21:58		20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	05:33-05:47/14	03:27	04:49-04:59/10	03:50	05:40-05:58/18	05:18		06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19		23:38		23:23		21:55		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	05:31-05:47/16	03:25	04:48-04:59/11	03:53	05:39-05:59/20	05:21		06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22		23:39		23:21		21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	05:31-05:49/18	03:24	04:48-05:00/12	03:55	05:38-05:59/21	05:24		06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25		23:41		23:19		21:48		20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	05:29-05:49/20	03:24	04:47-05:00/13	03:58	05:38-05:59/21	05:26		06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28		23:42		23:16		21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	05:29-05:50/21	03:23	04:47-05:01/14	04:00	05:38-06:00/22	05:29		06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31		23:43		23:14		21:42		19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	05:28-05:50/22	03:22	04:48-05:02/14	04:03	05:38-06:00/22	05:32		06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34		23:44		23:11		21:38		19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	05:28-05:51/23	03:22	04:48-05:02/14	04:05	05:39-06:01/22	05:35		07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37		23:45		23:09		21:35		19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	05:28-05:51/23	03:22	04:48-05:03/15	04:08	05:38-06:01/23	05:38		07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40		23:45		23:06		21:32		19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	05:27-05:51/24	03:21	04:48-05:03/15	04:11	05:38-06:01/23	05:41		07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43		23:46		23:04		21:28		19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	05:28-05:51/23	03:21	04:48-05:03/15	04:14	05:38-06:01/23	05:44		07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46		23:46		23:01		21:25		19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	05:28-05:51/23	03:21	04:48-05:03/15	04:16	05:38-06:01/23	05:47		07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49		23:46		22:58		21:22		19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	05:28-05:51/23	03:22	04:49-05:04/15	04:19	05:39-06:02/23	05:50		07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52		23:46		22:56		21:18		19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05	05:28-05:51/23	03:22	04:49-05:04/15	04:22	05:38-06:02/24	05:52		07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55		23:46		22:53		21:15		19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	05:28-05:51/23	03:23	04:49-05:03/14	04:25	05:38-06:01/23	05:55		07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57		23:46		22:50		21:12		19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	05:29-05:51/22	03:23	04:50-05:04/14	04:28	05:39-06:01/22	05:58		07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00		23:46		22:47		21:08		19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57	05:29-05:51/22	03:24	04:50-05:04/14	04:31	05:39-06:01/22	06:01		07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03		23:45		22:44		21:05		19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55	05:29-05:50/21	03:25	04:51-05:04/13	04:34	05:39-06:00/21	06:04		07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06		23:44		22:41		21:01		19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52	05:30-05:51/21	03:26	04:51-05:03/12	04:36	05:41-06:00/19	06:07		07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08		23:44		22:38		20:58		19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	05:30-05:50/20	03:27	04:52-05:02/10	04:39	05:41-05:58/17	06:09		07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11		23:43		22:35		20:55		19:09	16:30	15:08	14:57
31	09:11		06:59		03:48	05:31-05:50/19			04:42	05:43-05:58/15	06:12			08:04		10:11
	16:21		20:16		23:13				22:32		20:51			16:27		14:59
Potential sun hours	182	242	363	447	559		605		594		502		392	308	206	151
Sum of minutes with flicker	0	0	0	0	433		393		560		20		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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 5 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:57	05:26	06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:21	04:14	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 6 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 7 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:42	19:56	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 11:15/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case**WTG:** 8 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March		April	May	June	July	August	September		October		November	December
1	10:10	09:08	07:40	08:16-08:22/6	06:55	05:14	03:45	03:28	04:45	06:15		07:37	08:49-09:02/13	08:07	09:36
	15:01	16:24	17:50		20:19	21:46	23:16	23:42	22:29	20:48		19:05		16:23	15:05
2	10:10	09:05	07:37	08:13-08:25/12	06:52	05:11	03:43	03:30	04:48	06:18		07:40	08:47-09:04/17	08:10	09:38
	15:02	16:27	17:53		20:22	21:49	23:19	23:41	22:26	20:44		19:02		16:20	15:04
3	10:09	09:02	07:34	08:11-08:27/16	06:49	05:08	03:41	03:31	04:51	06:20		07:43	08:46-09:04/18	08:13	09:41
	15:04	16:30	17:56		20:24	21:52	23:21	23:40	22:23	20:41		18:58		16:17	15:02
4	10:08	08:59	07:31	08:09-08:27/18	06:45	05:05	03:39	03:33	04:54	06:23		07:46	08:45-09:05/20	08:16	09:43
	15:06	16:34	17:59		20:27	21:55	23:23	23:38	22:20	20:38		18:55		16:14	15:00
5	10:06	08:56	07:27	08:09-08:28/19	06:42	05:01	03:37	03:35	04:57	06:26		07:48	08:44-09:04/20	08:19	09:46
	15:08	16:37	18:02		20:30	21:58	23:25	23:37	22:17	20:34		18:52		16:11	14:59
6	10:05	08:53	07:24	08:08-08:28/20	06:38	04:58	03:35	03:37	05:00	06:29		07:51	08:43-09:04/21	08:22	09:48
	15:10	16:40	18:05		20:33	22:01	23:28	23:35	22:14	20:31		18:48		16:08	14:57
7	10:04	08:51	07:20	08:08-08:28/20	06:35	04:55	03:33	03:39	05:03	06:32		07:54	08:43-09:04/21	08:25	09:50
	15:13	16:43	18:08		20:36	22:04	23:30	23:33	22:11	20:27		18:45		16:05	14:56
8	10:03	08:47	07:17	08:07-08:28/21	06:31	04:52	03:32	03:41	05:06	06:34		07:57	08:43-09:03/20	08:28	09:52
	15:15	16:46	18:10		20:39	22:07	23:32	23:31	22:08	20:24		18:42		16:02	14:55
9	10:01	08:44	07:14	08:08-08:28/20	06:28	04:49	03:30	03:43	05:09	06:37		08:00	08:44-09:02/18	08:31	09:54
	15:17	16:49	18:13		20:42	22:10	23:33	23:30	22:04	20:21		18:38		15:59	14:54
10	09:59	08:41	07:10	08:07-08:26/19	06:25	04:46	03:29	03:45	05:12	06:40		08:02	08:44-09:01/17	08:34	09:56
	15:20	16:52	18:16		20:45	22:14	23:35	23:28	22:01	20:17		18:35		15:57	14:52
11	09:58	08:38	07:07	08:08-08:26/18	06:21	04:43	03:27	03:47	05:15	06:43		08:05	08:45-09:00/15	08:37	09:58
	15:22	16:55	18:19		20:47	22:17	23:37	23:26	21:58	20:14		18:31		15:54	14:52
12	09:56	08:35	07:04	08:09-08:24/15	06:18	04:40	03:26	03:50	05:18	06:45		08:08	08:47-08:57/10	08:40	10:00
	15:25	16:59	18:22		20:50	22:20	23:38	23:23	21:55	20:10		18:28		15:51	14:51
13	09:54	08:32	07:00	08:11-08:22/11	06:14	04:36	03:25	03:52	05:20	06:48		08:11		08:44	10:01
	15:27	17:02	18:25		20:53	22:23	23:40	23:21	21:51	20:07		18:25		15:48	14:50
14	09:52	08:29	06:57		06:11	04:33	03:24	03:55	05:23	06:51		08:14		08:47	10:03
	15:30	17:05	18:28		20:56	22:26	23:41	23:19	21:48	20:03		18:21		15:45	14:49
15	09:50	08:26	06:53		06:08	04:30	03:23	03:57	05:26	06:53		08:17		08:50	10:05
	15:33	17:08	18:31		20:59	22:29	23:42	23:17	21:45	20:00		18:18		15:43	14:49
16	09:48	08:23	06:50		06:04	04:27	03:22	04:00	05:29	06:56		08:19		08:53	10:06
	15:36	17:11	18:33		21:02	22:32	23:43	23:14	21:42	19:57		18:15		15:40	14:49
17	09:46	08:20	06:47		06:01	04:25	03:22	04:02	05:32	06:59		08:22		08:56	10:07
	15:39	17:14	18:36		21:05	22:35	23:44	23:12	21:38	19:53		18:12		15:37	14:48
18	09:44	08:16	06:43		05:57	04:22	03:21	04:05	05:35	07:02		08:25		08:59	10:08
	15:41	17:17	18:39		21:08	22:37	23:45	23:09	21:35	19:50		18:08		15:35	14:48
19	09:42	08:13	06:40		05:54	04:19	03:21	04:08	05:38	07:04		08:28		09:02	10:09
	15:44	17:20	18:42		21:11	22:40	23:46	23:07	21:32	19:46		18:05		15:32	14:48
20	09:39	08:10	06:36		05:51	04:16	03:21	04:11	05:41	07:07		08:31		09:05	10:10
	15:47	17:23	18:45		21:14	22:43	23:46	23:04	21:28	19:43		18:02		15:30	14:48
21	09:37	08:07	06:33		05:47	04:13	03:21	04:13	05:44	07:10		08:34		09:08	10:11
	15:50	17:26	18:48		21:17	22:46	23:46	23:01	21:25	19:39		17:58		15:27	14:49
22	09:35	08:03	06:30		05:44	04:10	03:21	04:16	05:47	07:13		08:37		09:11	10:11
	15:53	17:29	18:50		21:19	22:49	23:47	22:59	21:22	19:36		17:55		15:25	14:49
23	09:32	08:00	06:26		05:41	04:08	03:21	04:19	05:49	07:15		08:40		09:14	10:12
	15:56	17:32	18:53		21:22	22:52	23:47	22:56	21:18	19:33		17:52		15:22	14:50
24	09:30	07:57	06:23		05:37	04:05	03:22	04:22	05:52	07:18		08:43		09:16	10:12
	15:59	17:35	18:56		21:25	22:55	23:47	22:53	21:15	19:29		17:49		15:20	14:50
25	09:27	07:54	06:19		05:34	04:02	03:22	04:25	05:55	07:21		07:46		09:19	10:12
	16:02	17:38	18:59		21:28	22:58	23:46	22:50	21:12	19:26		16:46		15:18	14:51
26	09:24	07:50	06:16		05:31	04:00	03:23	04:28	05:58	07:24		07:49		09:22	10:13
	16:05	17:41	19:02		21:31	23:00	23:46	22:47	21:08	19:22		16:42		15:15	14:52
27	09:22	07:47	06:12		05:27	03:57	03:24	04:30	06:01	07:26		07:52		09:25	10:12
	16:08	17:44	19:05		21:34	23:03	23:45	22:44	21:05	19:19		16:39		15:13	14:53
28	09:19	07:44	06:09		05:24	03:55	03:25	04:33	06:04	07:29		07:55		09:28	10:12
	16:12	17:47	19:07		21:37	23:06	23:45	22:41	21:01	19:15		16:36		15:11	14:54
29	09:16		07:06		05:21	03:52	03:26	04:36	06:06	07:32		07:58		09:30	10:12
	16:15		20:10		21:40	23:08	23:44	22:39	20:58	19:12		16:33		15:09	14:56
30	09:14		07:02		05:18	03:50	03:27	04:39	06:09	07:35	08:52-09:00/8	08:01		09:33	10:12
	16:18		20:13		21:43	23:11	23:43	22:36	20:55	19:09		16:30		15:07	14:57
31	09:11		06:59			03:47		04:42	06:12			08:04			10:11
	16:21		20:16			23:14		22:33	20:51			16:27			14:58
Potential sun hours	182	242	363		447	559	605	594	502	392		308		206	151
Sum of minutes with flicker	0	0		215	0	0	0	0	0		8		210	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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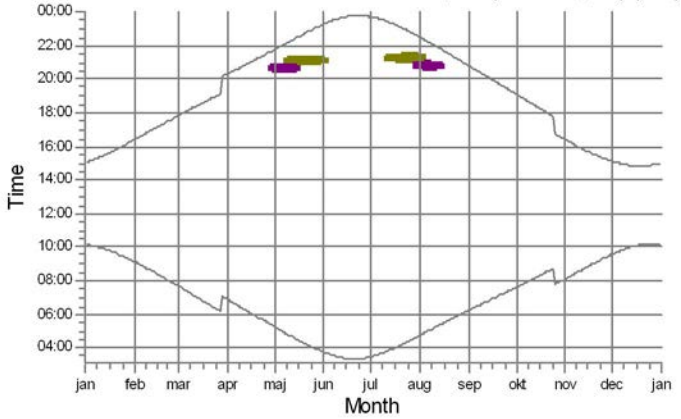
Calculated:
18.11.2019 11:15/3.3.247

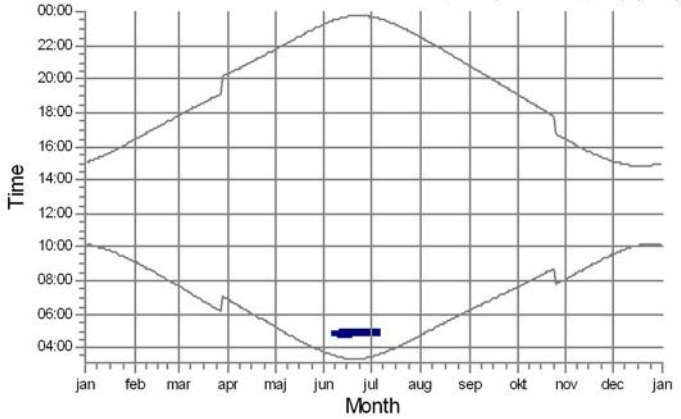
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case

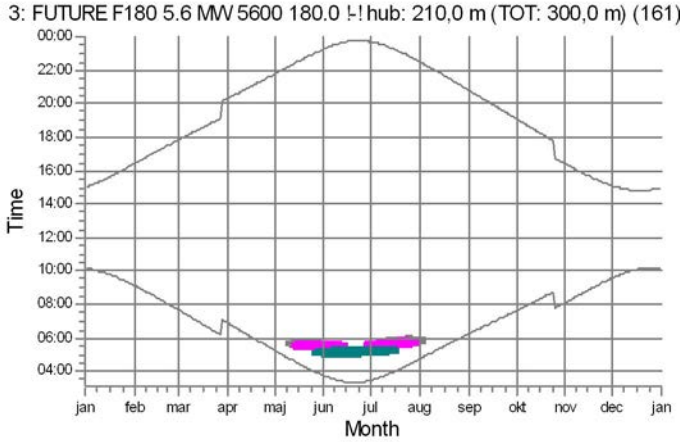
1: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (156)



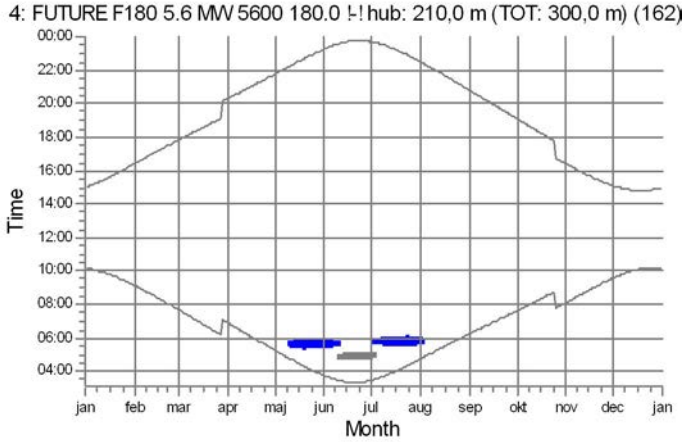
2: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (160)



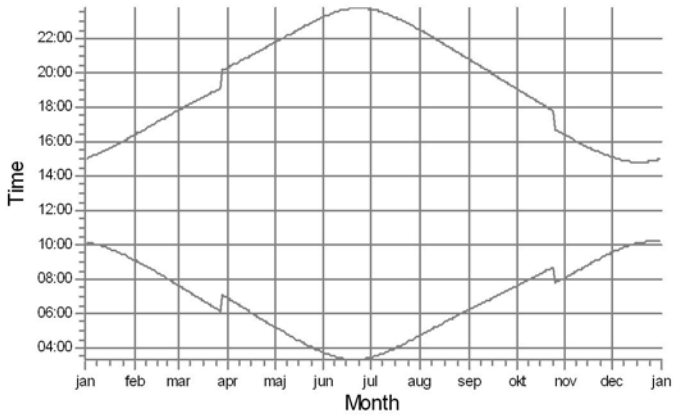
3: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (161)



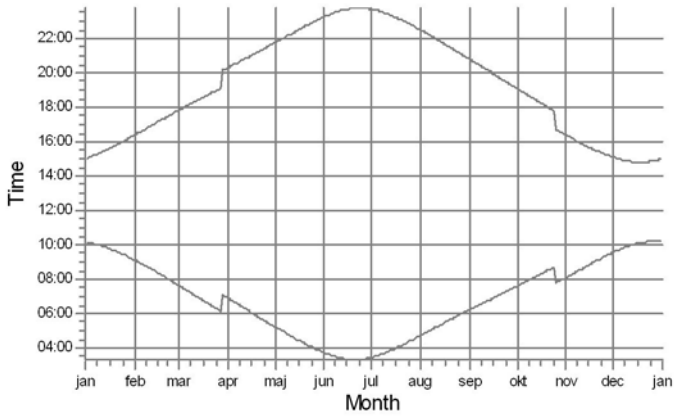
4: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (162)



5: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (155)



6: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (158)



Shadow receptors

RH01: RH01	RH03: RH03	RH05: RH05	RH09: RH09
RH02: RH02	RH04: RH04	RH08: RH08	

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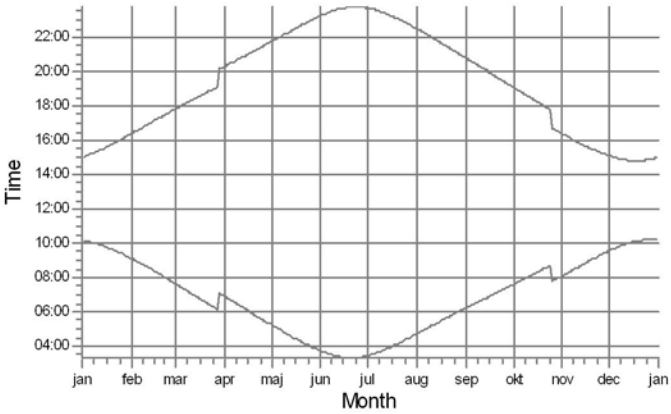
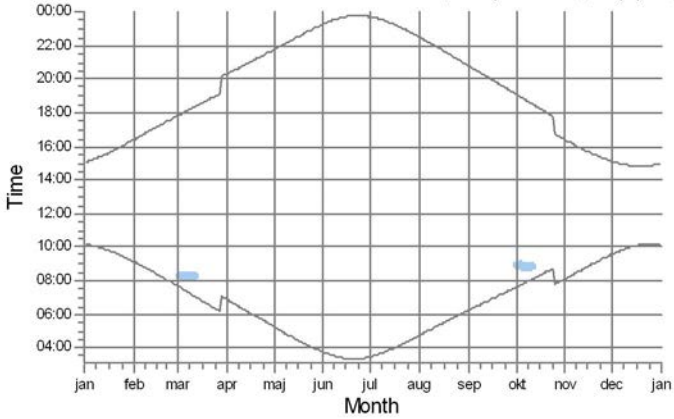
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case

7: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)



8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)



Shadow receptors

RH13: RH13

Project:
Söderskogen

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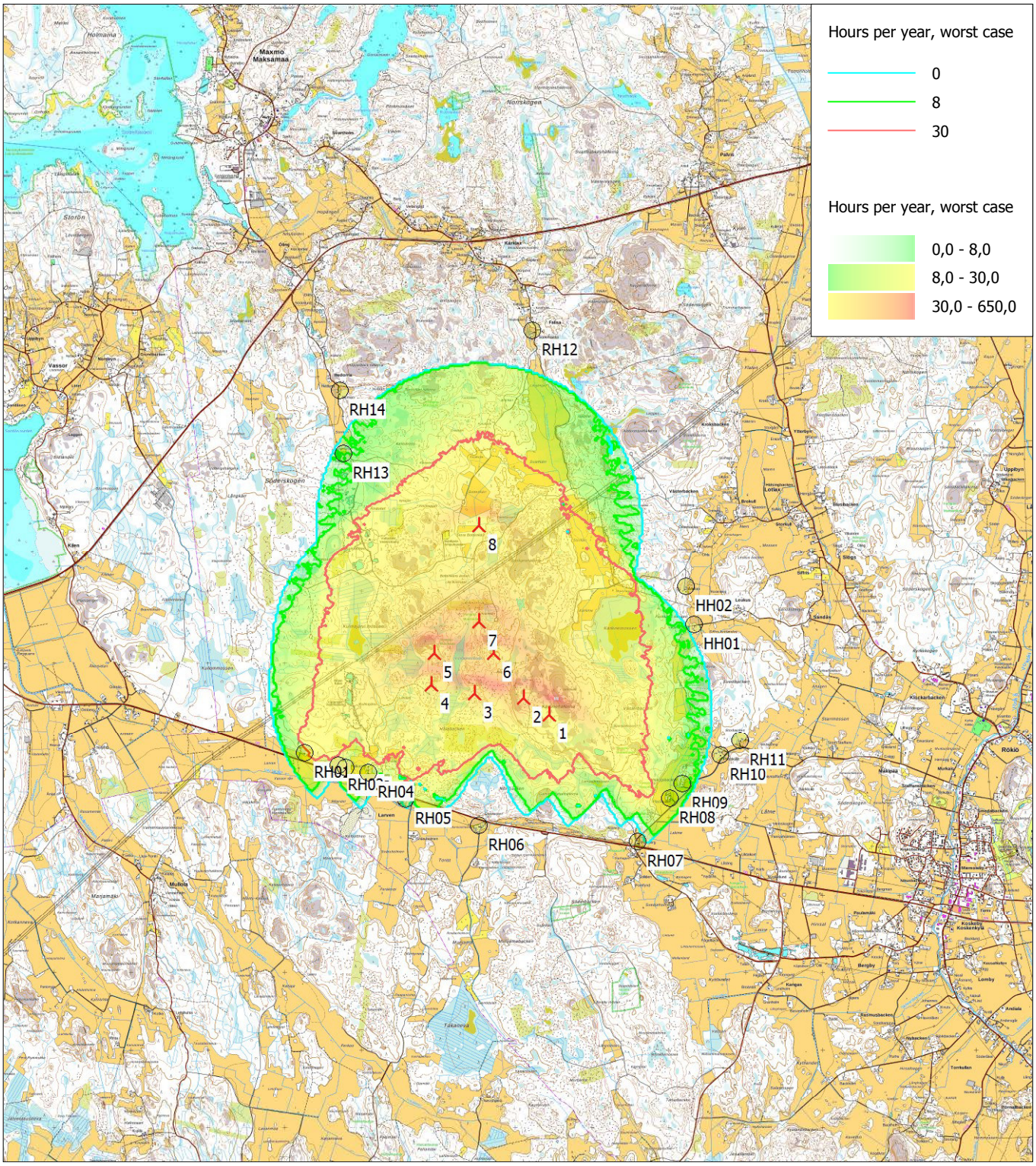
SHADOW - Map

Calculation: MP Proposal, 8xF180 @210m, Worst case



0 1 2 3 4 km

Map: Söde_Background map , Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 254 310 North: 7 012 440

New WTG Shadow receptor

Flicker map level: DEM 10m

Liite 3

Mallinnuksen lähtötiedot ja tulokset,

real case yhteisvaikutukset

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Söderskogen

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Calculated:
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SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

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) [SEINAJOKI]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational hours are calculated from WTGs in calculation and wind distribution:
Finnish Wind Atlas (gp=30279, lat=63.153, lon=22.140)

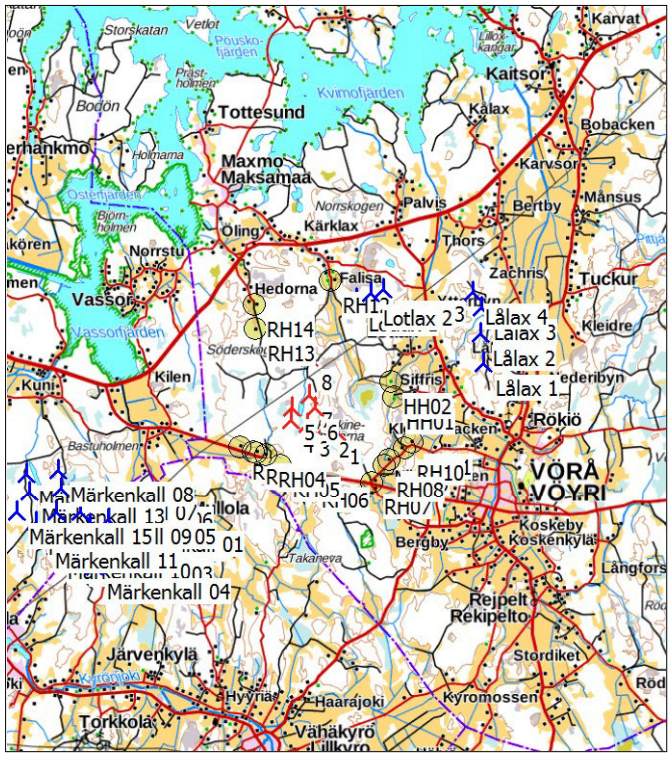
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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: DEM 10m
Obstacles not 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 1:250 000
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	255445	7011327	46,5	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
2	255108	7011549	50,2	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
3	254469	7011599	26,6	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
4	253911	7011714	27,9	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
5	253946	7012128	33,9	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
6	254714	7012124	38,4	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
7	254523	7012536	35,6	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
8	254528	7013790	19,2	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
Lotlax 1	256101	7015730	27,0	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lotlax 2	256560	7015928	33,2	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lotlax 3	256964	7016058	30,0	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lålax 1	260278	7013601	21,1	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 2	260174	7014579	28,5	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 3	260216	7015429	20,8	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 4	259924	7015937	27,7	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Märkenkall 01	247894	7008402	21,5	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 02	247294	7008259	25,0	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 03	246855	7007441	24,7	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 04	247445	7006854	25,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 05	246950	7008670	26,1	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 06	246864	7009208	21,0	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 07	246326	7009461	17,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 08	246247	7010081	20,5	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 09	246160	7008681	29,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 10	246126	7007532	23,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 11	245712	7007870	13,7	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 12	245517	7008318	15,8	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 13	245281	7009344	17,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 14	245200	7009948	18,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 15	244881	7008680	14,1	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0

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Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

Shadow receptor-Input

No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
HH01	HH01	257331	7012499	17,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
HH02	HH02	257219	7012995	17,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH01	RH01	252257	7010823	13,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH02	RH02	252700	7010660	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH03	RH03	252789	7010635	14,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH04	RH04	253090	7010568	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH05	RH05	253574	7010222	14,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH06	RH06	254528	7009881	18,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH07	RH07	256594	7009667	21,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH08	RH08	257015	7010236	19,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH09	RH09	257177	7010423	17,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH10	RH10	257669	7010798	18,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH11	RH11	257929	7010986	18,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH12	RH12	255219	7016333	14,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH13	RH13	252762	7014727	25,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH14	RH14	252714	7015547	21,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0

Calculation Results

Shadow receptor

		Shadow, worst case			**Shadow, expected values**
No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
HH01	HH01	0:00	0	0:00	0:00
HH02	HH02	0:00	0	0:00	0:00
RH01	RH01	18:38	64	0:24	5:33
RH02	RH02	19:14	75	0:22	5:43
RH03	RH03	19:17	70	0:23	5:45
RH04	RH04	19:03	53	0:26	5:35
RH05	RH05	6:44	31	0:17	1:58
RH06	RH06	0:00	0	0:00	0:00
RH07	RH07	0:00	0	0:00	0:00
RH08	RH08	15:43	53	0:23	4:12
RH09	RH09	11:01	38	0:22	2:45
RH10	RH10	0:00	0	0:00	0:00
RH11	RH11	0:00	0	0:00	0:00
RH12	RH12	20:37	67	0:28	3:47
RH13	RH13	7:13	26	0:21	1:13
RH14	RH14	0:00	0	0:00	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)	26:44	6:57
2	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)	6:44	1:58
3	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)	44:06	13:03
4	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)	23:26	6:57
5	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)	0:00	0:00
6	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)	0:00	0:00
7	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)	0:00	0:00
8	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)	7:13	1:13
Lotlax 1	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)	10:56	1:52
Lotlax 2	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)	6:07	1:11
Lotlax 3	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)	3:34	0:43
Lålax 1	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)	0:00	0:00
Lålax 2	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)	0:00	0:00
Lålax 3	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)	0:00	0:00
Lålax 4	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)	0:00	0:00
Märkenkall 01	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (223)	0:00	0:00
Märkenkall 02	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (230)	0:00	0:00
Märkenkall 03	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (231)	0:00	0:00
Märkenkall 04	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (232)	0:00	0:00

To be continued on next page...

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Calculated:
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SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
Märkenkall 05	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (233)	0:00	0:00
Märkenkall 06	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (234)	0:00	0:00
Märkenkall 07	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (235)	0:00	0:00
Märkenkall 08	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (236)	0:00	0:00
Märkenkall 09	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (237)	0:00	0:00
Märkenkall 10	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (224)	0:00	0:00
Märkenkall 11	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (225)	0:00	0:00
Märkenkall 12	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (226)	0:00	0:00
Märkenkall 13	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (227)	0:00	0:00
Märkenkall 14	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (228)	0:00	0:00
Märkenkall 15	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (229)	0:00	0:00

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** HH01 - HH01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:51
12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
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	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:50
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	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:54	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** HH02 - HH02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
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8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
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10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
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	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
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	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:49
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:51
26	09:24	07:50	06:16	05:31	03:59	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
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	16:11	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
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31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH01 - RH01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May			June			July			August			September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:32 (4)	03:29			04:45		05:44 (4)	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46			23:16	18	05:50 (4)	23:42			22:29	12	05:56 (4)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:32 (4)	03:31		05:46 (4)	04:48		05:46 (4)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	17	05:49 (4)	23:40	3	05:49 (4)	22:26	8	05:54 (4)	20:45	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:33 (4)	03:32		05:44 (4)	04:51			06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	16	05:49 (4)	23:39	6	05:50 (4)	22:23			20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:40		05:34 (4)	03:34		05:43 (4)	04:54			06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	15	05:49 (4)	23:38	8	05:51 (4)	22:20			20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		05:34 (4)	03:36		05:42 (4)	04:57			06:26	07:49	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	14	05:48 (4)	23:36	10	05:52 (4)	22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		05:35 (4)	03:37		05:42 (4)	05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	12	05:47 (4)	23:35	12	05:54 (4)	22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		05:36 (4)	03:39		05:41 (4)	05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	11	05:47 (4)	23:33	13	05:54 (4)	22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		05:37 (4)	03:41		05:41 (4)	05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	9	05:46 (4)	23:31	14	05:55 (4)	22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		05:38 (4)	03:44		05:40 (4)	05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	7	05:45 (4)	23:29	16	05:56 (4)	22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:39 (4)	03:29		05:39 (4)	03:46		05:40 (4)	05:12			06:40	08:03	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	2	05:41 (4)	23:35	5	05:44 (4)	23:27	17	05:57 (4)	22:01			20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:34 (4)	03:28			03:48		05:40 (4)	05:15			06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	10	05:44 (4)	23:36			23:25	18	05:58 (4)	21:58			20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:33 (4)	03:27			03:50		05:40 (4)	05:18			06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	14	05:47 (4)	23:38			23:23	18	05:58 (4)	21:55			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:31 (4)	03:26			03:53		05:39 (4)	05:21			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	16	05:47 (4)	23:39			23:21	20	05:59 (4)	21:51			20:07	18:25	15:48	14:51
14	09:52	08:29	06:57	06:11	04:34		05:31 (4)	03:25			03:55		05:38 (4)	05:24			06:51	08:14	08:47	10:03
	15:31	17:05	18:28	20:56	22:25	18	05:49 (4)	23:41			23:19	21	05:59 (4)	21:48			20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (4)	03:24			03:58		05:38 (4)	05:27			06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	20	05:49 (4)	23:42			23:16	21	05:59 (4)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:05	04:28		05:29 (4)	03:23			04:00		05:38 (4)	05:30			06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	21	05:50 (4)	23:43			23:14	22	06:00 (4)	21:42			19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:28 (4)	03:23			04:03		05:38 (4)	05:32			06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	22	05:50 (4)	23:44			23:11	22	06:00 (4)	21:38			19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:28 (4)	03:22			04:06		05:39 (4)	05:35			07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23	05:51 (4)	23:45			23:09	22	06:01 (4)	21:35			19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:28 (4)	03:22			04:08		05:38 (4)	05:38			07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23	05:51 (4)	23:45			23:06	23	06:01 (4)	21:32			19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:27 (4)	03:22			04:11		05:38 (4)	05:41			07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	24	05:51 (4)	23:46			23:04	23	06:01 (4)	21:28			19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:28 (4)	03:22			04:14		05:38 (4)	05:44			07:10	08:34	09:08	10:11
	15:51	17:26	18:48	21:17	22:46	23	05:51 (4)	23:46			23:01	23	06:01 (4)	21:25			19:40	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11		05:28 (4)	03:22			04:17		05:38 (4)	05:47			07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23	05:51 (4)	23:46			22:58	23	06:01 (4)	21:22			19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:28 (4)	03:22			04:19		05:39 (4)	05:50			07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23	05:51 (4)	23:46			22:56	23	06:02 (4)	21:18			19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:28 (4)	03:22			04:22		05:38 (4)	05:53			07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23	05:51 (4)	23:46			22:53	24	06:02 (4)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:28 (4)	03:23			04:25		05:38 (4)	05:55			07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23	05:51 (4)	23:46			22:50	23	06:01 (4)	21:12			19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:29 (4)	03:24			04:28		05:39 (4)	05:58			07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	22	05:51 (4)	23:46			22:47	22	06:01 (4)	21:08			19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:29 (4)	03:24			04:31		05:39 (4)	06:01			07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	22	05:51 (4)	23:45			22:44	22	06:01 (4)	21:05			19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:29 (4)	03:25			04:34		05:39 (4)	06:04			07:29	07:55	09:28	10:12
	16:12	17:47	19:08	21:37	23:06	21	05:50 (4)	23:44			22:41	21	06:00 (4)	21:01			19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:30 (4)	03:26			04:37		05:41 (4)	06:07			07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:51 (4)	23:44			22:38	19	06:00 (4)	20:58			19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50		05:30 (4)	03:28			04:40		05:41 (4)	06:10			07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:50 (4)	23:43			22:35	17	05:58 (4)	20:55			19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:31 (4)				04:43		05:43 (4)	06:12				08:04		10:11
	16:21		20:16		23:13	19	05:50 (4)				22:32	15	05:58 (4)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502			392	308	206	151
Total, worst case						433			124			541			20					
Sun reduction						0,49			0,45			0,46			0,42					
Oper. time red.						0,98			0,98			0,98			0,98					
Wind dir. red.						0,65			0,65			0,65			0,65					
Total reduction						0,31			0,29			0,29			0,27					
Total, real						134			36			159			5					

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH02 - RH02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:37 (3)	03:29		04:53 (4)	04:45		05:42 (3)	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16	9	05:46 (3)	23:42	9	05:02 (4)	22:29	16	05:58 (3)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:38 (3)	03:30		04:55 (4)	04:48		05:44 (3)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	6	05:44 (3)	23:40	7	05:02 (4)	22:26	14	05:58 (3)	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42			03:32		04:57 (4)	04:51		05:45 (3)	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21			23:39	3	05:00 (4)	22:23	11	05:56 (3)	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40			03:34			04:54		05:47 (3)	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23			23:38			22:20	7	05:54 (3)	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38			03:36			04:57			06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25			23:36			22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36			03:37			05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27			23:35			22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34			03:39			05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29			23:33			22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31			23:31			22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		05:36 (3)	03:31		03:44			05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10	9	05:45 (3)	23:33		23:29			22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:34 (3)	03:29	04:50 (4)	03:46		05:47 (3)	05:12			06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	12	05:46 (3)	23:35	6	04:56 (4)	23:27	4	05:51 (3)	22:01		20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:32 (3)	03:28		04:50 (4)	03:48		05:45 (3)	05:15		06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	15	05:47 (3)	23:36	8	04:58 (4)	23:25	8	05:53 (3)	21:58		20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:32 (3)	03:27		04:49 (4)	03:50		05:44 (3)	05:18		06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	17	05:49 (3)	23:38	10	04:59 (4)	23:23	11	05:55 (3)	21:55		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:30 (3)	03:26		04:48 (4)	03:53		05:42 (3)	05:21		06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	19	05:49 (3)	23:39	11	04:59 (4)	23:21	13	05:55 (3)	21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:30 (3)	03:25		04:48 (4)	03:55		05:42 (3)	05:24		06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	20	05:50 (3)	23:41	12	05:00 (4)	23:19	14	05:56 (3)	21:48		20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (3)	03:24		04:47 (4)	03:58		05:41 (3)	05:27		06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	21	05:50 (3)	23:42	13	05:00 (4)	23:16	16	05:57 (3)	21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:29 (3)	03:23		04:47 (4)	04:00		05:41 (3)	05:30		06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	22	05:51 (3)	23:43	14	05:01 (4)	23:14	17	05:58 (3)	21:42		19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:29 (3)	03:23		04:48 (4)	04:03		05:40 (3)	05:32		06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	21	05:50 (3)	23:44	14	05:02 (4)	23:11	18	05:58 (3)	21:38		19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:29 (3)	03:22		04:48 (4)	04:06		05:41 (3)	05:35		07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	22	05:51 (3)	23:44	14	05:02 (4)	23:09	19	06:00 (3)	21:35		19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:29 (3)	03:22		04:48 (4)	04:08		05:40 (3)	05:38		07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	22	05:51 (3)	23:45	15	05:03 (4)	23:06	20	06:00 (3)	21:32		19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:29 (3)	03:22		04:48 (4)	04:11		05:40 (3)	05:41		07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	21	05:50 (3)	23:46	15	05:03 (4)	23:04	20	06:00 (3)	21:28		19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:29 (3)	03:22		04:48 (4)	04:14		05:40 (3)	05:44		07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:51 (3)	23:46	15	05:03 (4)	23:01	21	06:01 (3)	21:25		19:39	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11		05:29 (3)	03:22		04:48 (4)	04:17		05:39 (3)	05:47		07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:51 (3)	23:46	15	05:03 (4)	22:58	22	06:01 (3)	21:22		19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:30 (3)	03:22		04:49 (4)	04:19		05:40 (3)	05:50		07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	20	05:50 (3)	23:46	15	05:04 (4)	22:56	22	06:02 (3)	21:18		19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:30 (3)	03:22		04:49 (4)	04:22		05:40 (3)	05:53		07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	20	05:50 (3)	23:46	15	05:04 (4)	22:53	21	06:01 (3)	21:15		19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:31 (3)	03:23		04:49 (4)	04:25		05:39 (3)	05:55		07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	19	05:50 (3)	23:46	14	05:03 (4)	22:50	22	06:01 (3)	21:12		19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:31 (3)	03:24		04:50 (4)	04:28		05:40 (3)	05:58		07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	19	05:50 (3)	23:45	14	05:04 (4)	22:47	22	06:02 (3)	21:08		19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:32 (3)	03:24		04:50 (4)	04:31		05:40 (3)	06:01		07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	17	05:49 (3)	23:45	14	05:04 (4)	22:44	21	06:01 (3)	21:05		19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:32 (3)	03:25		04:51 (4)	04:34		05:40 (3)	06:04		07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	16	05:48 (3)	23:44	13	05:04 (4)	22:41	21	06:01 (3)	21:01		19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:34 (3)	03:26		04:51 (4)	04:37		05:41 (3)	06:07		07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	14	05:48 (3)	23:44	12	05:03 (4)	22:38	20	06:01 (3)	20:58		19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50		05:34 (3)	03:28		04:52 (4)	04:40		05:41 (3)	06:09		07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	13	05:47 (3)	23:43	10	05:02 (4)	22:35	19	06:00 (3)	20:55		19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:35 (3)				04:43		05:42 (3)	06:12			08:04		10:11
	16:21		20:16		23:13	11	05:46 (3)				22:32	18	06:00 (3)	20:51			16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502		392	308	206	151
Total, worst case						414			284			408			48				
Sun reduction						0,49			0,45			0,46			0,42				
Oper. time red.						0,98			0,98			0,98			0,98				
Wind dir. red.						0,65			0,66			0,65			0,65				
Total reduction						0,31			0,29			0,29			0,27				
Total, real						128			83			120			13				

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi

Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH03 - RH03

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:25 (3)	03:29		05:35 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:44 (3)	23:42	9	05:44 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:25 (3)	03:30		05:36 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	18	05:43 (3)	23:40	10	05:46 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:26 (3)	03:32		05:35 (3)	04:51	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	18	05:44 (3)	23:39	12	05:47 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		05:26 (3)	03:34		05:34 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	18	05:44 (3)	23:38	13	05:47 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		05:26 (3)	03:36		05:34 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	17	05:43 (3)	23:36	14	05:48 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		05:27 (3)	03:37		05:34 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	16	05:43 (3)	23:35	15	05:49 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		05:28 (3)	03:39		05:33 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	14	05:42 (3)	23:33	16	05:49 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		05:29 (3)	03:41		05:33 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	13	05:42 (3)	23:31	17	05:50 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		05:29 (3)	03:44		05:32 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	12	05:41 (3)	23:29	18	05:50 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		05:30 (3)	03:46		05:33 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	11	05:41 (3)	23:27	18	05:51 (3)	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43			03:28		05:32 (3)	03:48		05:33 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	9	05:41 (3)	23:25	19	05:52 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:30 (3)	03:27		05:32 (3)	03:50		05:33 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	6	05:36 (3)	23:38	8	05:40 (3)	23:23	20	05:53 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:27 (3)	03:26		05:33 (3)	03:53		05:32 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	11	05:38 (3)	23:39	6	05:39 (3)	23:21	20	05:52 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:26 (3)	03:25		05:34 (3)	03:55		05:32 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	14	05:40 (3)	23:41	5	05:39 (3)	23:19	21	05:53 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:25 (3)	03:24		05:35 (3)	03:58		05:31 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	16	05:41 (3)	23:42	3	05:38 (3)	23:16	22	05:53 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:24 (3)	03:23			04:00		05:31 (3)	05:30	06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	18	05:42 (3)	23:43			23:14	22	05:53 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:23 (3)	03:23			04:03		05:31 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	19	05:42 (3)	23:44			23:11	23	05:54 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:23 (3)	03:22			04:06		05:31 (3)	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	20	05:43 (3)	23:44			23:09	23	05:54 (3)	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:23 (3)	03:22			04:08		05:32 (3)	05:38	07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	21	05:44 (3)	23:45			23:06	23	05:55 (3)	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16		05:22 (3)	03:22			04:11		05:32 (3)	05:41	07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	22	05:44 (3)	23:46			23:04	23	05:55 (3)	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14		05:22 (3)	03:22			04:14		05:32 (3)	05:44	07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:44 (3)	23:46			23:01	23	05:55 (3)	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11		05:22 (3)	03:22			04:17		05:32 (3)	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:44 (3)	23:46			22:58	22	05:54 (3)	21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:22 (3)	03:22			04:19		05:33 (3)	05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23	05:45 (3)	23:46			22:56	22	05:55 (3)	21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:22 (3)	03:22			04:22		05:33 (3)	05:53	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23	05:45 (3)	23:46			22:53	21	05:54 (3)	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:22 (3)	03:23			04:25		05:33 (3)	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23	05:45 (3)	23:46			22:50	21	05:54 (3)	21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:22 (3)	03:24			04:28		05:33 (3)	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23	05:45 (3)	23:45			22:47	20	05:53 (3)	21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:22 (3)	03:24		05:39 (3)	04:31		05:34 (3)	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23	05:45 (3)	23:45	1	05:40 (3)	22:44	19	05:53 (3)	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:22 (3)	03:25		05:38 (3)	04:34		05:34 (3)	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	22	05:44 (3)	23:44	4	05:42 (3)	22:41	18	05:52 (3)	21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:24 (3)	03:26		05:36 (3)	04:37		05:36 (3)	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:45 (3)	23:44	6	05:42 (3)	22:38	16	05:52 (3)	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:24 (3)	03:28		05:36 (3)	04:40		05:37 (3)	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:44 (3)	23:43	7	05:43 (3)	22:35	13	05:50 (3)	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:24 (3)				04:43		05:39 (3)	06:12		08:04		10:11
	16:21		20:16		23:13	20	05:44 (3)				22:32	10	05:49 (3)	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						389			205			563						
Sun reduction						0,49			0,45			0,46						
Oper. time red.						0,98			0,98			0,98						
Wind dir. red.						0,65			0,65			0,65						
Total reduction						0,31			0,29			0,30						
Total, real						121			59			166						

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi

Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH04 - RH04

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:55	05:15			03:46		04:59 (3)	03:29		05:01 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:18 (3)	23:42	25	05:26 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		04:58 (3)	03:30		05:03 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	20	05:18 (3)	23:40	24	05:27 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:41		04:58 (3)	03:32		05:03 (3)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:25	21:52			23:21	21	05:19 (3)	23:39	24	05:27 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		04:58 (3)	03:34		05:03 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	22	05:20 (3)	23:38	24	05:27 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		04:57 (3)	03:35		05:03 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	23	05:20 (3)	23:36	23	05:26 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		04:57 (3)	03:37		05:04 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	23	05:20 (3)	23:35	23	05:27 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		04:57 (3)	03:39		05:04 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	24	05:21 (3)	23:33	22	05:26 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		04:57 (3)	03:41		05:05 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	24	05:21 (3)	23:31	22	05:27 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		04:57 (3)	03:44		05:05 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	24	05:21 (3)	23:29	21	05:26 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		04:57 (3)	03:46		05:05 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	25	05:22 (3)	23:27	21	05:26 (3)	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43			03:28		04:58 (3)	03:48		05:06 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	25	05:23 (3)	23:25	20	05:26 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40			03:27		04:58 (3)	03:50		05:07 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19			23:38	25	05:23 (3)	23:23	19	05:26 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37			03:26		04:58 (3)	03:53		05:07 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22			23:39	25	05:23 (3)	23:21	17	05:24 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34			03:25		04:58 (3)	03:55		05:08 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25			23:41	25	05:23 (3)	23:19	16	05:24 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31			03:24		04:58 (3)	03:58		05:09 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28			23:42	25	05:23 (3)	23:16	14	05:23 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28			03:23		04:58 (3)	04:00		05:11 (3)	05:29	06:56	08:20	08:52	10:06
	15:36	17:11	18:34	21:02	22:31			23:43	26	05:24 (3)	23:14	11	05:22 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25			03:23		04:59 (3)	04:03		05:13 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34			23:44	25	05:24 (3)	23:11	7	05:20 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22			03:22		04:59 (3)	04:06			05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37			23:44	25	05:24 (3)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19			03:22		04:59 (3)	04:08			05:38	07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40			23:45	26	05:25 (3)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16			03:22		04:59 (3)	04:11			05:41	07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43			23:46	26	05:25 (3)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13			03:22		04:59 (3)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46			23:46	26	05:25 (3)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11			03:22		04:59 (3)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49			23:46	26	05:25 (3)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08			03:22		04:59 (3)	04:19			05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52			23:46	26	05:25 (3)	22:56			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05			03:22		05:00 (3)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55			23:46	26	05:26 (3)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03			03:23		05:00 (3)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57			23:46	25	05:25 (3)	22:50			21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:05 (3)	03:24		05:00 (3)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	5	05:10 (3)	23:45	26	05:26 (3)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:03 (3)	03:24		05:01 (3)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	9	05:12 (3)	23:45	25	05:26 (3)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:01 (3)	03:25		05:01 (3)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	13	05:14 (3)	23:44	26	05:27 (3)	22:41			21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:01 (3)	03:26		05:01 (3)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	15	05:16 (3)	23:43	25	05:26 (3)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:00 (3)	03:28		05:01 (3)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	16	05:16 (3)	23:43	25	05:26 (3)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:59 (3)				04:43			06:12		08:04		10:11
	16:21		20:16		23:13	18	05:17 (3)				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						76			734			333						
Sun reduction						0,49			0,45			0,46						
Oper. time red.						0,98			0,98			0,98						
Wind dir. red.						0,66			0,66			0,66						
Total reduction						0,31			0,29			0,30						
Total, real						24			213			99						

