

Memo

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aan Yvonne de Graaf Gemeente Oss
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projectnr. 0408379.00
betreft Slagschaduwberekening Bedrijventerrein De Geer, Oss

Aanleiding

In het MER *Windmolenpark Elzenburg – De Geer te Oss, 2017* zijn de effecten van een windmolenpark nabij Oss op de omgeving onderzocht. Onderdeel hiervan zijn de slagschaduweffecten. Het draaien van de wieken van een windmolen kan op momenten dat de zon schijnt leiden tot bewegende schaduw, de zogenaamde slagschaduw. Indien deze schaduw valt op woningen of kantoren kan dat als hinderlijk worden ervaren. In het MER zijn de effecten op woningen in de omgeving onderzocht.

Slagschaduw kan ook hinder geven op bedrijven. Dit is afhankelijk van de locatie van de bedrijven, waar het kantorengedeelte in de bedrijven zich bevindt en de oriëntatie van de ramen. Het Rarim (Activiteitenregeling Milieubeheer) heeft geen regels opgenomen over slagschaduw op bedrijven en kantoren, er gelden geen wettelijke normen voor slagschaduw op deze objecten. Om toch de effecten op kantoren inzichtelijk te maken zijn, in aanvulling op het MER, de slagschaduweffecten op elf bedrijven op bedrijventerrein De Geer te Oss onderzocht.

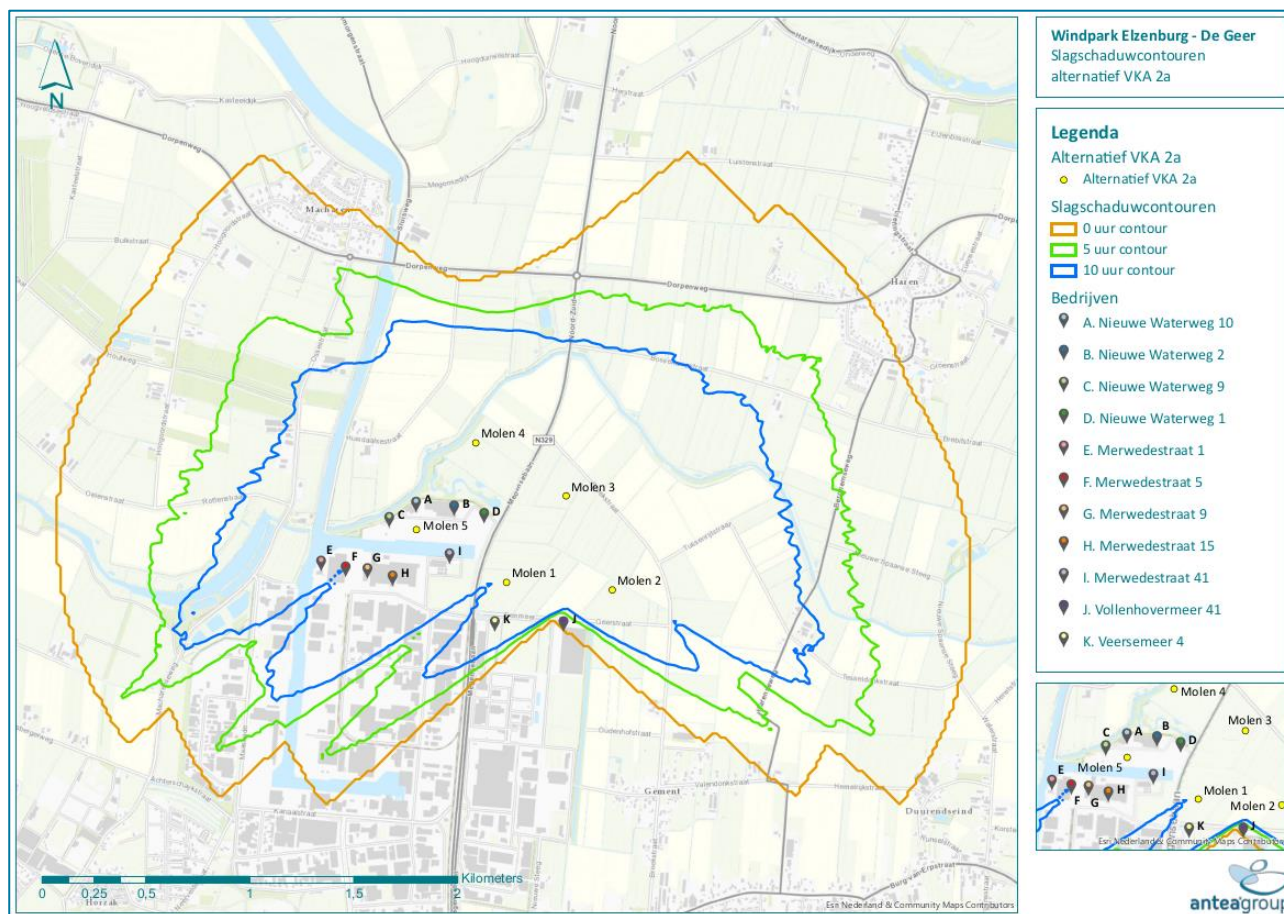
Slagschaduwberekening

Voor de locatie De Geer zijn de slagschaduweffecten van alternatief VKA 2a uit het MER berekend. Hierbij is gebruik gemaakt van windturbintype Nordex N131. Voor de berekeningen is gebruik gemaakt van het softwarepakket WindPro. In WindPro is op basis van een reële gemiddelde klimaat-, weer- en zonneverwachting voor het alternatief de 0 uur, 5 uur¹ (maat voor wettelijke norm) en 10 uur kans op slagschaduw per jaar contour berekend. De berekeningen geven vier klassen slagschaduw:

- 0 uur slagschaduw per jaar: objecten buiten de 0 uur contour hebben geen (kans op) slagschaduw (op basis van een reële gemiddelde klimaat-, weer- en zonneverwachting);
- 0 tot 5 uur slagschaduw per jaar: objecten tussen de 0 en 5 uur contour hebben kans op 0 tot 5 uur slagschaduw per jaar en daarmee per definitie minder kans op slagschaduw dan de wettelijke norm;
- 5 tot 10 uur per jaar: objecten tussen de 5 en 10 uur contour hebben kans op 5 tot 10 uur slagschaduw per jaar en daarmee meer kans op slagschaduw dan de wettelijke norm.
- > 10 uur slagschaduw: objecten binnen de 10 uur contour hebben kans op meer dan 10 uur slagschaduw per jaar en daarmee meer kans op slagschaduw dan de wettelijke norm.

In figuur 1 zijn de bovenstaande contouren weergegeven. Van de elf locaties op bedrijventerrein De Geer bevinden zich er tien binnen de 10 uur contour. De rekenresultaten zijn gespecificeerd naar de turbines en uren waarop de slagschaduw optreedt op het kantorengedeelte van de bedrijfslocaties. Deze resultaten zijn als bijlage toegevoegd.

¹ Commissie m.e.r. vraagt op 6 uur contour, 5 uur contour is veiliger, want scherper (norm ligt op 5 uur 40 minuten)



Figuur 1: Slagschaduwcontouren alternatief VKA 2a, met aanduiding bedrijven

Resultaten

Op de kantoorlocaties geldt een verwachte slagschaduw van circa een half uur tot 144 uur en 6 minuten per jaar. Windmolen 5 levert hier de grootste bijdrage aan, zie tabel 1. Windmolen 4 levert op geen van de bedrijven slagschaduw op. In tabel 1 zijn de resultaten samengevat weergegeven. In de bijlagen zijn uitdraaien met detailinformatie opgenomen. In bijlage 1 is een leeswijzer opgenomen waarin de navolgende bijlagen en informatie daarin worden toegelicht.

Tabel 1: Verwachte kans op slagschaduw op bedrijventerrein De Geer, per bedrijfslocatie

Aanduiding	Bedrijfslocatie	Uren / minuten per jaar	Windmolen	Uren / minuten per jaar
A	Nieuwe Waterweg 10	144:06	1	126:53
B	Nieuwe Waterweg 2	141:56	2	45:49
C	Nieuwe Waterweg 9	74:41	3	60:39
D	Nieuwe Waterweg 1	143:33	4	0:00
E	Merwedestraat 1	28:02	5	329:20
F	Merwedestraat 5	12:34		
G	Merwedestraat 9	18:34		
H	Merwedestraat 15	32:34		
I	Merwedestraat 41	60:21		
J	Vollenhovermeer 41	0:36		
K	Veersemeer 4	24:53		

memonummer:

betreft: Slagschaduwberekening Bedrijventerrein De Geer, Oss



Bijlagen:

1. Leeswijzer resultaten slagschaduwberekening
2. Kaart slagschaduwcontouren en locaties windmolens en receptoren
3. Main result slagschaduwberekeningen
4. Slagschaduwkalender per receptor
5. Grafische kalender per receptor
6. Slagschaduwkalender per windturbine
7. Grafische kalender per windturbine

1. Leeswijzer resultaten slagschaduwberekening

Uitgangspunten rekenresultaten

- Voor de slagschaduwberekeningen wordt gebruik gemaakt van het softwarepakket WindPro. De resultaten van de berekeningen worden weergegeven op een hoofdpagina (main result), slagschaduwkalenders per receptor en windturbines en grafische kalenders per receptor en windturbines.
- De eventuele schaduw van een windturbine op een grotere afstand dan twaalf maal de rotordiameter wordt verwaarloosd;
- Schaduw bij een zonnestand lager dan drie graden wordt als niet-hinderlijk beoordeeld. Bij zonsopgang en zonsondergang is het licht vrij diffuus en wordt de turbine vaak aan het zicht onttrokken door gebouwen en begroeiing;
- Binnen een afstand van circa 350 tot 400 m vanaf een de turbine kan de zon volledig bedekt worden door een rotorblad. De rotor moet dan haaks staan op de richting van de zon. De schaduw is dan maximaal en wordt als meer hinderlijk ervaren;
- Bij de bepaling van de schaduwduren is geen rekening gehouden met eventuele beplanting en gebouwen die het zicht kunnen belemmeren. Hierdoor kan de hinder minder zijn.
- Bij een windpark worden de schaduwuren en schaduwdagen van afzonderlijke turbines opgeteld voor zover de schaduwen elkaar niet overlappen;
- Er is volgens het Activiteitenbesluit een stilstandsvoorziening op een turbine nodig als de gemiddelde duur van hinderlijke schaduw gemiddeld meer is dan 17 dagen per jaar gedurende meer dan 20 minuten per dag. Omgerekend is dit 5 uur en 40 minuten per jaar.

Main result (bijlage 3)

Slagschaduwcontouren

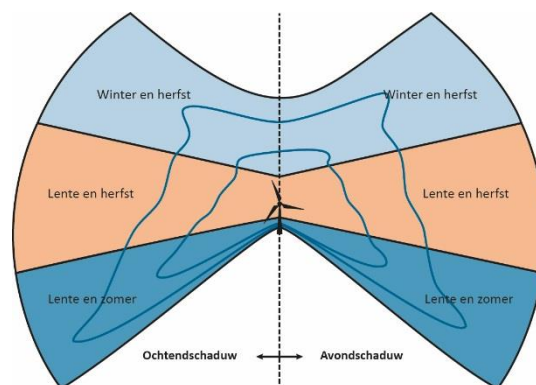
In WindPro wordt op basis van een reële gemiddelde klimaat-, weer- en zonneverwachting de 0 uur, 5 uur en 10 uur kans op slagschaduw per jaar berekend. Deze berekeningen leveren drie slagschaduwcontouren op en geven vier klassen slagschaduw:

- 0 uur slagschaduw per jaar: objecten buiten de 0 uur contour hebben geen (kans op) slagschaduw (op basis van een reële gemiddelde klimaat-, weer- en zonneverwachting);
- 0 tot 5 uur slagschaduw per jaar: objecten tussen de 0 en 5 uur contour hebben kans op 0 tot 5 uur slagschaduw per jaar en daarmee per definitie minder kans op slagschaduw dan de wettelijke norm uit het Activiteitenbesluit;
- 5 tot 10 uur per jaar: objecten tussen de 5 en 10 uur contour hebben kans op 5 tot 10 uur slagschaduw per jaar en daarmee meer kans op slagschaduw dan de wettelijke norm;
- > 10 uur slagschaduw: objecten binnen de 10 uur contour hebben kans op meer dan 10 uur slagschaduw per jaar en daarmee meer kans op slagschaduw dan de wettelijke norm.

Bij zonsopkomst en zonsondergang kan de schaduw van een windturbine aan de westkant en aan de oostkant ver reiken. Op afstanden groter dan twaalf maal de rotordiameter wordt de slagschaduw niet meer als hinderlijk beoordeeld.

Aan de noordzijde wordt het schaduwgebied begrensd omdat de zon in het zuiden altijd hoog staat. Aan de zuidzijde treedt geen schaduw op omdat de zon nooit in het noorden staat.

In de figuur hiernaast is weergegeven op welke momenten in het jaar en op de dag de slag de contouren betrekking hebben.



Windturbines

Windturbines worden aangeduid als WTG's (Wind Turbine Generators). Afhankelijk van welk type turbine gebruikt wordt in de berekening zijn de turbines voorzien van bepaalde eigenschappen, zoals de ashoogte, diameter van de rotorbladen, de berekende schaduwlengte en het aantal omwentelingen per minuut (RPM). Deze eigenschappen zijn van invloed op de slagschaduw.

Receptoren (gevoelige objecten)

Als zich in de door de slagschaduw getroffen uitwendige muren van gevoelige objecten (woningen, bedrijven etc.) ramen bevinden kan er sprake zijn van slagschaduwhinder. Om de potentiële en verwachte duur en periode van deze hinder te berekenen wordt er in het rekenmodel gewerkt met receptoren. Deze receptoren krijgen op basis van object specifieke informatie een bepaalde input mee:

- locatie: De locatie wordt bepaald op basis van coördinaten (noorderbreedte en oosterlengte);
- oriëntatie: Afhankelijk van waar de ramen van een object zich bevinden wordt de receptor op een windrichting georiënteerd. Dan krijgt de receptor een 'fixed direction'. Wanneer de ramen zich aan meerdere zijden van een object

bevinden, of wanneer niet duidelijk is waar de ramen zich bevinden, kan er gekozen worden voor een 'greenhouse mode'. In dit geval wordt de slagschaduw hinder op alle zijden van het object berekend.

- grootte: Afhankelijk van de grootte van een object kan de receptor specifieke maatvoering meekrijgen voor wat betreft hoogte, breedte, hoogte boven de grond e.d.

Worst case / verwachte hinderduur

Op basis van de turbineafmetingen, de gang van de zon en een minimale zonhoogte van drie graden boven de horizon, zijn de dagen en tijden berekend waarop slagschaduw kan optreden. De gang van de zon is voor alle dagen van het jaar bepaald met een astronomisch rekenmodel waarbij rekening is gehouden met de betreffende locatie (noorderbreedte en oosterlengte) op de aarde. De worst case hinderduur is een theoretisch maximum. Hieruit is de verwachte hinderduur berekend door het toepassen van correcties (zonnenschijn, oriëntatie en bedrijfstijd windturbine). Als gevolg van deze correcties is de verwachte hinderduur aanmerkelijk korter dan de worst case hinderduur.