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH05 - RH05

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June			July			August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46			03:29		04:50 (2)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16			23:41	13	05:03 (2)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44			03:30		04:51 (2)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49	23:18			23:40	12	05:03 (2)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41			03:32		04:52 (2)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20			23:39	11	05:03 (2)	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39			03:34		04:53 (2)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23			23:38	9	05:02 (2)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38			03:35		04:53 (2)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25			23:36	8	05:01 (2)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59	03:36		04:50 (2)	03:37		04:56 (2)	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	3	04:53 (2)	23:35	5	05:01 (2)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34		04:48 (2)	03:39			05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	7	04:55 (2)	23:33			22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32		04:48 (2)	03:41			05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	9	04:57 (2)	23:31			22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31		04:47 (2)	03:44			05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	10	04:57 (2)	23:29			22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29		04:46 (2)	03:46			05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:44	22:13	23:35	12	04:58 (2)	23:27			22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28		04:46 (2)	03:48			05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	13	04:59 (2)	23:25			21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27		04:46 (2)	03:50			05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	14	05:00 (2)	23:23			21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	03:26		04:46 (2)	03:53			05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	14	05:00 (2)	23:21			21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25		04:46 (2)	03:55			05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:41	15	05:01 (2)	23:19			21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24		04:46 (2)	03:58			05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	15	05:01 (2)	23:16			21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23		04:46 (2)	04:00			05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:34	21:02	22:31	23:43	15	05:01 (2)	23:14			21:41	19:57	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23		04:46 (2)	04:03			05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	16	05:02 (2)	23:11			21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22		04:46 (2)	04:06			05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	16	05:02 (2)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22		04:47 (2)	04:08			05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	16	05:03 (2)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22		04:47 (2)	04:11			05:41	07:07	08:31	09:04	10:10
	15:48	17:23	18:45	21:13	22:43	23:45	16	05:03 (2)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22		04:47 (2)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	16	05:03 (2)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22		04:47 (2)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23:46	16	05:03 (2)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22		04:47 (2)	04:19			05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	16	05:03 (2)	22:55			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22		04:47 (2)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	17	05:04 (2)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23		04:47 (2)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	16	05:03 (2)	22:50			21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24		04:48 (2)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	16	05:04 (2)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:24		04:49 (2)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	15	05:04 (2)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25		04:49 (2)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	15	05:04 (2)	22:41			21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26		04:49 (2)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	14	05:03 (2)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28		04:49 (2)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	14	05:03 (2)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48				04:42			06:12		08:04		10:11
	16:21		20:16		23:13				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605			594			502	392	308	206	151
Total, worst case							346			58						
Sun reduction							0,45			0,46						
Oper. time red.							0,98			0,98						
Wind dir. red.							0,66			0,66						
Total reduction							0,29			0,30						
Total, real							101			17						

Table 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:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH06 - RH06

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:01
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	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	23:25	21:58	20:14	18:31	15:54	14:52
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	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:26	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:27	06:53	08:17	08:49	10:04
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16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23	04:03	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:43	23:11	21:38	19:53	18:12	15:38	14:49
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	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22	04:11	05:41	07:07	08:31	09:04	10:09
	15:48	17:23	18:45	21:13	22:43	23:45	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22	04:14	05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22	04:17	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24	04:28	05:58	07:23	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:28	03:58	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26	04:37	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28	04:40	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH07 - RH07

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:46	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:22	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:13	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:20	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:23	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:58	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:42	23:13	21:41	19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:07
	15:42	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:08
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13	03:21	04:14	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:45	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:11	03:22	04:16	05:47	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:11
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:51
25	09:26	07:53	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:45	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:31	06:01	07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:02	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:00	09:32	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH08 - RH08

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:40	06:55	05:14		03:45	21:01 (1)	03:29		04:45	21:07 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46		23:15	11 21:12 (1)	23:41		22:29	18 21:25 (1)	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11		03:43	21:03 (1)	03:30		04:48	21:08 (1)	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49		23:18	8 21:11 (1)	23:40		22:26	16 21:24 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08		03:41	21:06 (1)	03:32		04:51	21:10 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52		23:20	4 21:10 (1)	23:39		22:23	13 21:23 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05		03:39		03:33		04:54	21:11 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55		23:23		23:37		22:20	10 21:21 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:01		03:37		03:35		04:57		06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58		23:25		23:36		22:17		20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58		03:35		03:37		05:00		06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01		23:27		23:34		22:13		20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55		03:34		03:39		05:03		06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04		23:29		23:33		22:10		20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	21:03 (1)	03:32		03:41		05:06		06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	6 21:09 (1)	23:31		23:31		22:07		20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	21:00 (1)	03:30		03:43		05:09		06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	11 21:11 (1)	23:33		23:29		22:04		20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	20:59 (1)	03:29		03:45	21:12 (1)	05:12		06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	15 21:14 (1)	23:34		23:27	6 21:18 (1)	22:01		20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	20:57 (1)	03:28		03:48	21:11 (1)	05:15		06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	17 21:14 (1)	23:36		23:25	9 21:20 (1)	21:58		20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40	20:56 (1)	03:26		03:50	21:09 (1)	05:18		06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	19 21:15 (1)	23:38		23:23	12 21:21 (1)	21:54		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	20:56 (1)	03:25		03:52	21:08 (1)	05:20		06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	20 21:16 (1)	23:39		23:21	14 21:22 (1)	21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	20:55 (1)	03:24		03:55	21:08 (1)	05:23		06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	21 21:16 (1)	23:40		23:18	15 21:23 (1)	21:48		20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	20:55 (1)	03:24		03:57	21:07 (1)	05:26		06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	22 21:17 (1)	23:41		23:16	17 21:24 (1)	21:45		20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28	20:54 (1)	03:23		04:00	21:07 (1)	05:29		06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23 21:17 (1)	23:42		23:14	18 21:25 (1)	21:41		19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25	20:54 (1)	03:22		04:03	21:06 (1)	05:32		06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23 21:17 (1)	23:43		23:11	19 21:25 (1)	21:38		19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22	20:55 (1)	03:22		04:05	21:06 (1)	05:35		07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23 21:18 (1)	23:44		23:09	20 21:26 (1)	21:35		19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	20:54 (1)	03:21		04:08	21:05 (1)	05:38		07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23 21:17 (1)	23:45		23:06	21 21:26 (1)	21:31		19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	20:54 (1)	03:21		04:11	21:05 (1)	05:41		07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23 21:17 (1)	23:45		23:03	21 21:26 (1)	21:28		19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13	20:55 (1)	03:21		04:13	21:05 (1)	05:44		07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	22 21:17 (1)	23:46		23:01	22 21:27 (1)	21:25		19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	20:55 (1)	03:21		04:16	21:05 (1)	05:46		07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	22 21:17 (1)	23:46		22:58	22 21:27 (1)	21:21		19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	20:56 (1)	03:22		04:19	21:05 (1)	05:49		07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	21 21:17 (1)	23:46		22:55	22 21:27 (1)	21:18		19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	20:56 (1)	03:22		04:22	21:04 (1)	05:52		07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	21 21:17 (1)	23:46		22:52	23 21:27 (1)	21:15		19:29	17:49	15:20	14:51
25	09:27	07:53	06:19	05:34	04:02	20:56 (1)	03:23		04:25	21:05 (1)	05:55		07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	21 21:17 (1)	23:45		22:50	23 21:28 (1)	21:11		19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	20:57 (1)	03:23		04:28	21:05 (1)	05:58		07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	19 21:16 (1)	23:45		22:47	22 21:27 (1)	21:08		19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57	20:57 (1)	03:24		04:31	21:05 (1)	06:01		07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:03	19 21:16 (1)	23:45		22:44	23 21:28 (1)	21:04		19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	20:58 (1)	03:25		04:33	21:05 (1)	06:04		07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	17 21:15 (1)	23:44		22:41	22 21:27 (1)	21:01		19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	20:59 (1)	03:26		04:36	21:05 (1)	06:06		07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	15 21:14 (1)	23:43		22:38	22 21:27 (1)	20:58		19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	21:00 (1)	03:27		04:39	21:06 (1)	06:09		07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	14 21:14 (1)	23:42		22:35	21 21:27 (1)	20:54		19:08	16:30	15:07	14:57
31	09:10		06:59		03:48	21:01 (1)			04:42	21:06 (1)	06:12			08:03		10:10
	16:21		20:16		23:13	12 21:13 (1)			22:32	20 21:26 (1)	20:51			16:27		14:59
Potential sun hours	182	242	363	447	559		605		594		502		392	308	206	151
Total, worst case						449		23		414		57				
Sun reduction						0,49		0,45		0,46		0,42				
Oper. time red.						0,98		0,98		0,98		0,98				
Wind dir. red.						0,58		0,58		0,58		0,58				
Total reduction						0,28		0,26		0,26		0,24				
Total, real						124		6		109		14				

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

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

Project:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH09 - RH09

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April			May			June			July			August			September	October	November	December
1	10:10	09:08	07:40	06:55			05:14			20:31 (1)	03:45		03:29			04:45			20:40 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19			21:46	18		20:49 (1)	23:15		23:41			22:29	18		20:58 (1)	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52			05:11			20:30 (1)	03:43		03:30			04:48			20:39 (1)	06:18	07:40	08:09	09:38
	15:02	16:27	17:53	20:21			21:49	19		20:49 (1)	23:18		23:40			22:26	20		20:59 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48			05:08			20:29 (1)	03:41		03:32			04:51			20:39 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24			21:52	21		20:50 (1)	23:20		23:39			22:23	20		20:59 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45			05:05			20:28 (1)	03:39		03:33			04:54			20:38 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27			21:55	22		20:50 (1)	23:23		23:37			22:20	21		20:59 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41			05:01			20:28 (1)	03:37		03:35			04:57			20:38 (1)	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30			21:58	22		20:50 (1)	23:25		23:36			22:17	22		21:00 (1)	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38			04:58			20:28 (1)	03:35		03:37			05:00			20:37 (1)	06:29	07:51	08:22	09:47
	15:10	16:40	18:05	20:33			22:01	22		20:50 (1)	23:27		23:34			22:13	22		20:59 (1)	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35			04:55			20:28 (1)	03:34		03:39			05:03			20:38 (1)	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36			22:04	22		20:50 (1)	23:29		23:33			22:10	22		21:00 (1)	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31			04:52			20:28 (1)	03:32		03:41			05:06			20:37 (1)	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38			22:07	22		20:50 (1)	23:31		23:31			22:07	22		20:59 (1)	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28			04:49			20:28 (1)	03:30		03:43			05:09			20:38 (1)	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41			22:10	21		20:49 (1)	23:33		23:29			22:04	21		20:59 (1)	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24			04:46			20:29 (1)	03:29		03:45			05:12			20:38 (1)	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44			22:13	20		20:49 (1)	23:34		23:27			22:01	21		20:59 (1)	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21			04:43			20:29 (1)	03:28		03:48			05:15			20:38 (1)	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47			22:16	19		20:48 (1)	23:36		23:25			21:58	20		20:58 (1)	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18			04:40			20:29 (1)	03:26		03:50			05:17			20:39 (1)	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50			22:19	18		20:47 (1)	23:38		23:23			21:54	18		20:57 (1)	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14			04:36			20:31 (1)	03:25		03:52			05:20			20:40 (1)	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53			22:22	16		20:47 (1)	23:39		23:21			21:51	15		20:55 (1)	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11			04:33			20:32 (1)	03:24		03:55			05:23			20:41 (1)	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56			22:25	13		20:45 (1)	23:40		23:18			21:48	13		20:54 (1)	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:07			04:30			20:34 (1)	03:23		03:57			05:26			20:44 (1)	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59			22:28	10		20:44 (1)	23:41		23:16			21:44	7		20:51 (1)	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04			04:28			20:36 (1)	03:23		04:00			05:29				06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02			22:31	5		20:41 (1)	23:42		23:14			21:41				19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01			04:25				03:22		04:03			05:32				06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04			22:34				23:43		23:11			21:38				19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57			04:22				03:22		04:05			05:35				07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07			22:37				23:44		23:09			21:35				19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54			04:19				03:21		04:08			05:38				07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10			22:40				23:45		23:06			21:31				19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51			04:16				03:21		04:11			05:41				07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13			22:43				23:45		23:03			21:28				19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47			04:13				03:21		04:13			05:44				07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16			22:46				23:46		23:01			21:25				19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44			04:10				03:21		04:16			05:46				07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19			22:49				23:46		22:58			21:21				19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41			04:08				03:22		04:19			05:49				07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22			22:51				23:46		22:55			21:18				19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37			04:05				03:22		04:22			05:52				07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25			22:54				23:46		22:52			21:15				19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34			04:02				03:23		04:25			05:55				07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28			22:57				23:46		22:50			21:11				19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31			04:00				03:23		04:28			05:58				07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31			23:00				23:45		22:47			21:08				19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27			03:57				03:24		04:30			06:01				07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34			23:03				23:45		22:44			21:04				19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24		20:35 (1)	03:55				03:25		04:33		20:45 (1)	06:03				07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	9	20:44 (1)	23:05				23:44		22:41	8	20:53 (1)	21:01				19:15	16:36	15:11	14:54
29	09:16		07:05	05:21		20:33 (1)	03:52				03:26		04:36		20:43 (1)	06:06				07:32	07:57	09:30	10:11
	16:15		20:10	21:40	13	20:46 (1)	23:08				23:43		22:38	12	20:55 (1)	20:58				19:12	16:33	15:09	14:56
30	09:13		07:02	05:18		20:31 (1)	03:50				03:27		04:39		20:42 (1)	06:09				07:34	08:00	09:33	10:11
	16:18		20:13	21:43	16	20:47 (1)	23:10				23:42		22:35	15	20:57 (1)	20:54				19:08	16:30	15:07	14:57
31	09:10		06:59				03:48						04:42		20:41 (1)	06:12					08:03		10:10
	16:21		20:16				23:13						22:32	16	20:57 (1)	20:51					16:26		14:59
Potential sun hours	182	242	363	447			559				605		594			502				392	308	206	151
Total, worst case					38			290						51			282						
Sun reduction					0,44			0,49						0,46			0,42						
Oper. time red.					0,98			0,98						0,98			0,98						
Wind dir. red.					0,56			0,56						0,56			0,56						
Total reduction					0,24			0,27						0,26			0,23						
Total, real					9			78						13			65						

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

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

Project:
Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH10 - RH10

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:
Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH11 - RH11

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:23	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:48	05:14	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:27	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:44	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:06
	15:38	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:47		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February			March			April	May	June
1	10:11	09:08			07:41		08:32 (Lotlax 1)	06:55	05:14	03:45
	15:00	16:24			17:50	24	08:56 (Lotlax 1)	20:19	21:46	23:16
2	10:10	09:05			07:37		08:32 (Lotlax 1)	06:52	05:11	03:43
	15:02	16:27			17:53	25	08:57 (Lotlax 1)	20:22	21:49	23:19
3	10:09	09:02			07:34		08:31 (Lotlax 1)	06:48	05:08	03:41
	15:04	16:30			17:56	25	08:56 (Lotlax 1)	20:24	21:52	23:21
4	10:08	08:59			07:31		08:31 (Lotlax 1)	06:45	05:04	03:39
	15:06	16:33			17:59	26	08:57 (Lotlax 1)	20:27	21:55	23:24
5	10:07	08:57			07:27		08:31 (Lotlax 1)	06:42	05:01	03:37
	15:08	16:36			18:02	25	08:56 (Lotlax 1)	20:30	21:59	23:26
6	10:06	08:54			07:24		08:31 (Lotlax 1)	06:38	04:58	03:35
	15:10	16:40			18:05	25	08:56 (Lotlax 1)	20:33	22:02	23:28
7	10:04	08:51			07:20		08:31 (Lotlax 1)	06:35	04:55	03:33
	15:12	16:43			18:08	23	08:54 (Lotlax 1)	20:36	22:05	23:30
8	10:03	08:48			07:17		08:32 (Lotlax 1)	06:31	04:52	03:31
	15:15	16:46			18:10	22	08:54 (Lotlax 1)	20:39	22:08	23:32
9	10:01	08:45			07:14		08:33 (Lotlax 1)	06:28	04:49	03:30
	15:17	16:49			18:13	19	08:52 (Lotlax 1)	20:42	22:11	23:34
10	10:00	08:42			07:10		08:34 (Lotlax 1)	06:24	04:45	03:28
	15:19	16:52			18:16	16	08:50 (Lotlax 1)	20:45	22:14	23:36
11	09:58	08:38			07:07		08:36 (Lotlax 1)	06:21	04:42	03:27
	15:22	16:55			18:19	11	08:47 (Lotlax 1)	20:47	22:17	23:37
12	09:56	08:35			07:04			06:18	04:39	03:26
	15:25	16:58			18:22			20:50	22:20	23:39
13	09:54	08:32			07:00			06:14	04:36	03:25
	15:27	17:01			18:25			20:53	22:23	23:40
14	09:52	08:29			06:57		07:31 (Lotlax 2)	06:11	04:33	03:24
	15:30	17:05			18:28	10	07:41 (Lotlax 2)	20:56	22:26	23:41
15	09:50	08:26			06:53		07:29 (Lotlax 2)	06:07	04:30	03:23
	15:33	17:08			18:31	14	07:43 (Lotlax 2)	20:59	22:29	23:43
16	09:48	08:23			06:50		07:27 (Lotlax 2)	06:04	04:27	03:22
	15:35	17:11			18:33	16	07:43 (Lotlax 2)	21:02	22:32	23:44
17	09:46	08:20			06:47		07:26 (Lotlax 2)	06:01	04:24	03:21
	15:38	17:14			18:36	18	07:44 (Lotlax 2)	21:05	22:35	23:45
18	09:44	08:16			06:43		07:25 (Lotlax 2)	05:57	04:21	03:21
	15:41	17:17			18:39	19	07:44 (Lotlax 2)	21:08	22:38	23:45
19	09:42	08:13			06:40		07:25 (Lotlax 2)	05:54	04:18	03:21
	15:44	17:20			18:42	19	07:44 (Lotlax 2)	21:11	22:41	23:46
20	09:39	08:10			06:36		07:24 (Lotlax 2)	05:51	04:16	03:20
	15:47	17:23			18:45	19	07:43 (Lotlax 2)	21:14	22:44	23:46
21	09:37	08:07			06:33		07:04 (Lotlax 3)	05:47	04:13	03:20
	15:50	17:26			18:48	21	07:43 (Lotlax 2)	21:17	22:46	23:47
22	09:35	08:04			06:30		07:00 (Lotlax 3)	05:44	04:10	03:21
	15:53	17:29			18:50	25	07:41 (Lotlax 2)	21:20	22:49	23:47
23	09:32	08:00			06:26		06:57 (Lotlax 3)	05:41	04:07	03:21
	15:56	17:32			18:53	28	07:41 (Lotlax 2)	21:22	22:52	23:47
24	09:30	07:57		08:41 (Lotlax 1)	06:23		06:55 (Lotlax 3)	05:37	04:05	03:21
	15:59	17:35	8	08:49 (Lotlax 1)	18:56	26	07:38 (Lotlax 2)	21:25	22:55	23:47
25	09:27	07:54		08:38 (Lotlax 1)	06:19		06:54 (Lotlax 3)	05:34	04:02	03:22
	16:02	17:38	15	08:53 (Lotlax 1)	18:59	22	07:35 (Lotlax 2)	21:28	22:58	23:47
26	09:25	07:50		08:36 (Lotlax 1)	06:16		06:55 (Lotlax 3)	05:31	03:59	03:22
	16:05	17:41	18	08:54 (Lotlax 1)	19:02	15	07:10 (Lotlax 3)	21:31	23:01	23:46
27	09:22	07:47		08:35 (Lotlax 1)	06:12		06:54 (Lotlax 3)	05:27	03:57	03:23
	16:08	17:44	21	08:56 (Lotlax 1)	19:05	14	07:08 (Lotlax 3)	21:34	23:03	23:46
28	09:19	07:44		08:33 (Lotlax 1)	06:09		06:55 (Lotlax 3)	05:24	03:54	03:24
	16:11	17:47	23	08:56 (Lotlax 1)	19:07	13	07:08 (Lotlax 3)	21:37	23:06	23:45
29	09:16				07:06		07:56 (Lotlax 3)	05:21	03:52	03:25
	16:14				20:10	9	08:05 (Lotlax 3)	21:40	23:09	23:44
30	09:14				07:02		08:00 (Lotlax 3)	05:17	03:49	03:27
	16:18				20:13	1	08:01 (Lotlax 3)	21:43	23:11	23:43
31	09:11				06:59				03:47	
	16:21				20:16				23:14	
Potential sun hours	182	242			363			447	559	606
Total, worst case			85			530				
Sun reduction			0,33			0,36				
Oper. time red.			0,98			0,98				
Wind dir. red.			0,58			0,57				
Total reduction			0,19			0,20				
Total, real			16			107				

Table 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:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	July	August	September			October			November	December
1	03:28	04:45	06:15			07:37			08:07	09:36
	23:42	22:30	20:48			19:05			16:23	15:05
2	03:29	04:48	06:18			07:40		09:17 (Lotlax 1)	08:10	09:38
	23:41	22:27	20:44			19:02	8	09:25 (Lotlax 1)	16:20	15:03
3	03:31	04:51	06:20			07:43		09:13 (Lotlax 1)	08:13	09:41
	23:40	22:23	20:41			18:58	14	09:27 (Lotlax 1)	16:17	15:02
4	03:33	04:54	06:23			07:46		09:11 (Lotlax 1)	08:16	09:43
	23:38	22:20	20:38			18:55	18	09:29 (Lotlax 1)	16:14	15:00
5	03:34	04:57	06:26			07:48		09:09 (Lotlax 1)	08:19	09:46
	23:37	22:17	20:34			18:52	21	09:30 (Lotlax 1)	16:11	14:58
6	03:36	05:00	06:29			07:51		09:08 (Lotlax 1)	08:22	09:48
	23:35	22:14	20:31			18:48	23	09:31 (Lotlax 1)	16:08	14:57
7	03:38	05:03	06:31			07:54		09:07 (Lotlax 1)	08:25	09:50
	23:34	22:11	20:27			18:45	24	09:31 (Lotlax 1)	16:05	14:56
8	03:40	05:06	06:34			07:57		09:07 (Lotlax 1)	08:28	09:52
	23:32	22:08	20:24			18:41	24	09:31 (Lotlax 1)	16:02	14:54
9	03:43	05:08	06:37			08:00		09:06 (Lotlax 1)	08:31	09:54
	23:30	22:05	20:21			18:38	25	09:31 (Lotlax 1)	15:59	14:53
10	03:45	05:11	06:40			08:02		09:06 (Lotlax 1)	08:34	09:56
	23:28	22:01	20:17			18:35	25	09:31 (Lotlax 1)	15:56	14:52
11	03:47	05:14	06:42			08:05		09:06 (Lotlax 1)	08:38	09:58
	23:26	21:58	20:14			18:31	25	09:31 (Lotlax 1)	15:54	14:51
12	03:49	05:17	06:45			08:08		09:06 (Lotlax 1)	08:41	10:00
	23:24	21:55	20:10			18:28	24	09:30 (Lotlax 1)	15:51	14:50
13	03:52	05:20	06:48			08:11		09:06 (Lotlax 1)	08:44	10:02
	23:21	21:52	20:07			18:25	23	09:29 (Lotlax 1)	15:48	14:50
14	03:54	05:23	06:51		07:47 (Lotlax 3)	08:14		09:06 (Lotlax 1)	08:47	10:03
	23:19	21:48	20:03	8	07:55 (Lotlax 3)	18:21	22	09:28 (Lotlax 1)	15:45	14:49
15	03:57	05:26	06:53		07:45 (Lotlax 3)	08:17		09:07 (Lotlax 1)	08:50	10:05
	23:17	21:45	20:00	12	07:57 (Lotlax 3)	18:18	20	09:27 (Lotlax 1)	15:42	14:49
16	03:59	05:29	06:56		07:44 (Lotlax 3)	08:20		09:08 (Lotlax 1)	08:53	10:06
	23:14	21:42	19:56	14	07:58 (Lotlax 3)	18:15	17	09:25 (Lotlax 1)	15:40	14:48
17	04:02	05:32	06:59		07:42 (Lotlax 3)	08:22		09:10 (Lotlax 1)	08:56	10:07
	23:12	21:38	19:53	15	07:57 (Lotlax 3)	18:11	13	09:23 (Lotlax 1)	15:37	14:48
18	04:05	05:35	07:02		07:42 (Lotlax 3)	08:25		09:15 (Lotlax 1)	08:59	10:08
	23:09	21:35	19:50	17	08:21 (Lotlax 2)	18:08	4	09:19 (Lotlax 1)	15:34	14:48
19	04:07	05:38	07:04		07:42 (Lotlax 3)	08:28			09:02	10:09
	23:07	21:32	19:46	25	08:25 (Lotlax 2)	18:05			15:32	14:48
20	04:10	05:41	07:07		07:42 (Lotlax 3)	08:31			09:05	10:10
	23:04	21:28	19:43	28	08:26 (Lotlax 2)	18:02			15:29	14:48
21	04:13	05:44	07:10		07:45 (Lotlax 3)	08:34			09:08	10:11
	23:02	21:25	19:39	26	08:27 (Lotlax 2)	17:58			15:27	14:48
22	04:16	05:46	07:13		07:48 (Lotlax 3)	08:37			09:11	10:12
	22:59	21:22	19:36	23	08:28 (Lotlax 2)	17:55			15:24	14:49
23	04:19	05:49	07:15		08:08 (Lotlax 2)	08:40			09:14	10:12
	22:56	21:18	19:32	19	08:27 (Lotlax 2)	17:52			15:22	14:49
24	04:21	05:52	07:18		08:08 (Lotlax 2)	08:43			09:17	10:12
	22:53	21:15	19:29	19	08:27 (Lotlax 2)	17:49			15:20	14:50
25	04:24	05:55	07:21		08:08 (Lotlax 2)	07:46			09:19	10:13
	22:50	21:12	19:26	19	08:27 (Lotlax 2)	16:45			15:17	14:51
26	04:27	05:58	07:23		08:08 (Lotlax 2)	07:49			09:22	10:13
	22:48	21:08	19:22	18	08:26 (Lotlax 2)	16:42			15:15	14:52
27	04:30	06:01	07:26		08:09 (Lotlax 2)	07:52			09:25	10:13
	22:45	21:05	19:19	17	08:26 (Lotlax 2)	16:39			15:13	14:53
28	04:33	06:03	07:29		08:09 (Lotlax 2)	07:55			09:28	10:13
	22:42	21:01	19:15	14	08:23 (Lotlax 2)	16:36			15:11	14:54
29	04:36	06:06	07:32		08:10 (Lotlax 2)	07:58			09:31	10:12
	22:39	20:58	19:12	12	08:22 (Lotlax 2)	16:33			15:09	14:55
30	04:39	06:09	07:34		08:13 (Lotlax 2)	08:01			09:33	10:12
	22:36	20:55	19:09	6	08:19 (Lotlax 2)	16:30			15:07	14:57
31	04:42	06:12				08:04				10:11
	22:33	20:51				16:26				14:58
Potential sun hours	595	502	392			308			206	151
Total, worst case				292			330			
Sun reduction				0,36			0,25			
Oper. time red.				0,98			0,98			
Wind dir. red.				0,56			0,58			
Total reduction				0,20			0,14			
Total, real				57			48			

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

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

Project:
Söderskogen

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Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH13 - RH13

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March			April	May	June	July	August	September			October			November	December
1	10:11	09:08	07:41		08:16 (8)	06:55	05:14	03:45	03:28	04:45	06:15			07:37		08:49 (8)	08:07	09:36
	15:01	16:24	17:50	6	08:22 (8)	20:19	21:46	23:16	23:42	22:30	20:48			19:05	13	09:02 (8)	16:24	15:05
2	10:10	09:05	07:37		08:13 (8)	06:52	05:11	03:43	03:30	04:48	06:18			07:40		08:47 (8)	08:10	09:38
	15:02	16:27	17:53	12	08:25 (8)	20:22	21:49	23:19	23:41	22:27	20:45			19:02	17	09:04 (8)	16:20	15:04
3	10:09	09:02	07:34		08:11 (8)	06:49	05:08	03:41	03:31	04:51	06:21			07:43		08:46 (8)	08:13	09:41
	15:04	16:30	17:56	16	08:27 (8)	20:25	21:53	23:21	23:40	22:24	20:41			18:59	18	09:04 (8)	16:17	15:02
4	10:08	09:00	07:31		08:09 (8)	06:45	05:05	03:39	03:33	04:54	06:23			07:46		08:45 (8)	08:16	09:43
	15:06	16:34	17:59	18	08:27 (8)	20:27	21:56	23:23	23:38	22:20	20:38			18:55	20	09:05 (8)	16:14	15:00
5	10:07	08:57	07:27		08:09 (8)	06:42	05:02	03:37	03:35	04:57	06:26			07:49		08:44 (8)	08:19	09:46
	15:08	16:37	18:02	19	08:28 (8)	20:30	21:59	23:26	23:37	22:17	20:34			18:52	20	09:04 (8)	16:11	14:59
6	10:05	08:54	07:24		08:08 (8)	06:38	04:58	03:35	03:37	05:00	06:29			07:51		08:43 (8)	08:22	09:48
	15:10	16:40	18:05	20	08:28 (8)	20:33	22:02	23:28	23:35	22:14	20:31			18:48	21	09:04 (8)	16:08	14:57
7	10:04	08:51	07:21		08:08 (8)	06:35	04:55	03:33	03:39	05:03	06:32			07:54		08:43 (8)	08:25	09:50
	15:13	16:43	18:08	20	08:28 (8)	20:36	22:05	23:30	23:34	22:11	20:28			18:45	21	09:04 (8)	16:05	14:56
8	10:03	08:48	07:17		08:07 (8)	06:32	04:52	03:32	03:41	05:06	06:34			07:57		08:43 (8)	08:28	09:52
	15:15	16:46	18:11	21	08:28 (8)	20:39	22:08	23:32	23:32	22:08	20:24			18:42	20	09:03 (8)	16:02	14:55
9	10:01	08:45	07:14		08:08 (8)	06:28	04:49	03:30	03:43	05:09	06:37			08:00		08:44 (8)	08:31	09:54
	15:17	16:49	18:14	20	08:28 (8)	20:42	22:11	23:34	23:30	22:05	20:21			18:38	18	09:02 (8)	16:00	14:54
10	10:00	08:42	07:11		08:07 (8)	06:25	04:46	03:29	03:45	05:12	06:40			08:03		08:44 (8)	08:35	09:56
	15:20	16:52	18:16	19	08:26 (8)	20:45	22:14	23:35	23:28	22:01	20:17			18:35	17	09:01 (8)	15:57	14:53
11	09:58	08:39	07:07		08:08 (8)	06:21	04:43	03:27	03:47	05:15	06:43			08:05		08:45 (8)	08:38	09:58
	15:22	16:56	18:19	18	08:26 (8)	20:48	22:17	23:37	23:26	21:58	20:14			18:32	15	09:00 (8)	15:54	14:52
12	09:56	08:35	07:04		08:09 (8)	06:18	04:40	03:26	03:50	05:18	06:45			08:08		08:47 (8)	08:41	10:00
	15:25	16:59	18:22	15	08:24 (8)	20:50	22:20	23:39	23:24	21:55	20:10			18:28	10	08:57 (8)	15:51	14:51
13	09:54	08:32	07:00		08:11 (8)	06:15	04:37	03:25	03:52	05:21	06:48			08:11			08:44	10:02
	15:28	17:02	18:25	11	08:22 (8)	20:53	22:23	23:40	23:21	21:52	20:07			18:25			15:48	14:50
14	09:52	08:29	06:57			06:11	04:34	03:24	03:55	05:23	06:51			08:14			08:47	10:03
	15:30	17:05	18:28			20:56	22:26	23:41	23:19	21:48	20:04			18:22			15:45	14:49
15	09:50	08:26	06:54			06:08	04:31	03:23	03:57	05:26	06:54			08:17			08:50	10:05
	15:33	17:08	18:31			20:59	22:29	23:43	23:17	21:45	20:00			18:18			15:43	14:49
16	09:48	08:23	06:50			06:04	04:28	03:22	04:00	05:29	06:56			08:20			08:53	10:06
	15:36	17:11	18:34			21:02	22:32	23:44	23:14	21:42	19:57			18:15			15:40	14:49
17	09:46	08:20	06:47			06:01	04:25	03:22	04:02	05:32	06:59			08:23			08:56	10:07
	15:39	17:14	18:36			21:05	22:35	23:44	23:12	21:38	19:53			18:12			15:37	14:48
18	09:44	08:17	06:43			05:58	04:22	03:21	04:05	05:35	07:02			08:25			08:59	10:08
	15:41	17:17	18:39			21:08	22:38	23:45	23:09	21:35	19:50			18:08			15:35	14:48
19	09:42	08:13	06:40			05:54	04:19	03:21	04:08	05:38	07:05			08:28			09:02	10:09
	15:44	17:20	18:42			21:11	22:41	23:46	23:07	21:32	19:46			18:05			15:32	14:48
20	09:39	08:10	06:37			05:51	04:16	03:21	04:11	05:41	07:07			08:31			09:05	10:10
	15:47	17:23	18:45			21:14	22:44	23:46	23:04	21:29	19:43			18:02			15:30	14:48
21	09:37	08:07	06:33			05:48	04:13	03:21	04:13	05:44	07:10			08:34			09:08	10:11
	15:50	17:26	18:48			21:17	22:46	23:47	23:02	21:25	19:40			17:59			15:27	14:49
22	09:35	08:04	06:30			05:44	04:10	03:21	04:16	05:47	07:13			08:37			09:11	10:12
	15:53	17:29	18:51			21:20	22:49	23:47	22:59	21:22	19:36			17:55			15:25	14:49
23	09:32	08:00	06:26			05:41	04:08	03:21	04:19	05:50	07:15			08:40			09:14	10:12
	15:56	17:32	18:53			21:23	22:52	23:47	22:56	21:18	19:33			17:52			15:22	14:50
24	09:30	07:57	06:23			05:37	04:05	03:22	04:22	05:52	07:18			08:43			09:17	10:12
	15:59	17:35	18:56			21:26	22:55	23:47	22:53	21:15	19:29			17:49			15:20	14:50
25	09:27	07:54	06:19			05:34	04:02	03:22	04:25	05:55	07:21			07:46			09:20	10:13
	16:02	17:38	18:59			21:29	22:58	23:47	22:50	21:12	19:26			16:46			15:18	14:51
26	09:25	07:51	06:16			05:31	04:00	03:23	04:28	05:58	07:24			07:49			09:22	10:13
	16:05	17:41	19:02			21:31	23:01	23:46	22:48	21:08	19:22			16:42			15:16	14:52
27	09:22	07:47	06:13			05:28	03:57	03:24	04:30	06:01	07:26			07:52			09:25	10:13
	16:09	17:44	19:05			21:34	23:03	23:46	22:45	21:05	19:19			16:39			15:13	14:53
28	09:19	07:44	06:09			05:24	03:55	03:25	04:33	06:04	07:29			07:55			09:28	10:13
	16:12	17:47	19:08			21:37	23:06	23:45	22:42	21:02	19:16			16:36			15:11	14:54
29	09:17		07:06			05:21	03:52	03:26	04:36	06:07	07:32			07:58			09:31	10:12
	16:15		20:10			21:40	23:09	23:44	22:39	20:58	19:12			16:33			15:09	14:56
30	09:14		07:02			05:18	03:50	03:27	04:39	06:09	07:35		08:52 (8)	08:01			09:33	10:12
	16:18		20:13			21:43	23:11	23:43	22:36	20:55	19:09	8	09:00 (8)	16:30			15:07	14:57
31	09:11		06:59				03:47		04:42	06:12				08:04				10:11
	16:21		20:16				23:14		22:33	20:51				16:27				14:59
Potential sun hours	182	242	363			447	559	605	594	502	392			308			206	151
Total, worst case				215								8			210			
Sun reduction				0,36								0,36			0,25			
Oper. time red.				0,98								0,98			0,98			
Wind dir. red.				0,56								0,56			0,56			
Total reduction				0,20								0,20			0,14			
Total, real				43								2			29			

Table 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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18.11.2019 13:11/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**Shadow receptor:** RH14 - RH14

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:47	23:16	23:42	22:30	20:48	19:05	16:24	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:39
	15:02	16:27	17:53	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:20	15:04
3	10:09	09:03	07:34	06:49	05:08	03:41	03:31	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:25	21:53	23:21	23:40	22:24	20:41	18:59	16:17	15:02
4	10:08	09:00	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:28	21:56	23:24	23:39	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:35	04:57	06:26	07:49	08:19	09:46
	15:08	16:37	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:59
6	10:06	08:54	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:21	06:35	04:55	03:33	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:05	23:30	23:34	22:11	20:28	18:45	16:05	14:56
8	10:03	08:48	07:17	06:32	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:53
	15:15	16:46	18:11	20:39	22:08	23:32	23:32	22:08	20:24	18:42	16:02	14:55
9	10:01	08:45	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:32	09:55
	15:17	16:49	18:14	20:42	22:11	23:34	23:30	22:05	20:21	18:38	16:00	14:53
10	10:00	08:42	07:11	06:25	04:46	03:29	03:45	05:12	06:40	08:03	08:35	09:57
	15:20	16:52	18:16	20:45	22:14	23:36	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:39	07:07	06:21	04:43	03:27	03:47	05:15	06:43	08:05	08:38	09:58
	15:22	16:55	18:19	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:54	14:51
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:41	10:00
	15:25	16:59	18:22	20:50	22:20	23:39	23:24	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:36	03:25	03:52	05:21	06:48	08:11	08:44	10:02
	15:27	17:02	18:25	20:53	22:23	23:40	23:22	21:52	20:07	18:25	15:48	14:50
14	09:53	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:45	14:49
15	09:51	08:26	06:54	06:08	04:30	03:23	03:57	05:26	06:54	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:43	23:17	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:20	08:53	10:06
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17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:23	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:45	23:12	21:39	19:53	18:12	15:37	14:48
18	09:44	08:17	06:43	05:58	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:09
	15:41	17:17	18:39	21:08	22:38	23:45	23:10	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:05	08:28	09:02	10:10
	15:44	17:20	18:42	21:11	22:41	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:40	08:10	06:37	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:47	23:47	23:02	21:25	19:40	17:59	15:27	14:49
22	09:35	08:04	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:12
	15:53	17:29	18:51	21:20	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
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25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:20	10:13
	16:02	17:38	18:59	21:29	22:58	23:47	22:50	21:12	19:26	16:46	15:18	14:51
26	09:25	07:51	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:32	23:01	23:46	22:48	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:13
	16:09	17:44	19:05	21:35	23:03	23:46	22:45	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:13
	16:12	17:47	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:36	15:11	14:54
29	09:17		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:31	10:12
	16:15		20:10	21:41	23:09	23:44	22:39	20:58	19:12	16:33	15:09	14:55
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:12
	16:18		20:13	21:44	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

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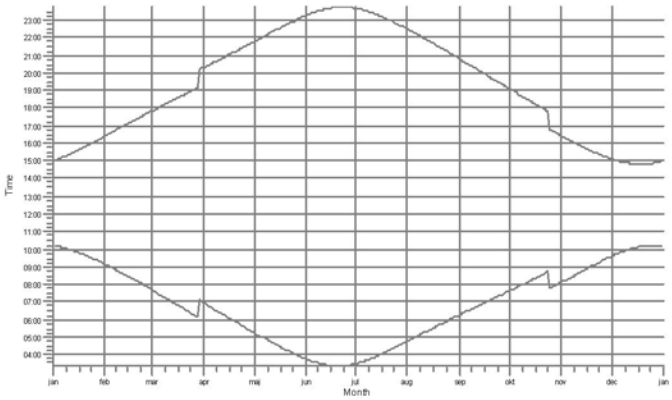
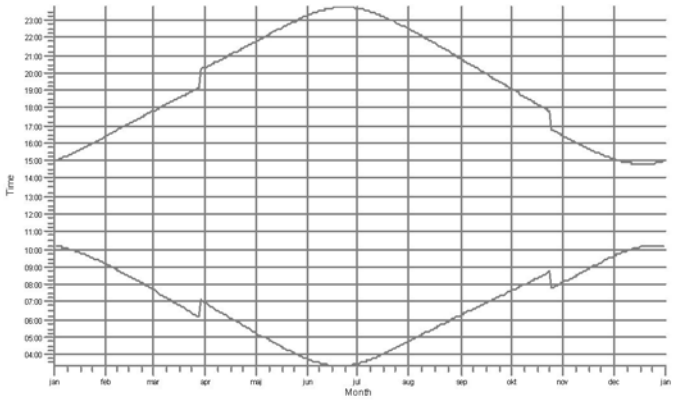
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

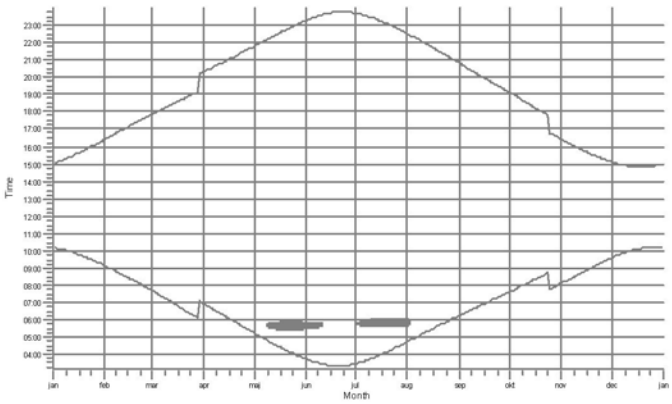
HH01: HH01



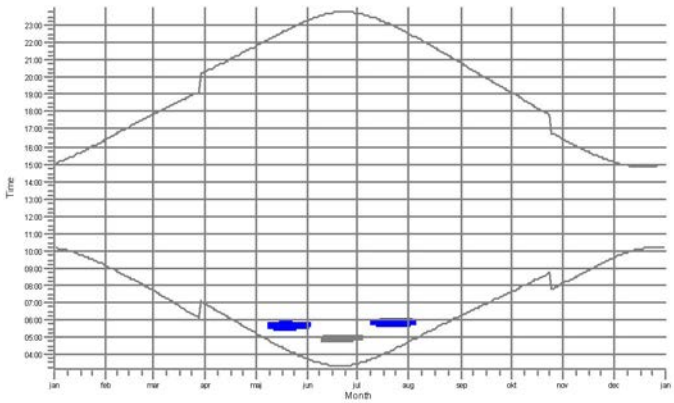
HH02: HH02



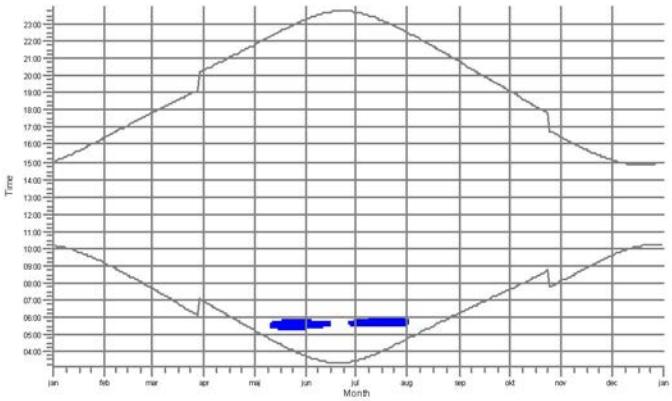
RH01: RH01



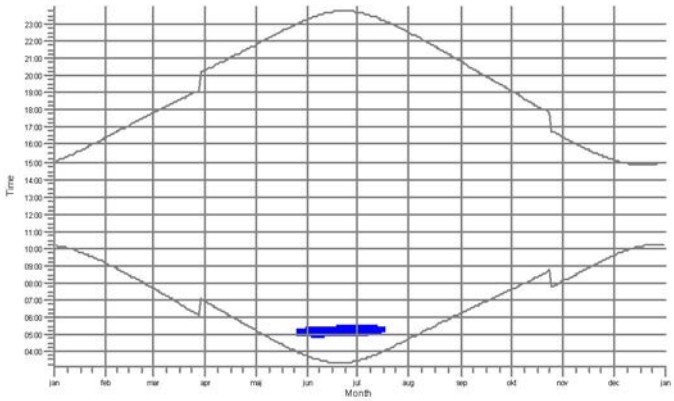
RH02: RH02



RH03: RH03



RH04: RH04



WTGs

3: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: [redacted]) 4: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

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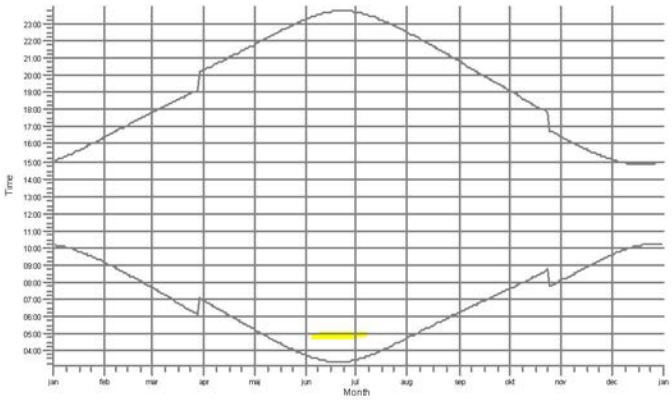
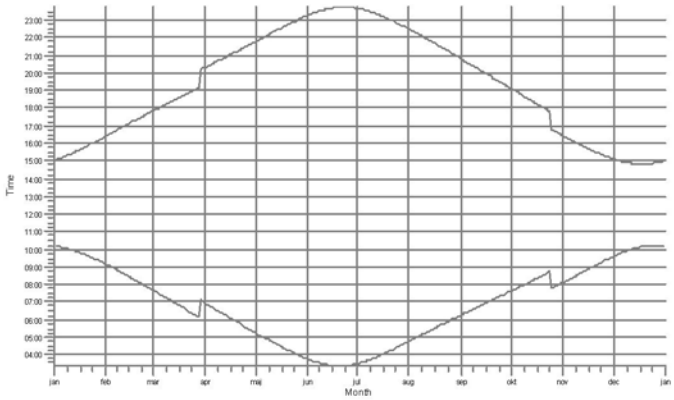
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

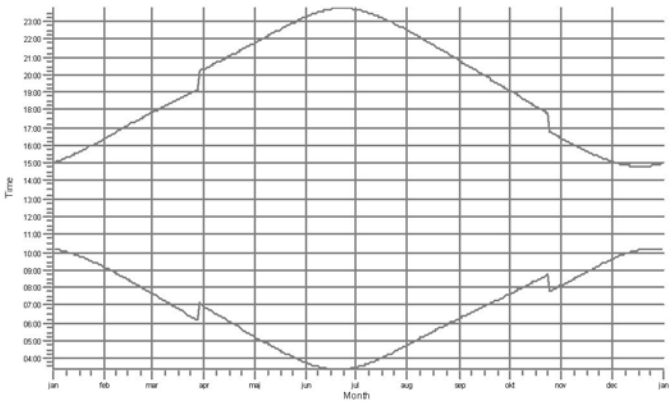
RH05: RH05



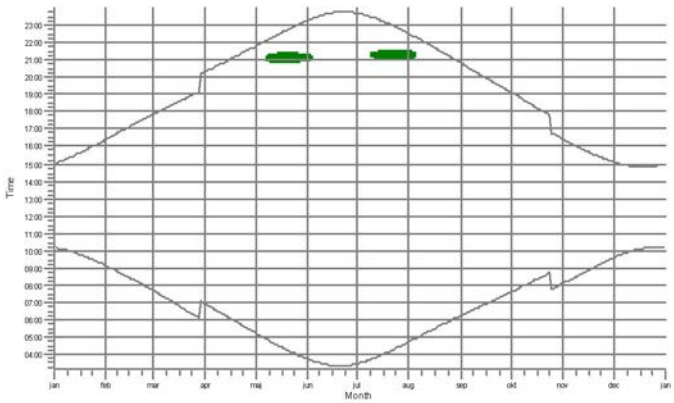
RH06: RH06



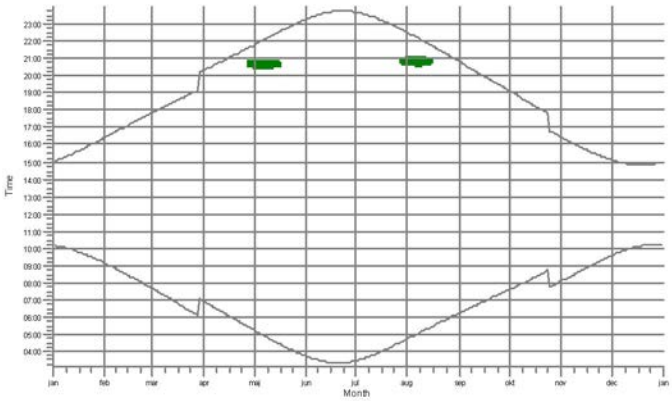
RH07: RH07



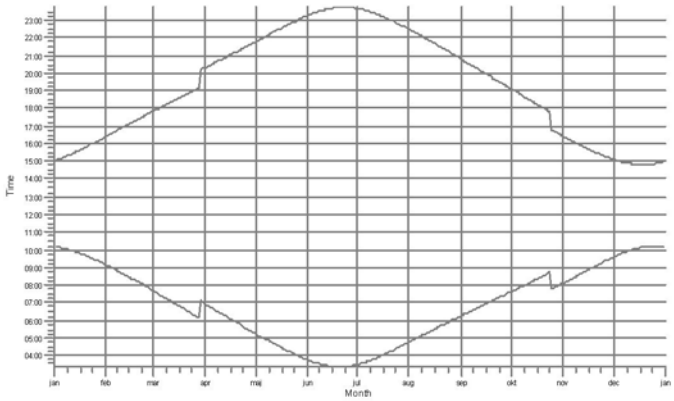
RH08: RH08



RH09: RH09



RH10: RH10



WTGs

1: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 3 s) 2: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

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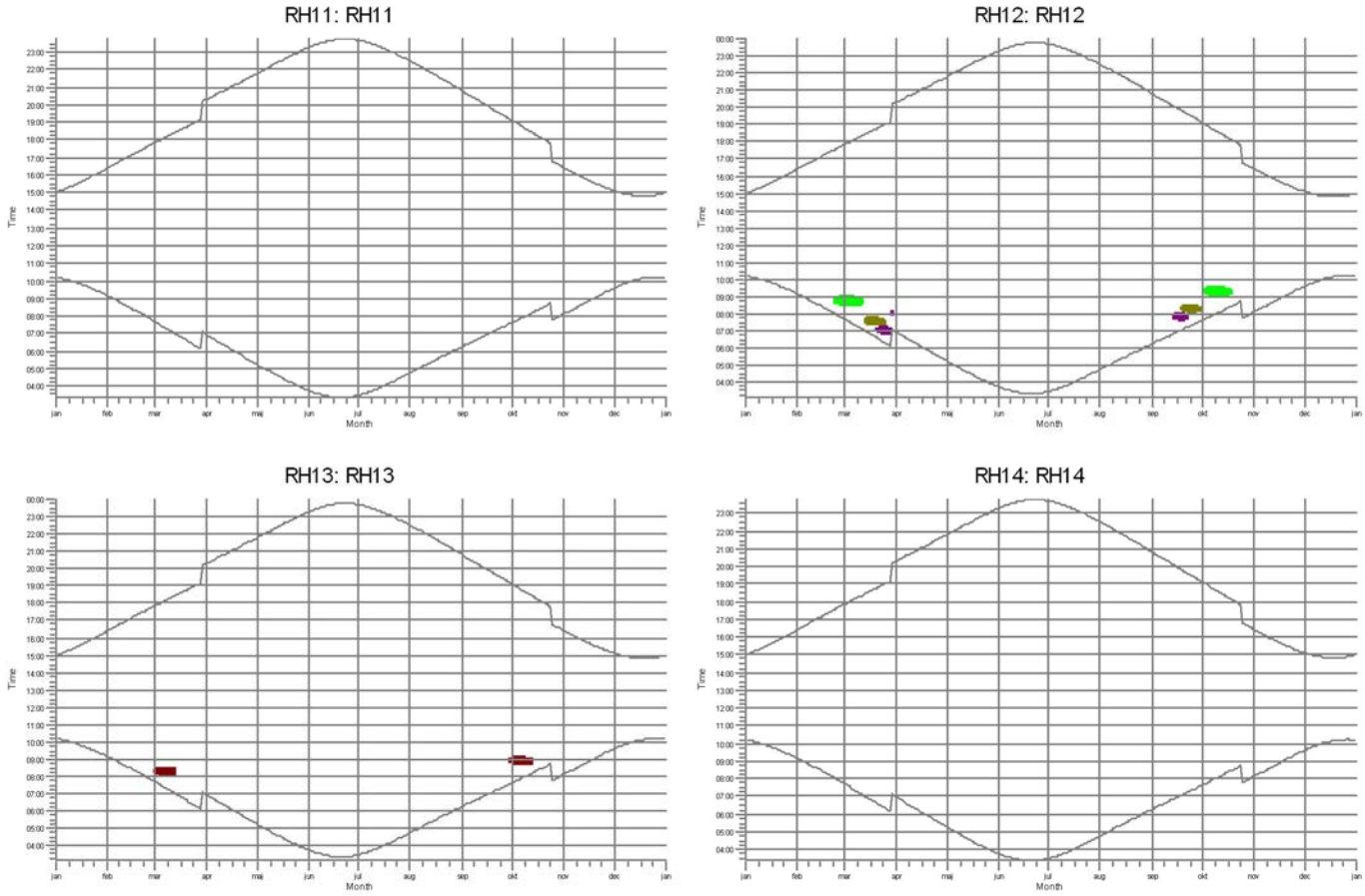
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)



WTGs

8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: [redacted]7) Lotlax 2: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)
Lotlax 1: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 1[redacted]) Lotlax 3: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)

Project:

Söderskogen

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SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 1 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April		May		June		July		August		September	October	November	December
1	10:10	09:08	07:40	06:55		05:14	20:31-20:49/18	03:45	21:01-21:12/11	03:29		04:45	20:40-20:58/18	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19		21:46		23:16		23:41		22:29	21:07-21:25/18	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52		05:11	20:30-20:49/19	03:43	21:03-21:11/8	03:30		04:48	20:39-20:59/20	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22		21:49		23:18		23:40		22:26	21:08-21:24/16	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48		05:08	20:29-20:50/21	03:41	21:06-21:10/4	03:32		04:51	20:39-20:59/20	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24		21:52		23:20		23:39		22:23	21:10-21:23/13	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45		05:05	20:28-20:50/22	03:39		03:33		04:54	20:38-20:59/21	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27		21:55		23:23		23:38		22:20	21:11-21:21/10	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42		05:02	20:28-20:50/22	03:37		03:35		04:57	20:38-21:00/22	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30		21:58		23:25		23:36		22:17		20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38		04:58	20:28-20:50/22	03:35		03:37		05:00	20:37-20:59/22	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33		22:01		23:27		23:35		22:14		20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35		04:55	20:28-20:50/22	03:34		03:39		05:03	20:38-21:00/22	06:31	07:54	08:25	09:50
	15:13	16:43	18:08	20:36		22:04		23:29		23:33		22:11		20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31		04:52	20:28-20:50/22	03:32		03:41		05:06	20:37-20:59/22	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39		22:07	21:03-21:09/6	23:31		23:31		22:07		20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28		04:49	20:28-20:49/21	03:30		03:43		05:09	20:38-20:59/21	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41		22:10	21:00-21:11/11	23:33		23:29		22:04		20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25		04:46	20:29-20:49/20	03:29		03:45	21:12-21:18/6	05:12	20:38-20:59/21	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44		22:13	20:59-21:14/15	23:35		23:27		22:01		20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21		04:43	20:29-20:48/19	03:28		03:48	21:11-21:20/9	05:15	20:38-20:58/20	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47		22:16	20:57-21:14/17	23:36		23:25		21:58		20:14	18:31	15:54	14:52
12	09:56	08:35	07:03	06:18		04:40	20:29-20:47/18	03:26		03:50	21:09-21:21/12	05:18	20:39-20:57/18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50		22:19	20:56-21:15/19	23:38		23:23		21:54		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14		04:37	20:31-20:47/16	03:25		03:52	21:08-21:22/14	05:21	20:40-20:55/15	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53		22:22	20:56-21:16/20	23:39		23:21		21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11		04:34	20:32-20:45/13	03:24		03:55	21:08-21:23/15	05:23	20:41-20:54/13	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56		22:25	20:55-21:16/21	23:41		23:19		21:48		20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08		04:31	20:34-20:44/10	03:24		03:57	21:07-21:24/17	05:26	20:44-20:51/7	06:53	08:16	08:49	10:04
	15:33	17:08	18:31	20:59		22:28	20:55-21:17/22	23:42		23:16		21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04		04:28	20:36-20:41/5	03:23		04:00	21:07-21:25/18	05:29		06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02		22:31	20:54-21:17/23	23:43		23:14		21:41		19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01		04:25	20:54-21:17/23	03:22		04:03	21:06-21:25/19	05:32		06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05		22:34		23:44		23:11		21:38		19:53	18:11	15:37	14:49
18	09:44	08:16	06:43	05:57		04:22	20:55-21:18/23	03:22		04:05	21:06-21:26/20	05:35		07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08		22:37		23:44		23:09		21:35		19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54		04:19	20:54-21:17/23	03:21		04:08	21:05-21:26/21	05:38		07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10		22:40		23:45		23:06		21:31		19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51		04:16	20:54-21:17/23	03:21		04:11	21:05-21:26/21	05:41		07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13		22:43		23:46		23:04		21:28		19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47		04:13	20:55-21:17/22	03:21		04:13	21:05-21:27/22	05:44		07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16		22:46		23:46		23:01		21:25		19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44		04:10	20:55-21:17/22	03:21		04:16	21:05-21:27/22	05:47		07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19		22:49		23:46		22:58		21:21		19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41		04:08	20:56-21:17/21	03:22		04:19	21:05-21:27/22	05:49		07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22		22:52		23:46		22:55		21:18		19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37		04:05	20:56-21:17/21	03:22		04:22	21:04-21:27/23	05:52		07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25		22:54		23:46		22:53		21:15		19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34		04:02	20:56-21:17/21	03:23		04:25	21:05-21:28/23	05:55		07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28		22:57		23:46		22:50		21:11		19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31		04:00	20:57-21:16/19	03:23		04:28	21:05-21:27/22	05:58		07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31		23:00		23:45		22:47		21:08		19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27		03:57	20:57-21:16/19	03:24		04:31	21:05-21:28/23	06:01		07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34		23:03		23:45		22:44		21:05		19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	20:35-20:44/9	03:55	20:58-21:15/17	03:25		04:33	20:45-20:53/8	06:04		07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37		23:05		23:44		22:41	21:05-21:27/22	21:01		19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	20:33-20:46/13	03:52	20:59-21:14/15	03:26		04:36	20:43-20:55/12	06:06		07:32	07:58	09:30	10:12
	16:15		20:10	21:40		23:08		23:43		22:38	21:05-21:27/22	20:58		19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	20:31-20:47/16	03:50	21:00-21:14/14	03:27		04:39	20:42-20:57/15	06:09		07:34	08:01	09:33	10:11
	16:18		20:13	21:43		23:11		23:43		22:35	21:06-21:27/21	20:54		19:09	16:30	15:07	14:57
31	09:11		06:59			03:48	21:01-21:13/12			04:42	20:41-20:57/16	06:12			08:04		10:11
	16:21		20:16			23:13				22:32	21:06-21:26/20	20:51			16:27		14:59
Potential sun hours	182	242	363	447		559		605		594		502		392	308	206	151
Sum of minutes with flicker	0	0	0	38		739		23		465		339		0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 2 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June		July		August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45		03:29	04:50-05:03/13	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16		23:42		22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43		03:30	04:51-05:03/12	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18		23:40		22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41		03:32	04:52-05:03/11	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21		23:39		22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39		03:33	04:53-05:02/9	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23		23:38		22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37		03:35	04:53-05:01/8	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25		23:36		22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	04:50-04:53/3	03:37	04:56-05:01/5	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27		23:35		22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	04:48-04:55/7	03:39		05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29		23:33		22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	04:48-04:57/9	03:41		05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31		23:31		22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	04:47-04:57/10	03:43		05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33		23:29		22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	04:46-04:58/12	03:45		05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35		23:27		22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	04:46-04:59/13	03:48		05:15	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36		23:25		21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	04:46-05:00/14	03:50		05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38		23:23		21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	04:46-05:00/14	03:52		05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39		23:21		21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	04:46-05:01/15	03:55		05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41		23:19		21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	04:46-05:01/15	03:57		05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42		23:16		21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:46-05:01/15	04:00		05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43		23:14		21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:46-05:02/16	04:03		05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44		23:11		21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:46-05:02/16	04:05		05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44		23:09		21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:47-05:03/16	04:08		05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45		23:06		21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:47-05:03/16	04:11		05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46		23:04		21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:47-05:03/16	04:14		05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46		23:01		21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:47-05:03/16	04:16		05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46		22:58		21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:47-05:03/16	04:19		05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46		22:56		21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:47-05:04/17	04:22		05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46		22:53		21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:47-05:03/16	04:25		05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46		22:50		21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:48-05:04/16	04:28		05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45		22:47		21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:49-05:04/15	04:31		06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45		22:44		21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:49-05:04/15	04:33		06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44		22:41		21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:49-05:03/14	04:36		06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44		22:38		20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:49-05:03/14	04:39		06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43		22:35		20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48			04:42		06:12		08:04		10:11
	16:21		20:16		23:13			22:32		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605		594		502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	346		58		0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 3 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45 04:59-05:18/19	03:29 05:01-05:26/25	04:45 05:42-05:58/16	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16 05:25-05:46/21	23:42 05:35-05:44/9	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 04:58-05:18/20	03:30 05:03-05:27/24	04:48 05:44-05:58/14	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18 05:25-05:44/19	23:40 05:36-05:46/10	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 04:58-05:19/21	03:32 05:03-05:27/24	04:51 05:45-05:56/11	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21 05:26-05:44/18	23:39 05:35-05:47/12	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39 04:58-05:20/22	03:33 05:03-05:27/24	04:54 05:47-05:54/7	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23 05:26-05:44/18	23:38 05:34-05:47/13	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37 04:57-05:20/23	03:35 05:03-05:26/23	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25 05:26-05:43/17	23:36 05:34-05:48/14	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 04:57-05:20/23	03:37 05:04-05:27/23	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27 05:27-05:43/16	23:35 05:34-05:49/15	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 04:57-05:21/24	03:39 05:04-05:26/22	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29 05:28-05:42/14	23:33 05:33-05:49/16	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32 04:57-05:21/24	03:41 05:05-05:27/22	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31 05:29-05:42/13	23:31 05:33-05:50/17	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 05:36-05:45/9	03:30 04:57-05:21/24	03:43 05:05-05:26/21	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33 05:29-05:41/12	23:29 05:32-05:50/18	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:34-05:46/12	03:29 04:57-05:22/25	03:45 05:05-05:26/21	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:30-05:41/11	23:27 05:33-05:51/18	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 05:32-05:47/15	03:28 04:58-05:23/25	03:48 05:06-05:26/20	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:36 05:32-05:41/9	23:25 05:33-05:53/20	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:30-05:49/19	03:26 04:58-05:23/25	03:50 05:07-05:26/19	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38 05:32-05:40/8	23:23 05:33-05:55/22	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 05:27-05:49/22	03:25 04:58-05:23/25	03:53 05:07-05:24/17	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39 05:33-05:39/6	23:21 05:32-05:55/23	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:26-05:50/24	03:24 04:58-05:23/25	03:55 05:08-05:24/16	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41 05:34-05:39/5	23:19 05:32-05:56/24	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 05:25-05:50/25	03:24 04:58-05:23/25	03:58 05:09-05:23/14	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42 05:35-05:38/3	23:16 05:31-05:57/26	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:24-05:51/27	03:23 04:58-05:24/26	04:00 05:11-05:22/11	05:29	06:56	08:19	08:52	10:06
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18	09:44	08:16	06:43	05:58	04:22 05:23-05:51/28	03:22 04:59-05:24/25	04:05 05:31-06:00/29	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 05:23-05:51/28	03:21 04:59-05:25/26	04:08 05:32-06:00/28	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:22-05:50/28	03:21 04:59-05:25/26	04:11 05:32-06:00/28	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 05:22-05:51/29	03:21 04:59-05:25/26	04:14 05:32-06:01/29	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10 05:22-05:51/29	03:21 04:59-05:25/26	04:16 05:32-06:01/29	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:22-05:50/28	03:22 04:59-05:25/26	04:19 05:33-06:02/29	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 05:22-05:50/28	03:22 05:00-05:26/26	04:22 05:33-06:01/28	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:22-05:50/28	03:23 05:00-05:25/25	04:25 05:33-06:01/28	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:05-05:10/5	03:23 05:00-05:26/26	04:28 05:33-06:02/29	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00 05:22-05:50/28	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57 05:03-05:12/9	03:24 05:01-05:26/25	04:31 05:34-06:01/27	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03 05:22-05:49/27	23:45 05:39-05:40/1	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:01-05:14/13	03:25 05:01-05:27/26	04:34 05:34-06:01/27	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06 05:22-05:48/26	23:44 05:38-05:42/4	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:01-05:16/15	03:26 05:01-05:26/25	04:36 05:36-06:01/25	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08 05:24-05:48/24	23:44 05:36-05:42/6	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:00-05:16/16	03:27 05:01-05:26/25	04:39 05:37-06:00/23	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11 05:24-05:47/23	23:43 05:36-05:43/7	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 04:59-05:17/18		04:42 05:39-06:00/21	06:12		08:04		10:11
	16:21		20:16		23:13 05:24-05:46/22		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	632	942	1024	48	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 4 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46 05:32-05:50/18	03:29 04:53-05:02/9	04:45 05:44-05:56/12	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 05:32-05:49/17	03:30 04:55-05:02/7	04:48 05:46-05:54/8	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40 05:46-05:49/3	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 05:33-05:49/16	03:32 04:57-05:00/3	04:51	06:21	07:43	08:13	09:41
	15:04	16:31	17:56	20:24	21:52	23:21	23:39 05:44-05:50/6	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39 05:34-05:49/15	03:33 05:43-05:51/8	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37 05:34-05:48/14	03:35 05:42-05:52/10	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 05:35-05:47/12	03:37 05:42-05:54/12	05:00	06:29	07:51	08:22	09:48
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7	10:04	08:50	07:20	06:35	04:55	03:34 05:36-05:47/11	03:39 05:41-05:54/13	05:03	06:32	07:54	08:25	09:50
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8	10:02	08:47	07:17	06:32	04:52	03:32 05:37-05:46/9	03:41 05:41-05:55/14	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31 05:38-05:45/7	03:43 05:40-05:56/16	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:39-05:41/2	03:29 04:50-04:56/6	03:46 05:40-05:57/17	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:39-05:44/5	23:27	22:01	20:17	18:35	15:57	14:53
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	15:23	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
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13	09:54	08:32	07:00	06:15	04:37 05:31-05:47/16	03:25 04:48-04:59/11	03:53 05:39-05:59/20	05:21	06:48	08:11	08:43	10:01
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14	09:52	08:29	06:57	06:11	04:34 05:31-05:49/18	03:24 04:48-05:00/12	03:55 05:38-05:59/21	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31 05:29-05:49/20	03:24 04:47-05:00/13	03:58 05:38-05:59/21	05:26	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:29-05:50/21	03:23 04:47-05:01/14	04:00 05:38-06:00/22	05:29	06:56	08:19	08:53	10:06
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	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
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25	09:27	07:54	06:19	05:34	04:02 05:28-05:51/23	03:23 04:49-05:03/14	04:25 05:38-06:01/23	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:29-05:51/22	03:23 04:50-05:04/14	04:28 05:39-06:01/22	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57 05:29-05:51/22	03:24 04:50-05:04/14	04:31 05:39-06:01/22	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:29-05:50/21	03:25 04:51-05:04/13	04:34 05:39-06:00/21	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:30-05:51/21	03:26 04:51-05:03/12	04:36 05:41-06:00/19	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:30-05:50/20	03:27 04:52-05:02/10	04:39 05:41-05:58/17	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48 05:31-05:50/19		04:42 05:43-05:58/15	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	433	393	560	20	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 5 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	03:57	05:26	06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:21	04:14	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 6 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
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26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
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28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:27	10:12
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29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:39	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 7 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:42	19:56	18:15	15:40	14:49
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	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
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	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
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	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
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	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
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	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
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	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
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	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
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	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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

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	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

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Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** 8 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40 08:16-08:22/6	06:55	05:14	03:45	03:28	04:45	06:15	07:37 08:49-09:02/13	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:10	09:05	07:37 08:13-08:25/12	06:52	05:11	03:43	03:30	04:48	06:18	07:40 08:47-09:04/17	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:19	23:41	22:26	20:44	19:02	16:20	15:04
3	10:09	09:02	07:34 08:11-08:27/16	06:49	05:08	03:41	03:31	04:51	06:20	07:43 08:46-09:04/18	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:02
4	10:08	08:59	07:31 08:09-08:27/18	06:45	05:05	03:39	03:33	04:54	06:23	07:46 08:45-09:05/20	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27 08:09-08:28/19	06:42	05:01	03:37	03:35	04:57	06:26	07:48 08:44-09:04/20	08:19	09:46
	15:08	16:37	18:02	20:30	21:58	23:25	23:37	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24 08:08-08:28/20	06:38	04:58	03:35	03:37	05:00	06:29	07:51 08:43-09:04/21	08:22	09:48
	15:10	16:40	18:05	20:33	22:01	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:20 08:08-08:28/20	06:35	04:55	03:33	03:39	05:03	06:32	07:54 08:43-09:04/21	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:30	23:33	22:11	20:27	18:45	16:05	14:56
8	10:03	08:47	07:17 08:07-08:28/21	06:31	04:52	03:32	03:41	05:06	06:34	07:57 08:43-09:03/20	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:32	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14 08:08-08:28/20	06:28	04:49	03:30	03:43	05:09	06:37	08:00 08:44-09:02/18	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:30	22:04	20:21	18:38	15:59	14:54
10	09:59	08:41	07:10 08:07-08:26/19	06:25	04:46	03:29	03:45	05:12	06:40	08:02 08:44-09:01/17	08:34	09:56
	15:20	16:52	18:16	20:45	22:14	23:35	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:38	07:07 08:08-08:26/18	06:21	04:43	03:27	03:47	05:15	06:43	08:05 08:45-09:00/15	08:37	09:58
	15:22	16:55	18:19	20:47	22:17	23:37	23:26	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04 08:09-08:24/15	06:18	04:40	03:26	03:50	05:18	06:45	08:08 08:47-08:57/10	08:40	10:00
	15:25	16:59	18:22	20:50	22:20	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00 08:11-08:22/11	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:44	10:01
	15:27	17:02	18:25	20:53	22:23	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:08	04:30	03:23	03:57	05:26	06:53	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:42	23:17	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:32	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:57	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:08
	15:41	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:35	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:11
	15:53	17:29	18:50	21:19	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:33	17:52	15:22	14:50
24	09:30	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:58	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
	16:08	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:39	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35 08:52-09:00/8	08:01	09:33	10:12
	16:18		20:13	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	215	0	0	0	0	0	8	210	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
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Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lotlax 1 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Operational time

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

	January	February		March		April	May	June	July	August	September	October		November	December
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	15:00	16:24		17:50		20:19	21:46	23:16	23:42	22:30	20:48	19:05		16:23	15:05
2	10:10	09:05		07:37	08:32-08:57/25	06:52	05:11	03:43	03:29	04:48	06:17	07:40	09:17-09:25/8	08:10	09:38
	15:02	16:27		17:53		20:22	21:49	23:19	23:41	22:26	20:44	19:02		16:20	15:03
3	10:09	09:02		07:34	08:31-08:56/25	06:48	05:08	03:41	03:31	04:51	06:20	07:43	09:13-09:27/14	08:13	09:41
	15:04	16:30		17:56		20:24	21:52	23:21	23:40	22:23	20:41	18:58		16:17	15:02
4	10:08	08:59		07:30	08:31-08:57/26	06:45	05:04	03:39	03:33	04:54	06:23	07:46	09:11-09:29/18	08:16	09:43
	15:06	16:33		17:59		20:27	21:55	23:23	23:38	22:20	20:38	18:55		16:14	15:00
5	10:07	08:56		07:27	08:31-08:56/25	06:42	05:01	03:37	03:34	04:57	06:26	07:48	09:09-09:30/21	08:19	09:46
	15:08	16:36		18:02		20:30	21:58	23:26	23:37	22:17	20:34	18:51		16:11	14:58
6	10:05	08:53		07:24	08:31-08:56/25	06:38	04:58	03:35	03:36	05:00	06:29	07:51	09:08-09:31/23	08:22	09:48
	15:10	16:40		18:05		20:33	22:01	23:28	23:35	22:14	20:31	18:48		16:08	14:57
7	10:04	08:51		07:20	08:31-08:54/23	06:35	04:55	03:33	03:38	05:03	06:31	07:54	09:07-09:31/24	08:25	09:50
	15:12	16:43		18:07		20:36	22:04	23:30	23:33	22:11	20:27	18:45		16:05	14:56
8	10:03	08:47		07:17	08:32-08:54/22	06:31	04:52	03:31	03:40	05:06	06:34	07:57	09:07-09:31/24	08:28	09:52
	15:15	16:46		18:10		20:39	22:07	23:32	23:32	22:08	20:24	18:41		16:02	14:54
9	10:01	08:44		07:14	08:33-08:52/19	06:28	04:49	03:30	03:43	05:08	06:37	08:00	09:06-09:31/25	08:31	09:54
	15:17	16:49		18:13		20:42	22:11	23:34	23:30	22:04	20:20	18:38		15:59	14:53
10	10:00	08:41		07:10	08:34-08:50/16	06:24	04:45	03:28	03:45	05:11	06:40	08:02	09:06-09:31/25	08:34	09:56
	15:19	16:52		18:16		20:44	22:14	23:35	23:28	22:01	20:17	18:35		15:56	14:52
11	09:58	08:38		07:07	08:36-08:47/11	06:21	04:42	03:27	03:47	05:14	06:42	08:05	09:06-09:31/25	08:37	09:58
	15:22	16:55		18:19		20:47	22:17	23:37	23:26	21:58	20:14	18:31		15:53	14:51
12	09:56	08:35		07:04		06:18	04:39	03:26	03:49	05:17	06:45	08:08	09:06-09:30/24	08:40	10:00
	15:25	16:58		18:22		20:50	22:20	23:39	23:24	21:55	20:10	18:28		15:51	14:50
13	09:54	08:32		07:00		06:14	04:36	03:25	03:52	05:20	06:48	08:11	09:06-09:29/23	08:44	10:02
	15:27	17:01		18:25		20:53	22:23	23:40	23:21	21:51	20:07	18:25		15:48	14:50
14	09:52	08:29		06:57		06:11	04:33	03:24	03:54	05:23	06:51	08:14	09:06-09:28/22	08:47	10:03
	15:30	17:05		18:28		20:56	22:26	23:41	23:19	21:48	20:03	18:21		15:45	14:49
15	09:50	08:26		06:53		06:07	04:30	03:23	03:57	05:26	06:53	08:17	09:07-09:27/20	08:50	10:05
	15:33	17:08		18:30		20:59	22:29	23:42	23:17	21:45	20:00	18:18		15:42	14:49
16	09:48	08:23		06:50		06:04	04:27	03:22	03:59	05:29	06:56	08:19	09:08-09:25/17	08:53	10:06
	15:35	17:11		18:33		21:02	22:32	23:44	23:14	21:42	19:56	18:15		15:40	14:48
17	09:46	08:20		06:47		06:01	04:24	03:21	04:02	05:32	06:59	08:22	09:10-09:23/13	08:56	10:07
	15:38	17:14		18:36		21:05	22:35	23:44	23:12	21:38	19:53	18:11		15:37	14:48
18	09:44	08:16		06:43		05:57	04:21	03:21	04:05	05:35	07:02	08:25	09:15-09:19/4	08:59	10:08
	15:41	17:17		18:39		21:08	22:38	23:45	23:09	21:35	19:50	18:08		15:34	14:48
19	09:42	08:13		06:40		05:54	04:18	03:21	04:07	05:38	07:04	08:28		09:02	10:09
	15:44	17:20		18:42		21:11	22:41	23:46	23:07	21:32	19:46	18:05		15:32	14:48
20	09:39	08:10		06:36		05:51	04:16	03:20	04:10	05:41	07:07	08:31		09:05	10:10
	15:47	17:23		18:45		21:14	22:43	23:46	23:04	21:28	19:43	18:01		15:29	14:48
21	09:37	08:07		06:33		05:47	04:13	03:20	04:13	05:43	07:10	08:34		09:08	10:11
	15:50	17:26		18:48		21:16	22:46	23:47	23:01	21:25	19:39	17:58		15:27	14:48
22	09:35	08:03		06:29		05:44	04:10	03:21	04:16	05:46	07:12	08:37		09:11	10:12
	15:53	17:29		18:50		21:19	22:49	23:47	22:59	21:22	19:36	17:55		15:24	14:49
23	09:32	08:00		06:26		05:41	04:07	03:21	04:19	05:49	07:15	08:40		09:14	10:12
	15:56	17:32		18:53		21:22	22:52	23:47	22:56	21:18	19:32	17:52		15:22	14:49
24	09:30	07:57	08:41-08:49/8	06:23		05:37	04:05	03:21	04:21	05:52	07:18	08:43		09:16	10:12
	15:59	17:35		18:56		21:25	22:55	23:47	22:53	21:15	19:29	17:49		15:20	14:50
25	09:27	07:54	08:38-08:53/15	06:19		05:34	04:02	03:22	04:24	05:55	07:21	07:46		09:19	10:13
	16:02	17:38		18:59		21:28	22:58	23:47	22:50	21:12	19:26	16:45		15:17	14:51
26	09:24	07:50	08:36-08:54/18	06:16		05:31	03:59	03:22	04:27	05:58	07:23	07:49		09:22	10:13
	16:05	17:41		19:02		21:31	23:01	23:46	22:47	21:08	19:22	16:42		15:15	14:52
27	09:22	07:47	08:35-08:56/21	06:12		05:27	03:57	03:23	04:30	06:01	07:26	07:52		09:25	10:13
	16:08	17:44		19:05		21:34	23:03	23:46	22:44	21:05	19:19	16:39		15:13	14:53
28	09:19	07:44	08:33-08:56/23	06:09		05:24	03:54	03:24	04:33	06:03	07:29	07:55		09:28	10:12
	16:11	17:47		19:07		21:37	23:06	23:45	22:42	21:01	19:15	16:36		15:11	14:54
29	09:16			07:05		05:21	03:52	03:25	04:36	06:06	07:32	07:58		09:30	10:12
	16:14			20:10		21:40	23:09	23:44	22:39	20:58	19:12	16:33		15:09	14:55
30	09:14			07:02		05:17	03:49	03:27	04:39	06:09	07:34	08:01		09:33	10:12
	16:18			20:13		21:43	23:11	23:43	22:36	20:55	19:08	16:29		15:07	14:57
31	09:11			06:59			03:47		04:42	06:12		08:04			10:11
	16:21			20:16			23:14		22:33	20:51		16:26			14:58
Potential sun hours	182	242		363		447	559	605	594	502	392	308		206	151
Sum of minutes with flicker	0	85		241		0	0	0	0	0	0	330		0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lotlax 2 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March		April	May	June	July	August	September		October	November	December
1	10:10	09:08	07:40		06:55	05:14	03:45	03:28	04:45	06:15		07:37	08:07	09:36
	15:00	16:24	17:50		20:19	21:46	23:16	23:42	22:30	20:48		19:05	16:23	15:05
2	10:10	09:05	07:37		06:52	05:11	03:43	03:29	04:48	06:17		07:40	08:10	09:38
	15:02	16:27	17:53		20:22	21:49	23:19	23:41	22:26	20:44		19:02	16:20	15:03
3	10:09	09:02	07:34		06:48	05:08	03:40	03:31	04:51	06:20		07:43	08:13	09:41
	15:04	16:30	17:56		20:24	21:52	23:21	23:40	22:23	20:41		18:58	16:17	15:01
4	10:08	08:59	07:30		06:45	05:04	03:38	03:33	04:54	06:23		07:45	08:16	09:43
	15:06	16:33	17:59		20:27	21:55	23:23	23:38	22:20	20:38		18:55	16:14	15:00
5	10:07	08:56	07:27		06:41	05:01	03:37	03:34	04:57	06:26		07:48	08:19	09:46
	15:08	16:36	18:02		20:30	21:58	23:26	23:37	22:17	20:34		18:51	16:11	14:58
6	10:05	08:53	07:24		06:38	04:58	03:35	03:36	05:00	06:29		07:51	08:22	09:48
	15:10	16:40	18:04		20:33	22:01	23:28	23:35	22:14	20:31		18:48	16:08	14:57
7	10:04	08:50	07:20		06:35	04:55	03:33	03:38	05:02	06:31		07:54	08:25	09:50
	15:12	16:43	18:07		20:36	22:04	23:30	23:33	22:11	20:27		18:45	16:05	14:56
8	10:03	08:47	07:17		06:31	04:52	03:31	03:40	05:05	06:34		07:57	08:28	09:52
	15:15	16:46	18:10		20:39	22:07	23:32	23:32	22:08	20:24		18:41	16:02	14:54
9	10:01	08:44	07:14		06:28	04:48	03:30	03:42	05:08	06:37		07:59	08:31	09:54
	15:17	16:49	18:13		20:42	22:11	23:34	23:30	22:04	20:20		18:38	15:59	14:53
10	10:00	08:41	07:10		06:24	04:45	03:28	03:45	05:11	06:40		08:02	08:34	09:56
	15:19	16:52	18:16		20:44	22:14	23:35	23:28	22:01	20:17		18:35	15:56	14:52
11	09:58	08:38	07:07		06:21	04:42	03:27	03:47	05:14	06:42		08:05	08:37	09:58
	15:22	16:55	18:19		20:47	22:17	23:37	23:26	21:58	20:14		18:31	15:53	14:51
12	09:56	08:35	07:03		06:18	04:39	03:26	03:49	05:17	06:45		08:08	08:40	10:00
	15:24	16:58	18:22		20:50	22:20	23:39	23:24	21:55	20:10		18:28	15:51	14:50
13	09:54	08:32	07:00		06:14	04:36	03:25	03:52	05:20	06:48		08:11	08:44	10:02
	15:27	17:01	18:25		20:53	22:23	23:40	23:21	21:51	20:07		18:25	15:48	14:50
14	09:52	08:29	06:57	07:31-07:41/10	06:11	04:33	03:24	03:54	05:23	06:51		08:14	08:47	10:03
	15:30	17:04	18:28		20:56	22:26	23:41	23:19	21:48	20:03		18:21	15:45	14:49
15	09:50	08:26	06:53	07:29-07:43/14	06:07	04:30	03:23	03:57	05:26	06:53		08:17	08:50	10:05
	15:33	17:08	18:30		20:59	22:29	23:42	23:17	21:45	20:00		18:18	15:42	14:48
16	09:48	08:23	06:50	07:27-07:43/16	06:04	04:27	03:22	03:59	05:29	06:56		08:19	08:53	10:06
	15:35	17:11	18:33		21:02	22:32	23:44	23:14	21:42	19:56		18:15	15:40	14:48
17	09:46	08:20	06:46	07:26-07:44/18	06:01	04:24	03:21	04:02	05:32	06:59		08:22	08:56	10:07
	15:38	17:14	18:36		21:05	22:35	23:44	23:12	21:38	19:53		18:11	15:37	14:48
18	09:44	08:16	06:43	07:25-07:44/19	05:57	04:21	03:21	04:05	05:35	07:01	08:19-08:21/2	08:25	08:59	10:08
	15:41	17:17	18:39		21:08	22:38	23:45	23:09	21:35	19:50		18:08	15:34	14:48
19	09:42	08:13	06:40	07:25-07:44/19	05:54	04:18	03:21	04:07	05:38	07:04	08:15-08:25/10	08:28	09:02	10:09
	15:44	17:20	18:42		21:11	22:40	23:46	23:07	21:32	19:46		18:05	15:32	14:48
20	09:39	08:10	06:36	07:24-07:43/19	05:51	04:15	03:20	04:10	05:41	07:07	08:12-08:26/14	08:31	09:05	10:10
	15:47	17:23	18:45		21:14	22:43	23:46	23:04	21:28	19:43		18:01	15:29	14:48
21	09:37	08:07	06:33	07:25-07:43/18	05:47	04:13	03:20	04:13	05:43	07:10	08:11-08:27/16	08:34	09:08	10:11
	15:50	17:26	18:48		21:16	22:46	23:47	23:01	21:25	19:39		17:58	15:27	14:48
22	09:35	08:03	06:29	07:24-07:41/17	05:44	04:10	03:20	04:16	05:46	07:12	08:10-08:28/18	08:37	09:11	10:12
	15:53	17:29	18:50		21:19	22:49	23:47	22:59	21:22	19:36		17:55	15:24	14:49
23	09:32	08:00	06:26	07:26-07:41/15	05:40	04:07	03:21	04:19	05:49	07:15	08:08-08:27/19	08:40	09:14	10:12
	15:56	17:32	18:53		21:22	22:52	23:47	22:56	21:18	19:32		17:52	15:22	14:49
24	09:30	07:57	06:23	07:26-07:38/12	05:37	04:04	03:21	04:21	05:52	07:18	08:08-08:27/19	08:43	09:16	10:12
	15:59	17:35	18:56		21:25	22:55	23:47	22:53	21:15	19:29		17:48	15:20	14:50
25	09:27	07:54	06:19	07:29-07:35/6	05:34	04:02	03:22	04:24	05:55	07:21	08:08-08:27/19	07:46	09:19	10:13
	16:02	17:38	18:59		21:28	22:58	23:47	22:50	21:12	19:26		16:45	15:17	14:51
26	09:24	07:50	06:16		05:30	03:59	03:22	04:27	05:58	07:23	08:08-08:26/18	07:49	09:22	10:13
	16:05	17:41	19:02		21:31	23:01	23:46	22:47	21:08	19:22		16:42	15:15	14:52
27	09:22	07:47	06:12		05:27	03:57	03:23	04:30	06:01	07:26	08:09-08:26/17	07:52	09:25	10:13
	16:08	17:44	19:05		21:34	23:03	23:46	22:44	21:05	19:19		16:39	15:13	14:53
28	09:19	07:44	06:09		05:24	03:54	03:24	04:33	06:03	07:29	08:09-08:23/14	07:55	09:28	10:12
	16:11	17:47	19:07		21:37	23:06	23:45	22:42	21:01	19:15		16:36	15:11	14:54
29	09:16		07:05		05:21	03:52	03:25	04:36	06:06	07:32	08:10-08:22/12	07:58	09:30	10:12
	16:14		20:10		21:40	23:09	23:44	22:39	20:58	19:12		16:33	15:09	14:55
30	09:14		07:02		05:17	03:49	03:26	04:39	06:09	07:34	08:13-08:19/6	08:01	09:33	10:12
	16:18		20:13		21:43	23:11	23:43	22:36	20:55	19:08		16:29	15:07	14:57
31	09:11		06:59			03:47		04:42	06:12			08:04		10:11
	16:21		20:16			23:14		22:33	20:51			16:26		14:58
Potential sun hours	182	242	363		447	559	606	594	502	392		308	206	151
Sum of minutes with flicker	0	0		183	0	0	0	0	0		184	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:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lotlax 3 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March		April	May	June	July	August	September		October	November	December
1	10:10	09:08	07:40		06:55	05:14	03:45	03:28	04:45	06:15		07:37	08:07	09:36
	15:00	16:24	17:50		20:19	21:46	23:16	23:42	22:30	20:48		19:05	16:23	15:05
2	10:10	09:05	07:37		06:52	05:11	03:43	03:29	04:48	06:17		07:40	08:10	09:38
	15:02	16:27	17:53		20:22	21:49	23:19	23:41	22:26	20:44		19:02	16:20	15:03
3	10:09	09:02	07:34		06:48	05:08	03:40	03:31	04:51	06:20		07:43	08:13	09:41
	15:04	16:30	17:56		20:24	21:52	23:21	23:40	22:23	20:41		18:58	16:17	15:01
4	10:08	08:59	07:30		06:45	05:04	03:38	03:33	04:54	06:23		07:45	08:16	09:43
	15:06	16:33	17:59		20:27	21:55	23:23	23:38	22:20	20:38		18:55	16:14	15:00
5	10:07	08:56	07:27		06:41	05:01	03:36	03:34	04:57	06:26		07:48	08:19	09:46
	15:08	16:36	18:02		20:30	21:58	23:26	23:37	22:17	20:34		18:51	16:11	14:58
6	10:05	08:53	07:24		06:38	04:58	03:35	03:36	04:59	06:29		07:51	08:22	09:48
	15:10	16:39	18:04		20:33	22:01	23:28	23:35	22:14	20:31		18:48	16:08	14:57
7	10:04	08:50	07:20		06:35	04:55	03:33	03:38	05:02	06:31		07:54	08:25	09:50
	15:12	16:43	18:07		20:36	22:04	23:30	23:33	22:11	20:27		18:45	16:05	14:55
8	10:03	08:47	07:17		06:31	04:52	03:31	03:40	05:05	06:34		07:57	08:28	09:52
	15:14	16:46	18:10		20:39	22:07	23:32	23:32	22:08	20:24		18:41	16:02	14:54
9	10:01	08:44	07:14		06:28	04:48	03:30	03:42	05:08	06:37		07:59	08:31	09:54
	15:17	16:49	18:13		20:42	22:10	23:34	23:30	22:04	20:20		18:38	15:59	14:53
10	09:59	08:41	07:10		06:24	04:45	03:28	03:45	05:11	06:40		08:02	08:34	09:56
	15:19	16:52	18:16		20:44	22:14	23:35	23:28	22:01	20:17		18:35	15:56	14:52
11	09:58	08:38	07:07		06:21	04:42	03:27	03:47	05:14	06:42		08:05	08:37	09:58
	15:22	16:55	18:19		20:47	22:17	23:37	23:26	21:58	20:14		18:31	15:53	14:51
12	09:56	08:35	07:03		06:18	04:39	03:26	03:49	05:17	06:45		08:08	08:40	10:00
	15:24	16:58	18:22		20:50	22:20	23:39	23:24	21:55	20:10		18:28	15:51	14:50
13	09:54	08:32	07:00		06:14	04:36	03:24	03:52	05:20	06:48		08:11	08:43	10:02
	15:27	17:01	18:25		20:53	22:23	23:40	23:21	21:51	20:07		18:25	15:48	14:49
14	09:52	08:29	06:57		06:11	04:33	03:23	03:54	05:23	06:51	07:47-07:55/8	08:14	08:47	10:03
	15:30	17:04	18:28		20:56	22:26	23:41	23:19	21:48	20:03		18:21	15:45	14:49
15	09:50	08:26	06:53		06:07	04:30	03:23	03:57	05:26	06:53	07:45-07:57/12	08:16	08:50	10:05
	15:32	17:08	18:30		20:59	22:29	23:42	23:17	21:45	20:00		18:18	15:42	14:48
16	09:48	08:23	06:50		06:04	04:27	03:22	03:59	05:29	06:56	07:44-07:58/14	08:19	08:53	10:06
	15:35	17:11	18:33		21:02	22:32	23:44	23:14	21:42	19:56		18:15	15:40	14:48
17	09:46	08:19	06:46		06:01	04:24	03:21	04:02	05:32	06:59	07:42-07:57/15	08:22	08:56	10:07
	15:38	17:14	18:36		21:05	22:35	23:44	23:12	21:38	19:53		18:11	15:37	14:48
18	09:44	08:16	06:43		05:57	04:21	03:21	04:05	05:35	07:01	07:42-07:57/15	08:25	08:59	10:08
	15:41	17:17	18:39		21:08	22:38	23:45	23:09	21:35	19:49		18:08	15:34	14:48
19	09:42	08:13	06:40		05:54	04:18	03:21	04:07	05:38	07:04	07:42-07:57/15	08:28	09:02	10:09
	15:44	17:20	18:42		21:11	22:40	23:46	23:07	21:32	19:46		18:05	15:32	14:48
20	09:39	08:10	06:36		05:50	04:15	03:20	04:10	05:40	07:07	07:42-07:56/14	08:31	09:05	10:10
	15:47	17:23	18:45		21:13	22:43	23:46	23:04	21:28	19:43		18:01	15:29	14:48
21	09:37	08:07	06:33	07:04-07:07/3	05:47	04:13	03:20	04:13	05:43	07:10	07:45-07:55/10	08:34	09:08	10:11
	15:50	17:26	18:47		21:16	22:46	23:47	23:01	21:25	19:39		17:58	15:27	14:48
22	09:35	08:03	06:29	07:00-07:08/8	05:44	04:10	03:20	04:16	05:46	07:12	07:48-07:53/5	08:37	09:11	10:11
	15:53	17:29	18:50		21:19	22:49	23:47	22:59	21:22	19:36		17:55	15:24	14:49
23	09:32	08:00	06:26	06:57-07:10/13	05:40	04:07	03:21	04:18	05:49	07:15		08:40	09:14	10:12
	15:56	17:32	18:53		21:22	22:52	23:47	22:56	21:18	19:32		17:52	15:22	14:49
24	09:30	07:57	06:23	06:55-07:09/14	05:37	04:04	03:21	04:21	05:52	07:18		08:43	09:16	10:12
	15:59	17:35	18:56		21:25	22:55	23:47	22:53	21:15	19:29		17:48	15:20	14:50
25	09:27	07:54	06:19	06:54-07:10/16	05:34	04:02	03:22	04:24	05:55	07:21		07:46	09:19	10:13
	16:02	17:38	18:59		21:28	22:58	23:47	22:50	21:11	19:25		16:45	15:17	14:51
26	09:24	07:50	06:16	06:55-07:10/15	05:30	03:59	03:22	04:27	05:58	07:23		07:49	09:22	10:13
	16:05	17:41	19:02		21:31	23:01	23:46	22:47	21:08	19:22		16:42	15:15	14:52
27	09:22	07:47	06:12	06:54-07:08/14	05:27	03:57	03:23	04:30	06:01	07:26		07:52	09:25	10:13
	16:08	17:44	19:04		21:34	23:03	23:46	22:44	21:05	19:19		16:39	15:13	14:53
28	09:19	07:44	06:09	06:55-07:08/13	05:24	03:54	03:24	04:33	06:03	07:29		07:55	09:28	10:12
	16:11	17:47	19:07		21:37	23:06	23:45	22:42	21:01	19:15		16:36	15:11	14:54
29	09:16		07:05	07:56-08:05/9	05:21	03:52	03:25	04:36	06:06	07:32		07:58	09:30	10:12
	16:14		20:10		21:40	23:09	23:44	22:39	20:58	19:12		16:33	15:09	14:55
30	09:14		07:02	08:00-08:01/1	05:17	03:49	03:26	04:39	06:09	07:34		08:01	09:33	10:12
	16:17		20:13		21:43	23:11	23:43	22:36	20:55	19:08		16:29	15:07	14:56
31	09:11		06:59			03:47		04:42	06:12			08:04		10:11
	16:21		20:16			23:14		22:33	20:51			16:26		14:58
Potential sun hours	182	242	363		447	559	606	594	502	392		308	206	151
Sum of minutes with flicker	0	0		106	0	0	0	0	0		108	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lålax 1 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:43	03:29	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:51	06:20	07:42	08:12	09:40
	15:04	16:30	17:55	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:33	04:53	06:23	07:45	08:16	09:43
	15:06	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:26	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:35	03:36	04:59	06:28	07:51	08:22	09:47
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:35	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:23	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:30	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:45	05:11	06:39	08:02	08:34	09:56
	15:19	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:34	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:53	14:51
12	09:56	08:35	07:03	06:17	04:39	03:26	03:49	05:17	06:45	08:08	08:40	09:59
	15:24	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:50	14:50
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:10	08:43	10:01
	15:27	17:01	18:24	20:53	22:22	23:39	23:21	21:51	20:06	18:24	15:48	14:49
14	09:52	08:29	06:56	06:11	04:33	03:24	03:54	05:23	06:50	08:13	08:46	10:03
	15:30	17:04	18:27	20:56	22:25	23:41	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:25	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:44	19:59	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:05
	15:35	17:10	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:39	05:54	04:18	03:21	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:04	15:32	14:48
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:20	04:13	05:43	07:09	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:48
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:36	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:35	17:55	15:24	14:49
23	09:32	08:00	06:26	05:40	04:07	03:21	04:18	05:49	07:15	08:39	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:14	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:51
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:23	04:30	06:00	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:18	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:35	15:11	14:54
29	09:16		07:05	05:20	03:52	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
30	09:13		07:02	05:17	03:49	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:10		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lålax 2 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:40
	15:04	16:30	17:55	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:06	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:26	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:35	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:35	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:30	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
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15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
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	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:51	15:22	14:49
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	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:18	16:39	15:13	14:52
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31	09:10		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lålax 3 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:44	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:10	09:38
	15:02	16:27	17:52	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:41
	15:04	16:30	17:55	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:05	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:25	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:34	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
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9	10:01	08:44	07:13	06:28	04:48	03:29	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:44	05:11	06:39	08:02	08:34	09:56
	15:19	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:34	15:56	14:52
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	15:24	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:50	14:50
13	09:54	08:32	07:00	06:14	04:36	03:24	03:52	05:20	06:48	08:11	08:43	10:01
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15	09:50	08:26	06:53	06:07	04:30	03:22	03:57	05:26	06:53	08:16	08:49	10:04
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17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:04	05:34	07:01	08:25	08:58	10:08
	15:41	17:16	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:39	05:54	04:18	03:20	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:04	15:31	14:48
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	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:35	17:55	15:24	14:48
23	09:32	08:00	06:26	05:40	04:07	03:20	04:18	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:21	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:50
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
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	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:18	16:39	15:13	14:52
28	09:19	07:43	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:35	15:11	14:54
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	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
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31	09:11		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Lålax 4 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:44	03:28	04:44	06:14	07:37	08:07	09:36
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:09	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:41
	15:03	16:30	17:55	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:05	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:25	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:37	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:34	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:28	23:35	22:14	20:30	18:48	16:08	14:57
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13	09:54	08:32	07:00	06:14	04:36	03:24	03:51	05:20	06:48	08:11	08:43	10:01
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14	09:52	08:29	06:56	06:11	04:33	03:23	03:54	05:23	06:50	08:13	08:46	10:03
	15:30	17:04	18:27	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:22	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:06
	15:35	17:10	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:12	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:04	05:34	07:01	08:25	08:58	10:08
	15:41	17:16	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:47
19	09:41	08:13	06:39	05:54	04:18	03:20	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:46	23:06	21:31	19:46	18:04	15:31	14:47
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
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	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:26	14:48
22	09:34	08:03	06:29	05:44	04:10	03:20	04:15	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:47	22:58	21:21	19:36	17:55	15:24	14:48
23	09:32	08:00	06:26	05:40	04:07	03:20	04:18	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:21	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:58	23:46	22:50	21:11	19:25	16:45	15:17	14:50
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:51
27	09:22	07:47	06:12	05:27	03:56	03:23	04:30	06:00	07:26	07:51	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:18	16:39	15:13	14:52
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29	09:16		07:05	05:20	03:51	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
30	09:13		07:02	05:17	03:49	03:26	04:39	06:09	07:34	08:00	09:33	10:12
	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:11		06:58		03:47		04:41	06:12		08:03		10:11
	16:20		20:16		23:14		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	606	595	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 01 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (223)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:42	22:29	20:48	19:06	16:24	15:06
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:40	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	17:59	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:37	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:35	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:45	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:17	18:35	15:57	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:15	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:35	07:04	06:18	04:40	03:28	03:51	05:18	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:37	03:26	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:25	20:53	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:50	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:15	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	06:59	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:44	23:11	21:38	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:28	09:02	10:09
	15:45	17:21	18:42	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:49
20	09:39	08:10	06:37	05:51	04:17	03:22	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:33	05:48	04:14	03:22	04:14	05:44	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:41	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:24	07:51	06:16	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:08	19:23	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:25	04:31	06:01	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:55
29	09:16		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 02 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (230)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	17:59	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
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	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:18	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:37	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:25	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
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	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:24	07:51	06:16	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:47	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:56
29	09:16		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 03 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (231)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:41	22:29	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:34	18:00	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:58	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:40	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:44	23:11	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:13	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:24	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:56
29	09:16		07:06	05:22	03:54	03:28	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:38	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:42	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 04 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (232)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:35
	15:02	16:25	17:51	20:19	21:46	23:16	23:41	22:29	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:40
	15:06	16:31	17:57	20:25	21:52	23:20	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	08:59	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:34	17:59	20:28	21:55	23:23	23:37	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:10	23:33	23:29	22:04	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:13	23:35	23:27	22:01	20:17	18:35	15:58	14:54
11	09:57	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:37	09:58
	15:24	16:56	18:20	20:48	22:16	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:35	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:08	08:40	09:59
	15:26	16:59	18:23	20:51	22:19	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:25	20:53	22:22	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:25	23:40	23:18	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:28	23:41	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:05
	15:37	17:12	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:43	23:11	21:38	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:41	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:28	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:02	15:31	14:50
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23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:13	10:11
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24	09:29	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:16	10:12
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	16:19		20:14	21:43	23:11	23:42	22:35	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:32	20:52		16:27		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	207	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 05 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (233)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:02	16:21	15:05
3	10:09	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
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	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:37	03:27	03:54	05:21	06:49	08:11	08:44	10:01
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14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
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17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
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	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
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	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
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29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:58	19:13	16:34	15:10	14:57
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	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 06 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (234)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:41	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
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	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
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	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:40	03:28	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:53	05:21	06:49	08:11	08:44	10:01
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	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
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	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
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Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
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
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Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 07 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (235)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Operational time