Kalender per receptor (bijlage 4)

Op de kalender per receptor wordt voor iedere dag de *worst case* slagschaduwhinderduur weergegeven. Naast de dag in de maand staat, van links naar rechts, de tijdstippen van zonsopgang en zonsondergang, het potentiële aantal minuten slagschaduw, het tijdstip waarop de slagschaduw hinder begint en eindigt en met welke windturbine de hinder begint en eindigt.

Onderaan de lijst wordt de worst case slagschaduwhinder per maand gecorrigeerd naar de verwachte slagschaduwhinder in minuten.

Grafische kalender per receptor (bijlage 5)

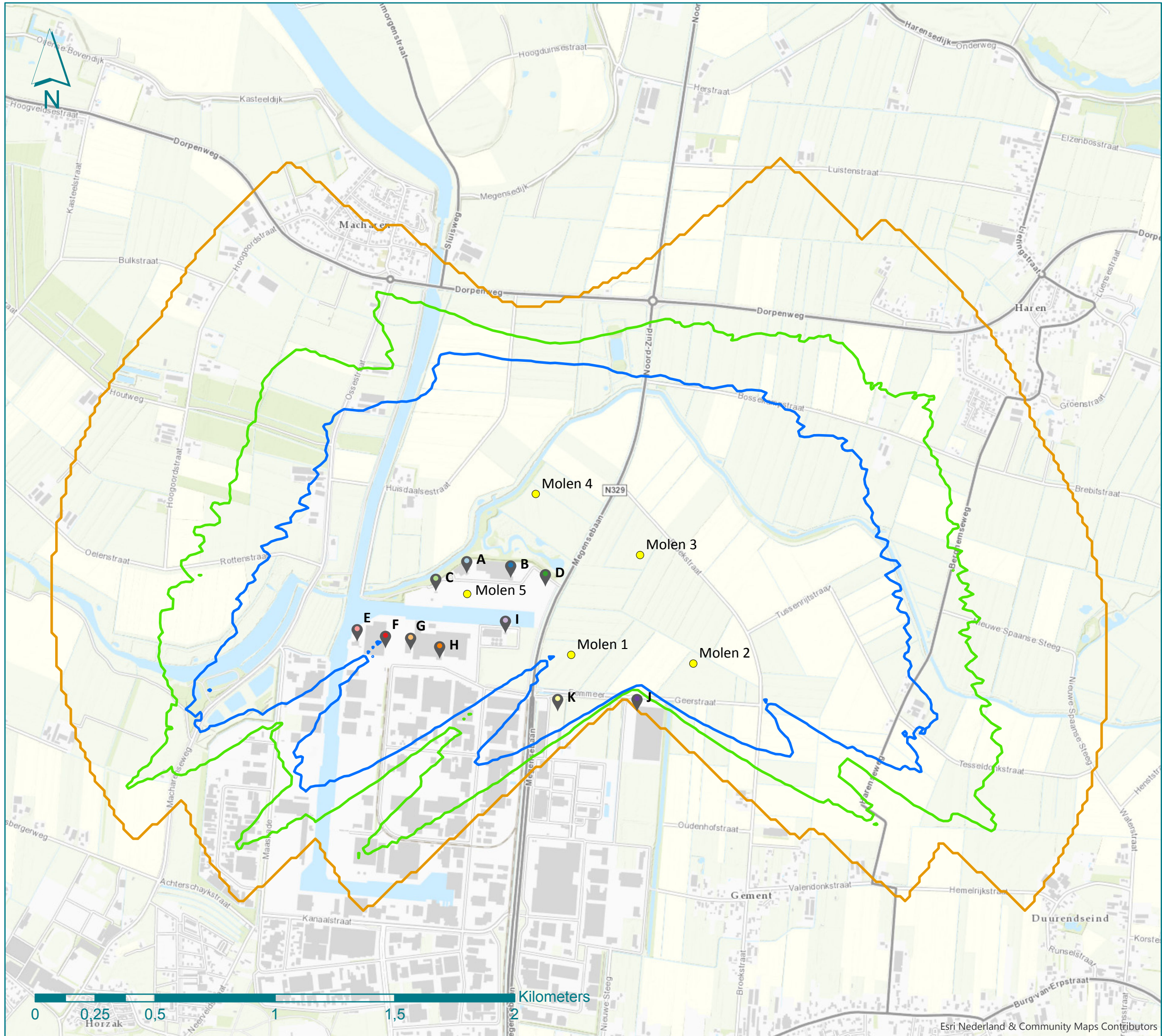
Op de grafische kalender per receptor worden de gegevens uit de kalender per receptor (bijlage 4) weergegeven in een grafiek. Per receptor is te zien welke windturbines op momenten slagschaduw hinder kunnen veroorzaken. Hieruit is af te lezen welke turbine op een bepaald moment slagschaduw kan veroorzaken op de betreffende receptor en hoe lang dit potentieel duurt (worst case).

Kalender per windturbine (bijlage 6)

In de bijlage 'kalender per windturbine' wordt voor iedere dag de tijdstippen weergegeven waarop deze turbine slagschaduw veroorzaakt. Daarachter wordt vermeld hoeveel minuten dit in totaal bedraagt. Het kan voorkomen dat een turbine op een dag slagschaduw veroorzaakt op meerdere momenten en/of receptoren. In dat geval worden er meerdere reeksen tijdstippen en minuten weergegeven.

Grafische kalender per windturbine (bijlage 7)

In de bijlage 'grafische kalender per windturbine' worden de gegevens uit de kalender per windturbine (bijlage 6) weergegeven in grafiekvorm. Per turbine is te zien welke receptoren op welke dagen en tijdstippen in het jaar slagschaduw hinder kunnen ondervinden. Hieruit is af te lezen welke receptor op een bepaald moment slagschaduw kan ondervinden en hoe lang dit kan duren (worst case).



Windpark Elzenburg - De Geer

Slagschaduwcontouren

alternatief VKA 2a

Legenda

Alternatief VKA 2a

● Alternatief VKA 2a

Slagschaduwcontouren

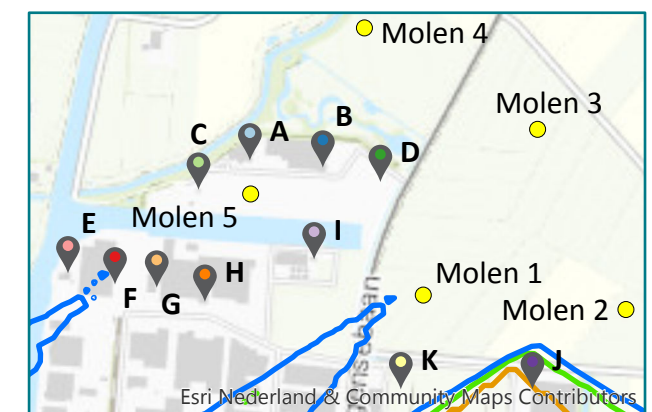
0 uur contour

5 uur contour

10 uur contour

Bedrijven

- A. Nieuwe Waterweg 10
- B. Nieuwe Waterweg 2
- C. Nieuwe Waterweg 9
- D. Nieuwe Waterweg 1
- E. Merwedestraat 1
- F. Merwedestraat 5
- G. Merwedestraat 9
- H. Merwedestraat 15
- I. Merwedestraat 41
- J. Vollenhovermeer 41
- K. Veersemeer 4



3. Main Result

Calculation: Slagschaduwberekening Bedrijventerrein De Geer

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) [DE BILT]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,48	2,65	3,60	5,24	6,59	6,28	6,20	6,12	4,48	3,32	1,87	1,32

Operational hours are calculated from WTGs in calculation and wind distribution:

Site data: WASP (4)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
551	691	677	440	479	759	621	1.062	1.287	854	608	451	8.480

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: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM)

Area object(s) used in calculation:

Project Wizard Roughness Areas (Corine land cover 2006 - 100 m grid)

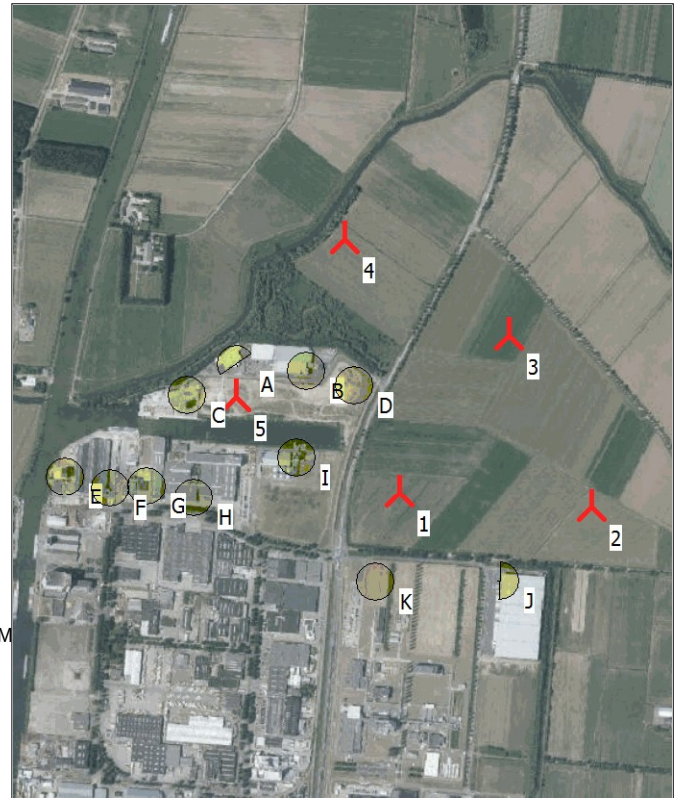
Obstacles used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

All coordinates are in

Dutch Stereo-RD/NAP 2008



▲ New WTG

Scale 1:20.000
 ● Shadow receptor

WTGs

	X (east)	Y (north)	Z [m]	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.				Calculation distance [m]	RPM [RPM]
1	166.667	422.287	6,0	NORDEX N131/3300 DE 3300 131....	Yes	NORDEX	N131/3300 DE-3.300	3.300	131,0	144,0	1.721 10,9
2	167.177	422.251	4,9	NORDEX N131/3300 DE 3300 131....	Yes	NORDEX	N131/3300 DE-3.300	3.300	131,0	144,0	1.721 10,9
3	166.955	422.704	3,0	NORDEX N131/3300 DE 3300 131....	Yes	NORDEX	N131/3300 DE-3.300	3.300	131,0	144,0	1.721 10,9
4	166.519	422.958	2,9	NORDEX N131/3300 DE 3300 131....	Yes	NORDEX	N131/3300 DE-3.300	3.300	131,0	144,0	1.721 10,9
5	166.233	422.541	5,1	NORDEX N131/3300 DE 3300 131....	Yes	NORDEX	N131/3300 DE-3.300	3.300	131,0	144,0	1.721 10,9

Shadow receptor-Input

No.	X (east)	Y (north)	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	166.233	422.626	7,0	15,0	1,0	4,0	-35,0	90,0	Fixed direction
B	166.419	422.608	8,4	15,0	10,0	1,0	0,0	90,0	"Green house mode"
C	166.104	422.545	10,0	15,0	3,0	1,0	0,0	90,0	"Green house mode"
D	166.546	422.571	8,9	40,0	10,0	1,0	0,0	90,0	"Green house mode"
E	165.781	422.327	6,2	15,0	20,0	1,0	0,0	90,0	"Green house mode"
F	165.898	422.298	4,0	2,0	2,0	1,0	0,0	90,0	"Green house mode"
G	165.995	422.302	4,0	3,0	3,0	1,0	0,0	90,0	"Green house mode"
H	166.122	422.272	7,2	20,0	15,0	1,0	0,0	90,0	"Green house mode"
I	166.395	422.380	6,6	15,0	20,0	1,0	0,0	90,0	"Green house mode"
J	166.935	422.055	9,1	25,0	8,0	1,0	-266,0	90,0	Fixed direction
K	166.602	422.050	6,8	25,0	15,0	1,0	-266,0	90,0	"Green house mode"

Main Result

Calculation: Slagschaduwberekening Bedrijventerrein De Geer

Calculation Results

Shadow receptor

No.	Shadow, worst case		Shadow, expected values	
	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]
A	601:12	263	3:30	144:06
B	638:06	321	3:23	141:56
C	327:57	206	2:42	74:41
D	709:11	354	2:56	143:33
E	114:36	179	1:08	28:02
F	52:30	123	0:39	12:34
G	77:13	170	0:46	18:34
H	133:13	183	1:05	32:34
I	284:25	215	2:17	60:21
J	2:52	17	0:13	0:36
K	98:16	108	1:03	24:53

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (193)	719:57	126:53
2	NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (194)	212:10	45:49
3	NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (195)	241:29	60:39
4	NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (196)	0:00	0:00
5	NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (197)	1335:01	329:20

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

Project:

Windpark Oss (Elzenburg)

Licensed user:

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Beneluxweg 125 Postbus 40
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Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

4. Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: A - Shadow Receptor: 15,0 × 1,0 Azimuth: -35,0° Slope: 90,0° (682)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June	
1	08:46 16:38	08:19 17:25	09:25 (1) 09:34 (1)	07:26 18:17	08:02 (2) 09:52 (1)	07:16 20:10	13:03 (5) 21:01
2	08:46 16:39	08:17 17:27	09:20 (1) 09:39 (1)	07:24 18:19	08:02 (2) 09:51 (1)	07:13 20:12	13:00 (5) 21:03
3	08:45 16:40	08:16 17:29	09:18 (1) 09:42 (1)	07:22 18:20	08:02 (2) 09:50 (1)	07:11 20:14	12:58 (5) 21:04
4	08:45 16:41	08:14 17:31	09:16 (1) 09:44 (1)	07:19 18:22	08:02 (2) 09:49 (1)	07:09 20:16	12:54 (5) 21:06
5	08:45 16:42	08:13 17:33	09:13 (1) 09:46 (1)	07:17 18:24	08:02 (2) 09:46 (1)	07:06 20:17	12:51 (5) 21:08
6	08:45 16:44	08:11 17:35	09:11 (1) 09:48 (1)	07:15 18:26	08:02 (2) 09:44 (1)	07:04 20:19	12:49 (5) 21:09
7	08:44 16:45	08:09 17:36	09:10 (1) 09:50 (1)	07:13 18:27	08:03 (2) 09:42 (1)	07:02 20:21	12:47 (5) 21:11
8	08:44 16:46	08:08 17:38	09:08 (1) 09:51 (1)	07:10 18:29	08:03 (2) 09:38 (1)	07:00 20:22	12:43 (5) 21:13
9	08:43 16:47	08:06 17:40	09:07 (1) 09:52 (1)	07:08 18:31	08:04 (2) 09:35 (1)	06:57 20:24	12:40 (5) 21:14
10	08:43 16:49	08:04 17:42	09:05 (1) 09:53 (1)	07:06 18:33	08:05 (2) 09:31 (1)	06:55 20:26	12:34 (5) 21:16
11	08:42 16:50	08:02 17:44	09:04 (1) 09:54 (1)	07:04 18:34	08:08 (2) 09:26 (1)	06:53 20:27	12:32 (5) 21:17
12	08:42 16:52	08:00 17:46	09:03 (1) 09:55 (1)	07:01 18:36	08:10 (2) 09:29	06:51 20:29	12:30 (5) 21:19
13	08:41 16:53	07:58 17:48	09:02 (1) 09:55 (1)	06:59 18:38	08:18 (2) 20:31	06:49 20:31	12:28 (5) 21:21
14	08:40 16:55	07:57 17:49	09:01 (1) 09:56 (1)	06:57 18:40	06:46 20:32	06:46 20:32	12:27 (5) 21:22
15	08:39 16:56	07:55 17:51	09:01 (1) 09:56 (1)	06:55 18:41	06:44 20:34	06:44 20:34	12:26 (5) 21:24
16	08:39 16:58	07:53 17:53	09:00 (1) 09:57 (1)	06:52 18:43	06:42 20:36	06:42 20:36	12:25 (5) 21:25
17	08:38 16:59	07:51 17:55	09:00 (1) 09:57 (1)	06:50 18:45	06:40 20:38	06:40 20:38	12:24 (5) 21:27
18	08:37 17:01	07:49 17:57	08:59 (1) 09:57 (1)	06:48 18:47	06:38 20:39	06:38 20:39	12:23 (5) 21:28
19	08:36 17:03	07:47 17:59	08:59 (1) 09:58 (1)	06:45 18:48	06:35 20:41	06:35 20:41	12:22 (5) 21:30
20	08:35 17:04	07:45 18:00	08:59 (1) 09:58 (1)	06:43 18:50	06:33 20:43	06:33 20:43	12:21 (5) 21:31
21	08:34 17:06	07:43 18:02	08:15 (2) 09:58 (1)	06:41 18:52	06:31 20:44	06:31 20:44	12:20 (5) 21:32
22	08:32 17:08	07:41 18:04	08:12 (2) 09:58 (1)	06:39 18:53	06:29 20:46	06:29 20:46	12:19 (5) 21:34
23	08:31 17:09	07:39 18:06	08:09 (2) 09:56 (1)	06:36 18:55	12:40 (5) 13:08 (5)	06:27 20:48	12:18 (5) 21:35
24	08:30 17:11	07:37 18:08	08:07 (2) 09:56 (1)	06:34 18:57	12:33 (5) 13:15 (5)	06:25 20:49	12:17 (5) 21:37
25	08:29 17:13	07:34 18:10	08:06 (2) 09:56 (1)	06:32 18:59	12:27 (5) 13:19 (5)	06:23 20:51	12:16 (5) 21:38
26	08:28 17:15	07:32 18:11	08:05 (2) 09:55 (1)	06:29 19:00	12:23 (5) 13:23 (5)	06:21 20:53	12:15 (5) 21:39
27	08:26 17:16	07:30 18:13	08:04 (2) 09:55 (1)	06:27 19:02	12:19 (5) 13:27 (5)	06:19 20:54	12:14 (5) 21:41
28	08:25 17:18	07:28 18:15	08:03 (2) 09:53 (1)	06:25 19:04	12:15 (5) 13:29 (5)	06:17 20:56	12:13 (5) 21:42
29	08:23 17:20		07:22 20:05		13:12 (5) 14:32 (5)	06:15 20:58	12:12 (5) 21:43
30	08:22 17:22		07:20 20:07		13:10 (5) 14:34 (5)	06:13 20:59	12:11 (5) 21:44
31	08:21 17:24		07:18 20:09		13:06 (5) 14:36 (5)	05:27 21:45	12:10 (5) 21:46
Potential sun hours	259	278	367	416	485	498	
Total, worst case		1532	1303	5135	5949	5840	
Sun reduction		0,27	0,30	0,38	0,42	0,38	
Oper. time red.		0,97	0,97	0,97	0,97	0,97	
Wind dir. red.		0,57	0,62	0,66	0,67	0,67	
Total reduction		0,15	0,18	0,24	0,27	0,24	
Total, real		227	235	1239	1609	1420	

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: A - Shadow Receptor: 15,0 × 1,0 Azimuth: -35,0° Slope: 90,0° (682)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July			August			September			October			November			December	
1	05:23		12:04 (5)	05:59		12:13 (5)	06:49		07:31 (3)	07:38			07:31		08:35 (1)	08:22	
	22:01	195	15:19 (5)	21:29	184	15:17 (5)	20:27	164	14:50 (5)	19:18			17:12	48	09:23 (1)	16:32	
2	05:24		12:04 (5)	06:01		12:14 (5)	06:50		07:32 (3)	07:39			08:47 (2)	07:33	08:36 (1)	08:23	
	22:00	195	15:19 (5)	21:27	184	15:18 (5)	20:25	158	14:48 (5)	19:16	12	08:59 (2)	17:10	46	09:22 (1)	16:31	
3	05:25		12:04 (5)	06:02		12:14 (5)	06:52		07:35 (3)	07:41			08:44 (2)	07:35	08:38 (1)	08:25	
	22:00	195	15:19 (5)	21:26	183	15:17 (5)	20:23	150	14:47 (5)	19:13	35	10:07 (1)	17:09	43	09:21 (1)	16:31	
4	05:25		12:05 (5)	06:04		12:14 (5)	06:54		07:37 (3)	07:43			08:42 (2)	07:36	08:40 (1)	08:26	
	21:59	194	15:19 (5)	21:24	182	15:16 (5)	20:20	141	14:45 (5)	19:11	47	10:11 (1)	17:07	40	09:20 (1)	16:30	
5	05:26		12:05 (5)	06:06		07:45 (3)	06:55		07:42 (3)	07:44			08:40 (2)	07:38	08:41 (1)	08:27	
	21:59	195	15:20 (5)	21:22	190	15:16 (5)	20:18	126	14:43 (5)	19:09	56	10:14 (1)	17:05	36	09:17 (1)	16:30	
6	05:27		12:05 (5)	06:07		07:41 (3)	06:57		12:45 (5)	07:46			08:39 (2)	07:40	08:43 (1)	08:29	
	21:58	194	15:19 (5)	21:20	197	15:15 (5)	20:16	117	14:42 (5)	19:07	63	10:17 (1)	17:03	33	09:16 (1)	16:29	
7	05:28		12:05 (5)	06:09		07:39 (3)	06:59		12:46 (5)	07:48			08:38 (2)	07:42	08:46 (1)	08:30	
	21:58	194	15:19 (5)	21:19	201	15:15 (5)	20:14	113	14:39 (5)	19:04	68	10:19 (1)	17:02	28	09:14 (1)	16:29	
8	05:29		12:06 (5)	06:10		07:37 (3)	07:00		12:49 (5)	07:49			08:38 (2)	07:44	08:48 (1)	08:31	
	21:57	194	15:20 (5)	21:17	203	15:14 (5)	20:11	109	14:38 (5)	19:02	73	10:21 (1)	17:00	24	09:12 (1)	16:29	
9	05:30		12:06 (5)	06:12		07:36 (3)	07:02		12:51 (5)	07:51			08:36 (2)	07:45	08:51 (1)	08:32	
	21:57	194	15:20 (5)	21:15	205	15:14 (5)	20:09	104	14:35 (5)	19:00	78	10:22 (1)	16:58	18	09:09 (1)	16:28	
10	05:31		12:06 (5)	06:13		07:34 (3)	07:03		12:53 (5)	07:53			08:36 (2)	07:47	08:56 (1)	08:33	
	21:56	194	15:20 (5)	21:13	207	15:13 (5)	20:07	100	14:33 (5)	18:58	80	10:23 (1)	16:57	9	09:05 (1)	16:28	
11	05:32		12:07 (5)	06:15		07:33 (3)	07:05		12:55 (5)	07:54			08:36 (2)	07:49		08:34	
	21:55	193	15:20 (5)	21:11	209	15:13 (5)	20:04	95	14:30 (5)	18:55	83	10:25 (1)	16:55		16:28		
12	05:33		12:07 (5)	06:17		07:32 (3)	07:07		12:58 (5)	07:56			08:36 (2)	07:51		08:35	
	21:54	193	15:20 (5)	21:09	209	15:12 (5)	20:02	90	14:28 (5)	18:53	85	10:26 (1)	16:54		16:28		
13	05:34		12:07 (5)	06:18		07:31 (3)	07:08		13:00 (5)	07:58			08:36 (2)	07:52		08:36	
	21:53	193	15:20 (5)	21:07	210	15:12 (5)	20:00	86	14:26 (5)	18:51	85	10:26 (1)	16:52		16:28		
14	05:35		12:07 (5)	06:20		07:30 (3)	07:10		13:02 (5)	07:59			08:36 (2)	07:54		08:37	
	21:52	193	15:20 (5)	21:05	210	15:10 (5)	19:57	80	14:22 (5)	18:49	86	10:26 (1)	16:51		16:28		
15	05:36		12:08 (5)	06:21		07:30 (3)	07:11		13:05 (5)	08:01			08:37 (2)	07:56		08:38	
	21:52	192	15:20 (5)	21:03	210	15:10 (5)	19:55	75	14:20 (5)	18:47	85	10:27 (1)	16:49		16:28		
16	05:37		12:08 (5)	06:23		07:28 (3)	07:13		13:07 (5)	08:03			08:37 (2)	07:58		08:39	
	21:50	192	15:20 (5)	21:01	210	15:09 (5)	19:53	69	14:16 (5)	18:44	86	10:28 (1)	16:48		16:28		
17	05:39		12:08 (5)	06:25		07:28 (3)	07:15		13:10 (5)	08:05			08:38 (2)	07:59		08:40	
	21:49	192	15:20 (5)	20:59	208	15:08 (5)	19:50	62	14:12 (5)	18:42	84	10:27 (1)	16:46		16:28		
18	05:40		12:09 (5)	06:26		07:27 (3)	07:16		13:13 (5)	08:06			08:39 (2)	08:01		08:41	
	21:48	192	15:21 (5)	20:57	208	15:07 (5)	19:48	55	14:08 (5)	18:40	82	10:28 (1)	16:45		16:28		
19	05:41		12:09 (5)	06:28		07:27 (3)	07:18		13:18 (5)	08:08			08:41 (2)	08:03		08:41	
	21:47	191	15:20 (5)	20:55	206	15:06 (5)	19:46	45	14:03 (5)	18:38	79	10:28 (1)	16:44		16:29		
20	05:42		12:09 (5)	06:29		07:26 (3)	07:20		13:24 (5)	08:10			08:43 (2)	08:04		08:42	
	21:46	191	15:20 (5)	20:53	206	15:05 (5)	19:43	33	13:57 (5)	18:36	75	10:28 (1)	16:43		16:29		
21	05:44		12:09 (5)	06:31		07:27 (3)	07:21		13:34 (5)	08:12			08:46 (2)	08:06		08:43	
	21:45	191	15:20 (5)	20:51	203	15:04 (5)	19:41	11	13:45 (5)	18:34	69	10:28 (1)	16:41		16:29		
22	05:45		12:10 (5)	06:33		07:26 (3)	07:23			08:13			09:29 (1)	08:08		08:43	
	21:44	190	15:20 (5)	20:49	202	15:03 (5)	19:39			18:32	59	10:28 (1)	16:40		16:30		
23	05:46		12:10 (5)	06:34		07:26 (3)	07:24			08:15			09:30 (1)	08:09		08:44	
	21:42	190	15:20 (5)	20:47	200	15:02 (5)	19:37			18:30	58	10:28 (1)	16:39		16:30		
24	05:48		12:10 (5)	06:36		07:27 (3)	07:26			08:17			09:29 (1)	08:11		08:44	
	21:41	189	15:19 (5)	20:45	198	15:02 (5)	19:34			18:28	58	10:27 (1)	16:38		16:31		
25	05:49		12:11 (5)	06:38		07:26 (3)	07:28			07:19			08:29 (1)	08:13		08:44	
	21:40	188	15:19 (5)	20:43	195	15:00 (5)	19:32			17:26	58	09:27 (1)	16:37		16:32		
26	05:51		12:12 (5)	06:39		07:27 (3)	07:29			07:20			08:30 (1)	08:14		08:45	
	21:38	187	15:19 (5)	20:40	191	14:59 (5)	19:30			17:24	56	09:26 (1)	16:36		16:32		
27	05:52		12:12 (5)	06:41		07:27 (3)	07:31			07:22			08:30 (1)	08:16		08:45	
	21:37	187	15:19 (5)	20:38	187	14:57 (5)	19:27			17:22	56	09:26 (1)	16:35		16:33		
28	05:53		12:11 (5)	06:42		07:28 (3)	07:33			07:24			08:31 (1)	08:17		08:45	
	21:35	187	15:18 (5)	20:36	184	14:56 (5)	19:25			17:20	54	09:25 (1)	16:34		16:34		
29	05:55		12:12 (5)	06:44		07:28 (3)	07:34			07:26			08:32 (1)	08:19		08:45	
	21:34	187	15:19 (5)	20:34	180	14:55 (5)	19:23			17:18	53	09:25 (1)	16:34		16:35		
30	05:56		12:12 (5)	06:46		07:29 (3)	07:36			07:27			08:33 (1)	08:20		08:46	
	21:32	186	15:18 (5)	20:32	176	14:54 (5)	19:20			17:16	51	09:24 (1)	16:33		16:36		
31	05:58		12:13 (5)	06:47		07:29 (3)				07:29			08:34 (1)			08:46	
	21:31	185	15:18 (5)	20:29	171	14:52 (5)				17:14	49	09:23 (1)				16:37	
Potential sun hours	501			453				381			332		267			244	
Total, worst case		5933			6109			1983			1963			325			
Sun reduction		0,38			0,42			0,35			0,31			0,21			
Oper. time red.		0,97			0,97			0,97			0,97			0,97			
Wind dir. red.		0,67			0,66			0,67			0,57			0,57			
Total reduction		0,25			0,27			0,23			0,17			0,12			
Total, real		1462			1632			449			338			38			