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2	10:10	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
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	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:54	05:21	06:49	08:11	08:44	10:02
	15:29	17:02	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:25	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:49
20	09:39	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
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	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:55
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 08 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (236)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:06
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:03	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:11	16:41	18:05	20:34	22:02	23:28	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:36	22:05	23:30	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:32	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:31	03:44	05:10	06:38	08:00	08:32	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:57	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:40	03:27	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:53	05:21	06:49	08:11	08:44	10:02
	15:29	17:02	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:25	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:49
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:22	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:49
20	09:40	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:14	05:45	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:22	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:51
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:20	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:13
	16:06	17:42	19:02	21:32	23:01	23:46	22:48	21:09	19:23	16:43	15:16	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:31	06:02	07:27	07:52	09:25	10:13
	16:09	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:55
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:09	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 09 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (237)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
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9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
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	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 10 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (224)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:41	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:43	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:41	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:11	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:24	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:54
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:19	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:27	04:35	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:41	21:02	19:16	16:37	15:13	14:56
29	09:16		07:06	05:22	03:54	03:28	04:38	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:43	22:39	20:58	19:13	16:34	15:11	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:28		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 11 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (225)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:03	16:21	15:05
3	10:08	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:42	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
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	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
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	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:09	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:11	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:48	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:54
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:20	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:13	14:56
29	09:17		07:06	05:22	03:54	03:28	04:38	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:43	22:39	20:58	19:13	16:34	15:11	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:13		22:33	20:52		16:28		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 12 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (226)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:19	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:09	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:11	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:20	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:54	03:28	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:13		22:33	20:52		16:28		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types) **WTG:** Märkenkall 13 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (227)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:35	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:02
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
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	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:25	18:42	16:03	14:56
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	15:19	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:12	08:44	10:02
	15:29	17:03	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:30	06:57	06:12	04:35	03:26	03:56	05:24	06:52	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:41	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
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26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:13
	16:06	17:42	19:02	21:32	23:01	23:46	22:48	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:13
	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:20	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:09	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:28		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 14 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (228)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:40	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:03	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:23	09:48
	15:12	16:41	18:05	20:34	22:02	23:28	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:37	22:05	23:30	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
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9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
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11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
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13	09:54	08:33	07:01	06:15	04:38	03:26	03:54	05:21	06:49	08:12	08:44	10:02
	15:29	17:03	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:30	06:58	06:12	04:35	03:26	03:56	05:24	06:52	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	21:00	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
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	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
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	15:51	17:27	18:48	21:17	22:47	23:46	23:02	21:26	19:40	17:59	15:28	14:50
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31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 15 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (229)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,00	2,82	4,23	6,60	8,77	9,10	8,87	6,81	4,67	2,52	1,17	0,58

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
751	721	337	253	458	779	836	1296	1344	791	536	466	8569

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:06	07:38	06:53	05:12	03:45	03:32	04:49	06:19	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:44	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:02
5	10:07	08:57	07:28	06:43	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:06	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
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	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:58	14:54
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	15:24	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	17:00	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:12	08:44	10:02
	15:29	17:03	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:30	06:58	06:12	04:35	03:26	03:56	05:24	06:52	08:14	08:47	10:03
	15:31	17:06	18:29	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:09	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
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	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
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	15:46	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:50
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Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
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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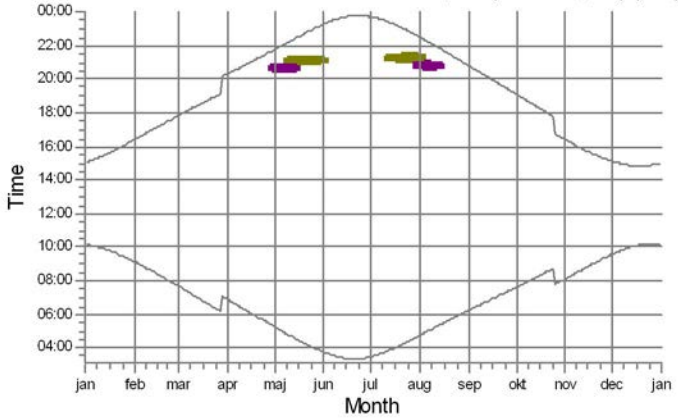
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

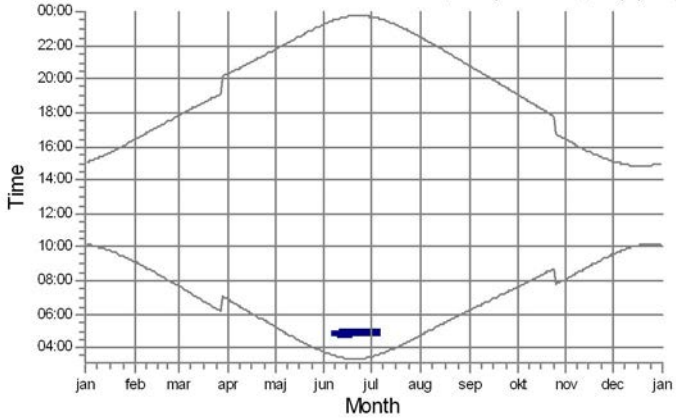
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

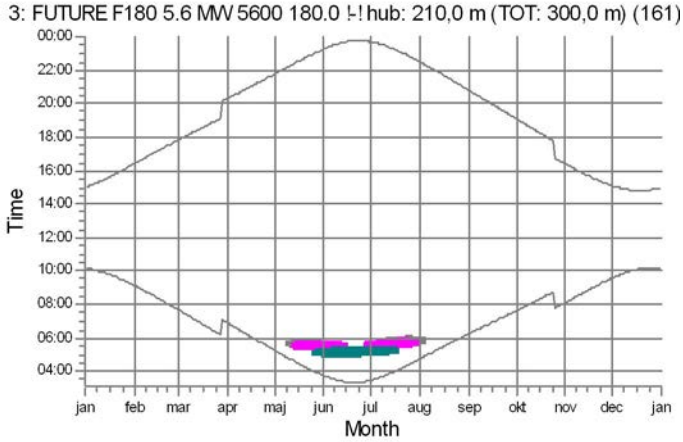
1: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (156)



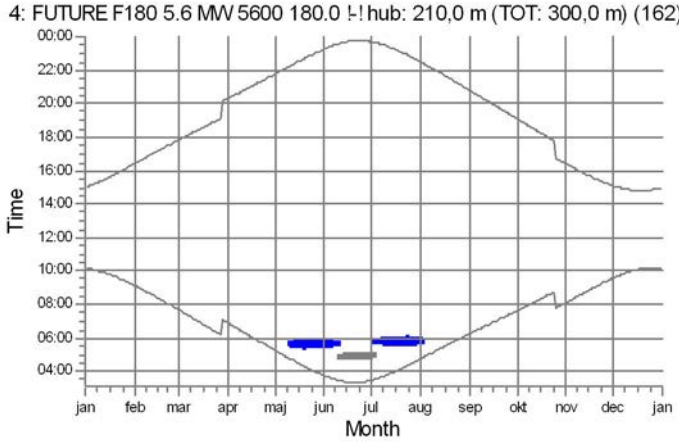
2: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (160)



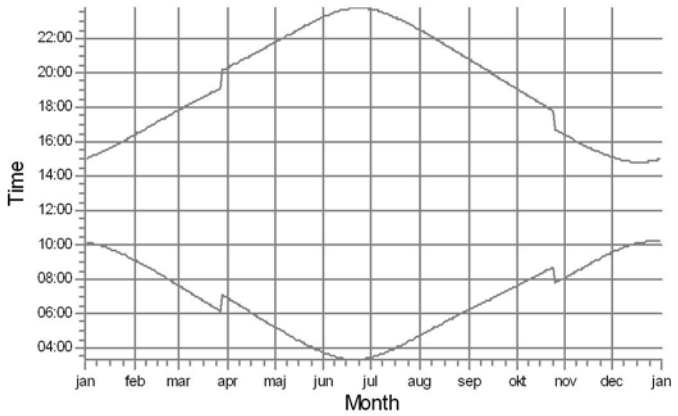
3: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (161)



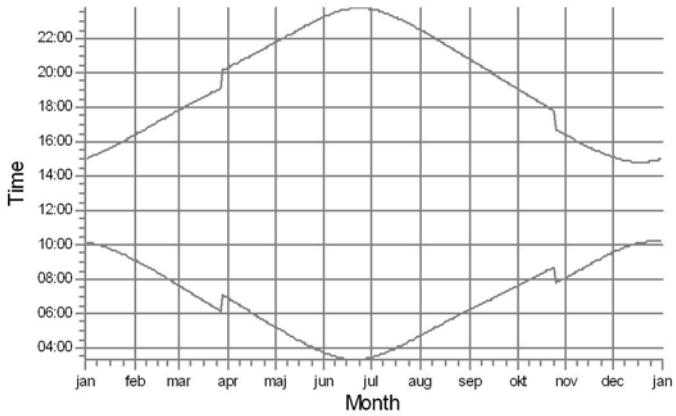
4: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (162)



5: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (155)



6: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (158)



Shadow receptors

RH01: RH01	RH03: RH03	RH05: RH05	RH09: RH09
RH02: RH02	RH04: RH04	RH08: RH08	

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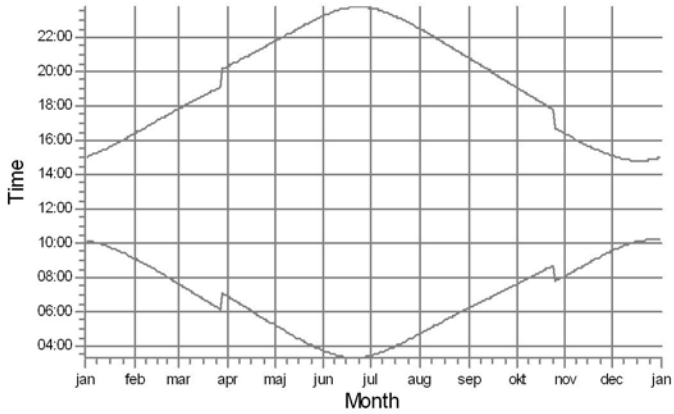
18.11.2019 13:11/3.3.247

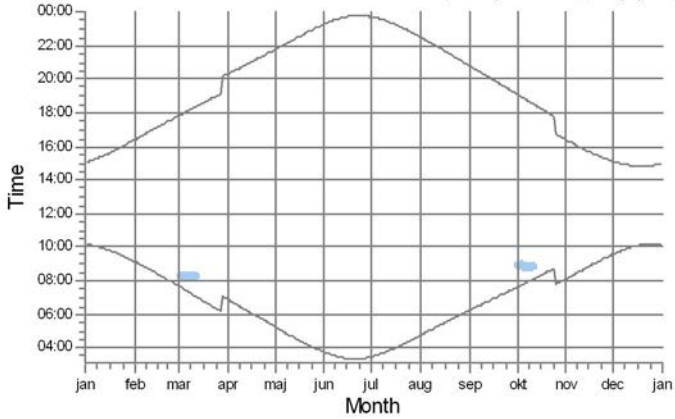
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

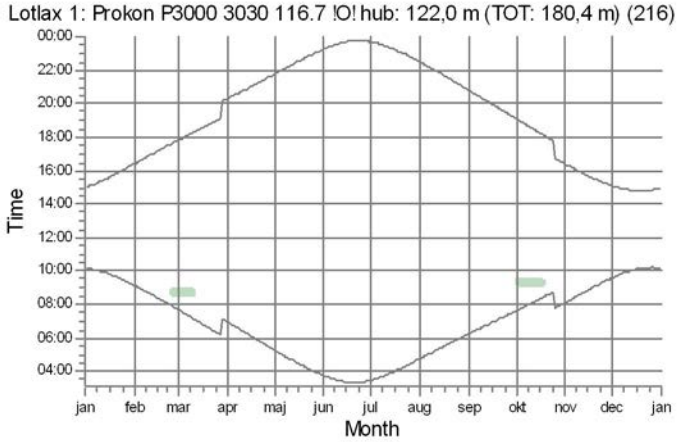
7: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)



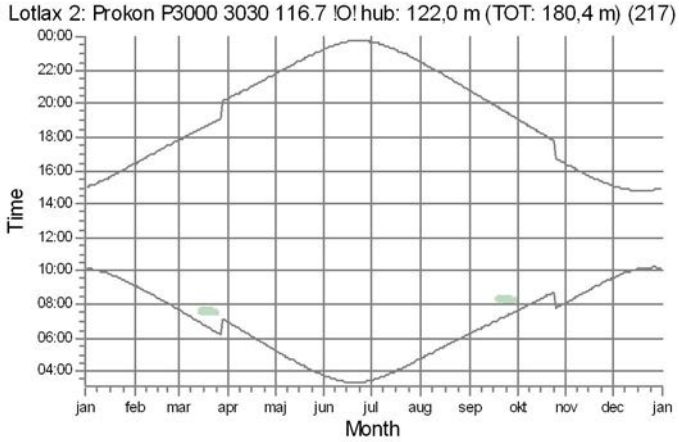
8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)



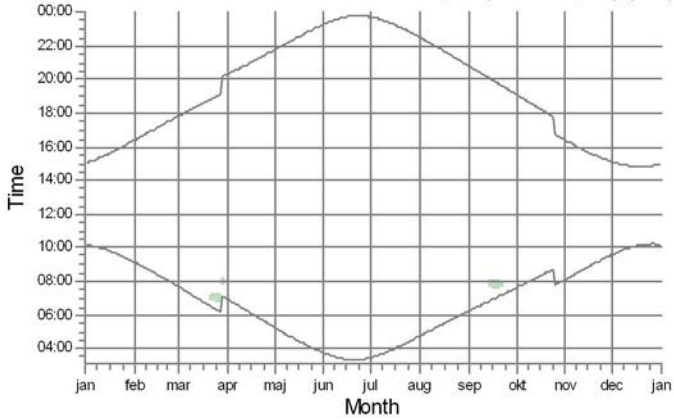
Lotlax 1: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)



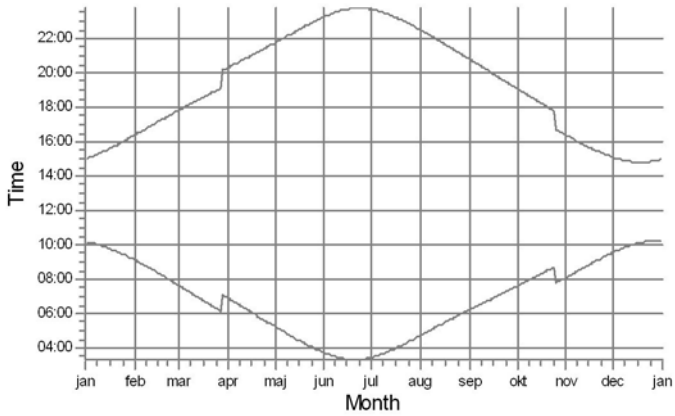
Lotlax 2: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)



Lotlax 3: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)



Lålax 1: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)



Shadow receptors

RH12: RH12 RH13: RH13

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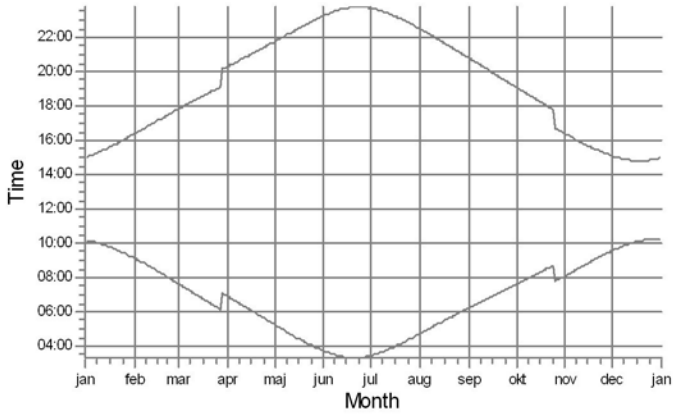
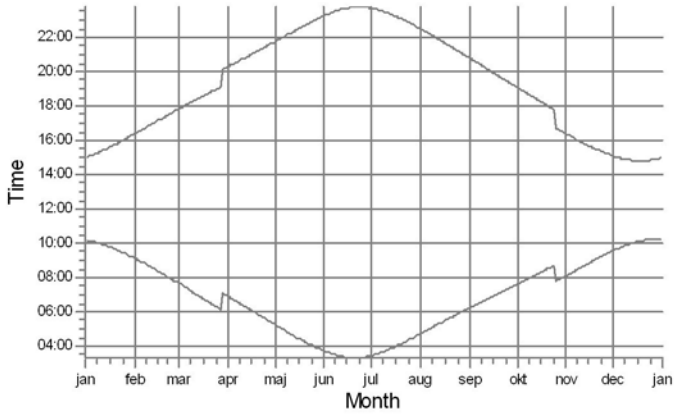
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

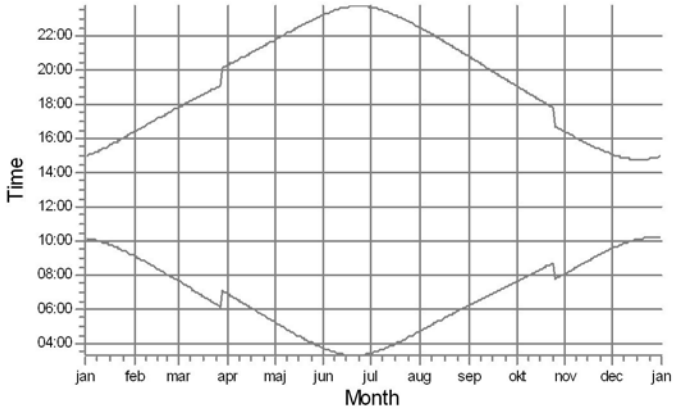
Lålax 2: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)



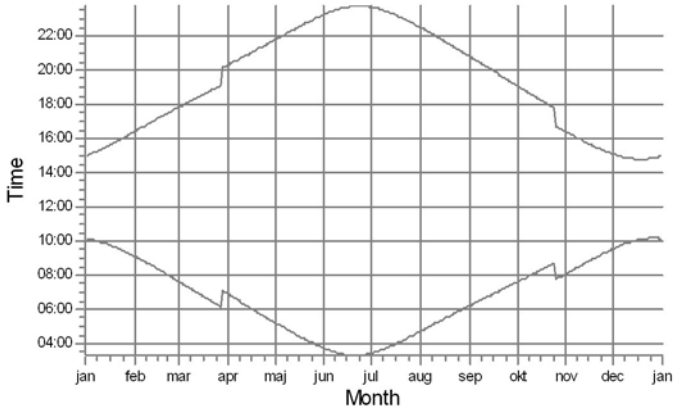
Lålax 3: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)



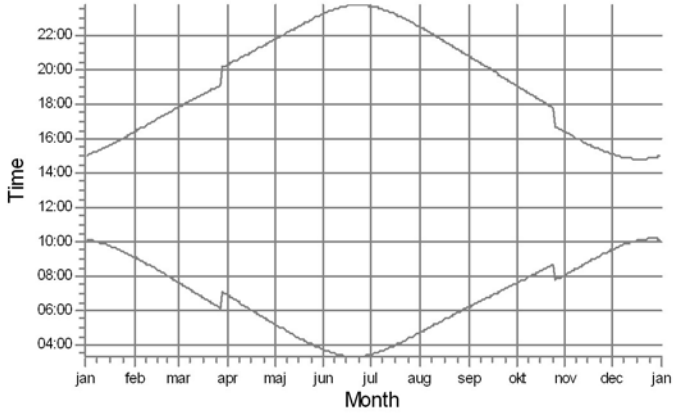
Lålax 4: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)



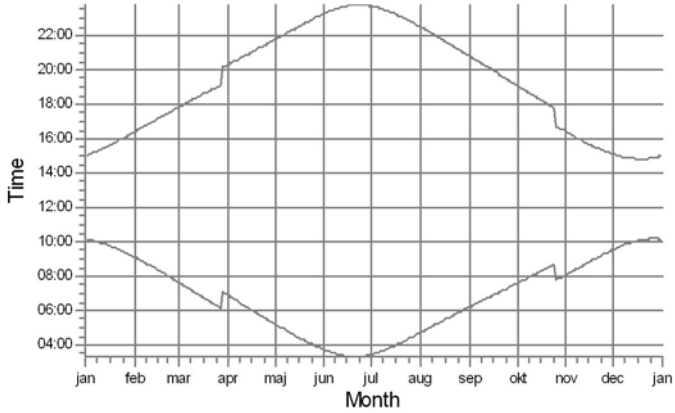
Märkenkall 01: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Märkenkall 02: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Märkenkall 03: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Shadow receptors

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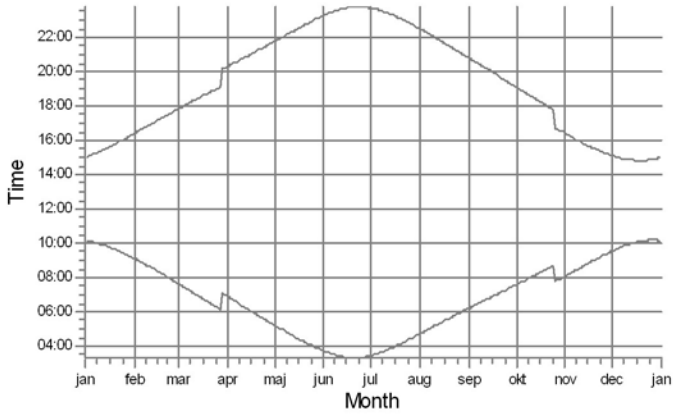
Calculated:
18.11.2019 13:11/3.3.247

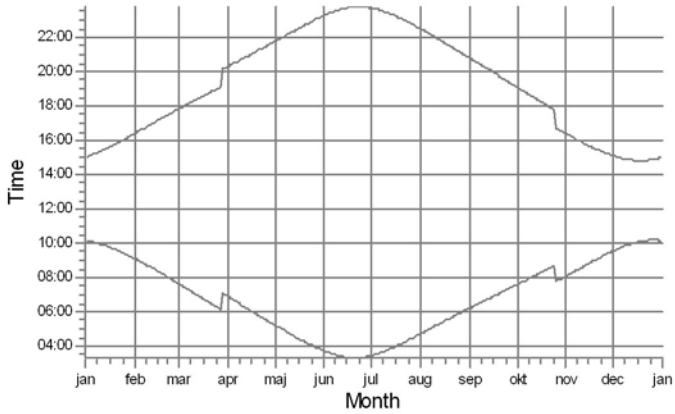
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

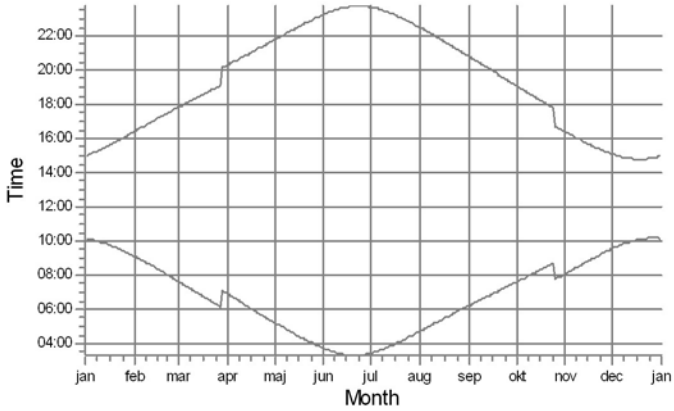
Märkenkall 04: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



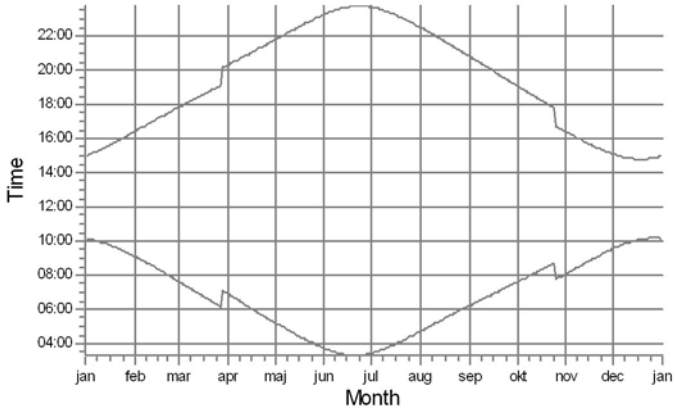
Märkenkall 05: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



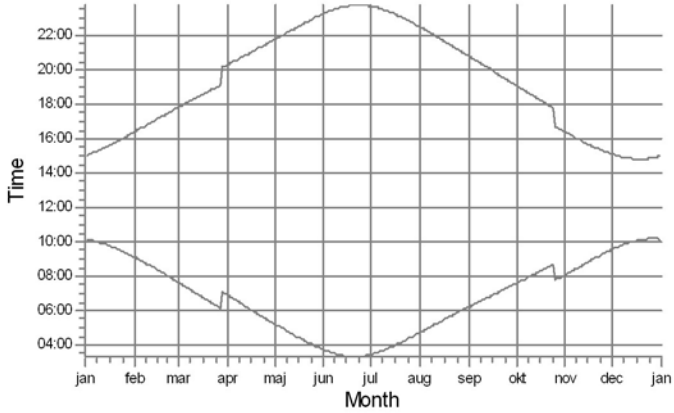
Märkenkall 06: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



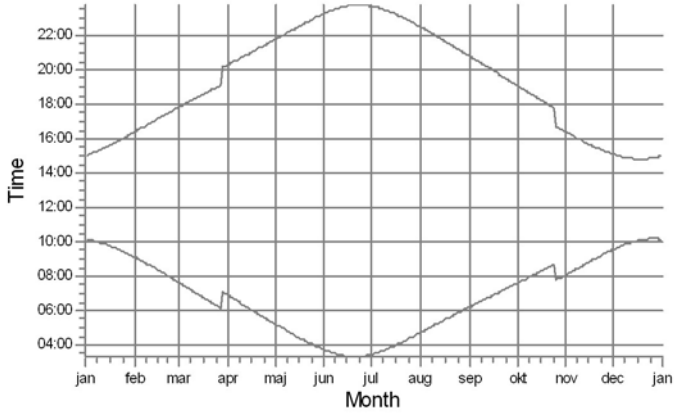
Märkenkall 07: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Märkenkall 08: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Märkenkall 09: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Shadow receptors

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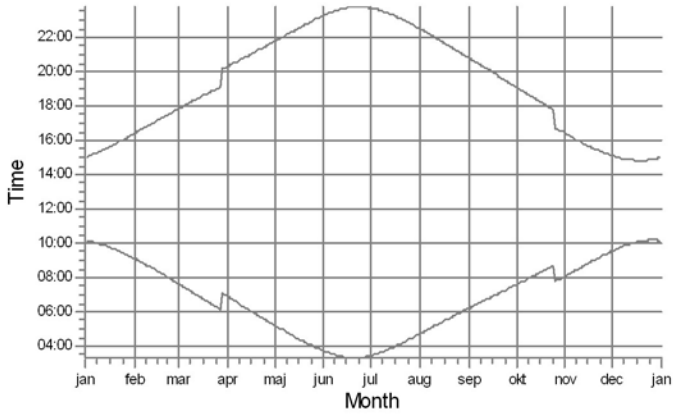
Calculated:
18.11.2019 13:11/3.3.247

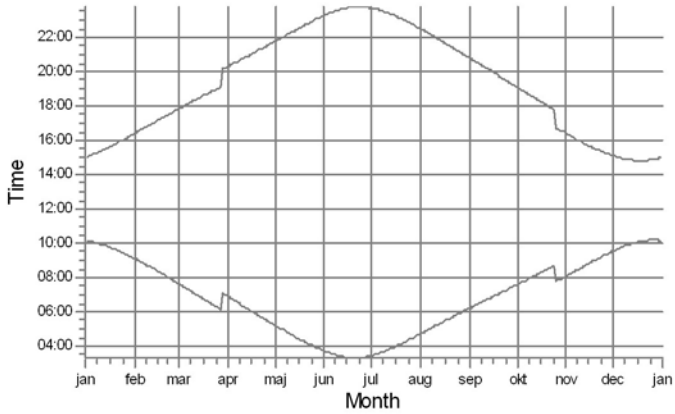
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)

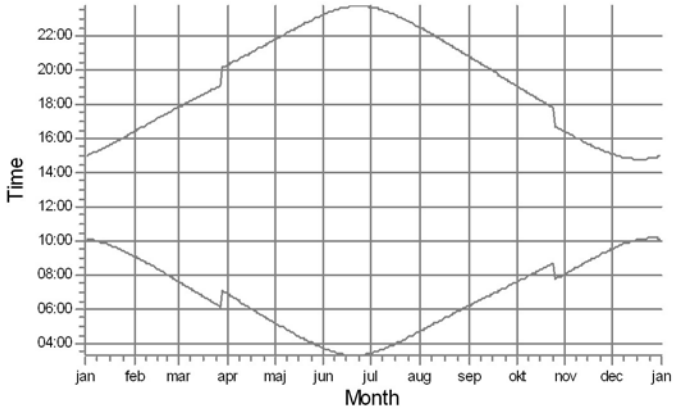
Märkenkall 10: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



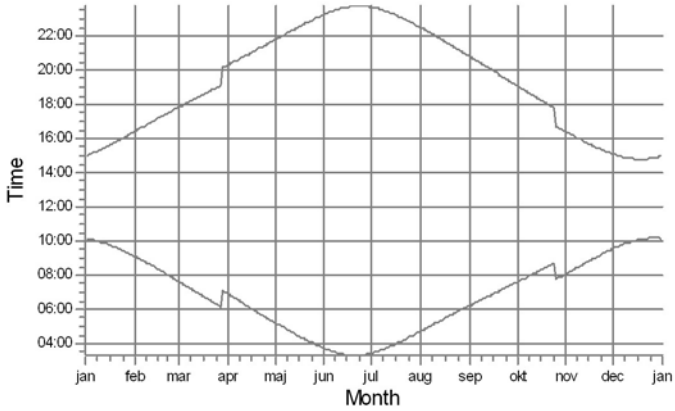
Märkenkall 11: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



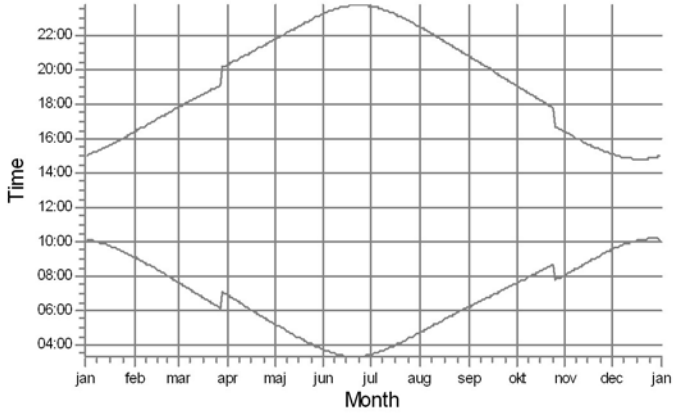
Märkenkall 12: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



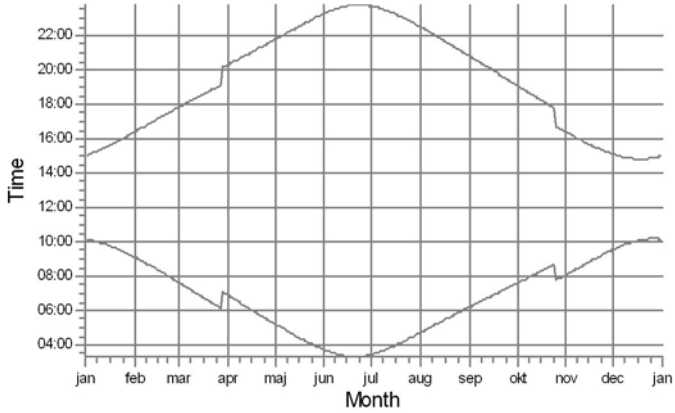
Märkenkall 13: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



Märkenkall 14: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



Märkenkall 15: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T



Shadow receptors

Project:
Söderskogen

Licensed user:
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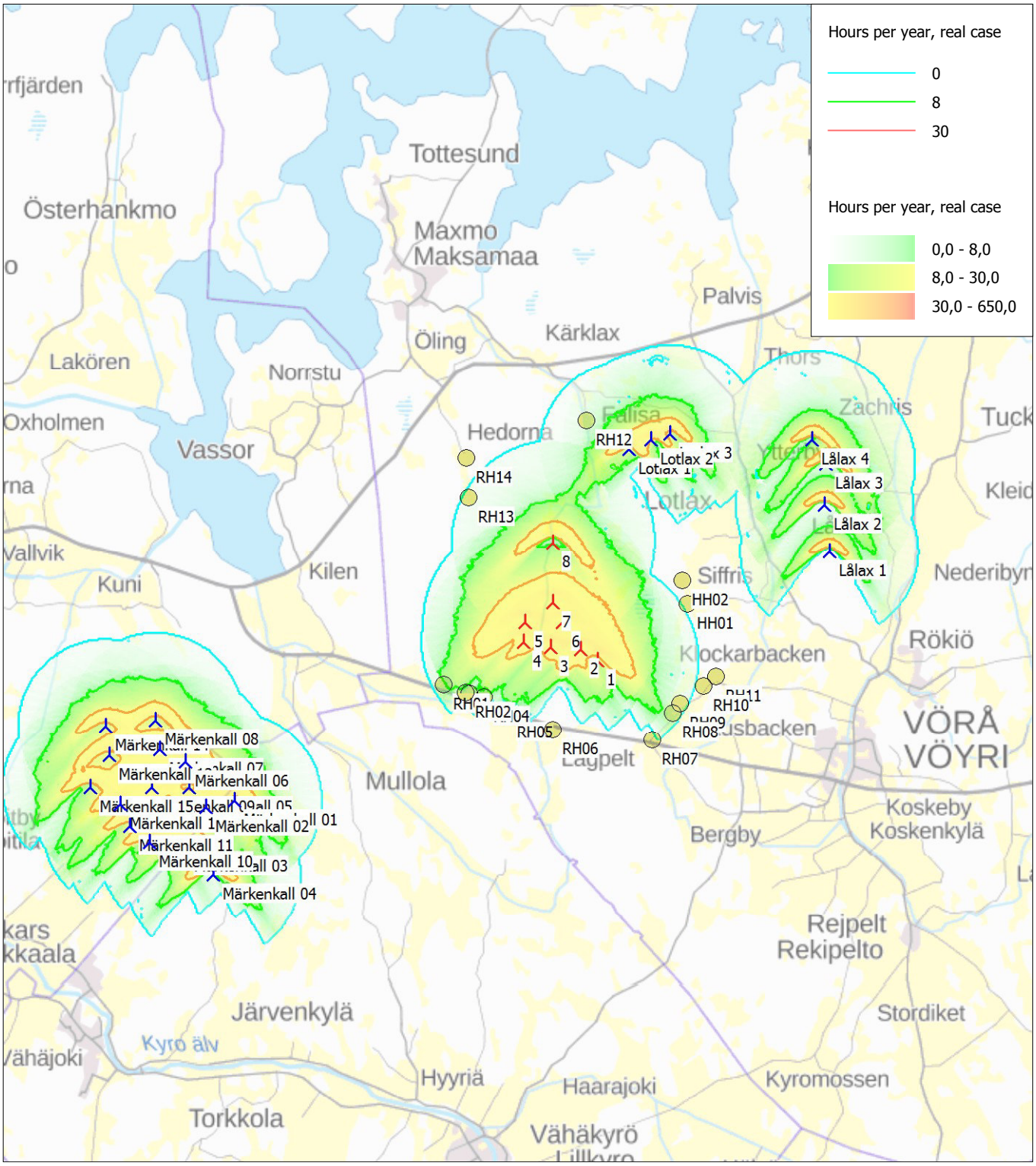
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:11/3.3.247

SHADOW - Map

Calculation: MP Proposal, 8xF180 @210m, Real case - cumulative impact (permitted WTG types)



0 2,5 5 7,5 10km

Map: Söde_Background map_160k , Print scale 1:120 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 252 630 North: 7 011 990

New WTG Shadow receptor

Flicker map level: DEM 10m

Liite 4

Mallinnuksen lähtötiedot ja tulokset,

worst case yhteisvaikutukset

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Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

Assumptions for shadow calculations

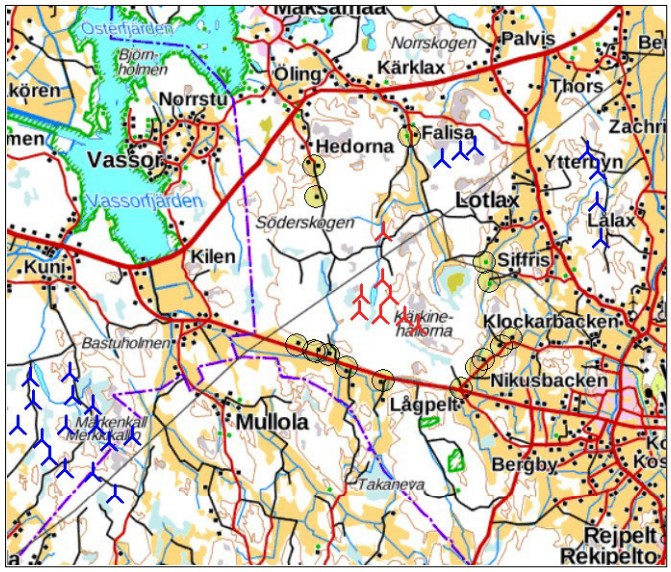
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

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

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

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: DEM 10m
Obstacles not 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 1:200 000
New WTG Shadow receptor

WTGs

	East	North	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	255445	7011327	46,5	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
2	255108	7011549	50,2	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
3	254469	7011599	26,6	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
4	253911	7011714	27,9	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
5	253946	7012128	33,9	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
6	254714	7012124	38,4	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
7	254523	7012536	35,6	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
8	254528	7013790	19,2	FUTURE F180 5.6 MW...	Yes	FUTURE	F180 5.6 MW-5600	5600	180,0	210,0	2102	12,1
Lotlax 1	256101	7015730	27,0	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lotlax 2	256560	7015928	33,2	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lotlax 3	256964	7016058	30,0	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	122,0	1836	0,0
Lålax 1	260278	7013601	21,1	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 2	260174	7014579	28,5	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 3	260216	7015429	20,8	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Lålax 4	259924	7015937	27,7	Prokon P3000 3030 1...	No	Prokon	P3000-3030	3030	116,7	142,0	1834	0,0
Märkenkall 01	247894	7008402	21,5	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 02	247294	7008259	25,0	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 03	246855	7007441	24,7	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 04	247445	7006854	25,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 05	246950	7008670	26,1	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 06	246864	7009208	21,0	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 07	246326	7009461	17,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 08	246247	7010081	20,5	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 09	246160	7008681	29,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 10	246126	7007532	23,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 11	245712	7007870	13,7	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 12	245517	7008318	15,8	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 13	245281	7009344	17,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 14	245200	7009948	18,9	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0
Märkenkall 15	244881	7008680	14,1	VESTAS V136-3.45 3r...	Yes	VESTAS	V136-3.45 3rdOc-3450	3450	136,0	172,0	1808	0,0

Shadow receptor-Input

No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
HH01	HH01	257331	7012499	17,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
HH02	HH02	257219	7012995	17,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH01	RH01	252257	7010823	13,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0

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SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

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No.	Name	East	North	Z [m]	Width [m]	Height [m]	Elevation a.g.l. [m]	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
RH02	RH02	252700	7010660	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH03	RH03	252789	7010635	14,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH04	RH04	253090	7010568	15,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH05	RH05	253574	7010222	14,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH06	RH06	254528	7009881	18,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH07	RH07	256594	7009667	21,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH08	RH08	257015	7010236	19,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH09	RH09	257177	7010423	17,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH10	RH10	257669	7010798	18,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH11	RH11	257929	7010986	18,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH12	RH12	255219	7016333	14,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH13	RH13	252762	7014727	25,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
RH14	RH14	252714	7015547	21,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0

Calculation Results

Shadow receptor

No.	Name	**Shadow, worst case** Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
HH01	HH01	0:00	0	0:00
HH02	HH02	0:00	0	0:00
RH01	RH01	18:38	64	0:24
RH02	RH02	19:14	75	0:22
RH03	RH03	19:17	70	0:23
RH04	RH04	19:03	53	0:26
RH05	RH05	6:44	31	0:17
RH06	RH06	0:00	0	0:00
RH07	RH07	0:00	0	0:00
RH08	RH08	15:43	53	0:23
RH09	RH09	11:01	38	0:22
RH10	RH10	0:00	0	0:00
RH11	RH11	0:00	0	0:00
RH12	RH12	20:37	67	0:28
RH13	RH13	7:13	26	0:21
RH14	RH14	0:00	0	0:00

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

No.	Name	Worst case [h/year]
1	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)	26:44
2	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)	6:44
3	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)	44:06
4	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)	23:26
5	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)	0:00
6	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)	0:00
7	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)	0:00
8	FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)	7:13
Lotlax 1	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)	10:56
Lotlax 2	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)	6:07
Lotlax 3	Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)	3:34
Lålax 1	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)	0:00
Lålax 2	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)	0:00
Lålax 3	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)	0:00
Lålax 4	Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)	0:00
Märkenkall 01	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (223)	0:00
Märkenkall 02	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (230)	0:00
Märkenkall 03	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (231)	0:00
Märkenkall 04	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (232)	0:00
Märkenkall 05	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (233)	0:00
Märkenkall 06	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (234)	0:00
Märkenkall 07	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (235)	0:00

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SHADOW - Main Result

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

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No.	Name	Worst case [h/year]
Märkenkall 08	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (236)	0:00
Märkenkall 09	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (237)	0:00
Märkenkall 10	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (224)	0:00
Märkenkall 11	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (225)	0:00
Märkenkall 12	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (226)	0:00
Märkenkall 13	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (227)	0:00
Märkenkall 14	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (228)	0:00
Märkenkall 15	VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (229)	0:00

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

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SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** HH01 - HH01

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:51
12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:54	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:57	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** HH02 - HH02

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:35
	15:00	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:03
3	10:08	09:02	07:34	06:48	05:08	03:41	03:31	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:04	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:36	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:04	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:50
	15:12	16:43	18:07	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:11	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:13	18:31	15:54	14:51
12	09:56	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	10:00
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:48
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:07
	15:38	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:10	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:13	03:21	04:13	05:43	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:24	14:49
23	09:32	08:00	06:26	05:41	04:07	03:21	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:49
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:51
26	09:24	07:50	06:16	05:31	03:59	03:23	04:27	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:54	03:25	04:33	06:03	07:29	07:55	09:27	10:12
	16:11	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:55
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH01 - RH01

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:32 (4)	03:29		04:45		05:44 (4)	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46		23:16	18	05:50 (4)	23:42		22:29	12	05:56 (4)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:32 (4)	03:31	05:46 (4)	04:48		05:46 (4)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	17	05:49 (4)	23:40	3	05:49 (4)	22:26	8	05:54 (4)	20:45	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42		05:33 (4)	03:32		05:44 (4)	04:51			06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21	16	05:49 (4)	23:39	6	05:50 (4)	22:23			20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40		05:34 (4)	03:34		05:43 (4)	04:54			06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23	15	05:49 (4)	23:38	8	05:51 (4)	22:20			20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38		05:34 (4)	03:36		05:42 (4)	04:57			06:26	07:49	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25	14	05:48 (4)	23:36	10	05:52 (4)	22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36		05:35 (4)	03:37		05:42 (4)	05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27	12	05:47 (4)	23:35	12	05:54 (4)	22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34		05:36 (4)	03:39		05:41 (4)	05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29	11	05:47 (4)	23:33	13	05:54 (4)	22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32		05:37 (4)	03:41		05:41 (4)	05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31	9	05:46 (4)	23:31	14	05:55 (4)	22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		03:31		05:38 (4)	03:44		05:40 (4)	05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10		23:33	7	05:45 (4)	23:29	16	05:56 (4)	22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	05:39 (4)	03:29		05:39 (4)	03:46		05:40 (4)	05:12			06:40	08:03	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	2 05:41 (4)	23:35	5	05:44 (4)	23:27	17	05:57 (4)	22:01			20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	05:34 (4)	03:28			03:48		05:40 (4)	05:15			06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	10 05:44 (4)	23:36			23:25	18	05:58 (4)	21:58			20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	05:33 (4)	03:27			03:50		05:40 (4)	05:18			06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	14 05:47 (4)	23:38			23:23	18	05:58 (4)	21:55			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	05:31 (4)	03:26			03:53		05:39 (4)	05:21			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	16 05:47 (4)	23:39			23:21	20	05:59 (4)	21:51			20:07	18:25	15:48	14:51
14	09:52	08:29	06:57	06:11	04:34	05:31 (4)	03:25			03:55		05:38 (4)	05:24			06:51	08:14	08:47	10:03
	15:31	17:05	18:28	20:56	22:25	18 05:49 (4)	23:41			23:19	21	05:59 (4)	21:48			20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31	05:29 (4)	03:24			03:58		05:38 (4)	05:27			06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	20 05:49 (4)	23:42			23:16	21	05:59 (4)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:05	04:28	05:29 (4)	03:23			04:00		05:38 (4)	05:30			06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	21 05:50 (4)	23:43			23:14	22	06:00 (4)	21:42			19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	05:28 (4)	03:23			04:03		05:38 (4)	05:32			06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	22 05:50 (4)	23:44			23:11	22	06:00 (4)	21:38			19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	05:28 (4)	03:22			04:06		05:39 (4)	05:35			07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23 05:51 (4)	23:45			23:09	22	06:01 (4)	21:35			19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	05:28 (4)	03:22			04:08		05:38 (4)	05:38			07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23 05:51 (4)	23:45			23:06	23	06:01 (4)	21:32			19:46	18:05	15:32	14:49
20	09:39	08:10	06:37	05:51	04:16	05:27 (4)	03:22			04:11		05:38 (4)	05:41			07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43	24 05:51 (4)	23:46			23:04	23	06:01 (4)	21:28			19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:14	05:28 (4)	03:22			04:14		05:38 (4)	05:44			07:10	08:34	09:08	10:11
	15:51	17:26	18:48	21:17	22:46	23 05:51 (4)	23:46			23:01	23	06:01 (4)	21:25			19:40	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11	05:28 (4)	03:22			04:17		05:38 (4)	05:47			07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23 05:51 (4)	23:46			22:58	23	06:01 (4)	21:22			19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	05:28 (4)	03:22			04:19		05:39 (4)	05:50			07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	23 05:51 (4)	23:46			22:56	23	06:02 (4)	21:18			19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	05:28 (4)	03:22			04:22		05:38 (4)	05:53			07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	23 05:51 (4)	23:46			22:53	24	06:02 (4)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	05:28 (4)	03:23			04:25		05:38 (4)	05:55			07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23 05:51 (4)	23:46			22:50	23	06:01 (4)	21:12			19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	05:29 (4)	03:24			04:28		05:39 (4)	05:58			07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	22 05:51 (4)	23:46			22:47	22	06:01 (4)	21:08			19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	05:29 (4)	03:24			04:31		05:39 (4)	06:01			07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	22 05:51 (4)	23:45			22:44	22	06:01 (4)	21:05			19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	05:29 (4)	03:25			04:34		05:39 (4)	06:04			07:29	07:55	09:28	10:12
	16:12	17:47	19:08	21:37	23:06	21 05:50 (4)	23:44			22:41	21	06:00 (4)	21:01			19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	05:30 (4)	03:26			04:37		05:41 (4)	06:07			07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21 05:51 (4)	23:44			22:38	19	06:00 (4)	20:58			19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50	05:30 (4)	03:28			04:40		05:41 (4)	06:10			07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20 05:50 (4)	23:43			22:35	17	05:58 (4)	20:55			19:09	16:30	15:08	14:57
31	09:11		06:59		03:48	05:31 (4)				04:43		05:43 (4)	06:12				08:04		10:11
	16:21		20:16		23:13	19 05:50 (4)				22:32	15	05:58 (4)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559		605			594			502			392	308	206	151
Total, worst case						433		124			541			20					

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH02 - RH02

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May		June		July		August		September	October	November	December
1	10:10	09:08	07:41	06:56	05:15		03:46		05:37 (3)	03:29		04:53 (4)	04:45		05:42 (3)	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46		23:16	9	05:46 (3)	23:42	9	05:02 (4)	22:29	16	05:58 (3)	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11		03:44		05:38 (3)	03:30		04:55 (4)	04:48		05:44 (3)	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49		23:18	6	05:44 (3)	23:40	7	05:02 (4)	22:26	14	05:58 (3)	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08		03:42			03:32		04:57 (4)	04:51		05:45 (3)	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52		23:21			23:39	3	05:00 (4)	22:23	11	05:56 (3)	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05		03:40			03:34			04:54		05:47 (3)	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55		23:23			23:38			22:20	7	05:54 (3)	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02		03:38			03:36			04:57			06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58		23:25			23:36			22:17			20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59		03:36			03:37			05:00			06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01		23:27			23:35			22:14			20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55		03:34			03:39			05:03			06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04		23:29			23:33			22:11			20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52		03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07		23:31			23:31			22:08			20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49		05:36 (3)	03:31		03:44			05:09			06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10	9	05:45 (3)	23:33		23:29			22:04			20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46		05:34 (3)	03:29	04:50 (4)	03:46		05:47 (3)	05:12			06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13	12	05:46 (3)	23:35	6	04:56 (4)	23:27	4	05:51 (3)	22:01		20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43		05:32 (3)	03:28		04:50 (4)	03:48		05:45 (3)	05:15		06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	15	05:47 (3)	23:36	8	04:58 (4)	23:25	8	05:53 (3)	21:58		20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:32 (3)	03:27		04:49 (4)	03:50		05:44 (3)	05:18		06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	17	05:49 (3)	23:38	10	04:59 (4)	23:23	11	05:55 (3)	21:55		20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:30 (3)	03:26		04:48 (4)	03:53		05:42 (3)	05:21		06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	19	05:49 (3)	23:39	11	04:59 (4)	23:21	13	05:55 (3)	21:51		20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:30 (3)	03:25		04:48 (4)	03:55		05:42 (3)	05:24		06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	20	05:50 (3)	23:41	12	05:00 (4)	23:19	14	05:56 (3)	21:48		20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:29 (3)	03:24		04:47 (4)	03:58		05:41 (3)	05:27		06:54	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	21	05:50 (3)	23:42	13	05:00 (4)	23:16	16	05:57 (3)	21:45		20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:29 (3)	03:23		04:47 (4)	04:00		05:41 (3)	05:30		06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	22	05:51 (3)	23:43	14	05:01 (4)	23:14	17	05:58 (3)	21:42		19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:29 (3)	03:23		04:48 (4)	04:03		05:40 (3)	05:32		06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	21	05:50 (3)	23:44	14	05:02 (4)	23:11	18	05:58 (3)	21:38		19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:29 (3)	03:22		04:48 (4)	04:06		05:41 (3)	05:35		07:02	08:25	08:59	10:08
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19	09:41	08:13	06:40	05:54	04:19		05:29 (3)	03:22		04:48 (4)	04:08		05:40 (3)	05:38		07:05	08:28	09:02	10:09
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21	09:37	08:07	06:33	05:48	04:14		05:29 (3)	03:22		04:48 (4)	04:14		05:40 (3)	05:44		07:10	08:34	09:08	10:10
	15:51	17:26	18:48	21:16	22:46	22	05:51 (3)	23:46	15	05:03 (4)	23:01	21	06:01 (3)	21:25		19:39	17:59	15:27	14:49
22	09:34	08:04	06:30	05:44	04:11		05:29 (3)	03:22		04:48 (4)	04:17		05:39 (3)	05:47		07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	22	05:51 (3)	23:46	15	05:03 (4)	22:58	22	06:01 (3)	21:22		19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08		05:30 (3)	03:22		04:49 (4)	04:19		05:40 (3)	05:50		07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52	20	05:50 (3)	23:46	15	05:04 (4)	22:56	22	06:02 (3)	21:18		19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05		05:30 (3)	03:22		04:49 (4)	04:22		05:40 (3)	05:53		07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55	20	05:50 (3)	23:46	15	05:04 (4)	22:53	21	06:01 (3)	21:15		19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03		05:31 (3)	03:23		04:49 (4)	04:25		05:39 (3)	05:55		07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	19	05:50 (3)	23:46	14	05:03 (4)	22:50	22	06:01 (3)	21:12		19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:31 (3)	03:24		04:50 (4)	04:28		05:40 (3)	05:58		07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	19	05:50 (3)	23:45	14	05:04 (4)	22:47	22	06:02 (3)	21:08		19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:32 (3)	03:24		04:50 (4)	04:31		05:40 (3)	06:01		07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	17	05:49 (3)	23:45	14	05:04 (4)	22:44	21	06:01 (3)	21:05		19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:32 (3)	03:25		04:51 (4)	04:34		05:40 (3)	06:04		07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	16	05:48 (3)	23:44	13	05:04 (4)	22:41	21	06:01 (3)	21:01		19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:34 (3)	03:26		04:51 (4)	04:37		05:41 (3)	06:07		07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	14	05:48 (3)	23:44	12	05:03 (4)	22:38	20	06:01 (3)	20:58		19:12	16:33	15:10	14:56
30	09:14		07:02	05:18	03:50		05:34 (3)	03:28		04:52 (4)	04:40		05:41 (3)	06:09		07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	13	05:47 (3)	23:43	10	05:02 (4)	22:35	19	06:00 (3)	20:55		19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:35 (3)				04:43		05:42 (3)	06:12			08:04		10:11
	16:21		20:16		23:13	11	05:46 (3)				22:32	18	06:00 (3)	20:51			16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502		392	308	206	151
Total, worst case						414			284			408			48				

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH03 - RH03

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15			03:46		05:25 (3)	03:29		05:35 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:44 (3)	23:42	9	05:44 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		05:25 (3)	03:30		05:36 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	18	05:43 (3)	23:40	10	05:46 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:42		05:26 (3)	03:32		05:35 (3)	04:51	06:21	07:43	08:13	09:41
	15:05	16:31	17:56	20:25	21:52			23:21	18	05:44 (3)	23:39	12	05:47 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		05:26 (3)	03:34		05:34 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	18	05:44 (3)	23:38	13	05:47 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		05:26 (3)	03:36		05:34 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	17	05:43 (3)	23:36	14	05:48 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		05:27 (3)	03:37		05:34 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	16	05:43 (3)	23:35	15	05:49 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		05:28 (3)	03:39		05:33 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	14	05:42 (3)	23:33	16	05:49 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		05:29 (3)	03:41		05:33 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	13	05:42 (3)	23:31	17	05:50 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		05:29 (3)	03:44		05:32 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	12	05:41 (3)	23:29	18	05:50 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		05:30 (3)	03:46		05:33 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	11	05:41 (3)	23:27	18	05:51 (3)	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43			03:28		05:32 (3)	03:48		05:33 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	9	05:41 (3)	23:25	19	05:52 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40		05:30 (3)	03:27		05:32 (3)	03:50		05:33 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	6	05:36 (3)	23:38	8	05:40 (3)	23:23	20	05:53 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37		05:27 (3)	03:26		05:33 (3)	03:53		05:32 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	11	05:38 (3)	23:39	6	05:39 (3)	23:21	20	05:52 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34		05:26 (3)	03:25		05:34 (3)	03:55		05:32 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	14	05:40 (3)	23:41	5	05:39 (3)	23:19	21	05:53 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31		05:25 (3)	03:24		05:35 (3)	03:58		05:31 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	16	05:41 (3)	23:42	3	05:38 (3)	23:16	22	05:53 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28		05:24 (3)	03:23			04:00		05:31 (3)	05:30	06:56	08:20	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	18	05:42 (3)	23:43			23:14	22	05:53 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25		05:23 (3)	03:23			04:03		05:31 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	19	05:42 (3)	23:44			23:11	23	05:54 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22		05:23 (3)	03:22			04:06		05:31 (3)	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	20	05:43 (3)	23:44			23:09	23	05:54 (3)	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19		05:23 (3)	03:22			04:08		05:32 (3)	05:38	07:05	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	21	05:44 (3)	23:45			23:06	23	05:55 (3)	21:32	19:46	18:05	15:32	14:49
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28	09:19	07:44	06:09	05:24	03:55		05:22 (3)	03:25		05:38 (3)	04:34		05:34 (3)	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	22	05:44 (3)	23:44	4	05:42 (3)	22:41	18	05:52 (3)	21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:24 (3)	03:26		05:36 (3)	04:37		05:36 (3)	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	21	05:45 (3)	23:44	6	05:42 (3)	22:38	16	05:52 (3)	20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:24 (3)	03:28		05:36 (3)	04:40		05:37 (3)	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	20	05:44 (3)	23:43	7	05:43 (3)	22:35	13	05:50 (3)	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		05:24 (3)				04:43		05:39 (3)	06:12		08:04		10:11
	16:21		20:16		23:13	20	05:44 (3)				22:32	10	05:49 (3)	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						389			205			563						

Table 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:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH04 - RH04

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August	September	October	November	December
1	10:10	09:08	07:41	06:55	05:15			03:46		04:59 (3)	03:29		05:01 (3)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46			23:16	19	05:18 (3)	23:42	25	05:26 (3)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11			03:44		04:58 (3)	03:30		05:03 (3)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49			23:18	20	05:18 (3)	23:40	24	05:27 (3)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08			03:41		04:58 (3)	03:32		05:03 (3)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:25	21:52			23:21	21	05:19 (3)	23:39	24	05:27 (3)	22:23	20:41	18:59	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05			03:39		04:58 (3)	03:34		05:03 (3)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55			23:23	22	05:20 (3)	23:38	24	05:27 (3)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02			03:38		04:57 (3)	03:35		05:03 (3)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58			23:25	23	05:20 (3)	23:36	23	05:26 (3)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59			03:36		04:57 (3)	03:37		05:04 (3)	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01			23:27	23	05:20 (3)	23:35	23	05:27 (3)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:21	06:35	04:55			03:34		04:57 (3)	03:39		05:04 (3)	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04			23:29	24	05:21 (3)	23:33	22	05:26 (3)	22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52			03:32		04:57 (3)	03:41		05:05 (3)	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07			23:31	24	05:21 (3)	23:31	22	05:27 (3)	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49			03:31		04:57 (3)	03:44		05:05 (3)	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:14	20:42	22:10			23:33	24	05:21 (3)	23:29	21	05:26 (3)	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46			03:29		04:57 (3)	03:46		05:05 (3)	05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:45	22:13			23:35	25	05:22 (3)	23:27	21	05:26 (3)	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43			03:28		04:58 (3)	03:48		05:06 (3)	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16			23:36	25	05:23 (3)	23:25	20	05:26 (3)	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40			03:27		04:58 (3)	03:50		05:07 (3)	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19			23:38	25	05:23 (3)	23:23	19	05:26 (3)	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37			03:26		04:58 (3)	03:53		05:07 (3)	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22			23:39	25	05:23 (3)	23:21	17	05:24 (3)	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34			03:25		04:58 (3)	03:55		05:08 (3)	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25			23:41	25	05:23 (3)	23:19	16	05:24 (3)	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:54	06:08	04:31			03:24		04:58 (3)	03:58		05:09 (3)	05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28			23:42	25	05:23 (3)	23:16	14	05:23 (3)	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28			03:23		04:58 (3)	04:00		05:11 (3)	05:29	06:56	08:20	08:52	10:06
	15:36	17:11	18:34	21:02	22:31			23:43	26	05:24 (3)	23:14	11	05:22 (3)	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25			03:23		04:59 (3)	04:03		05:13 (3)	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34			23:44	25	05:24 (3)	23:11	7	05:20 (3)	21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22			03:22		04:59 (3)	04:06			05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37			23:44	25	05:24 (3)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19			03:22		04:59 (3)	04:08			05:38	07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40			23:45	26	05:25 (3)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16			03:22		04:59 (3)	04:11			05:41	07:07	08:31	09:05	10:10
	15:48	17:23	18:45	21:14	22:43			23:46	26	05:25 (3)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13			03:22		04:59 (3)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46			23:46	26	05:25 (3)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11			03:22		04:59 (3)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49			23:46	26	05:25 (3)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08			03:22		04:59 (3)	04:19			05:50	07:15	08:40	09:13	10:12
	15:57	17:32	18:53	21:22	22:52			23:46	26	05:25 (3)	22:56			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05			03:22		05:00 (3)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:55			23:46	26	05:26 (3)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03			03:23		05:00 (3)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57			23:46	25	05:25 (3)	22:50			21:12	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00		05:05 (3)	03:24		05:00 (3)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	5	05:10 (3)	23:45	26	05:26 (3)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58		05:03 (3)	03:24		05:01 (3)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	9	05:12 (3)	23:45	25	05:26 (3)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55		05:01 (3)	03:25		05:01 (3)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:08	21:37	23:06	13	05:14 (3)	23:44	26	05:27 (3)	22:41			21:01	19:16	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53		05:01 (3)	03:26		05:01 (3)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	15	05:16 (3)	23:43	25	05:26 (3)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50		05:00 (3)	03:28		05:01 (3)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	16	05:16 (3)	23:43	25	05:26 (3)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48		04:59 (3)				04:43			06:12		08:04		10:11
	16:21		20:16		23:13	18	05:17 (3)				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502	392	308	206	151
Total, worst case						76			734			333						

Table 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:
Söderskogen

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+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH05 - RH05

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June			July			August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46			03:29		04:50 (2)	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16			23:41	13	05:03 (2)	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44			03:30		04:51 (2)	04:48	06:18	07:40	08:10	09:38
	15:03	16:28	17:53	20:22	21:49	23:18			23:40	12	05:03 (2)	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41			03:32		04:52 (2)	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20			23:39	11	05:03 (2)	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39			03:34		04:53 (2)	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23			23:38	9	05:02 (2)	22:20	20:38	18:55	16:15	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38			03:35		04:53 (2)	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25			23:36	8	05:01 (2)	22:17	20:34	18:52	16:12	14:59
6	10:05	08:53	07:24	06:38	04:59	03:36		04:50 (2)	03:37		04:56 (2)	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	3	04:53 (2)	23:35	5	05:01 (2)	22:14	20:31	18:48	16:09	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34		04:48 (2)	03:39			05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	7	04:55 (2)	23:33			22:11	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32		04:48 (2)	03:41			05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	9	04:57 (2)	23:31			22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31		04:47 (2)	03:44			05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	10	04:57 (2)	23:29			22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29		04:46 (2)	03:46			05:12	06:40	08:02	08:34	09:56
	15:20	16:53	18:16	20:44	22:13	23:35	12	04:58 (2)	23:27			22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28		04:46 (2)	03:48			05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:36	13	04:59 (2)	23:25			21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:27		04:46 (2)	03:50			05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	14	05:00 (2)	23:23			21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37	03:26		04:46 (2)	03:53			05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	14	05:00 (2)	23:21			21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25		04:46 (2)	03:55			05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:41	15	05:01 (2)	23:19			21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24		04:46 (2)	03:58			05:27	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	15	05:01 (2)	23:16			21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23		04:46 (2)	04:00			05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:34	21:02	22:31	23:43	15	05:01 (2)	23:14			21:41	19:57	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23		04:46 (2)	04:03			05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	16	05:02 (2)	23:11			21:38	19:53	18:12	15:38	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22		04:46 (2)	04:06			05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	16	05:02 (2)	23:09			21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22		04:47 (2)	04:08			05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	16	05:03 (2)	23:06			21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22		04:47 (2)	04:11			05:41	07:07	08:31	09:04	10:10
	15:48	17:23	18:45	21:13	22:43	23:45	16	05:03 (2)	23:04			21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22		04:47 (2)	04:14			05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	16	05:03 (2)	23:01			21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22		04:47 (2)	04:17			05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:51	21:19	22:49	23:46	16	05:03 (2)	22:58			21:22	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22		04:47 (2)	04:19			05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	16	05:03 (2)	22:55			21:18	19:33	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22		04:47 (2)	04:22			05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	17	05:04 (2)	22:53			21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23		04:47 (2)	04:25			05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	16	05:03 (2)	22:50			21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24		04:48 (2)	04:28			05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	16	05:04 (2)	22:47			21:08	19:22	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:24		04:49 (2)	04:31			06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	15	05:04 (2)	22:44			21:05	19:19	16:39	15:14	14:54
28	09:19	07:44	06:09	05:24	03:55	03:25		04:49 (2)	04:34			06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	15	05:04 (2)	22:41			21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26		04:49 (2)	04:37			06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	14	05:03 (2)	22:38			20:58	19:12	16:33	15:10	14:56
30	09:13		07:02	05:18	03:50	03:28		04:49 (2)	04:40			06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:42	14	05:03 (2)	22:35			20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48				04:42			06:12		08:04		10:11
	16:21		20:16		23:13				22:32			20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605			594			502	392	308	206	151
Total, worst case							346			58						

Table 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:
Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH06 - RH06

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:44	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:40
	15:05	16:31	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:18	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:46	08:16	09:43
	15:07	16:34	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:38	03:35	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:06	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:46	05:12	06:40	08:02	08:34	09:56
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11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
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12	09:56	08:35	07:04	06:18	04:40	03:27	03:50	05:18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:26	03:53	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:25	03:55	05:24	06:51	08:14	08:46	10:03
	15:31	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:22	15:46	14:50
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	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:23	04:03	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:43	23:11	21:38	19:53	18:12	15:38	14:49
18	09:43	08:16	06:43	05:58	04:22	03:22	04:06	05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:09
	15:45	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16	03:22	04:11	05:41	07:07	08:31	09:04	10:09
	15:48	17:23	18:45	21:13	22:43	23:45	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:22	04:14	05:44	07:10	08:34	09:07	10:10
	15:51	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11	03:22	04:17	05:47	07:13	08:37	09:10	10:11
	15:54	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:50
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:11
	15:57	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:23	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	16:00	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:03	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:52
26	09:24	07:50	06:16	05:31	04:00	03:24	04:28	05:58	07:23	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
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	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:12	14:55
29	09:16		07:06	05:21	03:53	03:26	04:37	06:07	07:32	07:58	09:30	10:12
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31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH07 - RH07

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:46	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:34	04:54	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:22	23:37	22:20	20:37	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:36	03:37	05:00	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:34	22:13	20:31	18:48	16:08	14:58
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
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	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:14	06:28	04:49	03:31	03:43	05:09	06:37	07:59	08:31	09:54
	15:18	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
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	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:53	05:21	06:48	08:11	08:43	10:01
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16	09:48	08:22	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23:42	23:13	21:41	19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:07
	15:42	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19	03:22	04:08	05:38	07:04	08:28	09:01	10:08
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21	09:36	08:06	06:33	05:47	04:13	03:21	04:14	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:45	23:01	21:25	19:39	17:58	15:27	14:49
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	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
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	16:02	17:38	18:59	21:28	22:57	23:45	22:50	21:11	19:25	16:45	15:18	14:51
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	16:06	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
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	16:09	17:44	19:04	21:34	23:02	23:45	22:44	21:04	19:19	16:39	15:13	14:53
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31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
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Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:

Söderskogen

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DE-28211 Bremen
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH08 - RH08

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May			June			July			August			September	October	November	December
1	10:10	09:08	07:40	06:55	05:14			03:45		21:01 (1)	03:29			04:45		21:07 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19	21:46			23:15	11	21:12 (1)	23:41			22:29	18	21:25 (1)	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11			03:43		21:03 (1)	03:30			04:48		21:08 (1)	06:18	07:40	08:09	09:38
	15:03	16:27	17:53	20:21	21:49			23:18	8	21:11 (1)	23:40			22:26	16	21:24 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08			03:41		21:06 (1)	03:32			04:51		21:10 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52			23:20	4	21:10 (1)	23:39			22:23	13	21:23 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05			03:39			03:33			04:54		21:11 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55			23:23			23:37			22:20	10	21:21 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:01			03:37			03:35			04:57			06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58			23:25			23:36			22:17			20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58			03:35			03:37			05:00			06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01			23:27			23:34			22:13			20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55			03:34			03:39			05:03			06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04			23:29			23:33			22:10			20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52		21:03 (1)	03:32			03:41			05:06			06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	6	21:09 (1)	23:31			23:31			22:07			20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49		21:00 (1)	03:30			03:43			05:09			06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	11	21:11 (1)	23:33			23:29			22:04			20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46		20:59 (1)	03:29			03:45		21:12 (1)	05:12			06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	15	21:14 (1)	23:34			23:27	6	21:18 (1)	22:01			20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43		20:57 (1)	03:28			03:48		21:11 (1)	05:15			06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	17	21:14 (1)	23:36			23:25	9	21:20 (1)	21:58			20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:40		20:56 (1)	03:26			03:50		21:09 (1)	05:18			06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	19	21:15 (1)	23:38			23:23	12	21:21 (1)	21:54			20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37		20:56 (1)	03:25			03:52		21:08 (1)	05:20			06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	20	21:16 (1)	23:39			23:21	14	21:22 (1)	21:51			20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33		20:55 (1)	03:24			03:55		21:08 (1)	05:23			06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	21	21:16 (1)	23:40			23:18	15	21:23 (1)	21:48			20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31		20:55 (1)	03:24			03:57		21:07 (1)	05:26			06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	22	21:17 (1)	23:41			23:16	17	21:24 (1)	21:45			20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:28		20:54 (1)	03:23			04:00		21:07 (1)	05:29			06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31	23	21:17 (1)	23:42			23:14	18	21:25 (1)	21:41			19:56	18:15	15:40	14:49
17	09:45	08:19	06:46	06:01	04:25		20:54 (1)	03:22			04:03		21:06 (1)	05:32			06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23	21:17 (1)	23:43			23:11	19	21:25 (1)	21:38			19:53	18:11	15:37	14:49
18	09:43	08:16	06:43	05:57	04:22		20:55 (1)	03:22			04:05		21:06 (1)	05:35			07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23	21:18 (1)	23:44			23:09	20	21:26 (1)	21:35			19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19		20:54 (1)	03:21			04:08		21:05 (1)	05:38			07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23	21:17 (1)	23:45			23:06	21	21:26 (1)	21:31			19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16		20:54 (1)	03:21			04:11		21:05 (1)	05:41			07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23	21:17 (1)	23:45			23:03	21	21:26 (1)	21:28			19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47	04:13		20:55 (1)	03:21			04:13		21:05 (1)	05:44			07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	22	21:17 (1)	23:46			23:01	22	21:27 (1)	21:25			19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10		20:55 (1)	03:21			04:16		21:05 (1)	05:46			07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	22	21:17 (1)	23:46			22:58	22	21:27 (1)	21:21			19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08		20:56 (1)	03:22			04:19		21:05 (1)	05:49			07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	21	21:17 (1)	23:46			22:55	22	21:27 (1)	21:18			19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05		20:56 (1)	03:22			04:22		21:04 (1)	05:52			07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	21	21:17 (1)	23:46			22:52	23	21:27 (1)	21:15			19:29	17:49	15:20	14:51
25	09:27	07:53	06:19	05:34	04:02		20:56 (1)	03:23			04:25		21:05 (1)	05:55			07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	21	21:17 (1)	23:45			22:50	23	21:28 (1)	21:11			19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00		20:57 (1)	03:23			04:28		21:05 (1)	05:58			07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	19	21:16 (1)	23:45			22:47	22	21:27 (1)	21:08			19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57		20:57 (1)	03:24			04:31		21:05 (1)	06:01			07:26	07:51	09:24	10:12
	16:09	17:44	19:04	21:34	23:03	19	21:16 (1)	23:45			22:44	23	21:28 (1)	21:04			19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55		20:58 (1)	03:25			04:33		21:05 (1)	06:04			07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	17	21:15 (1)	23:44			22:41	22	21:27 (1)	21:01			19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52		20:59 (1)	03:26			04:36		21:05 (1)	06:06			07:32	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	15	21:14 (1)	23:43			22:38	22	21:27 (1)	20:58			19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50		21:00 (1)	03:27			04:39		21:06 (1)	06:09			07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	14	21:14 (1)	23:42			22:35	21	21:27 (1)	20:54			19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		21:01 (1)				04:42		21:06 (1)	06:12				08:03		10:10
	16:21		20:16		23:13	12	21:13 (1)				22:32	20	21:26 (1)	20:51				16:27		14:59
Potential sun hours	182	242	363	447	559			605			594			502			392	308	206	151
Total, worst case						449			23			414			57					

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH09 - RH09

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April			May			June	July			August			September	October	November	December
1	10:10	09:08	07:40	06:55			05:14		20:31 (1)	03:45	03:29			04:45		20:40 (1)	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:19			21:46	18	20:49 (1)	23:15	23:41			22:29	18	20:58 (1)	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52			05:11		20:30 (1)	03:43	03:30			04:48		20:39 (1)	06:18	07:40	08:09	09:38
	15:02	16:27	17:53	20:21			21:49	19	20:49 (1)	23:18	23:40			22:26	20	20:59 (1)	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48			05:08		20:29 (1)	03:41	03:32			04:51		20:39 (1)	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24			21:52	21	20:50 (1)	23:20	23:39			22:23	20	20:59 (1)	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45			05:05		20:28 (1)	03:39	03:33			04:54		20:38 (1)	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27			21:55	22	20:50 (1)	23:23	23:37			22:20	21	20:59 (1)	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41			05:01		20:28 (1)	03:37	03:35			04:57		20:38 (1)	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30			21:58	22	20:50 (1)	23:25	23:36			22:17	22	21:00 (1)	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38			04:58		20:28 (1)	03:35	03:37			05:00		20:37 (1)	06:29	07:51	08:22	09:47
	15:10	16:40	18:05	20:33			22:01	22	20:50 (1)	23:27	23:34			22:13	22	20:59 (1)	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35			04:55		20:28 (1)	03:34	03:39			05:03		20:38 (1)	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36			22:04	22	20:50 (1)	23:29	23:33			22:10	22	21:00 (1)	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31			04:52		20:28 (1)	03:32	03:41			05:06		20:37 (1)	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38			22:07	22	20:50 (1)	23:31	23:31			22:07	22	20:59 (1)	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28			04:49		20:28 (1)	03:30	03:43			05:09		20:38 (1)	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41			22:10	21	20:49 (1)	23:33	23:29			22:04	21	20:59 (1)	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24			04:46		20:29 (1)	03:29	03:45			05:12		20:38 (1)	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44			22:13	20	20:49 (1)	23:34	23:27			22:01	21	20:59 (1)	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21			04:43		20:29 (1)	03:28	03:48			05:15		20:38 (1)	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47			22:16	19	20:48 (1)	23:36	23:25			21:58	20	20:58 (1)	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18			04:40		20:29 (1)	03:26	03:50			05:17		20:39 (1)	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50			22:19	18	20:47 (1)	23:38	23:23			21:54	18	20:57 (1)	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14			04:36		20:31 (1)	03:25	03:52			05:20		20:40 (1)	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53			22:22	16	20:47 (1)	23:39	23:21			21:51	15	20:55 (1)	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11			04:33		20:32 (1)	03:24	03:55			05:23		20:41 (1)	06:51	08:13	08:46	10:02
	15:30	17:05	18:28	20:56			22:25	13	20:45 (1)	23:40	23:18			21:48	13	20:54 (1)	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:07			04:30		20:34 (1)	03:23	03:57			05:26		20:44 (1)	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59			22:28	10	20:44 (1)	23:41	23:16			21:44	7	20:51 (1)	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04			04:28		20:36 (1)	03:23	04:00			05:29			06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02			22:31	5	20:41 (1)	23:42	23:14			21:41			19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01			04:25			03:22	04:03			05:32			06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04			22:34			23:43	23:11			21:38			19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57			04:22			03:22	04:05			05:35			07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07			22:37			23:44	23:09			21:35			19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54			04:19			03:21	04:08			05:38			07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10			22:40			23:45	23:06			21:31			19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51			04:16			03:21	04:11			05:41			07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13			22:43			23:45	23:03			21:28			19:43	18:02	15:30	14:49
21	09:36	08:06	06:33	05:47			04:13			03:21	04:13			05:44			07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16			22:46			23:46	23:01			21:25			19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44			04:10			03:21	04:16			05:46			07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19			22:49			23:46	22:58			21:21			19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41			04:08			03:22	04:19			05:49			07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22			22:51			23:46	22:55			21:18			19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37			04:05			03:22	04:22			05:52			07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25			22:54			23:46	22:52			21:15			19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34			04:02			03:23	04:25			05:55			07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28			22:57			23:46	22:50			21:11			19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31			04:00			03:23	04:28			05:58			07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31			23:00			23:45	22:47			21:08			19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27			03:57			03:24	04:30			06:01			07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34			23:03			23:45	22:44			21:04			19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24		20:35 (1)	03:55			03:25	04:33		20:45 (1)	06:03			07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	9	20:44 (1)	23:05			23:44	22:41	8	20:53 (1)	21:01			19:15	16:36	15:11	14:54
29	09:16		07:05	05:21		20:33 (1)	03:52			03:26	04:36		20:43 (1)	06:06			07:32	07:57	09:30	10:11
	16:15		20:10	21:40	13	20:46 (1)	23:08			23:43	22:38	12	20:55 (1)	20:58			19:12	16:33	15:09	14:56
30	09:13		07:02	05:18		20:31 (1)	03:50			03:27	04:39		20:42 (1)	06:09			07:34	08:00	09:33	10:11
	16:18		20:13	21:43	16	20:47 (1)	23:10			23:42	22:35	15	20:57 (1)	20:54			19:08	16:30	15:07	14:57
31	09:10		06:59				03:48				04:42		20:41 (1)	06:12				08:03		10:10
	16:21		20:16				23:13				22:32	16	20:57 (1)	20:51				16:26		14:59
Potential sun hours	182	242	363	447			559			605	594			502			392	308	206	151
Total, worst case					38			290				51			282					

Table 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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH10 - RH10

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:28	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:41	23:16	21:44	20:00	18:18	15:43	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:03	05:32	06:59	08:22	08:55	10:06
	15:39	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:18		20:13	21:43	23:10	23:42	22:35	20:54	19:08	16:30	15:07	14:57
31	09:10		06:59		03:48		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH11 - RH11

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:06	09:35
	15:01	16:24	17:50	20:18	21:46	23:15	23:41	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41	03:32	04:51	06:20	07:43	08:12	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:45	08:16	09:43
	15:06	16:33	17:59	20:27	21:55	23:23	23:37	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:59
6	10:05	08:53	07:23	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:47
	15:10	16:40	18:04	20:33	22:01	23:27	23:34	22:13	20:30	18:48	16:08	14:57
7	10:03	08:50	07:20	06:35	04:55	03:33	03:39	05:03	06:31	07:54	08:25	09:49
	15:13	16:43	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:56	08:28	09:52
	15:15	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:00	08:44	07:13	06:28	04:49	03:30	03:43	05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:54
10	09:59	08:41	07:10	06:24	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:34	23:27	22:01	20:17	18:35	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:48	05:14	06:42	08:05	08:37	09:57
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:54	14:52
12	09:55	08:35	07:03	06:18	04:39	03:26	03:50	05:17	06:45	08:08	08:40	09:59
	15:25	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:25	20:53	22:22	23:39	23:21	21:51	20:06	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:50	08:13	08:46	10:02
	15:30	17:05	18:27	20:56	22:25	23:40	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:33	17:08	18:30	20:59	22:28	23:42	23:16	21:44	20:00	18:18	15:42	14:49
16	09:48	08:22	06:50	06:04	04:27	03:23	04:00	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:46	06:01	04:24	03:22	04:02	05:32	06:59	08:22	08:55	10:06
	15:38	17:14	18:36	21:04	22:34	23:43	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:22	03:22	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:44	23:09	21:35	19:49	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:04	10:09
	15:47	17:23	18:45	21:13	22:43	23:45	23:03	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:51	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:22	05:37	04:05	03:22	04:22	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:52	21:15	19:29	17:49	15:20	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:25	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:27	05:58	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:19	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:55	03:25	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:05	05:21	03:52	03:26	04:36	06:06	07:31	07:57	09:30	10:11
	16:15		20:10	21:40	23:08	23:43	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:17	03:50	03:27	04:39	06:09	07:34	08:00	09:33	10:11
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31	09:10		06:59		03:47		04:42	06:12		08:03		10:10
	16:21		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February			March			April	May	June
1	10:11	09:08			07:41		08:32 (Lotlax 1)	06:55	05:14	03:45
	15:00	16:24			17:50	24	08:56 (Lotlax 1)	20:19	21:46	23:16
2	10:10	09:05			07:37		08:32 (Lotlax 1)	06:52	05:11	03:43
	15:02	16:27			17:53	25	08:57 (Lotlax 1)	20:22	21:49	23:19
3	10:09	09:02			07:34		08:31 (Lotlax 1)	06:48	05:08	03:41
	15:04	16:30			17:56	25	08:56 (Lotlax 1)	20:24	21:52	23:21
4	10:08	08:59			07:31		08:31 (Lotlax 1)	06:45	05:04	03:39
	15:06	16:33			17:59	26	08:57 (Lotlax 1)	20:27	21:55	23:24
5	10:07	08:57			07:27		08:31 (Lotlax 1)	06:42	05:01	03:37
	15:08	16:36			18:02	25	08:56 (Lotlax 1)	20:30	21:59	23:26
6	10:06	08:54			07:24		08:31 (Lotlax 1)	06:38	04:58	03:35
	15:10	16:40			18:05	25	08:56 (Lotlax 1)	20:33	22:02	23:28
7	10:04	08:51			07:20		08:31 (Lotlax 1)	06:35	04:55	03:33
	15:12	16:43			18:08	23	08:54 (Lotlax 1)	20:36	22:05	23:30
8	10:03	08:48			07:17		08:32 (Lotlax 1)	06:31	04:52	03:31
	15:15	16:46			18:10	22	08:54 (Lotlax 1)	20:39	22:08	23:32
9	10:01	08:45			07:14		08:33 (Lotlax 1)	06:28	04:49	03:30
	15:17	16:49			18:13	19	08:52 (Lotlax 1)	20:42	22:11	23:34
10	10:00	08:42			07:10		08:34 (Lotlax 1)	06:24	04:45	03:28
	15:19	16:52			18:16	16	08:50 (Lotlax 1)	20:45	22:14	23:36
11	09:58	08:38			07:07		08:36 (Lotlax 1)	06:21	04:42	03:27
	15:22	16:55			18:19	11	08:47 (Lotlax 1)	20:47	22:17	23:37
12	09:56	08:35			07:04			06:18	04:39	03:26
	15:25	16:58			18:22			20:50	22:20	23:39
13	09:54	08:32			07:00			06:14	04:36	03:25
	15:27	17:01			18:25			20:53	22:23	23:40
14	09:52	08:29			06:57		07:31 (Lotlax 2)	06:11	04:33	03:24
	15:30	17:05			18:28	10	07:41 (Lotlax 2)	20:56	22:26	23:41
15	09:50	08:26			06:53		07:29 (Lotlax 2)	06:07	04:30	03:23
	15:33	17:08			18:31	14	07:43 (Lotlax 2)	20:59	22:29	23:43
16	09:48	08:23			06:50		07:27 (Lotlax 2)	06:04	04:27	03:22
	15:35	17:11			18:33	16	07:43 (Lotlax 2)	21:02	22:32	23:44
17	09:46	08:20			06:47		07:26 (Lotlax 2)	06:01	04:24	03:21
	15:38	17:14			18:36	18	07:44 (Lotlax 2)	21:05	22:35	23:45
18	09:44	08:16			06:43		07:25 (Lotlax 2)	05:57	04:21	03:21
	15:41	17:17			18:39	19	07:44 (Lotlax 2)	21:08	22:38	23:45
19	09:42	08:13			06:40		07:25 (Lotlax 2)	05:54	04:18	03:21
	15:44	17:20			18:42	19	07:44 (Lotlax 2)	21:11	22:41	23:46
20	09:39	08:10			06:36		07:24 (Lotlax 2)	05:51	04:16	03:20
	15:47	17:23			18:45	19	07:43 (Lotlax 2)	21:14	22:44	23:46
21	09:37	08:07			06:33		07:04 (Lotlax 3)	05:47	04:13	03:20
	15:50	17:26			18:48	21	07:43 (Lotlax 2)	21:17	22:46	23:47
22	09:35	08:04			06:30		07:00 (Lotlax 3)	05:44	04:10	03:21
	15:53	17:29			18:50	25	07:41 (Lotlax 2)	21:20	22:49	23:47
23	09:32	08:00			06:26		06:57 (Lotlax 3)	05:41	04:07	03:21
	15:56	17:32			18:53	28	07:41 (Lotlax 2)	21:22	22:52	23:47
24	09:30	07:57		08:41 (Lotlax 1)	06:23		06:55 (Lotlax 3)	05:37	04:05	03:21
	15:59	17:35	8	08:49 (Lotlax 1)	18:56	26	07:38 (Lotlax 2)	21:25	22:55	23:47
25	09:27	07:54		08:38 (Lotlax 1)	06:19		06:54 (Lotlax 3)	05:34	04:02	03:22
	16:02	17:38	15	08:53 (Lotlax 1)	18:59	22	07:35 (Lotlax 2)	21:28	22:58	23:47
26	09:25	07:50		08:36 (Lotlax 1)	06:16		06:55 (Lotlax 3)	05:31	03:59	03:22
	16:05	17:41	18	08:54 (Lotlax 1)	19:02	15	07:10 (Lotlax 3)	21:31	23:01	23:46
27	09:22	07:47		08:35 (Lotlax 1)	06:12		06:54 (Lotlax 3)	05:27	03:57	03:23
	16:08	17:44	21	08:56 (Lotlax 1)	19:05	14	07:08 (Lotlax 3)	21:34	23:03	23:46
28	09:19	07:44		08:33 (Lotlax 1)	06:09		06:55 (Lotlax 3)	05:24	03:54	03:24
	16:11	17:47	23	08:56 (Lotlax 1)	19:07	13	07:08 (Lotlax 3)	21:37	23:06	23:45
29	09:16				07:06		07:56 (Lotlax 3)	05:21	03:52	03:25
	16:14				20:10	9	08:05 (Lotlax 3)	21:40	23:09	23:44
30	09:14				07:02		08:00 (Lotlax 3)	05:17	03:49	03:27
	16:18				20:13	1	08:01 (Lotlax 3)	21:43	23:11	23:43
31	09:11				06:59				03:47	
	16:21				20:16				23:14	
Potential sun hours	182	242			363			447	559	606
Total, worst case			85			530				

Table 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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH12 - RH12