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De Geer Shadow receptor: B - Shadow Receptor: 15,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (683)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January		February		March		April		May		June	
1	08:46		08:19	09:49 (1)	07:26		08:13 (2)	07:16	16:21 (5)	06:11	07:07 (3)	05:26
	16:38		17:25	72	11:01 (1)	18:17	107	10:57 (1)	20:10	106	18:07 (5)	21:01
2	08:46		08:17	09:48 (1)	07:24		08:13 (2)	07:13	16:19 (5)	06:09	07:07 (3)	05:25
	16:39		17:27	74	11:02 (1)	18:19	104	10:55 (1)	20:12	110	18:09 (5)	21:03
3	08:45		08:16	09:49 (1)	07:22		08:13 (2)	07:11	16:18 (5)	06:07	07:06 (3)	05:24
	16:40		17:29	74	11:03 (1)	18:20	100	10:53 (1)	20:14	112	18:10 (5)	21:04
4	08:45		08:14	09:48 (1)	07:19		08:14 (2)	07:09	16:16 (5)	06:05	07:06 (3)	05:24
	16:41		17:31	75	11:03 (1)	18:22	97	10:52 (1)	20:16	115	18:11 (5)	21:06
5	08:45		08:13	09:47 (1)	07:17		08:13 (2)	07:06	16:15 (5)	06:04	07:05 (3)	05:23
	16:42		17:33	76	11:03 (1)	18:24	92	10:48 (1)	20:17	117	18:12 (5)	21:08
6	08:45		08:11	09:47 (1)	07:15		08:14 (2)	07:04	16:14 (5)	06:02	07:06 (3)	05:22
	16:44		17:35	77	11:04 (1)	18:26	87	10:46 (1)	20:19	119	18:13 (5)	21:09
7	08:44		08:09	09:47 (1)	07:13		08:15 (2)	07:02	16:13 (5)	06:00	07:05 (3)	05:22
	16:45		17:36	78	11:05 (1)	18:27	79	10:43 (1)	20:21	121	18:14 (5)	21:11
8	08:44		08:07	09:47 (1)	07:10		08:15 (2)	07:00	16:11 (5)	05:58	07:05 (3)	05:21
	16:46		17:38	78	11:05 (1)	18:29	71	10:38 (1)	20:22	123	18:14 (5)	21:13
9	08:43		08:06	09:46 (1)	07:08		08:17 (2)	06:57	16:11 (5)	05:56	07:05 (3)	05:21
	16:47	10	10:16 (1)	10:26 (1)	17:40	80	11:06 (1)	18:31	61	10:34 (1)	20:24	124
10	08:43		08:04	09:46 (1)	07:06		08:18 (2)	06:55	16:10 (5)	05:55	07:05 (3)	05:20
	16:49	16	10:14 (1)	10:30 (1)	17:42	80	11:06 (1)	18:33	52	10:31 (1)	20:26	126
11	08:42		08:02	09:46 (1)	07:04		08:20 (2)	06:53	16:09 (5)	05:53	07:05 (3)	05:20
	16:50	21	10:12 (1)	10:33 (1)	17:44	80	11:06 (1)	18:34	37	10:25 (1)	20:27	128
12	08:42		08:00	09:46 (1)	07:01		08:22 (2)	06:51	16:08 (5)	05:51	07:05 (3)	05:20
	16:52	25	10:10 (1)	10:35 (1)	17:46	80	11:06 (1)	18:36	14	08:36 (2)	20:29	130
13	08:41		07:58	09:45 (1)	06:59			06:49	16:06 (5)	05:50	07:06 (3)	05:19
	16:53	29	10:07 (1)	10:37 (1)	17:48	82	11:07 (1)	18:38		20:31	132	18:18 (5)
14	08:40		07:57	09:45 (1)	06:57			06:46	16:05 (5)	05:48	07:05 (3)	05:19
	16:55	32	10:07 (1)	10:39 (1)	17:49	82	11:07 (1)	18:40		20:32	141	18:18 (5)
15	08:39		07:55	08:30 (2)	06:55			06:44	16:04 (5)	05:47	07:06 (3)	05:19
	16:56	36	10:04 (1)	10:41 (1)	17:51	92	11:07 (1)	18:41		20:34	154	18:19 (5)
16	08:39		07:53	08:27 (2)	06:52			06:42	16:03 (5)	05:45	07:06 (3)	05:19
	16:58	39	10:03 (1)	10:43 (1)	17:53	99	11:07 (1)	18:43		20:36	161	18:19 (5)
17	08:38		07:51	08:25 (2)	06:50		16:08 (5)	06:40	07:26 (3)	05:44	07:06 (3)	05:19
	16:59	41	10:04 (1)	10:44 (1)	17:55	102	11:06 (1)	18:45	20	16:28 (5)	20:38	167
18	08:37		07:49	08:23 (2)	06:48			06:38	15:59 (5)	05:42	07:24 (3)	05:19
	17:01	45	10:06 (1)	10:46 (1)	17:57	105	11:06 (1)	18:47	35	16:34 (5)	20:39	172
19	08:36		07:47	08:21 (2)	06:45			06:35	15:54 (5)	05:41	07:22 (3)	05:19
	17:03	48	10:08 (1)	10:48 (1)	17:59	108	11:06 (1)	18:48	45	16:39 (5)	20:41	176
20	08:35		07:45	08:19 (2)	06:43			06:33	15:50 (5)	05:39	07:20 (3)	05:19
	17:04	50	10:09 (1)	10:49 (1)	18:00	111	11:06 (1)	18:50	53	16:43 (5)	20:43	181
21	08:34		07:43	08:18 (2)	06:41			06:31	15:46 (5)	05:38	07:18 (3)	05:19
	17:06	53	10:10 (1)	10:50 (1)	18:02	112	11:05 (1)	18:52	59	16:45 (5)	20:44	184
22	08:32		07:41	08:17 (2)	06:39			06:29	15:43 (5)	05:37	07:16 (3)	05:19
	17:08	55	10:11 (1)	10:51 (1)	18:04	113	11:05 (1)	18:53	65	16:48 (5)	20:46	188
23	08:31		07:39	08:15 (2)	06:36			06:27	15:40 (5)	05:36	07:15 (3)	05:19
	17:09	57	10:12 (1)	10:53 (1)	18:06	114	11:03 (1)	18:55	71	16:51 (5)	20:48	189
24	08:30		07:37	08:15 (2)	06:34			06:25	15:37 (5)	05:34	07:14 (3)	05:19
	17:11	60	10:13 (1)	10:54 (1)	18:08	114	11:03 (1)	18:57	75	16:52 (5)	20:49	192
25	08:29		07:34	08:14 (2)	06:32			06:23	15:34 (5)	05:33	07:12 (3)	05:19
	17:13	61	10:14 (1)	10:55 (1)	18:10	113	11:02 (1)	18:59	80	16:54 (5)	20:51	195
26	08:28		07:32	08:14 (2)	06:29			06:21	15:32 (5)	05:32	07:11 (3)	05:19
	17:15	64	10:15 (1)	10:57 (1)	18:11	113	11:01 (1)	19:00	84	16:56 (5)	20:53	197
27	08:26		07:30	08:14 (2)	06:27			06:19	15:30 (5)	05:31	07:10 (3)	05:19
	17:16	65	10:16 (1)	10:58 (1)	18:13	111	11:00 (1)	19:02	89	16:59 (5)	20:54	198
28	08:25		07:28	08:13 (2)	06:25			06:17	15:27 (5)	05:30	07:09 (3)	05:19
	17:18	67	10:17 (1)	10:59 (1)	18:15	109	10:58 (1)	19:04	93	17:00 (5)	20:56	199
29	08:23		07:22					06:15	16:26 (5)	05:29	07:08 (3)	05:19
	17:20	68	10:18 (1)	10:59 (1)				06:13	16:24 (5)	05:28	07:07 (3)	05:19
30	08:22		07:20					06:11	16:24 (5)	05:28	07:07 (3)	05:19
	17:22	69	10:19 (1)	10:59 (1)				06:09	16:24 (5)	05:28	07:07 (3)	05:19
31	08:21		07:18					06:07	16:22 (5)	05:27	07:14 (3)	05:19
	17:24	71	11:01 (1)					06:05	16:22 (5)	05:27	07:14 (3)	05:19
Potential sun hours	259		278		367		416		485		498	
Total, worst case		1082		2604		1969		4660		5786		4215
Sun reduction		0,18		0,27		0,30		0,38		0,42		0,38
Oper. time red.		0,97		0,97		0,97		0,97		0,97		0,97
Wind dir. red.		0,58		0,58		0,62		0,66		0,66		0,66
Total reduction		0,10		0,15		0,18		0,24		0,27		0,24
Total, real		106		386		359		1116		1537		1008

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: B - Shadow Receptor: 15,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (683)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
Idle start wind speed: Cut in wind speed from power curve

	July		August		September		October		November		December	
1	05:23		07:26 (3)	05:59	07:15 (3)	06:49	16:08 (5)	07:38	09:03 (2)	07:31	09:16 (1)	08:22
	22:01	140	18:25 (5)	21:29	18:32 (5)	20:27	18:16 (5)	19:18	11	09:14 (2)	17:12	80
2	05:24		07:25 (3)	06:01	07:15 (3)	06:50	16:08 (5)	07:39	08:59 (2)	07:33	09:16 (1)	08:23
	22:00	142	18:25 (5)	21:27	18:32 (5)	20:25	18:14 (5)	19:16	29	11:00 (1)	17:10	79
3	05:25		07:25 (3)	06:02	07:15 (3)	06:52	16:09 (5)	07:41	08:57 (2)	07:35	09:16 (1)	08:25
	22:00	143	18:25 (5)	21:26	18:32 (5)	20:23	18:13 (5)	19:13	45	11:06 (1)	17:09	79
4	05:25		07:25 (3)	06:04	07:15 (3)	06:54	16:08 (5)	07:43	08:55 (2)	07:36	09:17 (1)	08:26
	21:59	145	18:26 (5)	21:24	18:32 (5)	20:20	18:11 (5)	19:11	58	11:11 (1)	17:07	78
5	05:26		07:25 (3)	06:06	07:15 (3)	06:55	16:09 (5)	07:44	08:53 (2)	07:38	09:16 (1)	08:27
	21:59	147	18:27 (5)	21:22	18:32 (5)	20:18	18:10 (5)	19:09	66	11:13 (1)	17:05	77
6	05:27		07:24 (3)	06:07	07:15 (3)	06:57	16:10 (5)	07:46	08:52 (2)	07:40	09:17 (1)	08:29
	21:58	148	18:26 (5)	21:20	18:32 (5)	20:16	18:09 (5)	19:07	76	11:17 (1)	17:03	76
7	05:28		07:24 (3)	06:09	07:15 (3)	06:59	16:10 (5)	07:48	08:51 (2)	07:42	09:18 (1)	08:30
	21:58	150	18:27 (5)	21:19	18:32 (5)	20:14	18:07 (5)	19:04	82	11:20 (1)	17:02	75
8	05:29		07:24 (3)	06:10	07:15 (3)	07:00	16:11 (5)	07:49	08:50 (2)	07:44	09:18 (1)	08:31
	21:57	150	18:27 (5)	21:17	18:31 (5)	20:11	18:06 (5)	19:02	89	11:23 (1)	17:00	75
9	05:30		07:24 (3)	06:12	07:15 (3)	07:02	16:11 (5)	07:51	08:48 (2)	07:45	09:19 (1)	08:32
	21:57	152	18:27 (5)	21:15	18:32 (5)	20:09	18:03 (5)	19:00	95	11:25 (1)	16:58	73
10	05:31		07:23 (3)	06:13	07:15 (3)	07:03	16:12 (5)	07:53	08:47 (2)	07:47	09:20 (1)	08:33
	21:56	155	18:28 (5)	21:13	18:31 (5)	20:07	18:02 (5)	18:58	99	11:27 (1)	16:57	72
11	05:32		07:23 (3)	06:15	07:16 (3)	07:05	16:13 (5)	07:54	08:47 (2)	07:49	09:21 (1)	08:34
	21:55	157	18:28 (5)	21:11	18:31 (5)	20:04	17:59 (5)	18:55	102	11:28 (1)	16:55	71
12	05:33		07:23 (3)	06:17	07:15 (3)	07:07	16:14 (5)	07:56	08:47 (2)	07:51	09:22 (1)	08:35
	21:54	158	18:28 (5)	21:09	18:30 (5)	20:02	17:58 (5)	18:53	105	11:30 (1)	16:54	69
13	05:34		07:22 (3)	06:18	07:16 (3)	07:08	16:15 (5)	07:58	08:46 (2)	07:52	09:23 (1)	08:36
	21:53	162	18:29 (5)	21:07	18:30 (5)	20:00	17:56 (5)	18:51	107	11:30 (1)	16:52	68
14	05:35		07:22 (3)	06:20	07:16 (3)	07:10	16:16 (5)	07:59	08:46 (2)	07:54	09:24 (1)	08:37
	21:52	162	18:29 (5)	21:05	18:30 (5)	19:57	17:53 (5)	18:49	109	11:31 (1)	16:51	66
15	05:36		07:21 (3)	06:21	07:17 (3)	07:11	16:18 (5)	08:01	08:46 (2)	07:56	09:25 (1)	08:38
	21:51	165	18:29 (5)	21:03	18:30 (5)	19:55	17:51 (5)	18:47	112	11:33 (1)	16:49	65
16	05:37		07:21 (3)	06:23	07:17 (3)	07:13	16:18 (5)	08:03	08:46 (2)	07:58	09:26 (1)	08:39
	21:50	167	18:29 (5)	21:01	18:29 (5)	19:53	17:47 (5)	18:44	114	11:34 (1)	16:48	63
17	05:39		07:20 (3)	06:25	07:18 (3)	07:15	16:20 (5)	08:05	08:46 (2)	07:59	09:27 (1)	08:40
	21:49	169	18:29 (5)	20:59	18:29 (5)	19:50	17:45 (5)	18:42	112	11:33 (1)	16:46	61
18	05:40		07:21 (3)	06:26	07:18 (3)	07:16	16:21 (5)	08:06	08:46 (2)	08:01	09:28 (1)	08:41
	21:48	170	18:30 (5)	20:57	18:28 (5)	19:48	17:42 (5)	18:40	114	11:34 (1)	16:45	59
19	05:41		07:20 (3)	06:28	07:19 (3)	07:18	16:23 (5)	08:08	08:47 (2)	08:03	09:30 (1)	08:41
	21:47	174	18:31 (5)	20:55	18:28 (5)	19:46	17:40 (5)	18:38	113	11:35 (1)	16:44	57
20	05:42		07:19 (3)	06:29	07:20 (3)	07:20	16:26 (5)	08:10	08:48 (2)	08:04	09:31 (1)	08:42
	21:46	176	18:31 (5)	20:53	18:26 (5)	19:43	17:38 (5)	18:36	112	11:35 (1)	16:43	55
21	05:44		07:19 (3)	06:31	07:21 (3)	07:21	16:27 (5)	08:12	08:49 (2)	08:06	09:33 (1)	08:43
	21:45	178	18:31 (5)	20:51	18:26 (5)	19:41	17:34 (5)	18:34	111	11:36 (1)	16:41	53
22	05:45		07:19 (3)	06:33	07:22 (3)	07:23	16:30 (5)	08:13	08:50 (2)	08:08	09:35 (1)	08:43
	21:44	180	18:32 (5)	20:49	18:25 (5)	19:39	17:32 (5)	18:32	110	11:36 (1)	16:40	50
23	05:46		07:18 (3)	06:34	07:24 (3)	07:24	16:33 (5)	08:15	08:52 (2)	08:09	09:36 (1)	08:44
	21:42	182	18:31 (5)	20:47	18:25 (5)	19:36	17:28 (5)	18:30	108	11:37 (1)	16:39	48
24	05:48		07:18 (3)	06:36	07:26 (3)	07:26	16:37 (5)	08:17	08:53 (2)	08:11	09:38 (1)	08:44
	21:41	183	18:31 (5)	20:45	18:24 (5)	19:34	17:24 (5)	18:28	105	11:36 (1)	16:38	45
25	05:49		07:17 (3)	06:38	07:27 (3)	07:28	16:41 (5)	07:19	07:55 (2)	08:13	09:41 (1)	08:44
	21:40	185	18:31 (5)	20:43	18:23 (5)	19:32	17:19 (5)	17:26	101	10:36 (1)	16:37	41
26	05:51		07:17 (3)	06:39	07:29 (3)	07:29	16:47 (5)	07:20	07:57 (2)	08:14	09:43 (1)	08:45
	21:38	187	18:32 (5)	20:40	18:23 (5)	19:30	17:12 (5)	17:24	97	10:36 (1)	16:36	39
27	05:52		07:17 (3)	06:41	07:31 (3)	07:31		07:22		08:01 (2)	08:16	
	21:37	189	18:32 (5)	20:38	18:21 (5)	19:27		17:22	88	10:36 (1)	16:35	36
28	05:53		07:16 (3)	06:42	07:34 (3)	07:33		07:24		09:15 (1)	08:17	
	21:35	191	18:32 (5)	20:36	18:21 (5)	19:25		17:20	81	10:36 (1)	16:34	32
29	05:55		07:16 (3)	06:44	07:39 (3)	07:34		07:26		09:15 (1)	08:19	
	21:34	193	18:32 (5)	20:34	18:19 (5)	19:23		17:18	81	10:36 (1)	16:34	29
30	05:56		07:16 (3)	06:46	16:07 (5)	07:36		07:27		09:15 (1)	08:20	
	21:32	194	18:32 (5)	20:32	18:19 (5)	19:20		17:16	81	10:36 (1)	16:33	25
31	05:58		07:16 (3)	06:47	16:07 (5)			07:29		09:15 (1)		
	21:31	195	18:33 (5)	20:29	18:17 (5)			17:14	81	10:36 (1)		
Potential sun hours	501		453		381		332		267		244	
Total, worst case	5189		5750		2394		2794		1796		47	
Sun reduction	0,38		0,42		0,35		0,31		0,21		0,17	
Oper. time red.	0,97		0,97		0,97		0,97		0,97		0,97	
Wind dir. red.	0,66		0,66		0,66		0,58		0,58		0,58	
Total reduction	0,24		0,26		0,22		0,17		0,12		0,09	
Total, real	1254		1518		538		481		209		4	