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	July	August	September			October			November	December
1	03:28	04:45	06:15			07:37			08:07	09:36
	23:42	22:30	20:48			19:05			16:23	15:05
2	03:29	04:48	06:18			07:40		09:17 (Lotlax 1)	08:10	09:38
	23:41	22:27	20:44			19:02	8	09:25 (Lotlax 1)	16:20	15:03
3	03:31	04:51	06:20			07:43		09:13 (Lotlax 1)	08:13	09:41
	23:40	22:23	20:41			18:58	14	09:27 (Lotlax 1)	16:17	15:02
4	03:33	04:54	06:23			07:46		09:11 (Lotlax 1)	08:16	09:43
	23:38	22:20	20:38			18:55	18	09:29 (Lotlax 1)	16:14	15:00
5	03:34	04:57	06:26			07:48		09:09 (Lotlax 1)	08:19	09:46
	23:37	22:17	20:34			18:52	21	09:30 (Lotlax 1)	16:11	14:58
6	03:36	05:00	06:29			07:51		09:08 (Lotlax 1)	08:22	09:48
	23:35	22:14	20:31			18:48	23	09:31 (Lotlax 1)	16:08	14:57
7	03:38	05:03	06:31			07:54		09:07 (Lotlax 1)	08:25	09:50
	23:34	22:11	20:27			18:45	24	09:31 (Lotlax 1)	16:05	14:56
8	03:40	05:06	06:34			07:57		09:07 (Lotlax 1)	08:28	09:52
	23:32	22:08	20:24			18:41	24	09:31 (Lotlax 1)	16:02	14:54
9	03:43	05:08	06:37			08:00		09:06 (Lotlax 1)	08:31	09:54
	23:30	22:05	20:21			18:38	25	09:31 (Lotlax 1)	15:59	14:53
10	03:45	05:11	06:40			08:02		09:06 (Lotlax 1)	08:34	09:56
	23:28	22:01	20:17			18:35	25	09:31 (Lotlax 1)	15:56	14:52
11	03:47	05:14	06:42			08:05		09:06 (Lotlax 1)	08:38	09:58
	23:26	21:58	20:14			18:31	25	09:31 (Lotlax 1)	15:54	14:51
12	03:49	05:17	06:45			08:08		09:06 (Lotlax 1)	08:41	10:00
	23:24	21:55	20:10			18:28	24	09:30 (Lotlax 1)	15:51	14:50
13	03:52	05:20	06:48			08:11		09:06 (Lotlax 1)	08:44	10:02
	23:21	21:52	20:07			18:25	23	09:29 (Lotlax 1)	15:48	14:50
14	03:54	05:23	06:51		07:47 (Lotlax 3)	08:14		09:06 (Lotlax 1)	08:47	10:03
	23:19	21:48	20:03	8	07:55 (Lotlax 3)	18:21	22	09:28 (Lotlax 1)	15:45	14:49
15	03:57	05:26	06:53		07:45 (Lotlax 3)	08:17		09:07 (Lotlax 1)	08:50	10:05
	23:17	21:45	20:00	12	07:57 (Lotlax 3)	18:18	20	09:27 (Lotlax 1)	15:42	14:49
16	03:59	05:29	06:56		07:44 (Lotlax 3)	08:20		09:08 (Lotlax 1)	08:53	10:06
	23:14	21:42	19:56	14	07:58 (Lotlax 3)	18:15	17	09:25 (Lotlax 1)	15:40	14:48
17	04:02	05:32	06:59		07:42 (Lotlax 3)	08:22		09:10 (Lotlax 1)	08:56	10:07
	23:12	21:38	19:53	15	07:57 (Lotlax 3)	18:11	13	09:23 (Lotlax 1)	15:37	14:48
18	04:05	05:35	07:02		07:42 (Lotlax 3)	08:25		09:15 (Lotlax 1)	08:59	10:08
	23:09	21:35	19:50	17	08:21 (Lotlax 2)	18:08	4	09:19 (Lotlax 1)	15:34	14:48
19	04:07	05:38	07:04		07:42 (Lotlax 3)	08:28			09:02	10:09
	23:07	21:32	19:46	25	08:25 (Lotlax 2)	18:05			15:32	14:48
20	04:10	05:41	07:07		07:42 (Lotlax 3)	08:31			09:05	10:10
	23:04	21:28	19:43	28	08:26 (Lotlax 2)	18:02			15:29	14:48
21	04:13	05:44	07:10		07:45 (Lotlax 3)	08:34			09:08	10:11
	23:02	21:25	19:39	26	08:27 (Lotlax 2)	17:58			15:27	14:48
22	04:16	05:46	07:13		07:48 (Lotlax 3)	08:37			09:11	10:12
	22:59	21:22	19:36	23	08:28 (Lotlax 2)	17:55			15:24	14:49
23	04:19	05:49	07:15		08:08 (Lotlax 2)	08:40			09:14	10:12
	22:56	21:18	19:32	19	08:27 (Lotlax 2)	17:52			15:22	14:49
24	04:21	05:52	07:18		08:08 (Lotlax 2)	08:43			09:17	10:12
	22:53	21:15	19:29	19	08:27 (Lotlax 2)	17:49			15:20	14:50
25	04:24	05:55	07:21		08:08 (Lotlax 2)	07:46			09:19	10:13
	22:50	21:12	19:26	19	08:27 (Lotlax 2)	16:45			15:17	14:51
26	04:27	05:58	07:23		08:08 (Lotlax 2)	07:49			09:22	10:13
	22:48	21:08	19:22	18	08:26 (Lotlax 2)	16:42			15:15	14:52
27	04:30	06:01	07:26		08:09 (Lotlax 2)	07:52			09:25	10:13
	22:45	21:05	19:19	17	08:26 (Lotlax 2)	16:39			15:13	14:53
28	04:33	06:03	07:29		08:09 (Lotlax 2)	07:55			09:28	10:13
	22:42	21:01	19:15	14	08:23 (Lotlax 2)	16:36			15:11	14:54
29	04:36	06:06	07:32		08:10 (Lotlax 2)	07:58			09:31	10:12
	22:39	20:58	19:12	12	08:22 (Lotlax 2)	16:33			15:09	14:55
30	04:39	06:09	07:34		08:13 (Lotlax 2)	08:01			09:33	10:12
	22:36	20:55	19:09	6	08:19 (Lotlax 2)	16:30			15:07	14:57
31	04:42	06:12				08:04				10:11
	22:33	20:51				16:26				14:58
Potential sun hours	595	502	392			308			206	151
Total, worst case				292			330			

Table 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:

Söderskogen

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Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH13 - RH13

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March			April	May	June	July	August	September			October			November	December
1	10:11	09:08	07:41		08:16 (8)	06:55	05:14	03:45	03:28	04:45	06:15			07:37		08:49 (8)	08:07	09:36
	15:01	16:24	17:50	6	08:22 (8)	20:19	21:46	23:16	23:42	22:30	20:48			19:05	13	09:02 (8)	16:24	15:05
2	10:10	09:05	07:37		08:13 (8)	06:52	05:11	03:43	03:30	04:48	06:18			07:40		08:47 (8)	08:10	09:38
	15:02	16:27	17:53	12	08:25 (8)	20:22	21:49	23:19	23:41	22:27	20:45			19:02	17	09:04 (8)	16:20	15:04
3	10:09	09:02	07:34		08:11 (8)	06:49	05:08	03:41	03:31	04:51	06:21			07:43		08:46 (8)	08:13	09:41
	15:04	16:30	17:56	16	08:27 (8)	20:25	21:53	23:21	23:40	22:24	20:41			18:59	18	09:04 (8)	16:17	15:02
4	10:08	09:00	07:31		08:09 (8)	06:45	05:05	03:39	03:33	04:54	06:23			07:46		08:45 (8)	08:16	09:43
	15:06	16:34	17:59	18	08:27 (8)	20:27	21:56	23:23	23:38	22:20	20:38			18:55	20	09:05 (8)	16:14	15:00
5	10:07	08:57	07:27		08:09 (8)	06:42	05:02	03:37	03:35	04:57	06:26			07:49		08:44 (8)	08:19	09:46
	15:08	16:37	18:02	19	08:28 (8)	20:30	21:59	23:26	23:37	22:17	20:34			18:52	20	09:04 (8)	16:11	14:59
6	10:05	08:54	07:24		08:08 (8)	06:38	04:58	03:35	03:37	05:00	06:29			07:51		08:43 (8)	08:22	09:48
	15:10	16:40	18:05	20	08:28 (8)	20:33	22:02	23:28	23:35	22:14	20:31			18:48	21	09:04 (8)	16:08	14:57
7	10:04	08:51	07:21		08:08 (8)	06:35	04:55	03:33	03:39	05:03	06:32			07:54		08:43 (8)	08:25	09:50
	15:13	16:43	18:08	20	08:28 (8)	20:36	22:05	23:30	23:34	22:11	20:28			18:45	21	09:04 (8)	16:05	14:56
8	10:03	08:48	07:17		08:07 (8)	06:32	04:52	03:32	03:41	05:06	06:34			07:57		08:43 (8)	08:28	09:52
	15:15	16:46	18:11	21	08:28 (8)	20:39	22:08	23:32	23:32	22:08	20:24			18:42	20	09:03 (8)	16:02	14:55
9	10:01	08:45	07:14		08:08 (8)	06:28	04:49	03:30	03:43	05:09	06:37			08:00		08:44 (8)	08:31	09:54
	15:17	16:49	18:14	20	08:28 (8)	20:42	22:11	23:34	23:30	22:05	20:21			18:38	18	09:02 (8)	16:00	14:54
10	10:00	08:42	07:11		08:07 (8)	06:25	04:46	03:29	03:45	05:12	06:40			08:03		08:44 (8)	08:35	09:56
	15:20	16:52	18:16	19	08:26 (8)	20:45	22:14	23:35	23:28	22:01	20:17			18:35	17	09:01 (8)	15:57	14:53
11	09:58	08:39	07:07		08:08 (8)	06:21	04:43	03:27	03:47	05:15	06:43			08:05		08:45 (8)	08:38	09:58
	15:22	16:56	18:19	18	08:26 (8)	20:48	22:17	23:37	23:26	21:58	20:14			18:32	15	09:00 (8)	15:54	14:52
12	09:56	08:35	07:04		08:09 (8)	06:18	04:40	03:26	03:50	05:18	06:45			08:08		08:47 (8)	08:41	10:00
	15:25	16:59	18:22	15	08:24 (8)	20:50	22:20	23:39	23:24	21:55	20:10			18:28	10	08:57 (8)	15:51	14:51
13	09:54	08:32	07:00		08:11 (8)	06:15	04:37	03:25	03:52	05:21	06:48			08:11			08:44	10:02
	15:28	17:02	18:25	11	08:22 (8)	20:53	22:23	23:40	23:21	21:52	20:07			18:25			15:48	14:50
14	09:52	08:29	06:57			06:11	04:34	03:24	03:55	05:23	06:51			08:14			08:47	10:03
	15:30	17:05	18:28			20:56	22:26	23:41	23:19	21:48	20:04			18:22			15:45	14:49
15	09:50	08:26	06:54			06:08	04:31	03:23	03:57	05:26	06:54			08:17			08:50	10:05
	15:33	17:08	18:31			20:59	22:29	23:43	23:17	21:45	20:00			18:18			15:43	14:49
16	09:48	08:23	06:50			06:04	04:28	03:22	04:00	05:29	06:56			08:20			08:53	10:06
	15:36	17:11	18:34			21:02	22:32	23:44	23:14	21:42	19:57			18:15			15:40	14:49
17	09:46	08:20	06:47			06:01	04:25	03:22	04:02	05:32	06:59			08:23			08:56	10:07
	15:39	17:14	18:36			21:05	22:35	23:44	23:12	21:38	19:53			18:12			15:37	14:48
18	09:44	08:17	06:43			05:58	04:22	03:21	04:05	05:35	07:02			08:25			08:59	10:08
	15:41	17:17	18:39			21:08	22:38	23:45	23:09	21:35	19:50			18:08			15:35	14:48
19	09:42	08:13	06:40			05:54	04:19	03:21	04:08	05:38	07:05			08:28			09:02	10:09
	15:44	17:20	18:42			21:11	22:41	23:46	23:07	21:32	19:46			18:05			15:32	14:48
20	09:39	08:10	06:37			05:51	04:16	03:21	04:11	05:41	07:07			08:31			09:05	10:10
	15:47	17:23	18:45			21:14	22:44	23:46	23:04	21:29	19:43			18:02			15:30	14:48
21	09:37	08:07	06:33			05:48	04:13	03:21	04:13	05:44	07:10			08:34			09:08	10:11
	15:50	17:26	18:48			21:17	22:46	23:47	23:02	21:25	19:40			17:59			15:27	14:49
22	09:35	08:04	06:30			05:44	04:10	03:21	04:16	05:47	07:13			08:37			09:11	10:12
	15:53	17:29	18:51			21:20	22:49	23:47	22:59	21:22	19:36			17:55			15:25	14:49
23	09:32	08:00	06:26			05:41	04:08	03:21	04:19	05:50	07:15			08:40			09:14	10:12
	15:56	17:32	18:53			21:23	22:52	23:47	22:56	21:18	19:33			17:52			15:22	14:50
24	09:30	07:57	06:23			05:37	04:05	03:22	04:22	05:52	07:18			08:43			09:17	10:12
	15:59	17:35	18:56			21:26	22:55	23:47	22:53	21:15	19:29			17:49			15:20	14:50
25	09:27	07:54	06:19			05:34	04:02	03:22	04:25	05:55	07:21			07:46			09:20	10:13
	16:02	17:38	18:59			21:29	22:58	23:47	22:50	21:12	19:26			16:46			15:18	14:51
26	09:25	07:51	06:16			05:31	04:00	03:23	04:28	05:58	07:24			07:49			09:22	10:13
	16:05	17:41	19:02			21:31	23:01	23:46	22:48	21:08	19:22			16:42			15:16	14:52
27	09:22	07:47	06:13			05:28	03:57	03:24	04:30	06:01	07:26			07:52			09:25	10:13
	16:09	17:44	19:05			21:34	23:03	23:46	22:45	21:05	19:19			16:39			15:13	14:53
28	09:19	07:44	06:09			05:24	03:55	03:25	04:33	06:04	07:29			07:55			09:28	10:13
	16:12	17:47	19:08			21:37	23:06	23:45	22:42	21:02	19:16			16:36			15:11	14:54
29	09:17		07:06			05:21	03:52	03:26	04:36	06:07	07:32			07:58			09:31	10:12
	16:15		20:10			21:40	23:09	23:44	22:39	20:58	19:12			16:33			15:09	14:56
30	09:14		07:02			05:18	03:50	03:27	04:39	06:09	07:35		08:52 (8)	08:01			09:33	10:12
	16:18		20:13			21:43	23:11	23:43	22:36	20:55	19:09	8	09:00 (8)	16:30			15:07	14:57
31	09:11		06:59				03:47		04:42	06:12				08:04				10:11
	16:21		20:16				23:14		22:33	20:51				16:27				14:59
Potential sun hours	182	242	363			447	559	605	594	502	392			308			206	151
Total, worst case				215								8			210			

Table 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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18.11.2019 13:34/3.3.247

SHADOW - Calendar

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**Shadow receptor:** RH14 - RH14

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:11	09:08	07:41	06:55	05:14	03:45	03:28	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:47	23:16	23:42	22:30	20:48	19:05	16:24	15:05
2	10:10	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:39
	15:02	16:27	17:53	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:20	15:04
3	10:09	09:03	07:34	06:49	05:08	03:41	03:31	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:25	21:53	23:21	23:40	22:24	20:41	18:59	16:17	15:02
4	10:08	09:00	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:28	21:56	23:24	23:39	22:20	20:38	18:55	16:14	15:00
5	10:07	08:57	07:27	06:42	05:01	03:37	03:35	04:57	06:26	07:49	08:19	09:46
	15:08	16:37	18:02	20:30	21:59	23:26	23:37	22:17	20:34	18:52	16:11	14:59
6	10:06	08:54	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:10	16:40	18:05	20:33	22:02	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:21	06:35	04:55	03:33	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:05	23:30	23:34	22:11	20:28	18:45	16:05	14:56
8	10:03	08:48	07:17	06:32	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:53
	15:15	16:46	18:11	20:39	22:08	23:32	23:32	22:08	20:24	18:42	16:02	14:55
9	10:01	08:45	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:32	09:55
	15:17	16:49	18:14	20:42	22:11	23:34	23:30	22:05	20:21	18:38	16:00	14:53
10	10:00	08:42	07:11	06:25	04:46	03:29	03:45	05:12	06:40	08:03	08:35	09:57
	15:20	16:52	18:16	20:45	22:14	23:36	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:39	07:07	06:21	04:43	03:27	03:47	05:15	06:43	08:05	08:38	09:58
	15:22	16:55	18:19	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:54	14:51
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:41	10:00
	15:25	16:59	18:22	20:50	22:20	23:39	23:24	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:36	03:25	03:52	05:21	06:48	08:11	08:44	10:02
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15	09:51	08:26	06:54	06:08	04:30	03:23	03:57	05:26	06:54	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:43	23:17	21:45	20:00	18:18	15:43	14:49
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	15:36	17:11	18:34	21:02	22:32	23:44	23:15	21:42	19:57	18:15	15:40	14:48
17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:23	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:45	23:12	21:39	19:53	18:12	15:37	14:48
18	09:44	08:17	06:43	05:58	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:09
	15:41	17:17	18:39	21:08	22:38	23:45	23:10	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:05	08:28	09:02	10:10
	15:44	17:20	18:42	21:11	22:41	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:40	08:10	06:37	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:47	23:47	23:02	21:25	19:40	17:59	15:27	14:49
22	09:35	08:04	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:12
	15:53	17:29	18:51	21:20	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:23	22:52	23:47	22:56	21:19	19:33	17:52	15:22	14:50
24	09:30	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:17	10:13
	15:59	17:35	18:56	21:26	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:20	10:13
	16:02	17:38	18:59	21:29	22:58	23:47	22:50	21:12	19:26	16:46	15:18	14:51
26	09:25	07:51	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:32	23:01	23:46	22:48	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:13
	16:09	17:44	19:05	21:35	23:03	23:46	22:45	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:13
	16:12	17:47	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:36	15:11	14:54
29	09:17		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:31	10:12
	16:15		20:10	21:41	23:09	23:44	22:39	20:58	19:12	16:33	15:09	14:55
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:12
	16:18		20:13	21:44	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Total, worst case												

Table 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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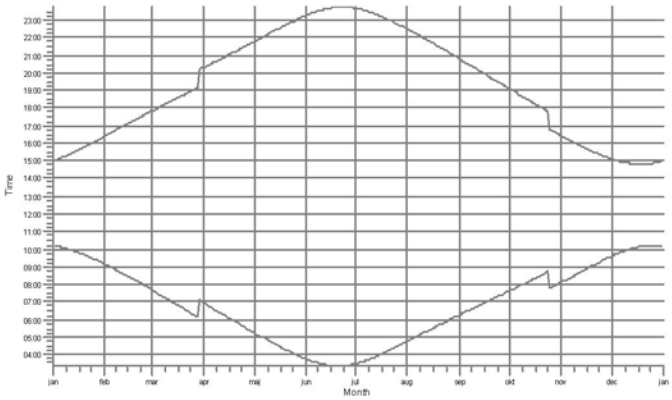
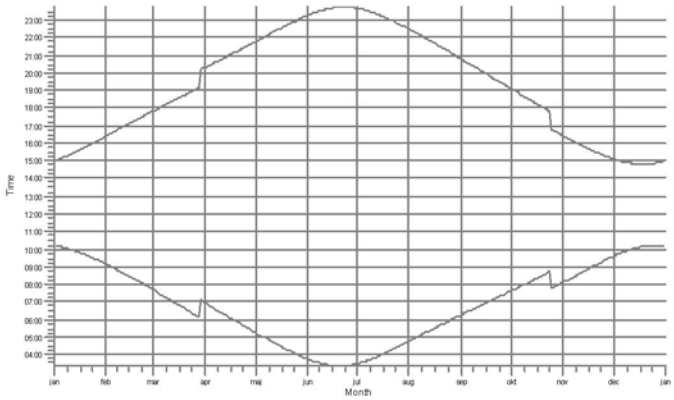
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

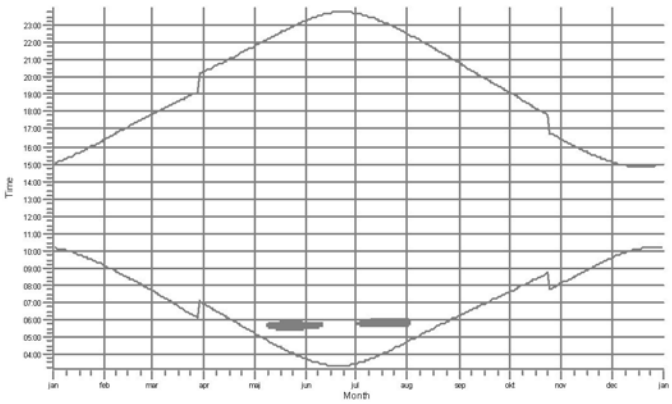
HH01: HH01



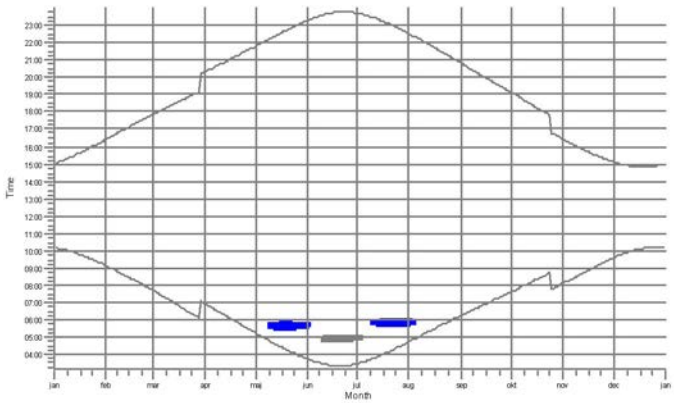
HH02: HH02



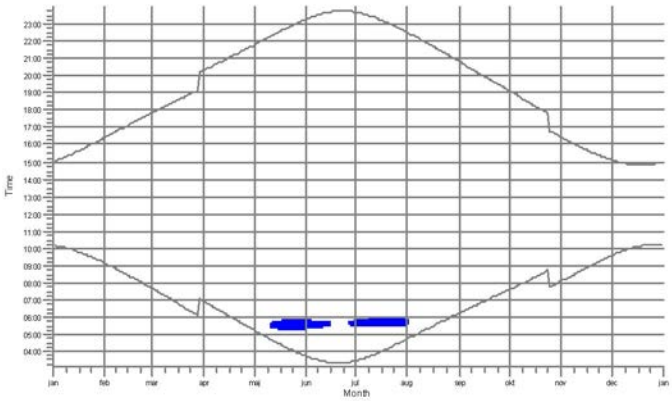
RH01: RH01



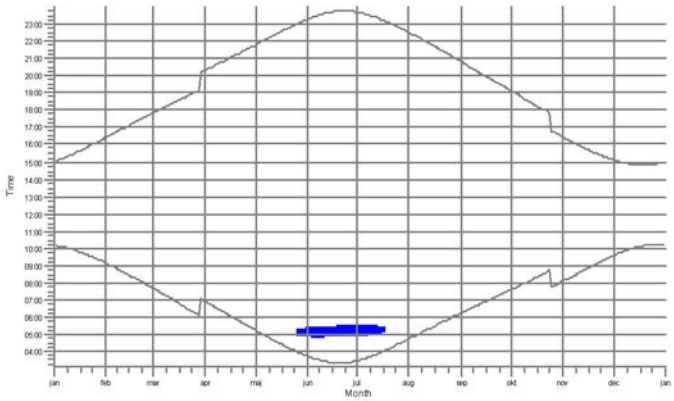
RH02: RH02



RH03: RH03



RH04: RH04



WTGs

3: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: [redacted]) 4: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

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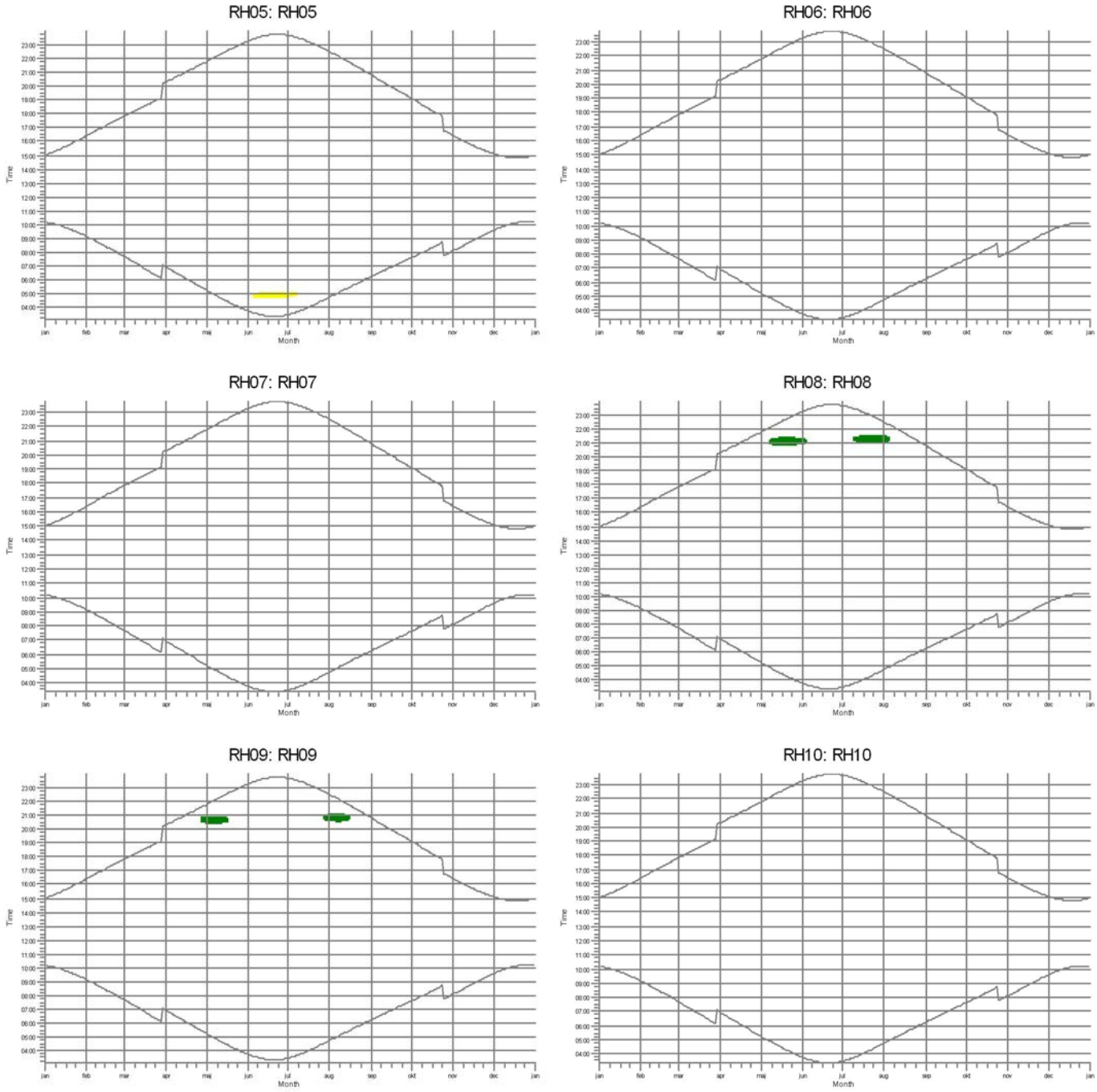
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)



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Calculated:
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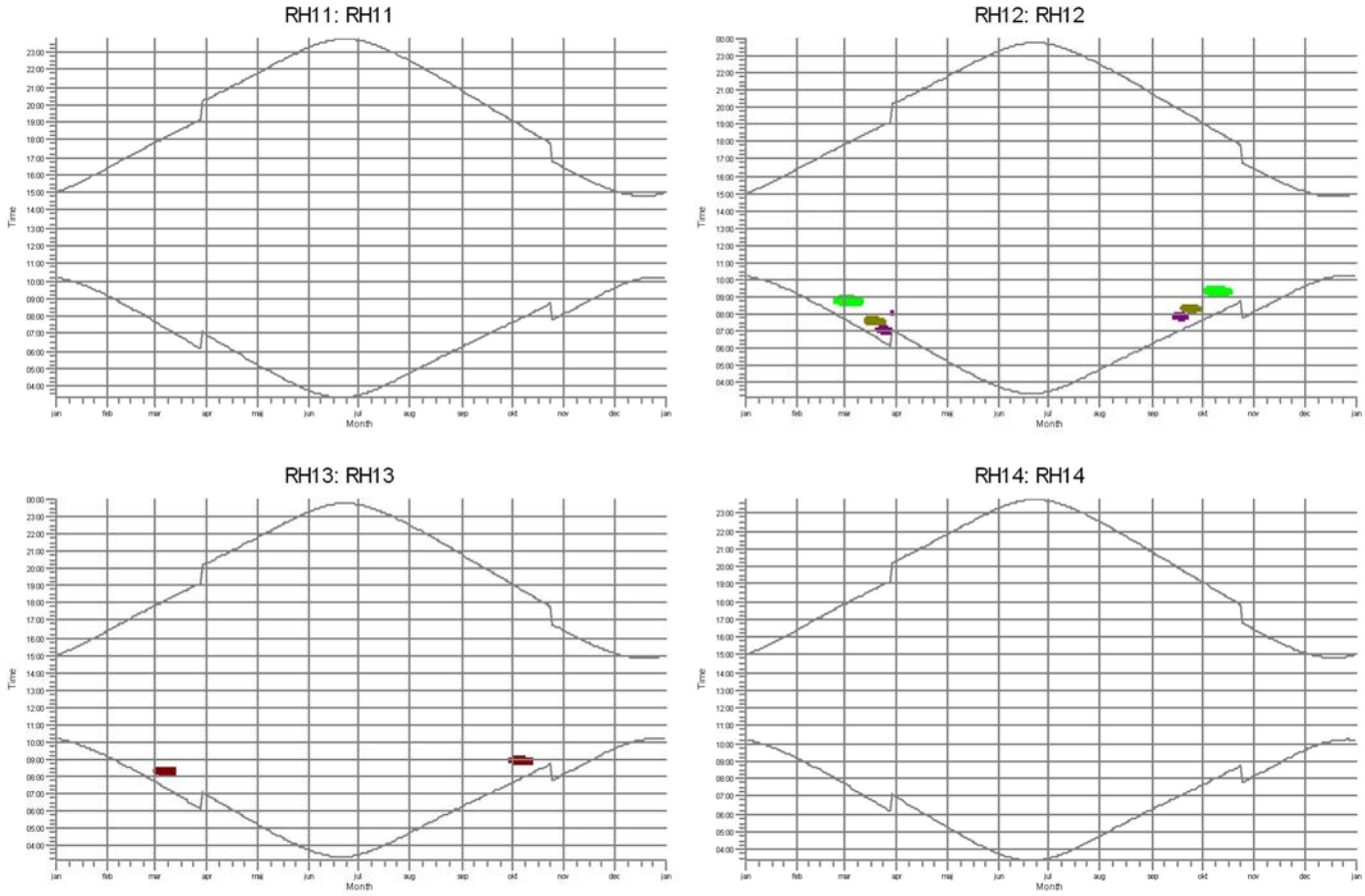
SHADOW - Calendar, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)



WTGs

8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 3 [redacted] 7) Lotlax 2: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)
Lotlax 1: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 1 [redacted]) Lotlax 3: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)

Project:

Söderskogen

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SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 1 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (156)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14 20:31-20:49/18	03:45 21:01-21:12/11	03:29	04:45 20:40-20:58/18	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:41	22:29 21:07-21:25/18	20:48	19:05	16:23	15:06
2	10:09	09:05	07:37	06:52	05:11 20:30-20:49/19	03:43 21:03-21:11/8	03:30	04:48 20:39-20:59/20	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40	22:26 21:08-21:24/16	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08 20:29-20:50/21	03:41 21:06-21:10/4	03:32	04:51 20:39-20:59/20	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:20	23:39	22:23 21:10-21:23/13	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05 20:28-20:50/22	03:39	03:33	04:54 20:38-20:59/21	06:23	07:45	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20 21:11-21:21/10	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02 20:28-20:50/22	03:37	03:35	04:57 20:38-21:00/22	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58 20:28-20:50/22	03:35	03:37	05:00 20:37-20:59/22	06:29	07:51	08:22	09:47
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55 20:28-20:50/22	03:34	03:39	05:03 20:38-21:00/22	06:31	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52 20:28-20:50/22	03:32	03:41	05:06 20:37-20:59/22	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07 21:03-21:09/6	23:31	23:31	22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 20:28-20:49/21	03:30	03:43	05:09 20:38-20:59/21	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10 21:00-21:11/11	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 20:29-20:49/20	03:29	03:45 21:12-21:18/6	05:12 20:38-20:59/21	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13 20:59-21:14/15	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 20:29-20:48/19	03:28	03:48 21:11-21:20/9	05:15 20:38-20:58/20	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16 20:57-21:14/17	23:36	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:03	06:18	04:40 20:29-20:47/18	03:26	03:50 21:09-21:21/12	05:18 20:39-20:57/18	06:45	08:08	08:40	09:59
	15:25	16:59	18:22	20:50	22:19 20:56-21:15/19	23:38	23:23	21:54	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 20:31-20:47/16	03:25	03:52 21:08-21:22/14	05:21 20:40-20:55/15	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22 20:56-21:16/20	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 20:32-20:45/13	03:24	03:55 21:08-21:23/15	05:23 20:41-20:54/13	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25 20:55-21:16/21	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 20:34-20:44/10	03:24	03:57 21:07-21:24/17	05:26 20:44-20:51/7	06:53	08:16	08:49	10:04
	15:33	17:08	18:31	20:59	22:28 20:55-21:17/22	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 20:36-20:41/5	03:23	04:00 21:07-21:25/18	05:29	06:56	08:19	08:52	10:05
	15:36	17:11	18:33	21:02	22:31 20:54-21:17/23	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25 20:54-21:17/23	03:22	04:03 21:06-21:25/19	05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:49
18	09:44	08:16	06:43	05:57	04:22 20:55-21:18/23	03:22	04:05 21:06-21:26/20	05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 20:54-21:17/23	03:21	04:08 21:05-21:26/21	05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16 20:54-21:17/23	03:21	04:11 21:05-21:26/21	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 20:55-21:17/22	03:21	04:13 21:05-21:27/22	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:29	05:44	04:10 20:55-21:17/22	03:21	04:16 21:05-21:27/22	05:47	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 20:56-21:17/21	03:22	04:19 21:05-21:27/22	05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 20:56-21:17/21	03:22	04:22 21:04-21:27/23	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 20:56-21:17/21	03:23	04:25 21:05-21:28/23	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 20:57-21:16/19	03:23	04:28 21:05-21:27/22	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:16	14:52
27	09:21	07:47	06:12	05:27	03:57 20:57-21:16/19	03:24	04:31 21:05-21:28/23	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24 20:35-20:44/9	03:55 20:58-21:15/17	03:25	04:33 20:45-20:53/8	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44	22:41 21:05-21:27/22	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21 20:33-20:46/13	03:52 20:59-21:14/15	03:26	04:36 20:43-20:55/12	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:43	22:38 21:05-21:27/22	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18 20:31-20:47/16	03:50 21:00-21:14/14	03:27	04:39 20:42-20:57/15	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35 21:06-21:27/21	20:54	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 21:01-21:13/12		04:42 20:41-20:57/16	06:12		08:04		10:11
	16:21		20:16		23:13		22:32 21:06-21:26/20	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	38	739	23	465	339	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 2 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (160)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June		July		August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45		03:29	04:50-05:03/13	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16		23:42		22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43		03:30	04:51-05:03/12	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18		23:40		22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:48	05:08	03:41		03:32	04:52-05:03/11	04:51	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21		23:39		22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39		03:33	04:53-05:02/9	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23		23:38		22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37		03:35	04:53-05:01/8	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25		23:36		22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	04:50-04:53/3	03:37	04:56-05:01/5	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27		23:35		22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	04:48-04:55/7	03:39		05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29		23:33		22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	04:48-04:57/9	03:41		05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31		23:31		22:07	20:24	18:41	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	04:47-04:57/10	03:43		05:09	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33		23:29		22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	04:46-04:58/12	03:45		05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35		23:27		22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43	03:28	04:46-04:59/13	03:48		05:15	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36		23:25		21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	04:46-05:00/14	03:50		05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38		23:23		21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	04:46-05:00/14	03:52		05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39		23:21		21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	04:46-05:01/15	03:55		05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41		23:19		21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:24	04:46-05:01/15	03:57		05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42		23:16		21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:46-05:01/15	04:00		05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43		23:14		21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:46-05:02/16	04:03		05:32	06:59	08:22	08:55	10:07
	15:39	17:14	18:36	21:05	22:34	23:44		23:11		21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:46-05:02/16	04:05		05:35	07:02	08:25	08:58	10:08
	15:42	17:17	18:39	21:08	22:37	23:44		23:09		21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:47-05:03/16	04:08		05:38	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45		23:06		21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:47-05:03/16	04:11		05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46		23:04		21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:47-05:03/16	04:14		05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46		23:01		21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:47-05:03/16	04:16		05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46		22:58		21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:47-05:03/16	04:19		05:49	07:15	08:40	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46		22:56		21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:47-05:04/17	04:22		05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46		22:53		21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:47-05:03/16	04:25		05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46		22:50		21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:48-05:04/16	04:28		05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:45		22:47		21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:49-05:04/15	04:31		06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45		22:44		21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:49-05:04/15	04:33		06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:05	23:44		22:41		21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:49-05:03/14	04:36		06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44		22:38		20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50	03:27	04:49-05:03/14	04:39		06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43		22:35		20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48			04:42		06:12		08:04		10:11
	16:21		20:16		23:13			22:32		20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605		594		502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	346		58		0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 3 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (161)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45 04:59-05:18/19	03:29 05:01-05:26/25	04:45 05:42-05:58/16	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16 05:25-05:46/21	23:42 05:35-05:44/9	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 04:58-05:18/20	03:30 05:03-05:27/24	04:48 05:44-05:58/14	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18 05:25-05:44/19	23:40 05:36-05:46/10	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 04:58-05:19/21	03:32 05:03-05:27/24	04:51 05:45-05:56/11	06:20	07:43	08:13	09:40
	15:04	16:30	17:56	20:24	21:52	23:21 05:26-05:44/18	23:39 05:35-05:47/12	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39 04:58-05:20/22	03:33 05:03-05:27/24	04:54 05:47-05:54/7	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23 05:26-05:44/18	23:38 05:34-05:47/13	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37 04:57-05:20/23	03:35 05:03-05:26/23	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25 05:26-05:43/17	23:36 05:34-05:48/14	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 04:57-05:20/23	03:37 05:04-05:27/23	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27 05:27-05:43/16	23:35 05:34-05:49/15	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 04:57-05:21/24	03:39 05:04-05:26/22	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29 05:28-05:42/14	23:33 05:33-05:49/16	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32 04:57-05:21/24	03:41 05:05-05:27/22	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31 05:29-05:42/13	23:31 05:33-05:50/17	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49 05:36-05:45/9	03:30 04:57-05:21/24	03:43 05:05-05:26/21	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33 05:29-05:41/12	23:29 05:32-05:50/18	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:34-05:46/12	03:29 04:57-05:22/25	03:45 05:05-05:26/21	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:30-05:41/11	23:27 05:33-05:51/18	22:01	20:17	18:35	15:57	14:53
11	09:57	08:38	07:07	06:21	04:43 05:32-05:47/15	03:28 04:58-05:23/25	03:48 05:06-05:26/20	05:15	06:43	08:05	08:37	09:58
	15:22	16:56	18:19	20:47	22:16	23:36 05:32-05:41/9	23:25 05:33-05:53/20	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:30-05:49/19	03:26 04:58-05:23/25	03:50 05:07-05:26/19	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38 05:32-05:40/8	23:23 05:33-05:55/22	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37 05:27-05:49/22	03:25 04:58-05:23/25	03:53 05:07-05:24/17	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39 05:33-05:39/6	23:21 05:32-05:55/23	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:26-05:50/24	03:24 04:58-05:23/25	03:55 05:08-05:24/16	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41 05:34-05:39/5	23:19 05:32-05:56/24	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31 05:25-05:50/25	03:24 04:58-05:23/25	03:58 05:09-05:23/14	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42 05:35-05:38/3	23:16 05:31-05:57/26	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:24-05:51/27	03:23 04:58-05:24/26	04:00 05:11-05:22/11	05:29	06:56	08:19	08:52	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14 05:31-05:58/27	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25 05:23-05:50/27	03:22 04:59-05:24/25	04:03 05:13-05:20/7	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11 05:31-05:58/27	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22 05:23-05:51/28	03:22 04:59-05:24/25	04:05 05:31-06:00/29	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19 05:23-05:51/28	03:21 04:59-05:25/26	04:08 05:32-06:00/28	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:22-05:50/28	03:21 04:59-05:25/26	04:11 05:32-06:00/28	05:41	07:07	08:31	09:04	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13 05:22-05:51/29	03:21 04:59-05:25/26	04:14 05:32-06:01/29	05:44	07:10	08:34	09:07	10:10
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10 05:22-05:51/29	03:21 04:59-05:25/26	04:16 05:32-06:01/29	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:22-05:50/28	03:22 04:59-05:25/26	04:19 05:33-06:02/29	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05 05:22-05:50/28	03:22 05:00-05:26/26	04:22 05:33-06:01/28	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:22-05:50/28	03:23 05:00-05:25/25	04:25 05:33-06:01/28	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:05-05:10/5	03:23 05:00-05:26/26	04:28 05:33-06:02/29	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00 05:22-05:50/28	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57 05:03-05:12/9	03:24 05:01-05:26/25	04:31 05:34-06:01/27	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03 05:22-05:49/27	23:45 05:39-05:40/1	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:01-05:14/13	03:25 05:01-05:27/26	04:34 05:34-06:01/27	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06 05:22-05:48/26	23:44 05:38-05:42/4	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:01-05:16/15	03:26 05:01-05:26/25	04:36 05:36-06:01/25	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08 05:24-05:48/24	23:44 05:36-05:42/6	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:00-05:16/16	03:27 05:01-05:26/25	04:39 05:37-06:00/23	06:09	07:34	08:01	09:33	10:11
	16:18		20:13	21:43	23:11 05:24-05:47/23	23:43 05:36-05:43/7	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48 04:59-05:17/18		04:42 05:39-06:00/21	06:12		08:04		10:11
	16:21		20:16		23:13 05:24-05:46/22		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	632	942	1024	48	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 4 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (162)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:15	03:46 05:32-05:50/18	03:29 04:53-05:02/9	04:45 05:44-05:56/12	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43 05:32-05:49/17	03:30 04:55-05:02/7	04:48 05:46-05:54/8	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:40 05:46-05:49/3	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41 05:33-05:49/16	03:32 04:57-05:00/3	04:51	06:21	07:43	08:13	09:41
	15:04	16:31	17:56	20:24	21:52	23:21	23:39 05:44-05:50/6	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39 05:34-05:49/15	03:33 05:43-05:51/8	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:01
5	10:06	08:56	07:27	06:42	05:02	03:37 05:34-05:48/14	03:35 05:42-05:52/10	04:57	06:26	07:48	08:19	09:45
	15:09	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35 05:35-05:47/12	03:37 05:42-05:54/12	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34 05:36-05:47/11	03:39 05:41-05:54/13	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:32	04:52	03:32 05:37-05:46/9	03:41 05:41-05:55/14	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:03	14:55
9	10:01	08:44	07:14	06:28	04:49	03:31 05:38-05:45/7	03:43 05:40-05:56/16	05:09	06:37	08:00	08:31	09:54
	15:18	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:21	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46 05:39-05:41/2	03:29 04:50-04:56/6	03:46 05:40-05:57/17	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35 05:39-05:44/5	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43 05:34-05:44/10	03:28 04:50-04:58/8	03:48 05:40-05:58/18	05:15	06:43	08:05	08:37	09:58
	15:23	16:56	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:32	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40 05:33-05:47/14	03:27 04:49-04:59/10	03:50 05:40-05:58/18	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:15	04:37 05:31-05:47/16	03:25 04:48-04:59/11	03:53 05:39-05:59/20	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34 05:31-05:49/18	03:24 04:48-05:00/12	03:55 05:38-05:59/21	05:24	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:22	15:46	14:50
15	09:50	08:26	06:53	06:08	04:31 05:29-05:49/20	03:24 04:47-05:00/13	03:58 05:38-05:59/21	05:26	06:54	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28 05:29-05:50/21	03:23 04:47-05:01/14	04:00 05:38-06:00/22	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25 05:28-05:50/22	03:22 04:48-05:02/14	04:03 05:38-06:00/22	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22 05:28-05:51/23	03:22 04:48-05:02/14	04:05 05:39-06:01/22	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:49
19	09:41	08:13	06:40	05:54	04:19 05:28-05:51/23	03:22 04:48-05:03/15	04:08 05:38-06:01/23	05:38	07:04	08:28	09:02	10:09
	15:45	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:49
20	09:39	08:10	06:36	05:51	04:16 05:27-05:51/24	03:21 04:48-05:03/15	04:11 05:38-06:01/23	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13 05:28-05:51/23	03:21 04:48-05:03/15	04:14 05:38-06:01/23	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:11 05:28-05:51/23	03:21 04:48-05:03/15	04:16 05:38-06:01/23	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08 05:28-05:51/23	03:22 04:49-05:04/15	04:19 05:39-06:02/23	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05 05:28-05:51/23	03:22 04:49-05:04/15	04:22 05:38-06:02/24	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02 05:28-05:51/23	03:23 04:49-05:03/14	04:25 05:38-06:01/23	05:55	07:21	07:46	09:19	10:12
	16:03	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00 05:29-05:51/22	03:23 04:50-05:04/14	04:28 05:39-06:01/22	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57 05:29-05:51/22	03:24 04:50-05:04/14	04:31 05:39-06:01/22	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55 05:29-05:50/21	03:25 04:51-05:04/13	04:34 05:39-06:00/21	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:55
29	09:16		07:06	05:21	03:52 05:30-05:51/21	03:26 04:51-05:03/12	04:36 05:41-06:00/19	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:13		07:02	05:18	03:50 05:30-05:50/20	03:27 04:52-05:02/10	04:39 05:41-05:58/17	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:08	14:57
31	09:11		06:59		03:48 05:31-05:50/19		04:42 05:43-05:58/15	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	433	393	560	20	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 5 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (155)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:21	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:21	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:31	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:58
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:55
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	15:36	17:11	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:15	15:40	14:49
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	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:49
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:48	04:13	03:21	04:14	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:59	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:51	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:50	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:33	17:52	15:22	14:50
24	09:29	07:57	06:23	05:38	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:51
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:06	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:13	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:14	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:07	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 6 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (158)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:35
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:03	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:07	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:29	22:04	20:20	18:38	16:00	14:54
10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:39	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:49	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:15	15:40	14:49
17	09:46	08:19	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:11	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:07	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:23	04:25	05:55	07:21	07:46	09:19	10:12
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26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:23	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
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28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:27	10:12
	16:12	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
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	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 7 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:29	04:45	06:15	07:37	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:24	15:06
2	10:09	09:05	07:37	06:52	05:11	03:43	03:30	04:48	06:18	07:40	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:18	23:41	22:26	20:44	19:02	16:20	15:04
3	10:08	09:02	07:34	06:49	05:08	03:41	03:32	04:51	06:20	07:43	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:02
4	10:07	08:59	07:30	06:45	05:05	03:39	03:33	04:54	06:23	07:46	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27	06:42	05:02	03:37	03:35	04:57	06:26	07:48	08:19	09:45
	15:08	16:37	18:02	20:30	21:58	23:25	23:36	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24	06:38	04:58	03:35	03:37	05:00	06:29	07:51	08:22	09:48
	15:11	16:40	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:50	07:20	06:35	04:55	03:34	03:39	05:03	06:32	07:54	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:29	23:33	22:11	20:27	18:45	16:05	14:56
8	10:02	08:47	07:17	06:31	04:52	03:32	03:41	05:06	06:34	07:57	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14	06:28	04:49	03:30	03:43	05:09	06:37	08:00	08:31	09:54
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10	09:59	08:41	07:10	06:25	04:46	03:29	03:45	05:12	06:40	08:02	08:34	09:56
	15:20	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:35	15:57	14:53
11	09:58	08:38	07:07	06:21	04:43	03:28	03:48	05:15	06:43	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04	06:18	04:40	03:26	03:50	05:18	06:45	08:08	08:40	10:00
	15:25	16:59	18:22	20:50	22:19	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00	06:14	04:37	03:25	03:52	05:21	06:48	08:11	08:43	10:01
	15:28	17:02	18:25	20:53	22:22	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:34	03:24	03:55	05:23	06:51	08:14	08:46	10:03
	15:30	17:05	18:28	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:50
15	09:50	08:26	06:53	06:08	04:31	03:23	03:57	05:26	06:53	08:17	08:50	10:04
	15:33	17:08	18:31	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:28	03:23	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:31	23:43	23:14	21:42	19:56	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:03	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:34	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:58	04:22	03:22	04:05	05:35	07:02	08:25	08:59	10:08
	15:42	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:41	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:45	23:06	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:13	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:49
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:34	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:22	04:19	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:56	21:18	19:32	17:52	15:22	14:50
24	09:29	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:12
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:16	14:52
27	09:22	07:47	06:12	05:28	03:57	03:24	04:31	06:01	07:26	07:52	09:25	10:12
	16:09	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35	08:01	09:33	10:11
	16:18		20:13	21:43	23:11	23:43	22:35	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:48		04:42	06:12		08:04		10:11
	16:21		20:16		23:13		22:32	20:51		16:27		14:59
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** 8 - FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40 08:16-08:22/6	06:55	05:14	03:45	03:28	04:45	06:15	07:37 08:49-09:02/13	08:07	09:36
	15:01	16:24	17:50	20:19	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:10	09:05	07:37 08:13-08:25/12	06:52	05:11	03:43	03:30	04:48	06:18	07:40 08:47-09:04/17	08:10	09:38
	15:02	16:27	17:53	20:22	21:49	23:19	23:41	22:26	20:44	19:02	16:20	15:04
3	10:09	09:02	07:34 08:11-08:27/16	06:49	05:08	03:41	03:31	04:51	06:20	07:43 08:46-09:04/18	08:13	09:41
	15:04	16:30	17:56	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:02
4	10:08	08:59	07:31 08:09-08:27/18	06:45	05:05	03:39	03:33	04:54	06:23	07:46 08:45-09:05/20	08:16	09:43
	15:06	16:34	17:59	20:27	21:55	23:23	23:38	22:20	20:38	18:55	16:14	15:00
5	10:06	08:56	07:27 08:09-08:28/19	06:42	05:01	03:37	03:35	04:57	06:26	07:48 08:44-09:04/20	08:19	09:46
	15:08	16:37	18:02	20:30	21:58	23:25	23:37	22:17	20:34	18:52	16:11	14:59
6	10:05	08:53	07:24 08:08-08:28/20	06:38	04:58	03:35	03:37	05:00	06:29	07:51 08:43-09:04/21	08:22	09:48
	15:10	16:40	18:05	20:33	22:01	23:28	23:35	22:14	20:31	18:48	16:08	14:57
7	10:04	08:51	07:20 08:08-08:28/20	06:35	04:55	03:33	03:39	05:03	06:32	07:54 08:43-09:04/21	08:25	09:50
	15:13	16:43	18:08	20:36	22:04	23:30	23:33	22:11	20:27	18:45	16:05	14:56
8	10:03	08:47	07:17 08:07-08:28/21	06:31	04:52	03:32	03:41	05:06	06:34	07:57 08:43-09:03/20	08:28	09:52
	15:15	16:46	18:10	20:39	22:07	23:32	23:31	22:08	20:24	18:42	16:02	14:55
9	10:01	08:44	07:14 08:08-08:28/20	06:28	04:49	03:30	03:43	05:09	06:37	08:00 08:44-09:02/18	08:31	09:54
	15:17	16:49	18:13	20:42	22:10	23:33	23:30	22:04	20:21	18:38	15:59	14:54
10	09:59	08:41	07:10 08:07-08:26/19	06:25	04:46	03:29	03:45	05:12	06:40	08:02 08:44-09:01/17	08:34	09:56
	15:20	16:52	18:16	20:45	22:14	23:35	23:28	22:01	20:17	18:35	15:57	14:52
11	09:58	08:38	07:07 08:08-08:26/18	06:21	04:43	03:27	03:47	05:15	06:43	08:05 08:45-09:00/15	08:37	09:58
	15:22	16:55	18:19	20:47	22:17	23:37	23:26	21:58	20:14	18:31	15:54	14:52
12	09:56	08:35	07:04 08:09-08:24/15	06:18	04:40	03:26	03:50	05:18	06:45	08:08 08:47-08:57/10	08:40	10:00
	15:25	16:59	18:22	20:50	22:20	23:38	23:23	21:55	20:10	18:28	15:51	14:51
13	09:54	08:32	07:00 08:11-08:22/11	06:14	04:36	03:25	03:52	05:20	06:48	08:11	08:44	10:01
	15:27	17:02	18:25	20:53	22:23	23:40	23:21	21:51	20:07	18:25	15:48	14:50
14	09:52	08:29	06:57	06:11	04:33	03:24	03:55	05:23	06:51	08:14	08:47	10:03
	15:30	17:05	18:28	20:56	22:26	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:08	04:30	03:23	03:57	05:26	06:53	08:17	08:50	10:05
	15:33	17:08	18:31	20:59	22:29	23:42	23:17	21:45	20:00	18:18	15:43	14:49
16	09:48	08:23	06:50	06:04	04:27	03:22	04:00	05:29	06:56	08:19	08:53	10:06
	15:36	17:11	18:33	21:02	22:32	23:43	23:14	21:42	19:57	18:15	15:40	14:49
17	09:46	08:20	06:47	06:01	04:25	03:22	04:02	05:32	06:59	08:22	08:56	10:07
	15:39	17:14	18:36	21:05	22:35	23:44	23:12	21:38	19:53	18:12	15:37	14:48
18	09:44	08:16	06:43	05:57	04:22	03:21	04:05	05:35	07:02	08:25	08:59	10:08
	15:41	17:17	18:39	21:08	22:37	23:45	23:09	21:35	19:50	18:08	15:35	14:48
19	09:42	08:13	06:40	05:54	04:19	03:21	04:08	05:38	07:04	08:28	09:02	10:09
	15:44	17:20	18:42	21:11	22:40	23:46	23:07	21:32	19:46	18:05	15:32	14:48
20	09:39	08:10	06:36	05:51	04:16	03:21	04:11	05:41	07:07	08:31	09:05	10:10
	15:47	17:23	18:45	21:14	22:43	23:46	23:04	21:28	19:43	18:02	15:30	14:48
21	09:37	08:07	06:33	05:47	04:13	03:21	04:13	05:44	07:10	08:34	09:08	10:11
	15:50	17:26	18:48	21:17	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:49
22	09:35	08:03	06:30	05:44	04:10	03:21	04:16	05:47	07:13	08:37	09:11	10:11
	15:53	17:29	18:50	21:19	22:49	23:47	22:59	21:22	19:36	17:55	15:25	14:49
23	09:32	08:00	06:26	05:41	04:08	03:21	04:19	05:49	07:15	08:40	09:14	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:33	17:52	15:22	14:50
24	09:30	07:57	06:23	05:37	04:05	03:22	04:22	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:49	15:20	14:50
25	09:27	07:54	06:19	05:34	04:02	03:22	04:25	05:55	07:21	07:46	09:19	10:12
	16:02	17:38	18:59	21:28	22:58	23:46	22:50	21:12	19:26	16:46	15:18	14:51
26	09:24	07:50	06:16	05:31	04:00	03:23	04:28	05:58	07:24	07:49	09:22	10:13
	16:05	17:41	19:02	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:52
27	09:22	07:47	06:12	05:27	03:57	03:24	04:30	06:01	07:26	07:52	09:25	10:12
	16:08	17:44	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:39	15:13	14:53
28	09:19	07:44	06:09	05:24	03:55	03:25	04:33	06:04	07:29	07:55	09:28	10:12
	16:12	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:36	15:11	14:54
29	09:16		07:06	05:21	03:52	03:26	04:36	06:06	07:32	07:58	09:30	10:12
	16:15		20:10	21:40	23:08	23:44	22:39	20:58	19:12	16:33	15:09	14:56
30	09:14		07:02	05:18	03:50	03:27	04:39	06:09	07:35 08:52-09:00/8	08:01	09:33	10:12
	16:18		20:13	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:07	14:57
31	09:11		06:59		03:47		04:42	06:12		08:04		10:11
	16:21		20:16		23:14		22:33	20:51		16:27		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
Sum of minutes with flicker	0	0	215	0	0	0	0	0	8	210	0	0