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

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

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: C - Shadow Receptor: 15,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (684)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	08:16 (1) 09:03 (1)	07:16 20:10	06:11 21:01
2	08:46 16:39	08:17 17:27	07:24 18:19	07:51 (2) 09:03 (1)	07:13 20:12	103 21:03
3	08:45 16:40	08:16 17:29	07:22 18:20	07:49 (2) 09:04 (1)	07:11 20:14	108 21:07
4	08:45 16:41	08:14 17:31	07:19 18:22	07:47 (2) 09:04 (1)	07:09 20:16	113 21:04
5	08:45 16:42	08:13 17:33	07:17 18:24	07:44 (2) 09:04 (1)	07:06 20:17	116 21:06
6	08:45 16:44	08:11 17:35	07:15 18:26	07:43 (2) 09:04 (1)	07:04 20:19	120 21:08
7	08:44 16:45	08:09 17:36	07:13 18:27	07:42 (2) 09:04 (1)	07:02 20:21	120 21:11
8	08:44 16:46	08:08 17:38	07:10 18:29	07:40 (2) 09:03 (1)	07:00 20:22	123 21:13
9	08:43 16:47	08:06 17:40	07:08 18:31	07:40 (2) 09:03 (1)	06:57 20:24	125 21:14
10	08:43 16:49	08:04 17:42	07:06 18:33	07:40 (2) 09:03 (1)	06:55 20:26	125 21:16
11	08:42 16:50	08:02 17:44	07:04 18:34	07:40 (2) 09:02 (1)	06:53 20:27	124 21:17
12	08:42 16:52	08:00 17:46	07:01 18:36	07:39 (2) 09:01 (1)	06:51 20:29	121 21:19
13	08:41 16:53	07:58 17:48	06:59 18:38	07:39 (2) 09:00 (1)	06:49 20:31	116 21:21
14	08:40 16:55	07:57 17:49	06:57 18:40	07:40 (2) 08:59 (1)	06:46 20:32	119 21:22
15	08:39 16:56	07:55 17:51	06:55 18:41	07:39 (2) 08:58 (1)	06:44 20:34	121 21:24
16	08:39 16:58	07:53 17:53	06:52 18:43	07:40 (2) 08:56 (1)	06:42 20:36	124 21:25
17	08:38 16:59	07:51 17:55	06:50 18:45	07:42 (2) 08:55 (1)	06:40 20:38	126 21:27
18	08:37 17:01	07:49 17:57	06:48 18:47	07:42 (2) 08:53 (1)	06:38 20:39	128 21:28
19	08:36 17:03	07:47 17:59	06:45 18:48	07:45 (2) 08:51 (1)	06:36 20:41	131 21:30
20	08:35 17:04	07:45 18:00	06:43 18:50	08:15 (1) 08:48 (1)	06:33 20:43	132 21:31
21	08:34 17:06	07:43 18:02	06:41 18:52	08:16 (1) 08:45 (1)	06:31 20:44	134 21:32
22	08:32 17:08	07:41 18:04	06:39 18:53	08:18 (1) 08:43 (1)	06:29 20:46	136 21:34
23	08:31 17:09	07:39 18:06	06:36 18:55	08:21 (1) 08:40 (1)	06:27 20:48	138 21:36
24	08:30 17:11	07:37 18:08	06:34 18:57	08:26 (1) 08:34 (1)	06:25 20:49	139 21:37
25	08:29 17:13	07:34 18:10	06:32 18:59	08:22 (1) 09:00 (1)	06:23 18:59	141 21:38
26	08:28 17:15	07:32 18:11	06:29 19:00	08:21 (1) 09:01 (1)	06:21 19:00	143 21:39
27	08:26 17:16	07:30 18:13	06:27 19:02	08:19 (1) 09:02 (1)	06:19 19:02	145 21:41
28	08:25 17:17	07:28 18:15	06:25 19:04	08:17 (1) 09:02 (1)	06:17 19:04	147 21:42
29	08:23 17:20		07:22 20:05	07:22 20:05	06:15 20:58	149 21:43
30	08:22 17:22		07:20 20:07	07:20 20:07	06:13 20:59	150 21:44
31	08:21 17:24		07:18 20:09	07:18 20:09	06:11 20:57	151 21:45
Potential sun hours	259	278	367	416	485	498
Total, worst case		288	1446	766	4012	4784
Sun reduction		0,27	0,30	0,38	0,42	0,38
Oper. time red.		0,97	0,97	0,97	0,97	0,97
Wind dir. red.		0,58	0,58	0,64	0,63	0,62
Total reduction		0,15	0,17	0,23	0,25	0,23
Total, real		43	246	178	1022	1092

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De Geer Shadow receptor: C - Shadow Receptor: 15,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (684)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:23 22:01 160	08:48 (5) 05:59 11:28 (5) 21:29 115	09:16 (5) 06:49 11:11 (5) 20:27	07:38 19:18 78	08:19 (2) 07:31 09:40 (1) 17:12	08:22 16:32
2	05:24 22:00 160	08:48 (5) 06:01 11:28 (5) 21:27 123	07:26 (3) 06:50 11:10 (5) 20:25	07:39 19:16 81	08:17 (2) 07:33 09:40 (1) 17:10	08:23 16:31
3	05:25 22:00 159	08:49 (5) 06:02 11:28 (5) 21:26 124	07:23 (3) 06:52 11:07 (5) 20:23	07:41 19:13 81	08:17 (2) 07:35 09:40 (1) 17:09	08:25 16:31
4	05:25 21:59 158	08:50 (5) 06:04 11:28 (5) 21:24 125	07:21 (3) 06:54 11:05 (5) 20:20	07:43 19:11 81	08:18 (2) 07:36 09:41 (1) 17:07	08:26 16:30
5	05:26 21:59 157	08:51 (5) 06:06 11:28 (5) 21:22 125	07:20 (3) 06:55 11:04 (5) 20:18	07:44 19:09 81	08:17 (2) 07:38 09:40 (1) 17:05	08:27 16:30
6	05:27 21:58 156	08:51 (5) 06:07 11:27 (5) 21:20 123	07:18 (3) 06:57 11:01 (5) 20:16	07:46 19:07 79	08:18 (2) 07:40 09:40 (1) 17:03	08:29 16:29
7	05:28 21:58 156	08:51 (5) 06:09 11:27 (5) 21:19 120	07:18 (3) 06:59 10:59 (5) 20:14	07:48 19:04 79	08:18 (2) 07:42 09:40 (1) 17:02	08:30 16:29
8	05:29 21:57 155	08:52 (5) 06:10 11:27 (5) 21:17 119	07:16 (3) 07:00 10:56 (5) 20:11	07:49 19:02 77	08:19 (2) 07:44 09:40 (1) 17:00	08:31 16:29
9	05:30 21:57 154	08:53 (5) 06:12 11:27 (5) 21:15 116	07:16 (3) 07:02 10:54 (5) 20:09	07:51 19:00 73	08:20 (2) 07:45 09:39 (1) 16:58	08:32 16:28
10	05:31 21:56 153	08:54 (5) 06:13 11:27 (5) 21:13 113	07:14 (3) 07:03 10:51 (5) 20:07	07:53 18:58 68	08:22 (2) 07:47 09:38 (1) 16:57	08:33 16:28
11	05:32 21:55 152	08:55 (5) 06:15 11:27 (5) 21:11 108	07:14 (3) 07:05 10:48 (5) 20:04	07:54 18:55 63	08:24 (2) 07:49 09:38 (1) 16:55	08:34 16:28
12	05:33 21:54 152	08:55 (5) 06:17 11:27 (5) 21:09 102	07:13 (3) 07:07 10:44 (5) 20:02	07:56 18:53 55	08:27 (2) 07:51 09:37 (1) 16:54	08:35 16:28
13	05:34 21:53 151	08:56 (5) 06:18 11:27 (5) 21:07 95	07:13 (3) 07:08 10:40 (5) 20:00	07:58 18:51 45	08:50 (1) 07:52 09:35 (1) 16:52	08:36 16:28
14	05:35 21:52 149	08:57 (5) 06:20 11:26 (5) 21:05 88	07:12 (3) 07:10 10:35 (5) 19:57	07:59 18:49 44	08:51 (1) 07:54 09:35 (1) 16:51	08:37 16:28
15	05:36 21:52 148	08:58 (5) 06:21 11:26 (5) 21:03 76	07:12 (3) 07:11 10:29 (5) 19:55	08:01 18:47 42	08:52 (1) 07:56 09:34 (1) 16:49	08:38 16:28
16	05:37 21:50 146	08:59 (5) 06:23 11:25 (5) 21:01 60	07:12 (3) 07:13 10:20 (5) 19:53	08:03 18:44 40	08:53 (1) 07:58 09:33 (1) 16:48	08:39 16:28
17	05:39 21:49 146	08:59 (5) 06:25 11:25 (5) 20:59 38	07:12 (3) 07:15 10:13 (3) 19:50	08:05 18:42 36	08:55 (1) 07:59 09:31 (1) 16:46	08:40 16:28
18	05:40 21:48 144	09:01 (5) 06:26 11:25 (5) 20:57 39	07:11 (3) 07:16 10:11 (3) 19:48	08:06 18:40 33	08:56 (1) 08:01 09:29 (1) 16:45	08:41 16:28
19	05:41 21:47 142	09:02 (5) 06:28 11:24 (5) 20:55 38	07:12 (3) 07:18 10:10 (3) 19:46	08:08 18:38 29	08:58 (1) 08:03 09:27 (1) 16:44	08:41 16:29
20	05:42 21:46 140	09:03 (5) 06:29 11:23 (5) 20:53 38	07:11 (3) 07:20 10:09 (1) 19:43	08:10 18:36 24	09:01 (1) 08:04 09:25 (1) 16:43	08:42 16:29
21	05:44 21:45 138	09:04 (5) 06:31 11:22 (5) 20:51 37	07:12 (3) 07:21 10:09 (1) 19:41	08:12 18:34 18	09:04 (1) 08:06 09:22 (1) 16:41	08:43 16:29
22	05:45 21:44 137	09:05 (5) 06:33 11:22 (5) 20:49 36	07:12 (3) 07:23 10:02 (1) 19:39	08:13 18:32 9	09:08 (1) 08:08 09:17 (1) 16:40	08:43 16:30
23	05:46 21:42 135	09:06 (5) 06:34 11:21 (5) 20:47 35	07:13 (3) 07:24 10:01 (1) 19:37	08:15 18:30 32	09:09 (1) 08:09 09:31 (1) 16:39	08:44 16:30
24	05:48 21:41 133	09:07 (5) 06:36 11:20 (5) 20:45 33	07:14 (3) 07:26 10:00 (1) 19:34	08:17 18:28 44	08:30 (2) 08:17 09:34 (1) 16:38	08:44 16:31
25	05:49 21:40 132	09:07 (5) 06:38 11:19 (5) 20:43 31	07:14 (3) 07:28 10:00 (1) 19:32	08:19 18:26 53	08:27 (2) 07:19 09:36 (1) 17:26	08:44 16:32
26	05:51 21:38 130	09:09 (5) 06:39 11:19 (5) 20:40 29	07:16 (3) 07:29 10:00 (1) 19:30	08:24 (2) 07:20 09:36 (1) 17:24	07:20 16:36	08:45 16:32
27	05:52 21:37 127	09:10 (5) 06:41 11:17 (5) 20:38 26	07:17 (3) 07:31 10:00 (1) 19:27	08:22 (2) 07:22 09:38 (1) 17:22	07:22 16:35	08:45 16:33
28	05:53 21:35 125	09:11 (5) 06:42 11:16 (5) 20:36 22	07:19 (3) 07:33 10:00 (1) 19:25	08:21 (2) 07:24 09:39 (1) 17:20	08:17 16:34	08:45 16:34
29	05:55 21:34 123	09:12 (5) 06:44 11:15 (5) 20:34 18	07:20 (3) 07:34 10:00 (1) 19:23	08:20 (2) 07:26 09:39 (1) 17:18	07:26 16:34	08:45 16:35
30	05:56 21:32 120	09:13 (5) 06:46 11:13 (5) 20:32 13	07:23 (3) 07:36 10:00 (1) 19:20	08:19 (2) 07:27 09:40 (1) 17:16	07:27 16:33	08:46 16:36
31	05:58 21:31 118	09:15 (5) 06:47 11:13 (5) 20:29	07:36 (3) 19:20	07:29 17:14	07:29 16:37	08:46 16:37
Potential sun hours	501	453	381	332	267	244
Total, worst case	4456	2165	544	1216		
Sun reduction	0,38	0,42	0,35	0,31		
Oper. time red.	0,97	0,97	0,97	0,97		
Wind dir. red.	0,62	0,63	0,58	0,58		
Total reduction	0,23	0,25	0,20	0,17		
Total, real	1031	552	107	211		

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: D - Shadow Receptor: 40,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (685)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum