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

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

Project:

Söderskogen

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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lotlax 1 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February		March		April	May	June	July	August	September	October		November	December
1	10:10	09:08		07:40	08:32-08:56/24	06:55	05:14	03:45	03:28	04:45	06:15	07:37		08:07	09:36
	15:00	16:24		17:50		20:19	21:46	23:16	23:42	22:30	20:48	19:05		16:23	15:05
2	10:10	09:05		07:37	08:32-08:57/25	06:52	05:11	03:43	03:29	04:48	06:17	07:40	09:17-09:25/8	08:10	09:38
	15:02	16:27		17:53		20:22	21:49	23:19	23:41	22:26	20:44	19:02		16:20	15:03
3	10:09	09:02		07:34	08:31-08:56/25	06:48	05:08	03:41	03:31	04:51	06:20	07:43	09:13-09:27/14	08:13	09:41
	15:04	16:30		17:56		20:24	21:52	23:21	23:40	22:23	20:41	18:58		16:17	15:02
4	10:08	08:59		07:30	08:31-08:57/26	06:45	05:04	03:39	03:33	04:54	06:23	07:46	09:11-09:29/18	08:16	09:43
	15:06	16:33		17:59		20:27	21:55	23:23	23:38	22:20	20:38	18:55		16:14	15:00
5	10:07	08:56		07:27	08:31-08:56/25	06:42	05:01	03:37	03:34	04:57	06:26	07:48	09:09-09:30/21	08:19	09:46
	15:08	16:36		18:02		20:30	21:58	23:26	23:37	22:17	20:34	18:51		16:11	14:58
6	10:05	08:53		07:24	08:31-08:56/25	06:38	04:58	03:35	03:36	05:00	06:29	07:51	09:08-09:31/23	08:22	09:48
	15:10	16:40		18:05		20:33	22:01	23:28	23:35	22:14	20:31	18:48		16:08	14:57
7	10:04	08:51		07:20	08:31-08:54/23	06:35	04:55	03:33	03:38	05:03	06:31	07:54	09:07-09:31/24	08:25	09:50
	15:12	16:43		18:07		20:36	22:04	23:30	23:33	22:11	20:27	18:45		16:05	14:56
8	10:03	08:47		07:17	08:32-08:54/22	06:31	04:52	03:31	03:40	05:06	06:34	07:57	09:07-09:31/24	08:28	09:52
	15:15	16:46		18:10		20:39	22:07	23:32	23:32	22:08	20:24	18:41		16:02	14:54
9	10:01	08:44		07:14	08:33-08:52/19	06:28	04:49	03:30	03:43	05:08	06:37	08:00	09:06-09:31/25	08:31	09:54
	15:17	16:49		18:13		20:42	22:11	23:34	23:30	22:04	20:20	18:38		15:59	14:53
10	10:00	08:41		07:10	08:34-08:50/16	06:24	04:45	03:28	03:45	05:11	06:40	08:02	09:06-09:31/25	08:34	09:56
	15:19	16:52		18:16		20:44	22:14	23:35	23:28	22:01	20:17	18:35		15:56	14:52
11	09:58	08:38		07:07	08:36-08:47/11	06:21	04:42	03:27	03:47	05:14	06:42	08:05	09:06-09:31/25	08:37	09:58
	15:22	16:55		18:19		20:47	22:17	23:37	23:26	21:58	20:14	18:31		15:53	14:51
12	09:56	08:35		07:04		06:18	04:39	03:26	03:49	05:17	06:45	08:08	09:06-09:30/24	08:40	10:00
	15:25	16:58		18:22		20:50	22:20	23:39	23:24	21:55	20:10	18:28		15:51	14:50
13	09:54	08:32		07:00		06:14	04:36	03:25	03:52	05:20	06:48	08:11	09:06-09:29/23	08:44	10:02
	15:27	17:01		18:25		20:53	22:23	23:40	23:21	21:51	20:07	18:25		15:48	14:50
14	09:52	08:29		06:57		06:11	04:33	03:24	03:54	05:23	06:51	08:14	09:06-09:28/22	08:47	10:03
	15:30	17:05		18:28		20:56	22:26	23:41	23:19	21:48	20:03	18:21		15:45	14:49
15	09:50	08:26		06:53		06:07	04:30	03:23	03:57	05:26	06:53	08:17	09:07-09:27/20	08:50	10:05
	15:33	17:08		18:30		20:59	22:29	23:42	23:17	21:45	20:00	18:18		15:42	14:49
16	09:48	08:23		06:50		06:04	04:27	03:22	03:59	05:29	06:56	08:19	09:08-09:25/17	08:53	10:06
	15:35	17:11		18:33		21:02	22:32	23:44	23:14	21:42	19:56	18:15		15:40	14:48
17	09:46	08:20		06:47		06:01	04:24	03:21	04:02	05:32	06:59	08:22	09:10-09:23/13	08:56	10:07
	15:38	17:14		18:36		21:05	22:35	23:44	23:12	21:38	19:53	18:11		15:37	14:48
18	09:44	08:16		06:43		05:57	04:21	03:21	04:05	05:35	07:02	08:25	09:15-09:19/4	08:59	10:08
	15:41	17:17		18:39		21:08	22:38	23:45	23:09	21:35	19:50	18:08		15:34	14:48
19	09:42	08:13		06:40		05:54	04:18	03:21	04:07	05:38	07:04	08:28		09:02	10:09
	15:44	17:20		18:42		21:11	22:41	23:46	23:07	21:32	19:46	18:05		15:32	14:48
20	09:39	08:10		06:36		05:51	04:16	03:20	04:10	05:41	07:07	08:31		09:05	10:10
	15:47	17:23		18:45		21:14	22:43	23:46	23:04	21:28	19:43	18:01		15:29	14:48
21	09:37	08:07		06:33		05:47	04:13	03:20	04:13	05:43	07:10	08:34		09:08	10:11
	15:50	17:26		18:48		21:16	22:46	23:47	23:01	21:25	19:39	17:58		15:27	14:48
22	09:35	08:03		06:29		05:44	04:10	03:21	04:16	05:46	07:12	08:37		09:11	10:12
	15:53	17:29		18:50		21:19	22:49	23:47	22:59	21:22	19:36	17:55		15:24	14:49
23	09:32	08:00		06:26		05:41	04:07	03:21	04:19	05:49	07:15	08:40		09:14	10:12
	15:56	17:32		18:53		21:22	22:52	23:47	22:56	21:18	19:32	17:52		15:22	14:49
24	09:30	07:57	08:41-08:49/8	06:23		05:37	04:05	03:21	04:21	05:52	07:18	08:43		09:16	10:12
	15:59	17:35		18:56		21:25	22:55	23:47	22:53	21:15	19:29	17:49		15:20	14:50
25	09:27	07:54	08:38-08:53/15	06:19		05:34	04:02	03:22	04:24	05:55	07:21	07:46		09:19	10:13
	16:02	17:38		18:59		21:28	22:58	23:47	22:50	21:12	19:26	16:45		15:17	14:51
26	09:24	07:50	08:36-08:54/18	06:16		05:31	03:59	03:22	04:27	05:58	07:23	07:49		09:22	10:13
	16:05	17:41		19:02		21:31	23:01	23:46	22:47	21:08	19:22	16:42		15:15	14:52
27	09:22	07:47	08:35-08:56/21	06:12		05:27	03:57	03:23	04:30	06:01	07:26	07:52		09:25	10:13
	16:08	17:44		19:05		21:34	23:03	23:46	22:44	21:05	19:19	16:39		15:13	14:53
28	09:19	07:44	08:33-08:56/23	06:09		05:24	03:54	03:24	04:33	06:03	07:29	07:55		09:28	10:12
	16:11	17:47		19:07		21:37	23:06	23:45	22:42	21:01	19:15	16:36		15:11	14:54
29	09:16			07:05		05:21	03:52	03:25	04:36	06:06	07:32	07:58		09:30	10:12
	16:14			20:10		21:40	23:09	23:44	22:39	20:58	19:12	16:33		15:09	14:55
30	09:14			07:02		05:17	03:49	03:27	04:39	06:09	07:34	08:01		09:33	10:12
	16:18			20:13		21:43	23:11	23:43	22:36	20:55	19:08	16:29		15:07	14:57
31	09:11			06:59			03:47		04:42	06:12		08:04			10:11
	16:21			20:16			23:14		22:33	20:51		16:26			14:58
Potential sun hours	182	242		363		447	559	605	594	502	392	308		206	151
Sum of minutes with flicker	0	85		241		0	0	0	0	0	0	330		0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lotlax 2 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March		April	May	June	July	August	September		October	November	December
1	10:10	09:08	07:40		06:55	05:14	03:45	03:28	04:45	06:15		07:37	08:07	09:36
	15:00	16:24	17:50		20:19	21:46	23:16	23:42	22:30	20:48		19:05	16:23	15:05
2	10:10	09:05	07:37		06:52	05:11	03:43	03:29	04:48	06:17		07:40	08:10	09:38
	15:02	16:27	17:53		20:22	21:49	23:19	23:41	22:26	20:44		19:02	16:20	15:03
3	10:09	09:02	07:34		06:48	05:08	03:40	03:31	04:51	06:20		07:43	08:13	09:41
	15:04	16:30	17:56		20:24	21:52	23:21	23:40	22:23	20:41		18:58	16:17	15:01
4	10:08	08:59	07:30		06:45	05:04	03:38	03:33	04:54	06:23		07:45	08:16	09:43
	15:06	16:33	17:59		20:27	21:55	23:23	23:38	22:20	20:38		18:55	16:14	15:00
5	10:07	08:56	07:27		06:41	05:01	03:37	03:34	04:57	06:26		07:48	08:19	09:46
	15:08	16:36	18:02		20:30	21:58	23:26	23:37	22:17	20:34		18:51	16:11	14:58
6	10:05	08:53	07:24		06:38	04:58	03:35	03:36	05:00	06:29		07:51	08:22	09:48
	15:10	16:40	18:04		20:33	22:01	23:28	23:35	22:14	20:31		18:48	16:08	14:57
7	10:04	08:50	07:20		06:35	04:55	03:33	03:38	05:02	06:31		07:54	08:25	09:50
	15:12	16:43	18:07		20:36	22:04	23:30	23:33	22:11	20:27		18:45	16:05	14:56
8	10:03	08:47	07:17		06:31	04:52	03:31	03:40	05:05	06:34		07:57	08:28	09:52
	15:15	16:46	18:10		20:39	22:07	23:32	23:32	22:08	20:24		18:41	16:02	14:54
9	10:01	08:44	07:14		06:28	04:48	03:30	03:42	05:08	06:37		07:59	08:31	09:54
	15:17	16:49	18:13		20:42	22:11	23:34	23:30	22:04	20:20		18:38	15:59	14:53
10	10:00	08:41	07:10		06:24	04:45	03:28	03:45	05:11	06:40		08:02	08:34	09:56
	15:19	16:52	18:16		20:44	22:14	23:35	23:28	22:01	20:17		18:35	15:56	14:52
11	09:58	08:38	07:07		06:21	04:42	03:27	03:47	05:14	06:42		08:05	08:37	09:58
	15:22	16:55	18:19		20:47	22:17	23:37	23:26	21:58	20:14		18:31	15:53	14:51
12	09:56	08:35	07:03		06:18	04:39	03:26	03:49	05:17	06:45		08:08	08:40	10:00
	15:24	16:58	18:22		20:50	22:20	23:39	23:24	21:55	20:10		18:28	15:51	14:50
13	09:54	08:32	07:00		06:14	04:36	03:25	03:52	05:20	06:48		08:11	08:44	10:02
	15:27	17:01	18:25		20:53	22:23	23:40	23:21	21:51	20:07		18:25	15:48	14:50
14	09:52	08:29	06:57	07:31-07:41/10	06:11	04:33	03:24	03:54	05:23	06:51		08:14	08:47	10:03
	15:30	17:04	18:28		20:56	22:26	23:41	23:19	21:48	20:03		18:21	15:45	14:49
15	09:50	08:26	06:53	07:29-07:43/14	06:07	04:30	03:23	03:57	05:26	06:53		08:17	08:50	10:05
	15:33	17:08	18:30		20:59	22:29	23:42	23:17	21:45	20:00		18:18	15:42	14:48
16	09:48	08:23	06:50	07:27-07:43/16	06:04	04:27	03:22	03:59	05:29	06:56		08:19	08:53	10:06
	15:35	17:11	18:33		21:02	22:32	23:44	23:14	21:42	19:56		18:15	15:40	14:48
17	09:46	08:20	06:46	07:26-07:44/18	06:01	04:24	03:21	04:02	05:32	06:59		08:22	08:56	10:07
	15:38	17:14	18:36		21:05	22:35	23:44	23:12	21:38	19:53		18:11	15:37	14:48
18	09:44	08:16	06:43	07:25-07:44/19	05:57	04:21	03:21	04:05	05:35	07:01	08:19-08:21/2	08:25	08:59	10:08
	15:41	17:17	18:39		21:08	22:38	23:45	23:09	21:35	19:50		18:08	15:34	14:48
19	09:42	08:13	06:40	07:25-07:44/19	05:54	04:18	03:21	04:07	05:38	07:04	08:15-08:25/10	08:28	09:02	10:09
	15:44	17:20	18:42		21:11	22:40	23:46	23:07	21:32	19:46		18:05	15:32	14:48
20	09:39	08:10	06:36	07:24-07:43/19	05:51	04:15	03:20	04:10	05:41	07:07	08:12-08:26/14	08:31	09:05	10:10
	15:47	17:23	18:45		21:14	22:43	23:46	23:04	21:28	19:43		18:01	15:29	14:48
21	09:37	08:07	06:33	07:25-07:43/18	05:47	04:13	03:20	04:13	05:43	07:10	08:11-08:27/16	08:34	09:08	10:11
	15:50	17:26	18:48		21:16	22:46	23:47	23:01	21:25	19:39		17:58	15:27	14:48
22	09:35	08:03	06:29	07:24-07:41/17	05:44	04:10	03:20	04:16	05:46	07:12	08:10-08:28/18	08:37	09:11	10:12
	15:53	17:29	18:50		21:19	22:49	23:47	22:59	21:22	19:36		17:55	15:24	14:49
23	09:32	08:00	06:26	07:26-07:41/15	05:40	04:07	03:21	04:19	05:49	07:15	08:08-08:27/19	08:40	09:14	10:12
	15:56	17:32	18:53		21:22	22:52	23:47	22:56	21:18	19:32		17:52	15:22	14:49
24	09:30	07:57	06:23	07:26-07:38/12	05:37	04:04	03:21	04:21	05:52	07:18	08:08-08:27/19	08:43	09:16	10:12
	15:59	17:35	18:56		21:25	22:55	23:47	22:53	21:15	19:29		17:48	15:20	14:50
25	09:27	07:54	06:19	07:29-07:35/6	05:34	04:02	03:22	04:24	05:55	07:21	08:08-08:27/19	07:46	09:19	10:13
	16:02	17:38	18:59		21:28	22:58	23:47	22:50	21:12	19:26		16:45	15:17	14:51
26	09:24	07:50	06:16		05:30	03:59	03:22	04:27	05:58	07:23	08:08-08:26/18	07:49	09:22	10:13
	16:05	17:41	19:02		21:31	23:01	23:46	22:47	21:08	19:22		16:42	15:15	14:52
27	09:22	07:47	06:12		05:27	03:57	03:23	04:30	06:01	07:26	08:09-08:26/17	07:52	09:25	10:13
	16:08	17:44	19:05		21:34	23:03	23:46	22:44	21:05	19:19		16:39	15:13	14:53
28	09:19	07:44	06:09		05:24	03:54	03:24	04:33	06:03	07:29	08:09-08:23/14	07:55	09:28	10:12
	16:11	17:47	19:07		21:37	23:06	23:45	22:42	21:01	19:15		16:36	15:11	14:54
29	09:16		07:05		05:21	03:52	03:25	04:36	06:06	07:32	08:10-08:22/12	07:58	09:30	10:12
	16:14		20:10		21:40	23:09	23:44	22:39	20:58	19:12		16:33	15:09	14:55
30	09:14		07:02		05:17	03:49	03:26	04:39	06:09	07:34	08:13-08:19/6	08:01	09:33	10:12
	16:18		20:13		21:43	23:11	23:43	22:36	20:55	19:08		16:29	15:07	14:57
31	09:11		06:59			03:47		04:42	06:12			08:04		10:11
	16:21		20:16			23:14		22:33	20:51			16:26		14:58
Potential sun hours	182	242	363		447	559	606	594	502	392		308	206	151
Sum of minutes with flicker	0	0	183		0	0	0	0	0	184		0	0	0

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

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

Project:

Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lotlax 3 - Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March		April	May	June	July	August	September		October	November	December
1	10:10	09:08	07:40		06:55	05:14	03:45	03:28	04:45	06:15		07:37	08:07	09:36
	15:00	16:24	17:50		20:19	21:46	23:16	23:42	22:30	20:48		19:05	16:23	15:05
2	10:10	09:05	07:37		06:52	05:11	03:43	03:29	04:48	06:17		07:40	08:10	09:38
	15:02	16:27	17:53		20:22	21:49	23:19	23:41	22:26	20:44		19:02	16:20	15:03
3	10:09	09:02	07:34		06:48	05:08	03:40	03:31	04:51	06:20		07:43	08:13	09:41
	15:04	16:30	17:56		20:24	21:52	23:21	23:40	22:23	20:41		18:58	16:17	15:01
4	10:08	08:59	07:30		06:45	05:04	03:38	03:33	04:54	06:23		07:45	08:16	09:43
	15:06	16:33	17:59		20:27	21:55	23:23	23:38	22:20	20:38		18:55	16:14	15:00
5	10:07	08:56	07:27		06:41	05:01	03:36	03:34	04:57	06:26		07:48	08:19	09:46
	15:08	16:36	18:02		20:30	21:58	23:26	23:37	22:17	20:34		18:51	16:11	14:58
6	10:05	08:53	07:24		06:38	04:58	03:35	03:36	04:59	06:29		07:51	08:22	09:48
	15:10	16:39	18:04		20:33	22:01	23:28	23:35	22:14	20:31		18:48	16:08	14:57
7	10:04	08:50	07:20		06:35	04:55	03:33	03:38	05:02	06:31		07:54	08:25	09:50
	15:12	16:43	18:07		20:36	22:04	23:30	23:33	22:11	20:27		18:45	16:05	14:55
8	10:03	08:47	07:17		06:31	04:52	03:31	03:40	05:05	06:34		07:57	08:28	09:52
	15:14	16:46	18:10		20:39	22:07	23:32	23:32	22:08	20:24		18:41	16:02	14:54
9	10:01	08:44	07:14		06:28	04:48	03:30	03:42	05:08	06:37		07:59	08:31	09:54
	15:17	16:49	18:13		20:42	22:10	23:34	23:30	22:04	20:20		18:38	15:59	14:53
10	09:59	08:41	07:10		06:24	04:45	03:28	03:45	05:11	06:40		08:02	08:34	09:56
	15:19	16:52	18:16		20:44	22:14	23:35	23:28	22:01	20:17		18:35	15:56	14:52
11	09:58	08:38	07:07		06:21	04:42	03:27	03:47	05:14	06:42		08:05	08:37	09:58
	15:22	16:55	18:19		20:47	22:17	23:37	23:26	21:58	20:14		18:31	15:53	14:51
12	09:56	08:35	07:03		06:18	04:39	03:26	03:49	05:17	06:45		08:08	08:40	10:00
	15:24	16:58	18:22		20:50	22:20	23:39	23:24	21:55	20:10		18:28	15:51	14:50
13	09:54	08:32	07:00		06:14	04:36	03:24	03:52	05:20	06:48		08:11	08:43	10:02
	15:27	17:01	18:25		20:53	22:23	23:40	23:21	21:51	20:07		18:25	15:48	14:49
14	09:52	08:29	06:57		06:11	04:33	03:23	03:54	05:23	06:51	07:47-07:55/8	08:14	08:47	10:03
	15:30	17:04	18:28		20:56	22:26	23:41	23:19	21:48	20:03		18:21	15:45	14:49
15	09:50	08:26	06:53		06:07	04:30	03:23	03:57	05:26	06:53	07:45-07:57/12	08:16	08:50	10:05
	15:32	17:08	18:30		20:59	22:29	23:42	23:17	21:45	20:00		18:18	15:42	14:48
16	09:48	08:23	06:50		06:04	04:27	03:22	03:59	05:29	06:56	07:44-07:58/14	08:19	08:53	10:06
	15:35	17:11	18:33		21:02	22:32	23:44	23:14	21:42	19:56		18:15	15:40	14:48
17	09:46	08:19	06:46		06:01	04:24	03:21	04:02	05:32	06:59	07:42-07:57/15	08:22	08:56	10:07
	15:38	17:14	18:36		21:05	22:35	23:44	23:12	21:38	19:53		18:11	15:37	14:48
18	09:44	08:16	06:43		05:57	04:21	03:21	04:05	05:35	07:01	07:42-07:57/15	08:25	08:59	10:08
	15:41	17:17	18:39		21:08	22:38	23:45	23:09	21:35	19:49		18:08	15:34	14:48
19	09:42	08:13	06:40		05:54	04:18	03:21	04:07	05:38	07:04	07:42-07:57/15	08:28	09:02	10:09
	15:44	17:20	18:42		21:11	22:40	23:46	23:07	21:32	19:46		18:05	15:32	14:48
20	09:39	08:10	06:36		05:50	04:15	03:20	04:10	05:40	07:07	07:42-07:56/14	08:31	09:05	10:10
	15:47	17:23	18:45		21:13	22:43	23:46	23:04	21:28	19:43		18:01	15:29	14:48
21	09:37	08:07	06:33	07:04-07:07/3	05:47	04:13	03:20	04:13	05:43	07:10	07:45-07:55/10	08:34	09:08	10:11
	15:50	17:26	18:47		21:16	22:46	23:47	23:01	21:25	19:39		17:58	15:27	14:48
22	09:35	08:03	06:29	07:00-07:08/8	05:44	04:10	03:20	04:16	05:46	07:12	07:48-07:53/5	08:37	09:11	10:11
	15:53	17:29	18:50		21:19	22:49	23:47	22:59	21:22	19:36		17:55	15:24	14:49
23	09:32	08:00	06:26	06:57-07:10/13	05:40	04:07	03:21	04:18	05:49	07:15		08:40	09:14	10:12
	15:56	17:32	18:53		21:22	22:52	23:47	22:56	21:18	19:32		17:52	15:22	14:49
24	09:30	07:57	06:23	06:55-07:09/14	05:37	04:04	03:21	04:21	05:52	07:18		08:43	09:16	10:12
	15:59	17:35	18:56		21:25	22:55	23:47	22:53	21:15	19:29		17:48	15:20	14:50
25	09:27	07:54	06:19	06:54-07:10/16	05:34	04:02	03:22	04:24	05:55	07:21		07:46	09:19	10:13
	16:02	17:38	18:59		21:28	22:58	23:47	22:50	21:11	19:25		16:45	15:17	14:51
26	09:24	07:50	06:16	06:55-07:10/15	05:30	03:59	03:22	04:27	05:58	07:23		07:49	09:22	10:13
	16:05	17:41	19:02		21:31	23:01	23:46	22:47	21:08	19:22		16:42	15:15	14:52
27	09:22	07:47	06:12	06:54-07:08/14	05:27	03:57	03:23	04:30	06:01	07:26		07:52	09:25	10:13
	16:08	17:44	19:04		21:34	23:03	23:46	22:44	21:05	19:19		16:39	15:13	14:53
28	09:19	07:44	06:09	06:55-07:08/13	05:24	03:54	03:24	04:33	06:03	07:29		07:55	09:28	10:12
	16:11	17:47	19:07		21:37	23:06	23:45	22:42	21:01	19:15		16:36	15:11	14:54
29	09:16		07:05	07:56-08:05/9	05:21	03:52	03:25	04:36	06:06	07:32		07:58	09:30	10:12
	16:14		20:10		21:40	23:09	23:44	22:39	20:58	19:12		16:33	15:09	14:55
30	09:14		07:02	08:00-08:01/1	05:17	03:49	03:26	04:39	06:09	07:34		08:01	09:33	10:12
	16:17		20:13		21:43	23:11	23:43	22:36	20:55	19:08		16:29	15:07	14:56
31	09:11		06:59			03:47		04:42	06:12			08:04		10:11
	16:21		20:16			23:14		22:33	20:51			16:26		14:58
Potential sun hours	182	242	363		447	559	606	594	502	392		308	206	151
Sum of minutes with flicker	0	0	106		0	0	0	0	0	108		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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18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lålax 1 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:43	03:29	04:48	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:40	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:51	06:20	07:42	08:12	09:40
	15:04	16:30	17:55	20:24	21:52	23:20	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:33	04:53	06:23	07:45	08:16	09:43
	15:06	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:26	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:35	03:36	04:59	06:28	07:51	08:22	09:47
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:35	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:23	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:30	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:45	05:11	06:39	08:02	08:34	09:56
	15:19	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:34	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:36	23:25	21:58	20:13	18:31	15:53	14:51
12	09:56	08:35	07:03	06:17	04:39	03:26	03:49	05:17	06:45	08:08	08:40	09:59
	15:24	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:50	14:50
13	09:54	08:32	07:00	06:14	04:36	03:25	03:52	05:20	06:48	08:10	08:43	10:01
	15:27	17:01	18:24	20:53	22:22	23:39	23:21	21:51	20:06	18:24	15:48	14:49
14	09:52	08:29	06:56	06:11	04:33	03:24	03:54	05:23	06:50	08:13	08:46	10:03
	15:30	17:04	18:27	20:56	22:25	23:41	23:18	21:48	20:03	18:21	15:45	14:49
15	09:50	08:25	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:44	19:59	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:05
	15:35	17:10	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:43	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:39	05:54	04:18	03:21	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:04	15:32	14:48
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
21	09:36	08:06	06:33	05:47	04:13	03:20	04:13	05:43	07:09	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:48
22	09:34	08:03	06:29	05:44	04:10	03:21	04:16	05:46	07:12	08:36	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:35	17:55	15:24	14:49
23	09:32	08:00	06:26	05:40	04:07	03:21	04:18	05:49	07:15	08:39	09:13	10:11
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:54	23:46	22:53	21:14	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:51
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:45	22:47	21:08	19:22	16:42	15:15	14:52
27	09:21	07:47	06:12	05:27	03:57	03:23	04:30	06:00	07:26	07:51	09:24	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:18	16:39	15:13	14:53
28	09:19	07:43	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:05	23:44	22:41	21:01	19:15	16:35	15:11	14:54
29	09:16		07:05	05:20	03:52	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
30	09:13		07:02	05:17	03:49	03:27	04:39	06:09	07:34	08:00	09:33	10:11
	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:10		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lålax 2 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:45	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:09	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:40
	15:04	16:30	17:55	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:06	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:26	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:35	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:35	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:30	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:45	05:11	06:39	08:02	08:34	09:56
	15:19	16:52	18:16	20:44	22:13	23:35	23:27	22:01	20:17	18:34	15:56	14:52
11	09:57	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
	15:22	16:55	18:19	20:47	22:16	23:37	23:25	21:58	20:13	18:31	15:53	14:51
12	09:56	08:35	07:03	06:17	04:39	03:26	03:49	05:17	06:45	08:08	08:40	10:00
	15:24	16:58	18:22	20:50	22:19	23:38	23:23	21:54	20:10	18:28	15:50	14:50
13	09:54	08:32	07:00	06:14	04:36	03:24	03:52	05:20	06:48	08:10	08:43	10:01
	15:27	17:01	18:24	20:53	22:22	23:40	23:21	21:51	20:06	18:24	15:48	14:49
14	09:52	08:29	06:56	06:11	04:33	03:23	03:54	05:23	06:50	08:13	08:46	10:03
	15:30	17:04	18:27	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:23	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:06
	15:35	17:10	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:05	05:35	07:01	08:25	08:58	10:08
	15:41	17:17	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:39	05:54	04:18	03:20	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:04	15:32	14:48
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:12	03:20	04:13	05:43	07:09	08:34	09:07	10:10
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:27	14:48
22	09:34	08:03	06:29	05:44	04:10	03:20	04:16	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:35	17:55	15:24	14:48
23	09:32	08:00	06:26	05:40	04:07	03:21	04:18	05:49	07:15	08:39	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:46	22:55	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:22	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:50
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:51
27	09:21	07:47	06:12	05:27	03:56	03:23	04:30	06:00	07:26	07:51	09:25	10:12
	16:08	17:44	19:04	21:34	23:03	23:45	22:44	21:04	19:18	16:39	15:13	14:52
28	09:19	07:43	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:54	09:27	10:12
	16:11	17:47	19:07	21:37	23:06	23:44	22:41	21:01	19:15	16:35	15:11	14:54
29	09:16		07:05	05:20	03:52	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
30	09:13		07:02	05:17	03:49	03:26	04:39	06:09	07:34	08:00	09:33	10:11
	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:10		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lålax 3 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:45	03:28	04:44	06:14	07:37	08:06	09:35
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:47	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:10	09:38
	15:02	16:27	17:52	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:08	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:41
	15:04	16:30	17:55	20:24	21:52	23:21	23:39	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:05	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:25	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:36	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:34	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:27	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:55	03:33	03:38	05:02	06:31	07:54	08:25	09:50
	15:12	16:42	18:07	20:36	22:04	23:29	23:33	22:10	20:27	18:44	16:05	14:55
8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:31	23:31	22:07	20:24	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:29	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:29	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:44	05:11	06:39	08:02	08:34	09:56
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11	09:58	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
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14	09:52	08:29	06:56	06:11	04:33	03:23	03:54	05:23	06:50	08:13	08:46	10:03
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15	09:50	08:26	06:53	06:07	04:30	03:22	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:06
	15:35	17:10	18:33	21:01	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:11	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:04	05:34	07:01	08:25	08:58	10:08
	15:41	17:16	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:48
19	09:41	08:13	06:39	05:54	04:18	03:20	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:45	23:06	21:31	19:46	18:04	15:31	14:48
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:12	03:20	04:13	05:43	07:09	08:34	09:07	10:11
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:26	14:48
22	09:34	08:03	06:29	05:44	04:10	03:20	04:15	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:46	22:58	21:21	19:35	17:55	15:24	14:48
23	09:32	08:00	06:26	05:40	04:07	03:20	04:18	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:42	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:46	22:53	21:15	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:21	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:57	23:46	22:50	21:11	19:25	16:45	15:17	14:50
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:51
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	16:11	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:35	15:11	14:54
29	09:16		07:05	05:20	03:51	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
30	09:13		07:02	05:17	03:49	03:26	04:39	06:09	07:34	08:00	09:33	10:11
	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:11		06:58		03:47		04:42	06:12		08:03		10:11
	16:20		20:16		23:13		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	605	594	502	392	308	206	151
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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18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types) **WTG:** Lålax 4 - Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:40	06:55	05:14	03:44	03:28	04:44	06:14	07:37	08:07	09:36
	15:00	16:24	17:50	20:18	21:46	23:16	23:42	22:29	20:48	19:05	16:23	15:05
2	10:09	09:05	07:37	06:51	05:11	03:42	03:29	04:47	06:17	07:40	08:10	09:38
	15:02	16:27	17:53	20:21	21:49	23:18	23:41	22:26	20:44	19:01	16:20	15:03
3	10:09	09:02	07:33	06:48	05:07	03:40	03:31	04:50	06:20	07:42	08:13	09:41
	15:03	16:30	17:55	20:24	21:52	23:21	23:40	22:23	20:41	18:58	16:17	15:01
4	10:07	08:59	07:30	06:45	05:04	03:38	03:32	04:53	06:23	07:45	08:16	09:43
	15:05	16:33	17:58	20:27	21:55	23:23	23:38	22:20	20:37	18:55	16:14	15:00
5	10:06	08:56	07:27	06:41	05:01	03:36	03:34	04:56	06:25	07:48	08:19	09:45
	15:08	16:36	18:01	20:30	21:58	23:25	23:37	22:17	20:34	18:51	16:11	14:58
6	10:05	08:53	07:23	06:38	04:58	03:34	03:36	04:59	06:28	07:51	08:22	09:48
	15:10	16:39	18:04	20:33	22:01	23:28	23:35	22:14	20:30	18:48	16:08	14:57
7	10:04	08:50	07:20	06:34	04:54	03:33	03:38	05:02	06:31	07:54	08:25	09:50
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8	10:02	08:47	07:17	06:31	04:51	03:31	03:40	05:05	06:34	07:56	08:28	09:52
	15:14	16:46	18:10	20:38	22:07	23:32	23:31	22:07	20:24	18:41	16:02	14:54
9	10:01	08:44	07:13	06:28	04:48	03:29	03:42	05:08	06:37	07:59	08:31	09:54
	15:17	16:49	18:13	20:41	22:10	23:33	23:30	22:04	20:20	18:38	15:59	14:53
10	09:59	08:41	07:10	06:24	04:45	03:28	03:44	05:11	06:39	08:02	08:34	09:56
	15:19	16:52	18:16	20:44	22:13	23:35	23:28	22:01	20:17	18:34	15:56	14:52
11	09:58	08:38	07:07	06:21	04:42	03:27	03:47	05:14	06:42	08:05	08:37	09:58
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13	09:54	08:32	07:00	06:14	04:36	03:24	03:51	05:20	06:48	08:11	08:43	10:01
	15:27	17:01	18:24	20:53	22:22	23:40	23:21	21:51	20:06	18:24	15:47	14:49
14	09:52	08:29	06:56	06:11	04:33	03:23	03:54	05:23	06:50	08:13	08:46	10:03
	15:30	17:04	18:27	20:56	22:25	23:41	23:19	21:48	20:03	18:21	15:45	14:49
15	09:50	08:26	06:53	06:07	04:30	03:22	03:57	05:26	06:53	08:16	08:49	10:04
	15:32	17:07	18:30	20:59	22:28	23:42	23:16	21:45	20:00	18:18	15:42	14:48
16	09:48	08:22	06:50	06:04	04:27	03:22	03:59	05:29	06:56	08:19	08:52	10:06
	15:35	17:10	18:33	21:02	22:31	23:43	23:14	21:41	19:56	18:14	15:39	14:48
17	09:46	08:19	06:46	06:00	04:24	03:21	04:02	05:32	06:58	08:22	08:55	10:07
	15:38	17:13	18:36	21:04	22:34	23:44	23:12	21:38	19:53	18:11	15:37	14:48
18	09:44	08:16	06:43	05:57	04:21	03:21	04:04	05:34	07:01	08:25	08:58	10:08
	15:41	17:16	18:39	21:07	22:37	23:45	23:09	21:35	19:49	18:08	15:34	14:47
19	09:41	08:13	06:39	05:54	04:18	03:20	04:07	05:37	07:04	08:28	09:01	10:09
	15:44	17:20	18:42	21:10	22:40	23:46	23:06	21:31	19:46	18:04	15:31	14:47
20	09:39	08:10	06:36	05:50	04:15	03:20	04:10	05:40	07:07	08:31	09:04	10:10
	15:47	17:23	18:44	21:13	22:43	23:46	23:04	21:28	19:42	18:01	15:29	14:48
21	09:37	08:06	06:33	05:47	04:12	03:20	04:13	05:43	07:09	08:34	09:07	10:11
	15:50	17:26	18:47	21:16	22:46	23:46	23:01	21:25	19:39	17:58	15:26	14:48
22	09:34	08:03	06:29	05:44	04:10	03:20	04:15	05:46	07:12	08:37	09:10	10:11
	15:53	17:29	18:50	21:19	22:49	23:47	22:58	21:21	19:36	17:55	15:24	14:48
23	09:32	08:00	06:26	05:40	04:07	03:20	04:18	05:49	07:15	08:40	09:13	10:12
	15:56	17:32	18:53	21:22	22:52	23:47	22:56	21:18	19:32	17:51	15:22	14:49
24	09:29	07:57	06:22	05:37	04:04	03:21	04:21	05:52	07:18	08:43	09:16	10:12
	15:59	17:35	18:56	21:25	22:55	23:47	22:53	21:15	19:29	17:48	15:19	14:50
25	09:27	07:53	06:19	05:34	04:02	03:21	04:24	05:55	07:20	07:45	09:19	10:12
	16:02	17:38	18:59	21:28	22:58	23:46	22:50	21:11	19:25	16:45	15:17	14:50
26	09:24	07:50	06:15	05:30	03:59	03:22	04:27	05:57	07:23	07:48	09:22	10:12
	16:05	17:41	19:01	21:31	23:00	23:46	22:47	21:08	19:22	16:42	15:15	14:51
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28	09:19	07:43	06:09	05:24	03:54	03:24	04:33	06:03	07:29	07:54	09:28	10:12
	16:11	17:47	19:07	21:37	23:06	23:45	22:41	21:01	19:15	16:35	15:11	14:54
29	09:16		07:05	05:20	03:51	03:25	04:36	06:06	07:31	07:57	09:30	10:12
	16:14		20:10	21:40	23:08	23:44	22:38	20:58	19:12	16:32	15:09	14:55
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	16:17		20:13	21:43	23:11	23:43	22:35	20:54	19:08	16:29	15:07	14:56
31	09:11		06:58		03:47		04:41	06:12		08:03		10:11
	16:20		20:16		23:14		22:32	20:51		16:26		14:58
Potential sun hours	182	242	363	447	559	606	595	502	392	308	206	151
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 01 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (223)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:42	22:29	20:48	19:06	16:24	15:06
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:40	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	17:59	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:37	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:49	16:09	14:58
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	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:45	16:06	14:57
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	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:17	18:35	15:57	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:15	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:35	07:04	06:18	04:40	03:28	03:51	05:18	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
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14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
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16	09:48	08:23	06:50	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
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	15:40	17:15	18:37	21:05	22:34	23:44	23:11	21:38	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:28	09:02	10:09
	15:45	17:21	18:42	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:49
20	09:39	08:10	06:37	05:51	04:17	03:22	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
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	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:41	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:24	07:51	06:16	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:08	19:23	16:43	15:16	14:53
27	09:22	07:47	06:13	05:28	03:58	03:25	04:31	06:01	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:29	07:55	09:28	10:12
	16:12	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:55
29	09:16		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
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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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 02 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (230)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	17:59	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:18	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:37	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:25	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:44	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:24	07:51	06:16	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:53
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	16:09	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:56
29	09:16		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:43	22:36	20:55	19:09	16:30	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 03 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (231)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:46	23:16	23:41	22:29	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:52	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:34	18:00	20:28	21:55	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
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9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:58	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:08	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:40	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:44	23:11	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:13	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:24	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:37	23:06	23:44	22:41	21:02	19:16	16:37	15:12	14:56
29	09:16		07:06	05:22	03:54	03:28	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:38	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:42	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 04 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (232)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:35
	15:02	16:25	17:51	20:19	21:46	23:16	23:41	22:29	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:49	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:40
	15:06	16:31	17:57	20:25	21:52	23:20	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	08:59	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:34	17:59	20:28	21:55	23:23	23:37	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:02	20:31	21:58	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:01	23:27	23:34	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:04	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:07	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:10	23:33	23:29	22:04	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:34	09:56
	15:21	16:53	18:17	20:45	22:13	23:35	23:27	22:01	20:17	18:35	15:58	14:54
11	09:57	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:37	09:58
	15:24	16:56	18:20	20:48	22:16	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:35	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:08	08:40	09:59
	15:26	16:59	18:23	20:51	22:19	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:25	20:53	22:22	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:25	23:40	23:18	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:28	23:41	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:05
	15:37	17:12	18:34	21:02	22:31	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:34	23:43	23:11	21:38	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:41	08:13	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:28	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:34	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:10	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:36	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:13	10:11
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:29	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:28	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:24	07:51	06:16	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:31	23:00	23:45	22:47	21:08	19:23	16:43	15:17	14:53
27	09:22	07:47	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:34	23:03	23:45	22:44	21:05	19:19	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:04	07:30	07:55	09:27	10:12
	16:13	17:48	19:08	21:37	23:05	23:44	22:41	21:02	19:16	16:37	15:12	14:56
29	09:16		07:06	05:22	03:54	03:28	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:40	23:08	23:43	22:38	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:43	23:11	23:42	22:35	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:32	20:52		16:27		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	207	152
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 05 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (233)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:02	16:21	15:05
3	10:09	09:02	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:45
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:33	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:31	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
11	09:58	08:39	07:07	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:37	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:15	05:45	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	18:59	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:16	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
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29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 06 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (234)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:41	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:54	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:35	15:57	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:40	03:28	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:53	05:21	06:49	08:11	08:44	10:01
	15:29	17:02	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:25	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:49
20	09:39	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:14	05:44	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:36	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:49	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
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	16:06	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:31	06:02	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
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	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:12	14:55
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:30	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

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Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 07 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (235)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
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9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
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10	10:00	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:18	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:54	05:21	06:49	08:11	08:44	10:02
	15:29	17:02	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:25	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:49
20	09:39	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:14	05:45	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:09	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:55
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
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:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 08 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (236)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:46	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:06
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:03	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:34	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:02	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:36	03:38	05:01	06:29	07:52	08:22	09:48
	15:11	16:41	18:05	20:34	22:02	23:28	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:36	22:05	23:30	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:32	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:31	03:44	05:10	06:38	08:00	08:32	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:46	05:13	06:40	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:57	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
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	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:37	03:26	03:53	05:21	06:49	08:11	08:44	10:02
	15:29	17:02	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:25	15:49	14:51
14	09:52	08:29	06:57	06:12	04:34	03:25	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:31	03:25	03:58	05:27	06:54	08:17	08:50	10:05
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16	09:48	08:23	06:51	06:05	04:28	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:49
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:42	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:49
19	09:42	08:14	06:40	05:55	04:20	03:22	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:49
20	09:40	08:10	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:44	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:14	05:45	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:22	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:51
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:20	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:13
	16:06	17:42	19:02	21:32	23:01	23:46	22:48	21:09	19:23	16:43	15:16	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:31	06:02	07:27	07:52	09:25	10:13
	16:09	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:55
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:09	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:18	03:51	03:28	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

Söderskogen

Licensed user:
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Stephanitorsbollwerk 3 (Haus LUV)
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+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 09 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (237)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:02	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:02	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:00	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:02	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:06	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
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	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:19	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:34	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:58	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
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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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 10 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (224)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:41	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:26	20:45	19:02	16:21	15:05
3	10:08	09:02	07:34	06:49	05:09	03:43	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:41	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:41	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:31	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:32	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:00	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:11	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:37	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:06	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:31	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:45	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:10	08:34	09:08	10:10
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:58	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:16	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:57	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:24	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:54
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:19	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:27	04:35	06:04	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:41	21:02	19:16	16:37	15:13	14:56
29	09:16		07:06	05:22	03:54	03:28	04:38	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:43	22:39	20:58	19:13	16:34	15:11	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		06:59		03:49		04:43	06:13		08:04		10:11
	16:22		20:16		23:13		22:33	20:52		16:28		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
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Stephanitorsbollwerk 3 (Haus LUV)
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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 11 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (225)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:03	16:21	15:05
3	10:08	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:23	20:42	18:59	16:18	15:03
4	10:07	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:45
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:02	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:28	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:36	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:56	22:26	23:41	23:19	21:48	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:09	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:44	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:11	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:48	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:24	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:04	03:24	04:26	05:56	07:21	07:46	09:19	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:45	22:47	21:09	19:23	16:43	15:17	14:54
27	09:22	07:48	06:13	05:28	03:58	03:26	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:44	21:05	19:20	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:13	14:56
29	09:17		07:06	05:22	03:54	03:28	04:38	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:43	22:39	20:58	19:13	16:34	15:11	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:11
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:13		22:33	20:52		16:28		15:00
Potential sun hours	183	243	363	447	559	604	593	502	392	308	206	152
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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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 12 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (226)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:09	09:05	07:38	06:53	05:12	03:45	03:32	04:49	06:19	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:18	23:40	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:20	20:38	18:56	16:15	15:02
5	10:06	08:57	07:28	06:42	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:25	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:24	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	09:59	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:27	22:01	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:22	06:49	08:11	08:44	10:01
	15:29	17:03	18:26	20:54	22:23	23:39	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:29	06:57	06:12	04:35	03:26	03:56	05:24	06:51	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:09	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:04
	15:34	17:09	18:31	20:59	22:29	23:42	23:16	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:24	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:07	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:40	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:46	17:21	18:43	21:11	22:40	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:39	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:45	21:14	22:43	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:11	08:34	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:51
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:57	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
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	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:53
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:12
	16:07	17:42	19:02	21:32	23:00	23:46	22:47	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:12
	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:20	16:40	15:15	14:55
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:44	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:54	03:28	04:37	06:07	07:32	07:58	09:30	10:12
	16:16		20:11	21:41	23:08	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:13		22:33	20:52		16:28		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 13 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (227)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:35	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:02
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:05	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:36	22:05	23:30	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:25	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:23	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:27	03:54	05:21	06:49	08:12	08:44	10:02
	15:29	17:03	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:30	06:57	06:12	04:35	03:26	03:56	05:24	06:52	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	20:59	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:41	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:40	08:10	06:37	05:52	04:17	03:23	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:46	21:14	22:44	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:23	04:15	05:45	07:11	08:35	09:08	10:11
	15:51	17:27	18:48	21:17	22:46	23:46	23:01	21:25	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:12	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:46	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:58	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:20	10:12
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:25	04:29	05:59	07:24	07:49	09:22	10:13
	16:06	17:42	19:02	21:32	23:01	23:46	22:48	21:09	19:23	16:43	15:17	14:53
27	09:22	07:48	06:13	05:28	03:58	03:25	04:32	06:02	07:27	07:52	09:25	10:13
	16:10	17:45	19:05	21:35	23:03	23:45	22:45	21:05	19:20	16:40	15:14	14:54
28	09:19	07:44	06:10	05:25	03:56	03:26	04:35	06:05	07:30	07:55	09:28	10:12
	16:13	17:48	19:08	21:38	23:06	23:45	22:42	21:02	19:16	16:37	15:12	14:56
29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:09	23:44	22:39	20:59	19:13	16:34	15:10	14:57
30	09:14		07:03	05:19	03:51	03:29	04:40	06:10	07:35	08:01	09:33	10:12
	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:28		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	152
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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Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 14 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (228)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
2	10:10	09:06	07:38	06:53	05:12	03:44	03:31	04:49	06:18	07:41	08:10	09:38
	15:04	16:28	17:54	20:22	21:50	23:19	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:43	08:13	09:41
	15:05	16:31	17:57	20:25	21:53	23:21	23:40	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:07	16:34	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:01
5	10:07	08:57	07:28	06:42	05:02	03:38	03:36	04:58	06:27	07:49	08:19	09:46
	15:09	16:38	18:03	20:31	21:59	23:25	23:37	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:23	09:48
	15:12	16:41	18:05	20:34	22:02	23:28	23:35	22:14	20:31	18:49	16:09	14:58
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:37	22:05	23:30	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:32	23:32	22:08	20:25	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:44	05:10	06:38	08:00	08:32	09:54
	15:18	16:50	18:14	20:42	22:11	23:33	23:30	22:05	20:21	18:39	16:00	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:23	16:56	18:20	20:48	22:17	23:37	23:26	21:58	20:14	18:32	15:55	14:53
12	09:56	08:36	07:04	06:19	04:41	03:28	03:51	05:19	06:46	08:09	08:41	10:00
	15:26	16:59	18:23	20:51	22:20	23:38	23:24	21:55	20:11	18:29	15:52	14:52
13	09:54	08:33	07:01	06:15	04:38	03:26	03:54	05:21	06:49	08:12	08:44	10:02
	15:29	17:03	18:26	20:54	22:23	23:40	23:21	21:52	20:07	18:26	15:49	14:51
14	09:52	08:30	06:58	06:12	04:35	03:26	03:56	05:24	06:52	08:14	08:47	10:03
	15:31	17:06	18:28	20:57	22:26	23:41	23:19	21:49	20:04	18:22	15:46	14:51
15	09:50	08:26	06:54	06:08	04:32	03:25	03:59	05:27	06:54	08:17	08:50	10:05
	15:34	17:09	18:31	21:00	22:29	23:42	23:17	21:45	20:01	18:19	15:44	14:50
16	09:48	08:23	06:51	06:05	04:29	03:24	04:01	05:30	06:57	08:20	08:53	10:06
	15:37	17:12	18:34	21:02	22:32	23:43	23:14	21:42	19:57	18:16	15:41	14:50
17	09:46	08:20	06:47	06:02	04:26	03:23	04:04	05:33	07:00	08:23	08:56	10:07
	15:40	17:15	18:37	21:05	22:35	23:44	23:12	21:39	19:54	18:12	15:38	14:50
18	09:44	08:17	06:44	05:58	04:23	03:23	04:06	05:36	07:02	08:26	08:59	10:08
	15:43	17:18	18:40	21:08	22:38	23:45	23:09	21:35	19:50	18:09	15:36	14:50
19	09:42	08:14	06:41	05:55	04:20	03:23	04:09	05:39	07:05	08:29	09:02	10:09
	15:45	17:21	18:43	21:11	22:41	23:45	23:07	21:32	19:47	18:06	15:33	14:50
20	09:40	08:11	06:37	05:52	04:17	03:22	04:12	05:42	07:08	08:32	09:05	10:10
	15:48	17:24	18:46	21:14	22:44	23:46	23:04	21:29	19:43	18:03	15:31	14:50
21	09:37	08:07	06:34	05:48	04:14	03:22	04:15	05:45	07:11	08:35	09:08	10:11
	15:51	17:27	18:48	21:17	22:47	23:46	23:02	21:26	19:40	17:59	15:28	14:50
22	09:35	08:04	06:30	05:45	04:11	03:23	04:17	05:47	07:13	08:37	09:11	10:11
	15:54	17:30	18:51	21:20	22:49	23:46	22:59	21:22	19:37	17:56	15:26	14:50
23	09:32	08:01	06:27	05:42	04:09	03:23	04:20	05:50	07:16	08:40	09:14	10:12
	15:57	17:33	18:54	21:23	22:52	23:47	22:56	21:19	19:33	17:53	15:23	14:51
24	09:30	07:58	06:23	05:38	04:06	03:23	04:23	05:53	07:19	08:43	09:17	10:12
	16:00	17:36	18:57	21:26	22:55	23:46	22:53	21:15	19:30	17:50	15:21	14:52
25	09:27	07:54	06:20	05:35	04:03	03:24	04:26	05:56	07:21	07:46	09:20	10:13
	16:03	17:39	19:00	21:29	22:58	23:46	22:50	21:12	19:26	16:46	15:19	14:52
26	09:25	07:51	06:17	05:32	04:01	03:24	04:29	05:59	07:24	07:49	09:22	10:13
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29	09:17		07:06	05:22	03:53	03:27	04:37	06:07	07:32	07:58	09:31	10:12
	16:16		20:11	21:41	23:09	23:44	22:39	20:59	19:13	16:34	15:10	14:57
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	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:08	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:27		15:00
Potential sun hours	182	242	363	447	559	604	594	502	392	308	206	151
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:
Söderskogen

Licensed user:
wpd AG
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DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Calendar per WTG

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)**WTG:** Märkenkall 15 - VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TOT: 240,0 m) (229)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	10:10	09:08	07:41	06:56	05:15	03:47	03:30	04:46	06:16	07:38	08:07	09:36
	15:02	16:25	17:51	20:19	21:47	23:16	23:42	22:30	20:48	19:06	16:24	15:07
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	15:04	16:28	17:54	20:22	21:50	23:18	23:41	22:27	20:45	19:03	16:21	15:05
3	10:09	09:03	07:34	06:49	05:09	03:42	03:33	04:52	06:21	07:44	08:13	09:41
	15:06	16:31	17:57	20:25	21:53	23:21	23:39	22:24	20:42	18:59	16:18	15:03
4	10:08	09:00	07:31	06:46	05:06	03:40	03:35	04:55	06:24	07:46	08:16	09:43
	15:08	16:35	18:00	20:28	21:56	23:23	23:38	22:21	20:38	18:56	16:15	15:02
5	10:07	08:57	07:28	06:43	05:03	03:39	03:37	04:58	06:27	07:49	08:19	09:46
	15:10	16:38	18:03	20:31	21:59	23:25	23:36	22:17	20:35	18:52	16:12	15:00
6	10:05	08:54	07:24	06:39	04:59	03:37	03:38	05:01	06:30	07:52	08:22	09:48
	15:12	16:41	18:06	20:34	22:02	23:27	23:35	22:14	20:31	18:49	16:09	14:59
7	10:04	08:51	07:21	06:36	04:56	03:35	03:40	05:04	06:32	07:55	08:26	09:50
	15:14	16:44	18:08	20:36	22:05	23:29	23:33	22:11	20:28	18:46	16:06	14:57
8	10:03	08:48	07:18	06:32	04:53	03:33	03:42	05:07	06:35	07:57	08:29	09:52
	15:16	16:47	18:11	20:39	22:08	23:31	23:31	22:08	20:25	18:42	16:03	14:56
9	10:01	08:45	07:14	06:29	04:50	03:32	03:45	05:10	06:38	08:00	08:32	09:54
	15:19	16:50	18:14	20:42	22:11	23:33	23:29	22:05	20:21	18:39	16:01	14:55
10	10:00	08:42	07:11	06:25	04:47	03:30	03:47	05:13	06:41	08:03	08:35	09:56
	15:21	16:53	18:17	20:45	22:14	23:35	23:28	22:02	20:18	18:36	15:58	14:54
11	09:58	08:39	07:08	06:22	04:44	03:29	03:49	05:16	06:43	08:06	08:38	09:58
	15:24	16:56	18:20	20:48	22:17	23:37	23:25	21:58	20:14	18:32	15:55	14:53
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	16:16		20:11	21:41	23:08	23:44	22:39	20:59	19:13	16:34	15:11	14:57
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	16:19		20:14	21:44	23:11	23:43	22:36	20:55	19:09	16:31	15:09	14:58
31	09:11		07:00		03:49		04:43	06:13		08:04		10:11
	16:22		20:17		23:14		22:33	20:52		16:28		15:00
Potential sun hours	182	242	363	447	559	604	593	502	392	308	206	152
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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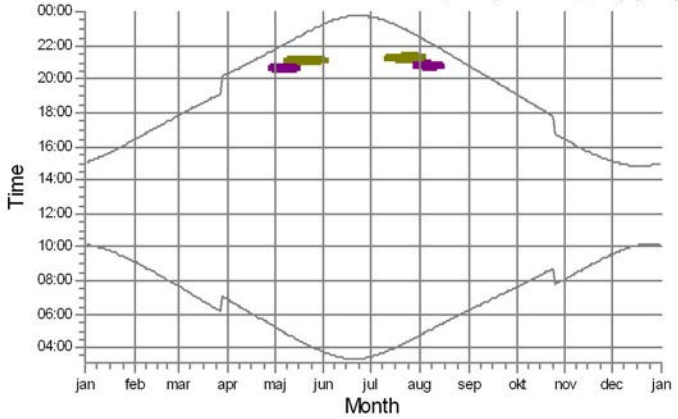
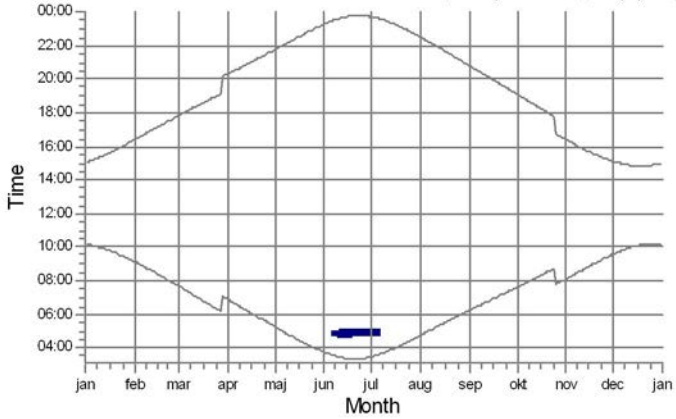
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

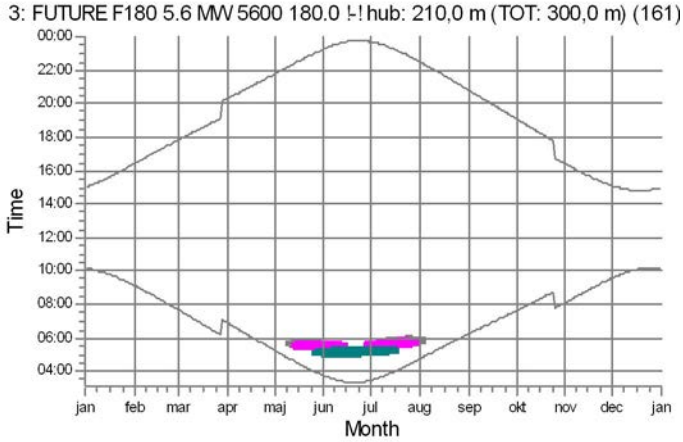
1: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (156)



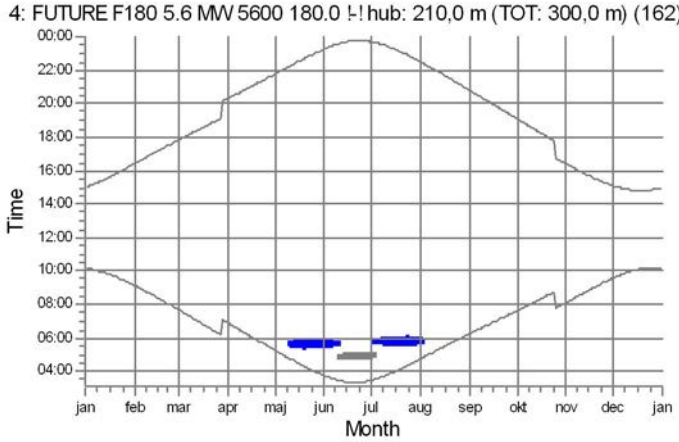
2: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (160)



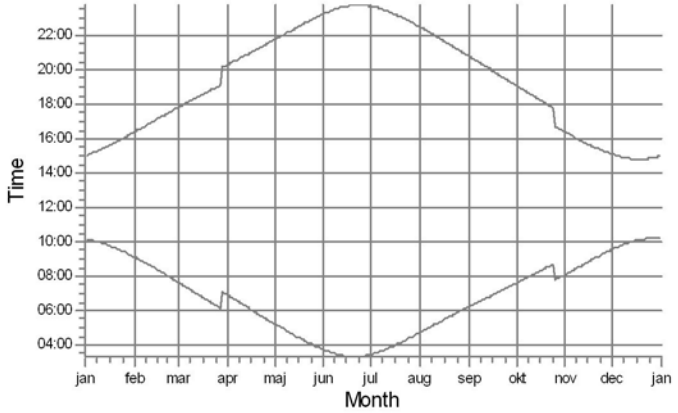
3: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (161)



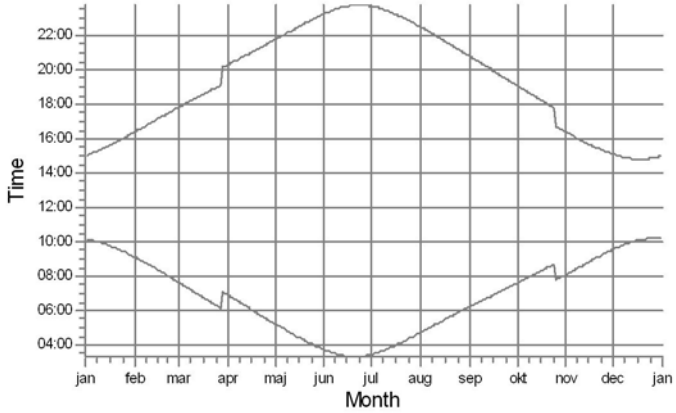
4: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (162)



5: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (155)



6: FUTURE F180 5.6 MW 5600 180.0 ⊢! hub: 210,0 m (TOT: 300,0 m) (158)



Shadow receptors

RH01: RH01	RH03: RH03	RH05: RH05	RH09: RH09
RH02: RH02	RH04: RH04	RH08: RH08	

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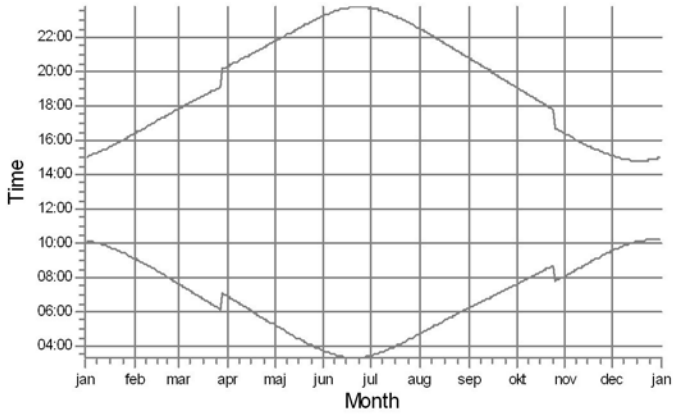
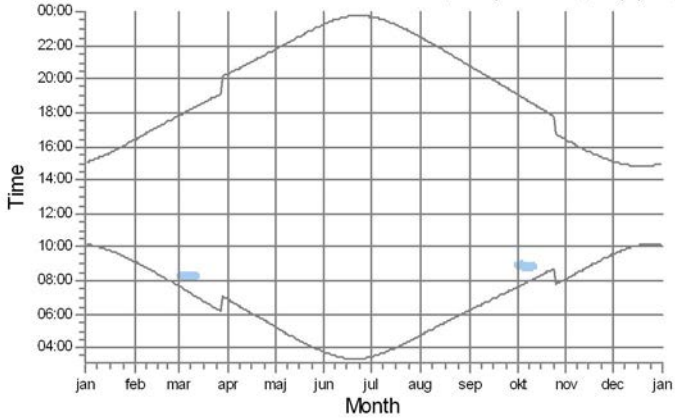
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

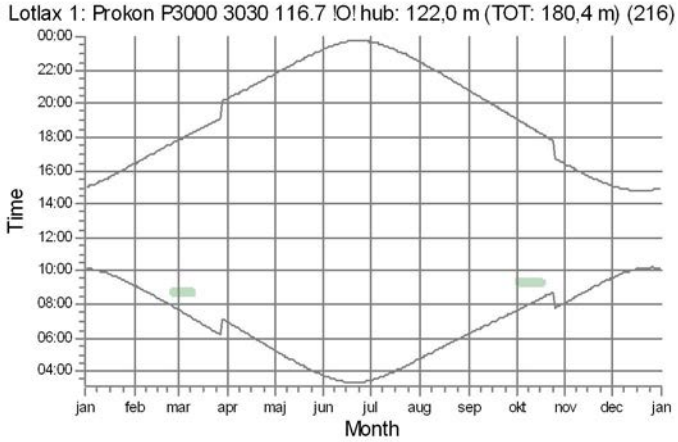
7: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (159)



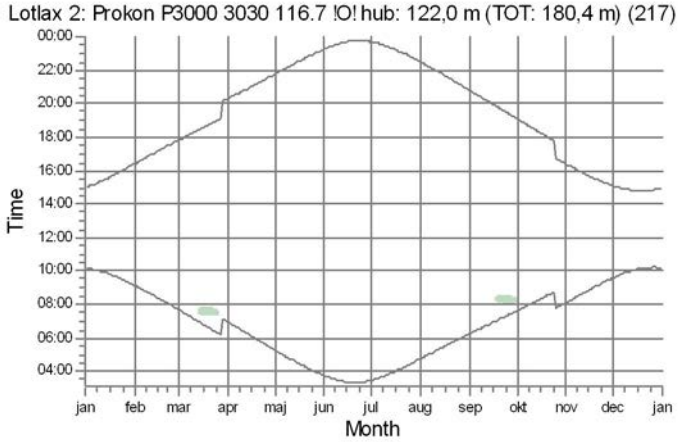
8: FUTURE F180 5.6 MW 5600 180.0 !-! hub: 210,0 m (TOT: 300,0 m) (157)



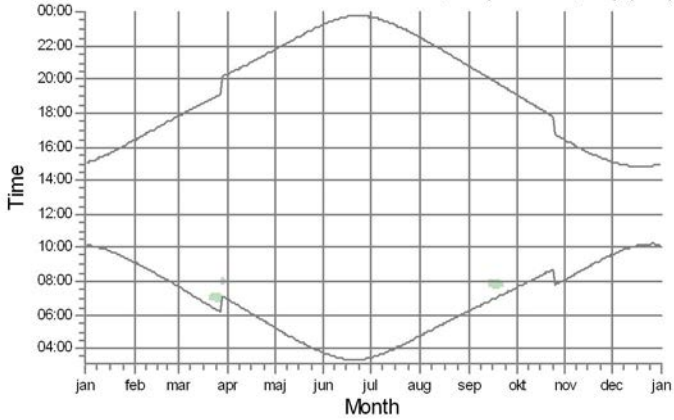
Lotlax 1: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (216)



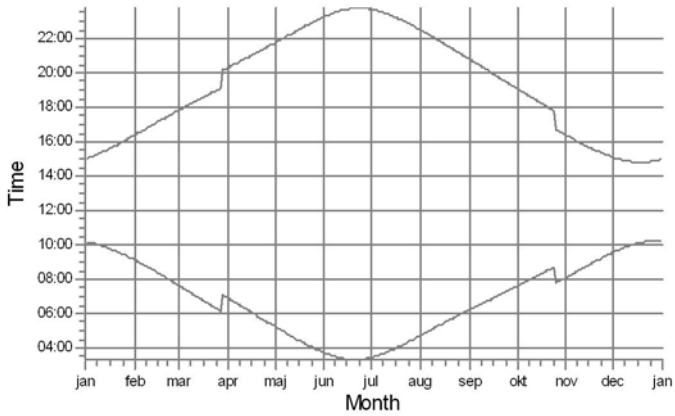
Lotlax 2: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (217)



Lotlax 3: Prokon P3000 3030 116.7 !O! hub: 122,0 m (TOT: 180,4 m) (218)



Lålax 1: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (219)



Shadow receptors

RH12: RH12 RH13: RH13

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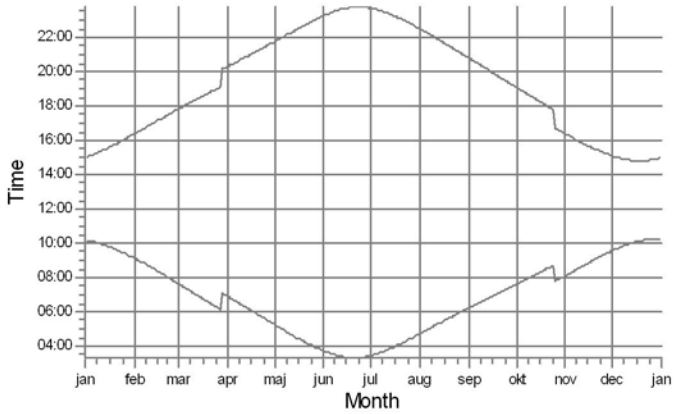
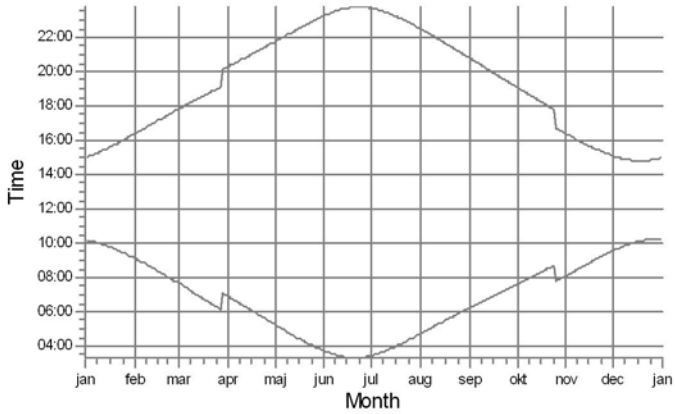
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

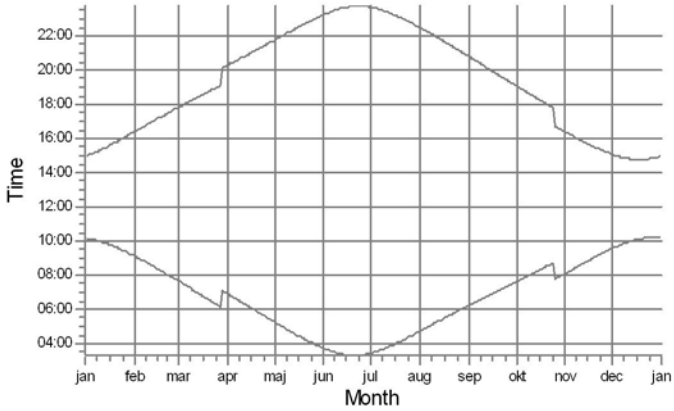
Lålax 2: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (220)



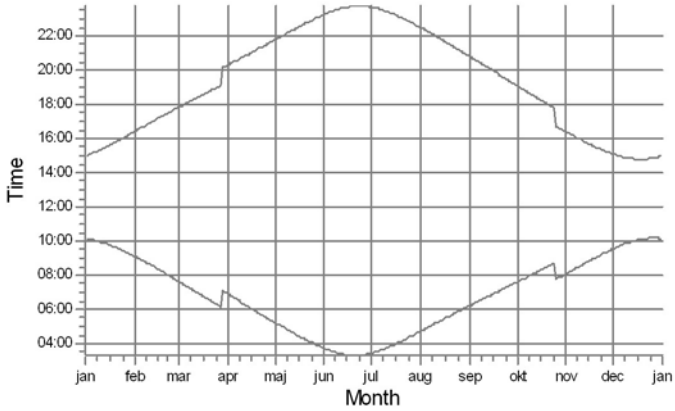
Lålax 3: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (221)



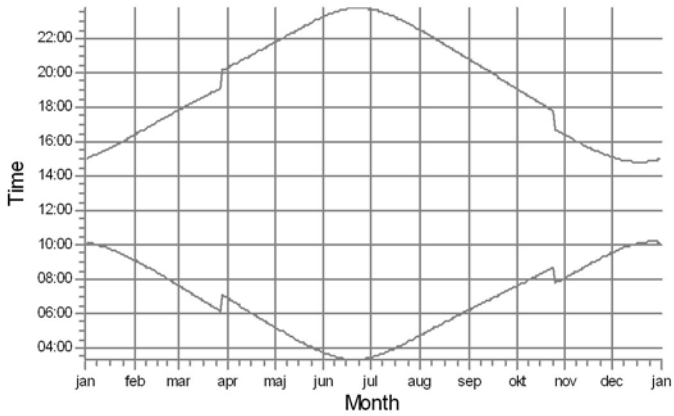
Lålax 4: Prokon P3000 3030 116.7 !O! hub: 142,0 m (TOT: 200,4 m) (222)



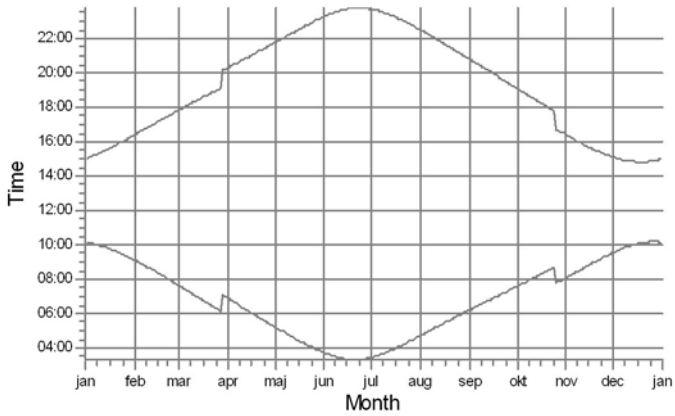
Märkenkall 01: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Märkenkall 02: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Märkenkall 03: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (TO



Shadow receptors

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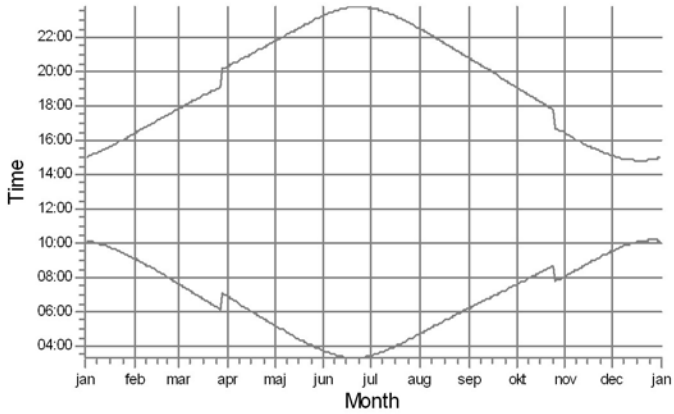
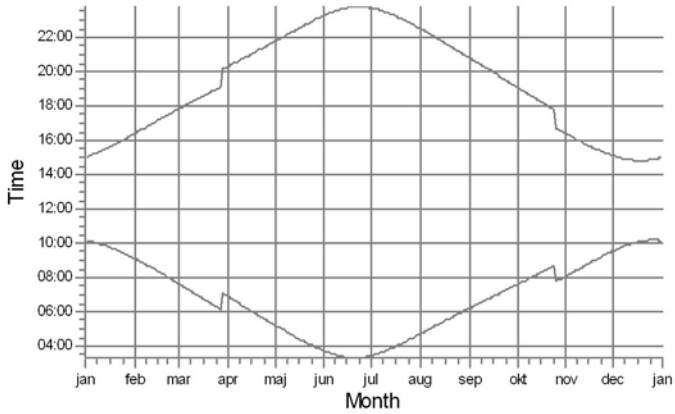
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

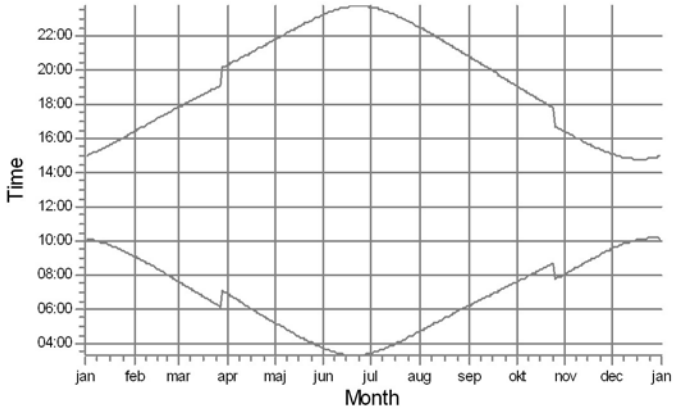
Märkenkall 04: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



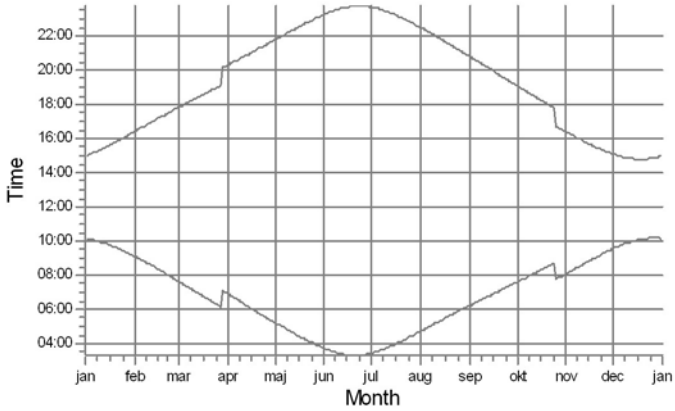
Märkenkall 05: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



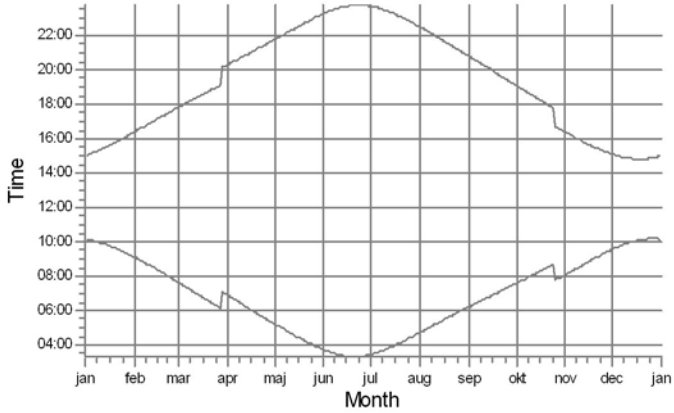
Märkenkall 06: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



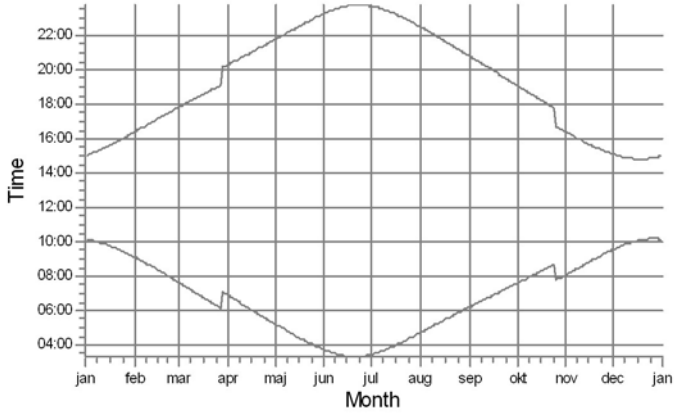
Märkenkall 07: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Märkenkall 08: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Märkenkall 09: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



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Calculated:
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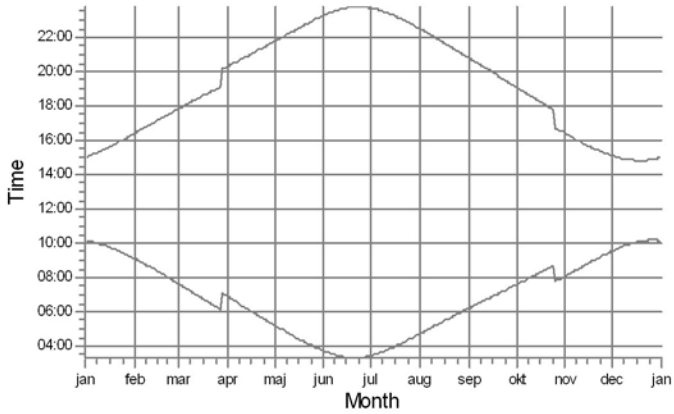
SHADOW - Calendar per WTG, graphical

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)

Märkenkall 10: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



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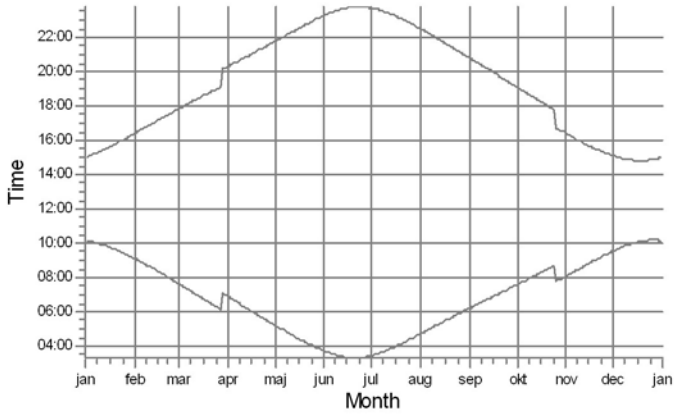

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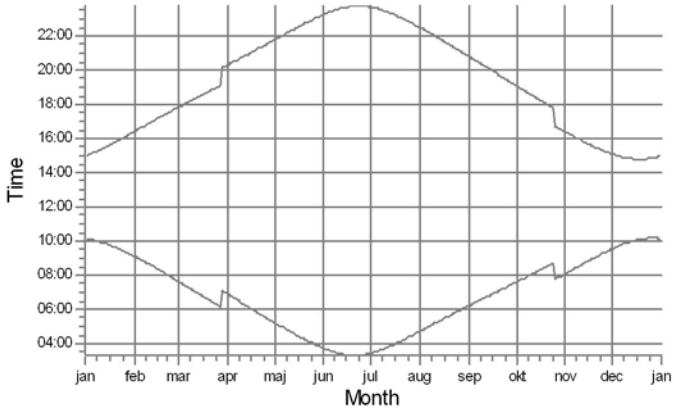

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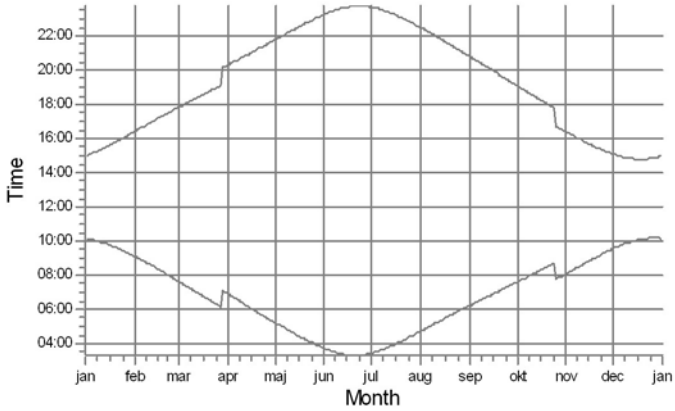
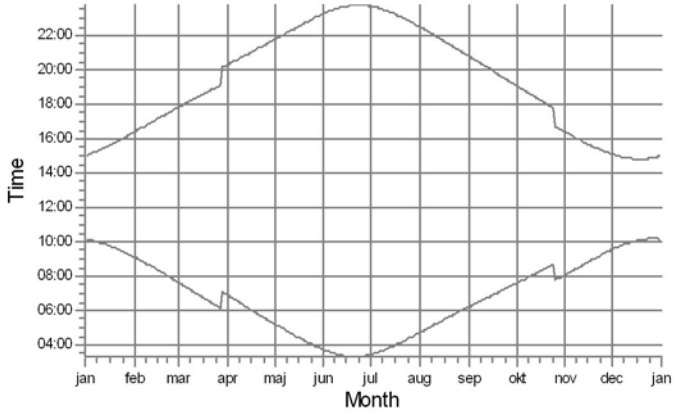
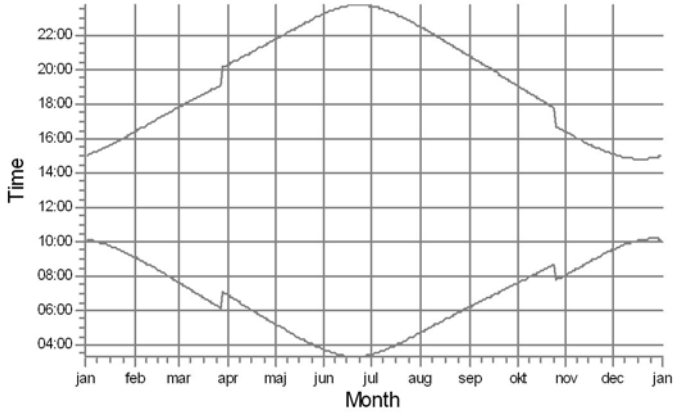


Märkenkall 14: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



Märkenkall 15: VESTAS V136-3.45 3rdOc 3450 136.0 !O! hub: 172,0 m (T(



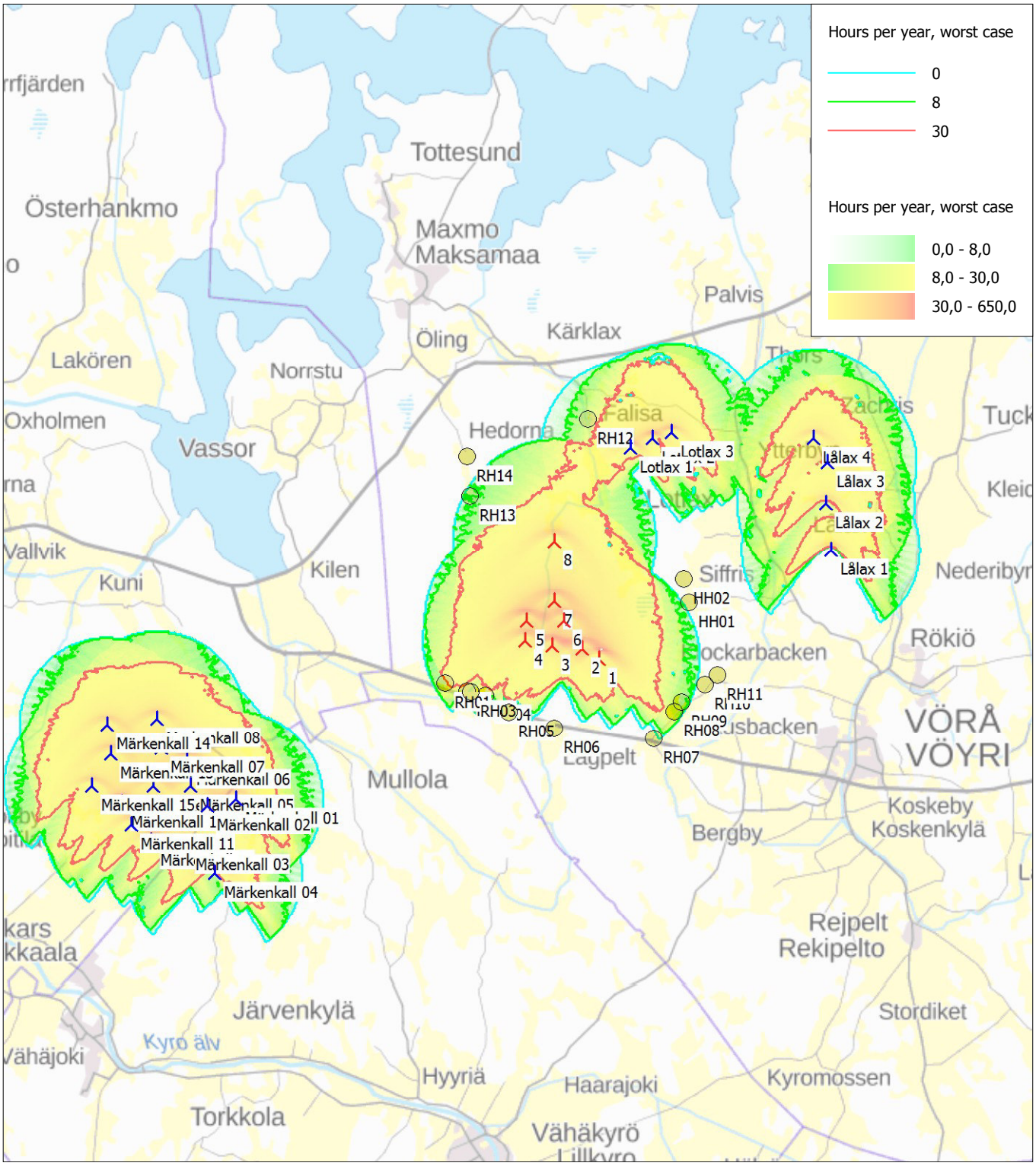
Shadow receptors

Project:
Söderskogen

Licensed user:
wpd AG
Stephanitorsbollwerk 3 (Haus LUV)
DE-28211 Bremen
+49 7142 77810
Anders Stenberg / a.stenberg@wpd.fi
Calculated:
18.11.2019 13:34/3.3.247

SHADOW - Map

Calculation: MP Proposal, 8xF180 @210m, Worst case - cumulative impact (permitted WTG types)



Map: Söde_Background map_160k , Print scale 1:120 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 252 600 North: 7 011 960

New WTG Shadow receptor

Flicker map level: DEM 10m