551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January		February		March		April		May		June	
1	08:46		10:56 (1)	08:19	10:30 (1)	07:26	08:15 (2)	07:16	17:45 (5)	06:11	07:10 (3)	05:26
	16:38	56	11:52 (1)	17:25	12:22 (1)	18:17	12:18 (1)	20:10	18:51 (5)	21:01	19:17 (5)	21:47
2	08:46		10:56 (1)	08:17	10:30 (1)	07:24	08:15 (2)	07:13	17:44 (5)	06:09	07:09 (3)	05:25
	16:39	57	11:53 (1)	17:27	12:22 (1)	18:19	12:17 (1)	20:12	18:52 (5)	21:03	19:18 (5)	21:48
3	08:45		10:54 (1)	08:16	10:30 (1)	07:22	08:15 (2)	07:11	17:42 (5)	06:07	07:07 (3)	05:24
	16:40	59	11:53 (1)	17:29	12:23 (1)	18:20	12:16 (1)	20:14	18:54 (5)	21:04	19:17 (5)	21:49
4	08:45		10:53 (1)	08:14	10:29 (1)	07:19	08:15 (2)	07:09	17:40 (5)	06:05	07:05 (3)	05:24
	16:41	62	11:55 (1)	17:31	12:23 (1)	18:22	12:14 (1)	20:16	18:55 (5)	21:06	19:17 (5)	21:50
5	08:45		10:52 (1)	08:13	10:29 (1)	07:17	08:14 (2)	07:06	17:39 (5)	06:04	07:03 (3)	05:23
	16:42	63	11:55 (1)	17:33	12:24 (1)	18:24	12:12 (1)	20:17	18:57 (5)	21:08	19:17 (5)	21:51
6	08:45		10:51 (1)	08:11	10:28 (1)	07:15	08:15 (2)	07:04	17:38 (5)	06:02	07:02 (3)	05:22
	16:44	66	11:57 (1)	17:35	12:24 (1)	18:26	12:10 (1)	20:19	18:59 (5)	21:09	19:18 (5)	21:52
7	08:44		10:49 (1)	08:09	10:29 (1)	07:13	08:15 (2)	07:02	17:37 (5)	06:00	07:01 (3)	05:22
	16:45	69	11:58 (1)	17:36	12:25 (1)	18:27	12:08 (1)	20:21	19:01 (5)	21:11	19:17 (5)	21:53
8	08:44		10:48 (1)	08:07	10:28 (1)	07:10	08:15 (2)	07:00	17:35 (5)	05:58	06:59 (3)	05:21
	16:46	71	11:59 (1)	17:38	12:25 (1)	18:29	12:05 (1)	20:22	19:02 (5)	21:13	19:17 (5)	21:54
9	08:43		10:47 (1)	08:06	10:28 (1)	07:08	08:16 (2)	06:57	17:34 (5)	05:56	06:58 (3)	05:21
	16:47	73	12:00 (1)	17:40	12:25 (1)	18:31	12:02 (1)	20:24	19:04 (5)	21:14	19:17 (5)	21:54
10	08:43		10:46 (1)	08:04	10:27 (1)	07:06	08:17 (2)	06:55	17:33 (5)	05:55	06:56 (3)	05:20
	16:49	76	12:02 (1)	17:42	12:25 (1)	18:33	11:59 (1)	20:26	19:05 (5)	21:16	19:17 (5)	21:55
11	08:42		10:45 (1)	08:02	10:27 (1)	07:04	08:18 (2)	06:53	17:32 (5)	05:53	06:55 (3)	05:20
	16:50	78	12:03 (1)	17:44	12:25 (1)	18:34	11:55 (1)	20:27	19:07 (5)	21:17	19:17 (5)	21:56
12	08:42		10:44 (1)	08:00	08:42 (2)	07:01	08:18 (2)	06:51	17:31 (5)	05:51	06:53 (3)	05:20
	16:52	80	12:04 (1)	17:46	12:25 (1)	18:36	11:50 (1)	20:29	19:09 (5)	21:19	19:17 (5)	21:57
13	08:41		10:43 (1)	07:58	08:39 (2)	06:59	08:19 (2)	06:49	17:29 (5)	05:50	06:52 (3)	05:19
	16:53	82	12:05 (1)	17:48	12:25 (1)	18:38	11:44 (1)	20:31	19:09 (5)	21:21	19:17 (5)	21:57
14	08:40		10:42 (1)	07:57	08:36 (2)	06:57	08:21 (2)	06:46	17:29 (5)	05:48	06:50 (3)	05:19
	16:55	84	12:06 (1)	17:49	12:26 (1)	18:40	11:37 (1)	20:32	19:10 (5)	21:22	19:16 (5)	21:58
15	08:39		10:41 (1)	07:55	08:34 (2)	06:55	08:22 (2)	06:44	17:28 (5)	05:47	06:49 (3)	05:19
	16:56	86	12:07 (1)	17:51	12:26 (1)	18:41	11:30 (1)	20:34	19:11 (5)	21:24	19:16 (5)	21:58
16	08:38		10:40 (1)	07:53	08:32 (2)	06:52	08:24 (2)	06:42	17:28 (5)	05:45	06:47 (3)	05:19
	16:58	88	12:08 (1)	17:53	12:26 (1)	18:43	11:23 (1)	20:36	19:12 (5)	21:25	19:16 (5)	21:59
17	08:38		10:40 (1)	07:51	08:30 (2)	06:50	08:28 (2)	06:40	17:27 (5)	05:44	06:47 (3)	05:19
	16:59	89	12:09 (1)	17:55	12:26 (1)	18:45	11:17 (1)	20:38	19:13 (5)	21:27	19:16 (5)	21:59
18	08:37		10:39 (1)	07:49	08:28 (2)	06:48	10:54 (1)	06:38	17:27 (5)	05:42	06:46 (3)	05:19
	17:01	91	12:10 (1)	17:57	12:25 (1)	18:47	11:08 (1)	20:39	19:14 (5)	21:28	19:16 (5)	22:00
19	08:36		10:38 (1)	07:47	08:26 (2)	06:45		06:35	17:27 (5)	05:41	06:44 (3)	05:19
	17:03	94	12:12 (1)	17:59	12:25 (1)	18:48		20:41	19:14 (5)	21:30	19:15 (5)	22:00
20	08:35		10:38 (1)	07:45	08:24 (2)	06:43		06:33	17:26 (5)	05:39	06:44 (3)	05:19
	17:04	95	12:13 (1)	18:00	12:25 (1)	18:50		20:43	19:15 (5)	21:31	19:15 (5)	22:00
21	08:34		10:36 (1)	07:43	08:23 (2)	06:41		06:31	17:26 (5)	05:38	06:43 (3)	05:19
	17:06	97	12:13 (1)	18:02	12:25 (1)	18:52		20:44	19:15 (5)	21:32	19:15 (5)	22:01
22	08:32		10:36 (1)	07:41	08:21 (2)	06:39		06:29	17:26 (5)	05:37	06:43 (3)	05:19
	17:08	98	12:14 (1)	18:04	12:25 (1)	18:53		20:46	19:16 (5)	21:34	19:15 (5)	22:01
23	08:31		10:36 (1)	07:39	08:19 (2)	06:36		06:27	17:26 (5)	05:36	06:42 (3)	05:19
	17:09	99	12:15 (1)	18:06	12:23 (1)	18:55		20:48	19:16 (5)	21:35	19:15 (5)	22:01
24	08:30		10:34 (1)	07:37	08:18 (2)	06:34		06:25	17:26 (5)	05:34	06:42 (3)	05:20
	17:11	102	12:16 (1)	18:08	12:23 (1)	18:57	20	17:30 (5)	19:16 (5)	21:37	19:15 (5)	22:01
25	08:29		10:34 (1)	07:34	08:18 (2)	06:32		06:23	17:26 (5)	05:33	06:41 (3)	05:20
	17:13	103	12:17 (1)	18:10	12:22 (1)	18:59	30	17:35 (5)	19:17 (5)	21:38	19:14 (5)	22:01
26	08:28		10:34 (1)	07:32	08:17 (2)	06:29		06:21	17:26 (5)	05:32	06:41 (3)	05:20
	17:15	104	12:18 (1)	18:11	12:22 (1)	19:00	38	17:39 (5)	19:17 (5)	21:39	19:14 (5)	22:01
27	08:26		10:33 (1)	07:30	08:17 (2)	06:27		06:19	17:26 (5)	05:31	06:40 (3)	05:21
	17:16	106	12:19 (1)	18:13	12:21 (1)	19:02	44	17:42 (5)	19:17 (5)	21:41	19:14 (5)	22:01
28	08:25		10:33 (1)	07:28	08:15 (2)	06:25		06:17	07:21 (3)	05:30	06:40 (3)	05:21
	17:18	107	12:20 (1)	18:15	12:19 (1)	19:04	50	17:44 (5)	19:17 (5)	21:42	19:14 (5)	22:01
29	08:23		10:32 (1)			07:22		06:15	07:17 (3)	05:29	06:40 (3)	05:22
	17:20	108	12:20 (1)			20:05	54	18:46 (5)	19:17 (5)	21:43	19:13 (5)	22:01
30	08:22		10:31 (1)			07:20		06:13	07:13 (3)	05:28	06:39 (3)	05:22
	17:22	109	12:20 (1)			20:07	58	18:48 (5)	19:17 (5)	21:44	19:13 (5)	22:01
31	08:20		10:31 (1)			07:18		06:11	05:27	06:39 (3)		
	17:24	111	12:22 (1)			20:09	62	18:49 (5)	21:45	171	19:13 (5)	
Potential sun hours	259		278			367		416	485		498	
Total, worst case	2663		3944			2455		3002	5235		4924	
Sun reduction	0,18		0,27			0,30		0,38	0,42		0,38	
Oper. time red.	0,97		0,97			0,97		0,97	0,97		0,97	
Wind dir. red.	0,62		0,61			0,61		0,64	0,65		0,65	
Total reduction	0,11		0,16			0,18		0,23	0,26		0,24	
Total, real	280		619			438		697	1373		1163	

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: D - Shadow Receptor: 40,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (685)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
Idle start wind speed: Cut in wind speed from power curve

	July		August		September		October		November		December	
1	05:23		06:43 (3)	05:59	07:04 (3)	06:49	17:31 (5)	07:38	08:58 (2)	07:31	09:57 (1)	08:22
	22:01	164	19:16 (5)	21:29	19:27 (5)	20:27	19:06 (5)	19:18	12:27 (1)	17:12	11:55 (1)	16:32
2	05:24		06:43 (3)	06:01	07:05 (3)	06:50	17:31 (5)	07:39	08:56 (2)	07:33	09:57 (1)	08:23
	22:00	164	19:16 (5)	21:27	19:27 (5)	20:25	19:03 (5)	19:16	12:31 (1)	17:10	11:55 (1)	16:31
3	05:25		06:44 (3)	06:02	07:07 (3)	06:52	17:32 (5)	07:41	08:55 (2)	07:35	09:58 (1)	08:25
	22:00	165	19:17 (5)	21:26	19:27 (5)	20:23	19:02 (5)	19:13	12:35 (1)	17:09	11:55 (1)	16:31
4	05:25		06:44 (3)	06:04	07:08 (3)	06:54	17:32 (5)	07:43	08:54 (2)	07:36	09:58 (1)	08:26
	21:59	165	19:17 (5)	21:24	19:27 (5)	20:20	18:59 (5)	19:11	12:38 (1)	17:07	11:55 (1)	16:30
5	05:26		06:45 (3)	06:06	07:10 (3)	06:55	17:33 (5)	07:44	08:52 (2)	07:38	09:58 (1)	08:27
	21:59	166	19:18 (5)	21:22	19:27 (5)	20:18	18:57 (5)	19:09	12:40 (1)	17:05	11:53 (1)	16:30
6	05:27		06:44 (3)	06:07	07:10 (3)	06:57	17:34 (5)	07:46	08:51 (2)	07:40	09:58 (1)	08:29
	21:58	167	19:18 (5)	21:20	19:27 (5)	20:16	18:55 (5)	19:07	12:43 (1)	17:03	11:53 (1)	16:29
7	05:28		06:45 (3)	06:09	07:12 (3)	06:59	17:34 (5)	07:48	08:51 (2)	07:42	09:59 (1)	08:30
	21:58	167	19:18 (5)	21:19	19:27 (5)	20:14	18:52 (5)	19:04	12:45 (1)	17:02	11:53 (1)	16:29
8	05:29		06:45 (3)	06:10	07:13 (3)	07:00	17:35 (5)	07:49	08:50 (2)	07:44	10:00 (1)	08:31
	21:57	169	19:19 (5)	21:17	19:26 (5)	20:11	18:51 (5)	19:02	12:46 (1)	17:00	11:53 (1)	16:29
9	05:30		06:46 (3)	06:12	07:15 (3)	07:02	17:36 (5)	07:51	08:49 (2)	07:45	10:01 (1)	08:32
	21:57	168	19:19 (5)	21:15	19:27 (5)	20:09	18:48 (5)	19:00	12:47 (1)	16:58	11:53 (1)	16:28
10	05:31		06:46 (3)	06:13	07:16 (3)	07:03	17:37 (5)	07:53	08:49 (2)	07:47	10:01 (1)	08:33
	21:56	169	19:20 (5)	21:13	19:26 (5)	20:07	18:46 (5)	18:58	12:49 (1)	16:57	11:53 (1)	16:28
11	05:32		06:47 (3)	06:15	07:18 (3)	07:05	17:37 (5)	07:54	08:49 (2)	07:49	10:02 (1)	08:34
	21:55	169	19:20 (5)	21:11	19:26 (5)	20:04	18:43 (5)	18:55	12:50 (1)	16:55	11:52 (1)	16:28
12	05:33		06:47 (3)	06:17	07:20 (3)	07:07	17:39 (5)	07:56	08:49 (2)	07:51	10:03 (1)	08:35
	21:54	170	19:21 (5)	21:09	19:25 (5)	20:02	18:41 (5)	18:53	12:51 (1)	16:54	11:52 (1)	16:28
13	05:34		06:48 (3)	06:18	07:22 (3)	07:08	17:40 (5)	07:58	08:48 (2)	07:52	10:04 (1)	08:36
	21:53	171	19:21 (5)	21:07	19:26 (5)	20:00	18:38 (5)	18:51	12:52 (1)	16:52	11:52 (1)	16:28
14	05:35		06:48 (3)	06:20	07:25 (3)	07:10	17:42 (5)	07:59	08:49 (2)	07:54	10:05 (1)	08:37
	21:52	172	19:22 (5)	21:05	19:25 (5)	19:57	18:36 (5)	18:49	12:52 (1)	16:51	11:52 (1)	16:28
15	05:36		06:48 (3)	06:21	07:30 (3)	07:11	17:44 (5)	08:01	08:49 (2)	07:56	10:06 (1)	08:38
	21:51	172	19:22 (5)	21:03	19:25 (5)	19:55	18:34 (5)	18:47	12:53 (1)	16:49	11:51 (1)	16:28
16	05:37		06:49 (3)	06:23	17:32 (5)	07:13	17:45 (5)	08:03	08:49 (2)	07:58	10:07 (1)	08:39
	21:50	172	19:22 (5)	21:01	19:24 (5)	19:53	18:31 (5)	18:44	12:54 (1)	16:48	11:51 (1)	16:28
17	05:39		06:49 (3)	06:25	17:32 (5)	07:15	17:48 (5)	08:05	08:49 (2)	07:59	10:07 (1)	08:40
	21:49	174	19:23 (5)	20:59	19:23 (5)	19:50	18:28 (5)	18:42	12:54 (1)	16:46	11:50 (1)	16:28
18	05:40		06:51 (3)	06:26	17:31 (5)	07:16	17:51 (5)	08:06	08:50 (2)	08:01	10:08 (1)	08:41
	21:48	174	19:24 (5)	20:57	19:22 (5)	19:48	18:23 (5)	18:40	12:54 (1)	16:45	11:50 (1)	16:28
19	05:41		06:51 (3)	06:28	17:31 (5)	07:18	17:56 (5)	08:08	08:51 (2)	08:03	10:10 (1)	08:41
	21:47	175	19:24 (5)	20:55	19:22 (5)	19:46	18:19 (5)	18:38	12:55 (1)	16:44	11:49 (1)	16:29
20	05:42		06:51 (3)	06:29	17:30 (5)	07:20		08:10	08:52 (2)	08:04	10:11 (1)	08:42
	21:46	175	19:24 (5)	20:53	19:21 (5)	19:43		18:36	12:55 (1)	16:43	11:49 (1)	16:29
21	05:44		06:52 (3)	06:31	17:31 (5)	07:21		08:12	08:53 (2)	08:06	10:12 (1)	08:43
	21:45	175	19:24 (5)	20:51	19:20 (5)	19:41	18:34	163	12:55 (1)	16:41	11:49 (1)	16:29
22	05:45		06:53 (3)	06:33	17:30 (5)	07:23		08:13	08:55 (2)	08:08	10:14 (1)	08:43
	21:44	175	19:25 (5)	20:49	19:19 (5)	19:39	18:32	162	12:56 (1)	16:40	11:49 (1)	16:30
23	05:46		06:54 (3)	06:34	17:30 (5)	07:24		08:15	08:57 (2)	08:09	10:14 (1)	08:44
	21:42	175	19:25 (5)	20:47	19:19 (5)	19:36	18:30	159	12:56 (1)	16:39	11:48 (1)	16:30
24	05:48		06:54 (3)	06:36	17:29 (5)	07:26		08:17	08:58 (2)	08:11	10:16 (1)	08:44
	21:41	175	19:25 (5)	20:45	19:17 (5)	19:34	18:28	156	12:55 (1)	16:38	11:47 (1)	16:31
25	05:49		06:55 (3)	06:38	17:30 (5)	07:28		07:19	08:00 (2)	08:13	10:18 (1)	08:44
	21:40	175	19:25 (5)	20:43	19:16 (5)	19:32	17:26	153	11:55 (1)	16:37	11:47 (1)	16:32
26	05:51		06:57 (3)	06:39	17:30 (5)	07:29	09:12 (2)	07:20	08:02 (2)	08:14	10:19 (1)	08:45
	21:38	175	19:26 (5)	20:40	19:16 (5)	19:30	11:57 (1)	17:24	11:55 (1)	16:36	11:47 (1)	16:32
27	05:52		06:58 (3)	06:41	17:30 (5)	07:31	09:07 (2)	07:22	08:04 (2)	08:16	10:20 (1)	08:45
	21:37	174	19:26 (5)	20:38	19:14 (5)	19:27	12:03 (1)	17:22	11:55 (1)	16:35	11:46 (1)	16:33
28	05:53		06:58 (3)	06:42	17:30 (5)	07:33	09:04 (2)	07:24	08:06 (2)	08:17	10:22 (1)	08:45
	21:35	174	19:26 (5)	20:36	19:13 (5)	19:25	12:09 (1)	17:20	11:55 (1)	16:34	11:46 (1)	16:34
29	05:55		07:00 (3)	06:44	17:30 (5)	07:34	09:01 (2)	07:26	08:09 (2)	08:19	10:24 (1)	08:45
	21:34	173	19:27 (5)	20:34	19:11 (5)	19:23	12:14 (1)	17:18	11:55 (1)	16:34	11:46 (1)	16:35
30	05:56		07:01 (3)	06:46	17:30 (5)	07:36	08:59 (2)	07:27	08:13 (2)	08:20	10:25 (1)	08:46
	21:32	173	19:27 (5)	20:32	19:10 (5)	19:20	12:21 (1)	17:16	11:55 (1)	16:33	11:45 (1)	16:36
31	05:58		07:03 (3)	06:47	17:30 (5)			07:29	09:57 (1)			08:46
	21:31	171	19:27 (5)	20:29	19:07 (5)			17:14	11:55 (1)			16:37
Potential sun hours	501		453		381		332		267		244	
Total, worst case	5303		4029		1583		4640		3082		1691	
Sun reduction	0,38		0,42		0,35		0,31		0,21		0,17	
Oper. time red.	0,97		0,97		0,97		0,97		0,97		0,97	
Wind dir. red.	0,65		0,64		0,63		0,61		0,62		0,62	
Total reduction	0,24		0,26		0,21		0,18		0,12		0,10	
Total, real	1268		1041		339		842		385		168	

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
 Beneluxweg 125 Postbus 40
 NL-4900 AA OOSTERHOUT
 0513 634045
 Koen Wilmer / koen.wilmer@anteagroup.com
 Calculated:
 23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: E - Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (686)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46	08:19	07:26	07:16	07:51 (1)	06:11
	16:38	17:25	18:17	20:10	08:31 (1)	21:01
2	08:46	08:17	07:24	07:13	07:51 (1)	06:09
	16:39	17:27	18:19	20:12	08:31 (1)	21:03
3	08:45	08:16	07:22	07:11	07:51 (1)	06:07
	16:40	17:29	18:20	20:14	08:31 (1)	21:04
4	08:45	08:14	07:19	07:09	07:50 (1)	06:05
	16:41	17:31	18:22	20:16	08:30 (1)	21:06
5	08:45	08:13	07:17	07:06	07:51 (1)	06:04
	16:42	17:33	18:24	20:17	08:29 (1)	21:08
6	08:45	08:11	07:15	07:04	07:51 (1)	06:02
	16:44	17:35	18:26	20:19	08:29 (1)	21:09
7	08:44	08:09	07:13	07:02	07:52 (1)	06:00
	16:45	17:36	18:27	20:21	08:28 (1)	21:11
8	08:44	08:08	07:11	07:00	07:52 (1)	05:58
	16:46	17:38	18:29	20:22	08:26 (1)	21:13
9	08:43	08:06	07:08	06:57	07:53 (1)	05:57
	16:47	17:40	18:31	20:24	08:25 (1)	21:14
10	08:43	08:04	07:06	06:55	07:54 (1)	05:55
	16:49	17:42	18:33	20:26	08:24 (1)	21:16
11	08:42	08:02	07:04	06:53	07:55 (1)	05:53
	16:50	17:44	18:34	20:27	08:22 (1)	21:17
12	08:42	08:00	07:01	06:51	07:56 (1)	05:51
	16:52	17:46	18:36	20:29	08:20 (1)	21:19
13	08:41	07:58	06:59	06:49	07:57 (1)	05:50
	16:53	17:48	18:38	20:31	08:17 (1)	21:21
14	08:40	07:57	06:57	06:46	07:59 (1)	05:48
	16:55	17:49	18:40	20:32	08:15 (1)	21:22
15	08:39	07:55	06:55	06:44	08:02 (1)	05:47
	16:56	17:51	18:41	20:34	08:11 (1)	21:24
16	08:39	07:53	06:52	06:42		05:45
	16:58	17:53	18:43	20:36		21:25
17	08:38	07:51	06:50	06:40		05:44
	16:59	17:55	18:45	20:38		21:27
18	08:37	07:49	06:48	06:38		05:42
	17:01	17:57	18:47	20:39		21:28
19	08:36	07:47	06:46	07:08 (2)	06:36	05:41
	17:03	17:59	18:48	07:15 (2)	20:41	21:30
20	08:35	07:45	06:43	07:06 (2)	06:33	05:39
	17:04	18:00	18:50	07:17 (2)	20:43	21:31
21	08:34	07:43	06:41	07:03 (2)	06:31	05:38
	17:06	18:02	18:52	07:19 (1)	20:44	21:33
22	08:32	07:41	06:39	07:01 (2)	06:29	06:53 (3)
	17:08	18:04	18:53	07:23 (1)	20:46	05:37
23	08:31	07:39	06:36	06:59 (2)	06:27	06:59 (3)
	17:09	18:06	18:55	07:25 (1)	20:48	05:36
24	08:30	07:37	06:34	06:57 (2)	06:25	07:02 (3)
	17:11	18:08	18:57	07:27 (1)	20:49	05:34
25	08:29	07:34	06:32	06:55 (2)	06:23	07:03 (3)
	17:13	18:10	18:59	07:27 (1)	20:51	05:33
26	08:28	07:32	06:29	06:55 (2)	06:21	07:04 (3)
	17:15	18:11	19:00	07:28 (1)	20:53	05:32
27	08:26	07:30	06:27	06:55 (2)	06:19	06:45 (3)
	17:16	18:13	19:02	07:29 (1)	20:54	05:31
28	08:25	07:28	06:25	06:54 (1)	06:17	07:06 (3)
	17:18	18:15	19:04	07:30 (1)	20:56	05:30
29	08:23		07:22	07:53 (1)	06:15	07:06 (3)
	17:20		20:05	07:53 (1)	06:15	06:39 (3)
30	08:22		07:20	07:53 (1)	06:13	05:29
	17:22		20:07	08:31 (1)	20:59	07:07 (3)
31	08:21		07:18	07:52 (1)		05:27
	17:24		20:09	08:30 (1)		06:22 (5)
Potential sun hours	260	278	367	416	485	498
Total, worst case			360	637	1090	1953
Sun reduction			0,30	0,38	0,42	0,38
Oper. time red.			0,97	0,97	0,97	0,97
Wind dir. red.			0,62	0,63	0,67	0,68
Total reduction			0,18	0,23	0,27	0,25
Total, real			66	147	298	483

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: E - Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (686)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July	August	September	October	November	December
1	05:23 22:01 66	06:24 (5) 05:59 07:30 (5) 21:29	06:52 (3) 06:49 07:13 (3) 20:27	07:54 (1) 07:38 08:21 (1) 19:18	07:31 17:12	08:22 16:32
2	05:24 22:00 65	06:24 (5) 06:01 07:29 (5) 21:27	06:52 (3) 06:51 07:14 (3) 20:25	07:52 (1) 07:39 08:22 (1) 19:16	07:33 17:10	08:23 16:31
3	05:25 22:00 64	06:25 (5) 06:03 07:29 (5) 21:26	06:51 (3) 06:52 07:15 (3) 20:23	07:51 (1) 07:41 08:23 (1) 19:13	07:35 17:09	08:25 16:31
4	05:25 21:59 64	06:26 (5) 06:04 07:30 (5) 21:24	06:49 (3) 06:54 07:15 (3) 20:20	07:50 (1) 07:43 08:24 (1) 19:11	07:36 17:07	08:26 16:30
5	05:26 21:59 64	06:26 (5) 06:06 07:30 (5) 21:22	06:49 (3) 06:55 07:16 (3) 20:18	07:48 (1) 07:44 08:24 (1) 19:09	07:38 17:05	08:27 16:30
6	05:27 21:58 63	06:26 (5) 06:07 07:29 (5) 21:20	06:48 (3) 06:57 07:16 (3) 20:16	07:47 (1) 07:46 08:25 (1) 19:07	07:40 17:03	08:29 16:29
7	05:28 21:58 62	06:27 (5) 06:09 07:29 (5) 21:19	06:48 (3) 06:59 07:17 (3) 20:14	07:46 (1) 07:48 08:24 (1) 19:04	07:42 17:02	08:30 16:29
8	05:29 21:57 62	06:27 (5) 06:10 07:29 (5) 21:17	06:47 (3) 07:00 07:16 (3) 20:11	07:46 (1) 07:49 08:25 (1) 19:02	07:44 17:00	08:31 16:29
9	05:30 21:57 60	06:28 (5) 06:12 07:28 (5) 21:15	06:47 (3) 07:02 07:17 (3) 20:09	07:44 (1) 07:51 08:24 (1) 19:00	07:45 16:58	08:32 16:28
10	05:31 21:56 60	06:28 (5) 06:13 07:28 (5) 21:13	06:47 (3) 07:03 07:16 (3) 20:07	07:44 (1) 07:53 08:24 (1) 18:58	07:47 16:57	08:33 16:28
11	05:32 21:55 59	06:29 (5) 06:15 07:28 (5) 21:11	06:47 (3) 07:05 07:17 (3) 20:04	07:44 (1) 07:54 08:23 (1) 18:55	07:49 16:55	08:34 16:28
12	05:33 21:54 58	06:30 (5) 06:17 07:28 (5) 21:09	06:46 (3) 07:07 07:16 (3) 20:02	07:44 (1) 07:56 08:23 (1) 18:53	07:51 16:54	08:35 16:28
13	05:34 21:53 57	06:30 (5) 06:18 07:27 (5) 21:07	06:47 (3) 07:08 07:16 (3) 20:00	07:44 (1) 07:58 08:22 (1) 18:51	07:52 16:52	08:36 16:28
14	05:35 21:52 56	06:31 (5) 06:20 07:27 (5) 21:05	06:47 (3) 07:10 07:14 (3) 19:57	07:44 (1) 07:59 08:21 (1) 18:49	07:54 16:51	08:37 16:28
15	05:36 21:52 54	06:32 (5) 06:21 07:26 (5) 21:03	06:49 (3) 07:11 07:14 (3) 19:55	07:44 (1) 08:01 08:20 (1) 18:47	07:56 16:49	08:38 16:28
16	05:37 21:51 53	06:33 (5) 06:23 07:26 (5) 21:01	06:50 (3) 07:13 07:12 (3) 19:53	07:43 (2) 08:03 08:18 (1) 18:44	07:58 16:48	08:39 16:28
17	05:39 21:49 52	06:33 (5) 06:25 07:25 (5) 20:59	06:52 (3) 07:15 07:11 (3) 19:50	07:43 (2) 08:05 08:17 (1) 18:42	07:59 16:46	08:40 16:28
18	05:40 21:48 50	06:35 (5) 06:26 07:25 (5) 20:57	06:53 (3) 07:16 07:10 (3) 19:48	07:42 (2) 08:06 08:15 (1) 18:40	08:01 16:45	08:41 16:28
19	05:41 21:47 48	06:36 (5) 06:28 07:24 (5) 20:55	06:55 (3) 07:18 07:09 (3) 19:46	07:43 (2) 08:08 08:14 (1) 18:38	08:03 16:44	08:41 16:29
20	05:42 21:46 47	06:37 (5) 06:29 07:24 (5) 20:53	06:56 (3) 07:20 07:06 (3) 19:44	07:45 (2) 08:10 08:12 (1) 18:36	08:04 16:43	08:42 16:29
21	05:44 21:45 45	06:38 (5) 06:31 07:23 (5) 20:51	06:58 (3) 07:21 07:03 (3) 19:41	07:46 (2) 08:12 08:09 (1) 18:34	08:06 16:41	08:43 16:29
22	05:45 21:44 42	06:40 (5) 06:33 07:22 (5) 20:49	07:23 19:39	07:48 (2) 08:13 08:06 (1) 18:32	08:08 16:40	08:43 16:30
23	05:46 21:42 40	06:41 (5) 06:34 07:21 (5) 20:47	07:24 19:37	07:49 (2) 08:15 08:01 (2) 18:30	08:09 16:39	08:44 16:30
24	05:48 21:41 38	06:42 (5) 06:36 07:20 (5) 20:45	07:26 19:34	07:51 (2) 08:17 07:59 (2) 18:28	08:11 16:38	08:44 16:31
25	05:49 21:40 35	06:43 (5) 06:38 07:18 (5) 20:43	07:28 19:32	07:53 (2) 08:19 07:56 (2) 17:26	08:13 16:37	08:45 16:32
26	05:51 21:38 32	06:45 (5) 06:39 07:17 (5) 20:40	07:29 19:30	07:20 17:24	08:14 16:36	08:45 16:32
27	05:52 21:37 29	06:46 (5) 06:41 07:15 (5) 20:38	07:31 19:27	07:22 17:22	08:16 16:35	08:45 16:33
28	05:53 21:35 25	06:49 (5) 06:42 07:14 (5) 20:36	07:33 19:25	07:24 17:20	08:17 16:34	08:45 16:34
29	05:55 21:34 19	06:52 (5) 06:44 07:11 (5) 20:34	07:34 19:23	07:26 17:18	08:19 16:34	08:45 16:35
30	05:56 21:32 16	06:54 (3) 06:46 07:10 (3) 20:32	07:36 19:20	07:27 17:16	08:20 16:33	08:46 16:36
31	05:58 21:31 18	06:54 (3) 06:47 07:12 (3) 20:29	07:55 (1) 08:19 (1)	07:29 17:14	08:46 16:37	08:46 16:37
Potential sun hours	501	453	381	332	267	244
Total, worst case	1503	566	767			
Sun reduction	0,38	0,42	0,35			
Oper. time red.	0,97	0,97	0,97			
Wind dir. red.	0,68	0,65	0,62			
Total reduction	0,25	0,26	0,21			
Total, real	377	149	163			

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: F - Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (687)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	07:53 (2) 08:26 (1)	06:11 21:01
2	08:46 16:39	08:17 17:27	07:24 18:19	07:13 20:12	07:54 (2) 08:27 (1)	06:09 21:03
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	07:54 (1) 08:28 (1)	06:07 21:04
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	07:52 (1) 08:28 (1)	06:05 21:06
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	07:51 (1) 08:28 (1)	06:04 21:08
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	07:51 (1) 08:29 (1)	06:02 21:09
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	07:50 (1) 08:29 (1)	06:00 21:11
8	08:44 16:46	08:08 17:38	07:10 18:29	07:00 20:22	07:49 (1) 08:28 (1)	05:58 21:13
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	07:49 (1) 08:28 (1)	05:57 21:14
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	07:49 (1) 08:28 (1)	05:55 21:16
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	07:49 (1) 08:28 (1)	05:53 21:17
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	07:49 (1) 08:27 (1)	05:51 21:19
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	07:48 (1) 08:26 (1)	05:50 21:21
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	07:48 (1) 08:25 (1)	05:48 21:22
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	07:49 (1) 08:24 (1)	05:47 21:24
16	08:39 16:58	07:53 17:53	06:52 18:43	06:42 20:36	07:49 (1) 08:23 (1)	05:45 21:25
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	07:50 (1) 08:22 (1)	05:44 21:27
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	07:51 (1) 08:21 (1)	05:42 21:28
19	08:36 17:03	07:47 17:59	06:46 18:48	06:36 20:41	07:52 (1) 08:19 (1)	05:41 21:30
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	07:54 (1) 08:17 (1)	05:39 21:31
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	07:55 (1) 08:15 (1)	05:38 21:32
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	07:58 (1) 08:12 (1)	05:37 21:34
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 07:02 (2)	08:03 (1) 08:06 (1)	05:36 21:35
24	08:30 17:11	07:37 18:08	06:34 18:57	06:25 07:15 (2)	05:34 21:37	05:34 21:37
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 07:16 (2)	05:33 21:38	05:33 21:38
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 07:17 (2)	05:32 21:39	05:32 21:39
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 07:18 (2)	05:31 21:41	05:31 21:41
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 07:17 (1)	05:30 21:42	05:30 21:42
29	08:23 17:20	07:22 18:15	06:15 20:05	06:15 07:54 (2)	05:29 21:43	05:29 21:43
30	08:22 17:22	07:20 18:15	06:13 20:07	06:13 07:54 (2)	05:28 21:44	05:28 21:44
31	08:21 17:24	07:18 18:15	06:11 20:09	06:11 07:53 (2)	05:27 21:45	05:27 21:45
Potential sun hours	260	278	367	416	485	498
Total, worst case			200	737	627	
Sun reduction			0,30	0,38	0,42	
Oper. time red.			0,97	0,97	0,97	
Wind dir. red.			0,63	0,63	0,67	
Total reduction			0,18	0,23	0,27	
Total, real			37	169	170	

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

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

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: F - Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (687)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:23 22:01	05:59 21:29	06:41 (3) 07:09 (3)	06:49 20:27	07:48 (1) 08:27 (1)	07:31 17:12
2	05:24 22:00	06:01 21:27	06:41 (3) 07:09 (3)	06:50 20:25	07:47 (1) 08:26 (1)	17:12 17:10
3	05:25 22:00	06:03 21:26	06:41 (3) 07:08 (3)	06:52 20:23	07:47 (1) 08:26 (1)	17:10 17:09
4	05:25 21:59	06:04 21:24	06:41 (3) 07:07 (3)	06:54 20:20	07:47 (1) 08:26 (1)	17:09 17:07
5	05:26 21:59	06:06 21:22	06:42 (3) 07:07 (3)	06:55 20:18	07:46 (1) 08:25 (1)	17:07 17:05
6	05:27 21:58	06:07 21:20	06:42 (3) 07:06 (3)	06:57 20:16	07:47 (1) 08:25 (1)	17:05 17:03
7	05:28 21:58	06:09 21:19	06:43 (3) 07:06 (3)	06:59 20:14	07:46 (1) 08:23 (1)	17:03 17:02
8	05:29 21:57	06:10 21:17	06:44 (3) 07:04 (3)	07:00 20:11	07:47 (1) 08:23 (1)	17:02 17:00
9	05:30 21:57	06:12 21:15	06:45 (3) 07:03 (3)	07:02 20:09	07:47 (1) 08:21 (1)	17:00 16:58
10	05:31 21:56	06:13 21:13	06:46 (3) 07:01 (3)	07:03 20:07	07:47 (2) 08:20 (1)	16:58 16:57
11	05:32 21:55	06:15 21:11	06:49 (3) 06:59 (3)	07:05 20:04	07:45 (2) 08:18 (1)	16:57 16:55
12	05:33 21:54	06:17 21:09	07:07 20:02	07:07 20:02	07:56 18:53	16:55 16:54
13	05:34 21:53	06:18 21:07	07:08 20:00	07:08 20:00	07:58 18:51	16:54 16:52
14	05:35 21:52	06:20 21:05	07:10 19:57	07:10 19:57	07:59 18:49	16:52 16:51
15	05:36 21:52	06:21 21:03	07:11 19:55	07:11 19:55	08:01 18:47	16:51 16:49
16	05:37 21:50	06:23 21:01	07:13 19:53	07:13 19:53	08:03 18:44	16:49 16:48
17	05:39 21:49	06:25 20:59	07:15 19:50	07:15 19:50	08:05 18:42	16:48 16:46
18	05:40 21:48	06:26 20:57	07:16 19:48	07:16 19:48	08:06 18:40	16:46 16:45
19	05:41 21:47	06:28 20:55	07:18 19:46	07:18 19:46	08:08 18:38	16:45 16:44
20	05:42 21:46	06:29 20:53	07:20 19:44	07:20 19:44	08:10 18:36	16:44 16:43
21	05:44 21:45	06:31 20:51	07:21 19:41	07:21 19:41	08:12 18:34	16:43 16:41
22	05:45 21:44	06:33 20:49	07:23 19:39	07:23 19:39	08:13 18:32	16:41 16:40
23	05:46 21:42	06:34 20:47	07:24 19:37	07:24 19:37	08:15 18:30	16:40 16:39
24	05:48 21:41	06:36 20:45	07:26 19:34	07:26 19:34	08:17 18:28	16:39 16:38
25	05:49 21:40	06:38 20:43	07:28 19:32	07:28 19:32	08:19 18:26	16:38 16:37
26	05:51 21:38	06:39 20:40	07:29 19:30	07:29 19:30	08:20 18:24	16:37 16:36
27	05:52 21:37	06:41 20:38	07:31 19:27	07:31 19:27	08:22 18:22	16:36 16:35
28	05:53 21:35	06:42 20:36	07:33 19:25	07:33 19:25	08:24 18:20	16:35 16:34
29	05:55 21:34	06:44 20:34	07:34 19:23	07:34 19:23	08:26 18:18	16:34 16:34
30	05:56 21:32	06:46 20:32	07:36 19:20	07:36 19:20	08:28 18:16	16:34 16:33
31	05:58 21:31	06:47 20:29	07:38 19:17	07:38 19:17	08:30 18:14	16:33 16:33
Potential sun hours	501	453	381	332	267	244
Total, worst case	387	581	618			
Sun reduction	0,38	0,42	0,35			
Oper. time red.	0,97	0,97	0,97			
Wind dir. red.	0,67	0,64	0,63			
Total reduction	0,25	0,26	0,21			
Total, real	96	151	132			

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: G - Shadow Receptor: 3,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (688)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	07:54 (2) 08:32 (1)	05:26 21:01
2	08:46 16:39	08:17 17:27	07:24 18:19	07:13 20:12	07:55 (2) 08:33 (1)	05:25 21:03
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	07:55 (2) 08:34 (1)	05:25 21:04
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	07:55 (2) 08:34 (1)	05:24 21:06
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	07:55 (1) 08:35 (1)	05:23 21:08
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	07:54 (1) 08:36 (1)	05:22 21:09
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	07:53 (1) 08:36 (1)	05:22 21:11
8	08:44 16:46	08:08 17:38	07:10 18:29	07:00 20:22	07:52 (1) 08:36 (1)	05:21 21:13
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	07:51 (1) 08:36 (1)	05:21 21:14
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	07:51 (1) 08:36 (1)	05:20 21:16
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	07:51 (1) 08:36 (1)	05:20 21:17
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	07:51 (1) 08:36 (1)	05:20 21:19
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	07:49 (1) 08:35 (1)	05:19 21:21
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	07:50 (1) 08:34 (1)	05:19 21:22
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	07:50 (1) 08:34 (1)	05:19 21:24
16	08:39 16:58	07:53 17:53	06:52 18:43	06:42 20:36	07:50 (1) 08:33 (1)	05:19 21:25
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	07:50 (1) 08:32 (1)	05:19 21:27
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	07:51 (1) 08:32 (1)	05:19 21:28
19	08:36 17:03	07:47 17:59	06:45 18:48	06:36 20:41	07:51 (1) 08:31 (1)	05:19 21:30
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	07:52 (1) 08:30 (1)	05:19 21:31
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	07:52 (1) 08:28 (1)	05:19 21:32
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	07:53 (1) 08:27 (1)	05:19 21:34
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	07:54 (1) 08:25 (1)	05:19 21:35
24	08:30 17:11	07:37 18:08	06:34 18:57	06:25 20:49	07:55 (1) 08:23 (1)	05:20 21:37
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	07:57 (1) 08:21 (1)	05:20 21:38
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	07:59 (1) 08:19 (1)	05:21 21:39
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	08:02 (1) 08:15 (1)	05:21 21:41
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	05:30 21:42	05:21 21:43
29	08:23 17:20	07:22 20:05	06:15 20:58	06:15 20:58	05:29 21:43	05:22 22:01
30	08:22 17:22	07:20 20:07	06:13 20:59	06:13 20:59	05:28 21:44	05:23 22:01
31	08:21 17:24	07:18 20:09	06:11 20:59	06:11 20:59	05:27 21:45	05:23 22:01
Potential sun hours	260	278	367	416	485	498
Total, worst case			230	1027	713	435
Sun reduction			0,30	0,38	0,42	0,38
Oper. time red.			0,97	0,97	0,97	0,97
Wind dir. red.			0,62	0,63	0,67	0,67
Total reduction			0,18	0,23	0,27	0,25
Total, real			42	235	195	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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: G - Shadow Receptor: 3,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (688)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:23 22:01	06:40 (3) 06:55 (3)	05:59 21:29	06:37 (3) 07:04 (3)	06:49 20:27	07:50 (1) 08:35 (1)
2	05:24 22:00	06:39 (3) 06:55 (3)	06:01 21:27	06:38 (3) 07:04 (3)	06:50 20:25	07:49 (1) 08:34 (1)
3	05:25 22:00	06:39 (3) 06:56 (3)	06:02 21:26	06:39 (3) 07:02 (3)	06:52 20:23	07:49 (1) 08:34 (1)
4	05:27 21:59	06:38 (3) 06:57 (3)	06:07 21:24	06:43 (3) 07:01 (3)	06:57 20:20	07:49 (1) 08:33 (1)
5	05:26 21:59	06:39 (3) 06:58 (3)	06:06 21:22	06:41 (3) 07:00 (3)	06:55 20:18	07:49 (1) 08:32 (1)
6	05:27 21:58	06:38 (3) 06:58 (3)	06:07 21:20	06:43 (3) 06:57 (3)	06:57 20:16	07:50 (1) 08:32 (1)
7	05:28 21:58	06:38 (3) 06:59 (3)	06:09 21:19	06:46 (3) 06:55 (3)	06:59 20:14	07:50 (1) 08:30 (1)
8	05:29 21:57	06:37 (3) 07:00 (3)	06:10 21:17	07:00 20:11	07:00 20:11	07:50 (2) 08:29 (1)
9	05:30 21:57	06:37 (3) 07:00 (3)	06:12 21:15	07:02 20:09	07:51 20:09	07:45 16:58
10	05:31 21:56	06:37 (3) 07:01 (3)	06:13 21:13	07:03 20:07	07:53 18:58	16:58 16:57
11	05:32 21:55	06:37 (3) 07:02 (3)	06:15 21:11	07:05 20:04	07:54 18:55	16:58 16:55
12	05:33 21:54	06:36 (3) 07:02 (3)	06:17 21:09	07:07 20:02	07:56 18:53	16:58 16:54
13	05:34 21:53	06:36 (3) 07:03 (3)	06:18 21:07	07:08 20:00	07:58 18:51	16:58 16:52
14	05:35 21:52	06:36 (3) 07:03 (3)	06:20 21:05	07:10 19:57	07:59 18:49	16:58 16:51
15	05:36 21:52	06:36 (3) 07:04 (3)	06:21 21:03	07:11 19:55	08:01 18:47	16:58 16:49
16	05:37 21:50	06:35 (3) 07:04 (3)	06:23 21:01	08:07 (1) 19:53	08:03 18:44	16:58 16:48
17	05:39 21:49	06:35 (3) 07:04 (3)	06:25 20:59	08:05 (1) 19:50	08:05 18:42	16:59 16:46
18	05:40 21:48	06:36 (3) 07:05 (3)	06:26 20:57	08:02 (1) 19:48	08:06 18:40	16:46 16:45
19	05:41 21:47	06:35 (3) 07:05 (3)	06:28 20:55	08:01 (1) 19:46	08:08 18:38	16:45 16:44
20	05:42 21:46	06:35 (3) 07:06 (3)	06:29 20:53	07:59 (1) 19:44	08:10 18:36	16:44 16:43
21	05:44 21:45	06:35 (3) 07:06 (3)	06:31 20:51	07:58 (1) 19:41	08:12 18:34	16:43 16:41
22	05:45 21:44	06:35 (3) 07:06 (3)	06:33 20:49	07:56 (1) 19:39	08:13 18:32	16:43 16:40
23	05:46 21:42	06:35 (3) 07:06 (3)	06:34 20:47	07:55 (1) 19:37	08:15 18:30	16:40 16:39
24	05:48 21:41	06:35 (3) 07:06 (3)	06:36 20:45	07:55 (1) 19:34	08:17 18:28	16:39 16:38
25	05:49 21:40	06:35 (3) 07:06 (3)	06:38 20:43	07:53 (1) 19:32	08:19 17:26	16:38 16:37
26	05:51 21:38	06:35 (3) 07:06 (3)	06:39 20:40	07:53 (1) 19:30	08:14 17:24	16:37 16:36
27	05:52 21:37	06:35 (3) 07:06 (3)	06:41 20:38	07:52 (1) 19:27	08:16 17:22	16:36 16:35
28	05:53 21:35	06:36 (3) 07:06 (3)	06:42 20:36	07:51 (1) 19:25	08:17 17:20	16:35 16:34
29	05:55 21:34	06:36 (3) 07:06 (3)	06:44 20:34	07:50 (1) 19:23	08:19 17:18	16:34 16:34
30	05:56 21:32	06:36 (3) 07:05 (3)	06:46 20:32	07:50 (1) 19:20	08:20 17:16	16:34 16:33
31	05:58 21:31	06:37 (3) 07:05 (3)	06:47 20:29	07:49 (1) 19:17	08:21 17:14	16:33 16:37
Potential sun hours	501	453	381	332	267	244
Total, worst case	811	721	696			
Sun reduction	0,38	0,42	0,35			
Oper. time red.	0,97	0,97	0,97			
Wind dir. red.	0,67	0,64	0,63			
Total reduction	0,25	0,26	0,21			
Total, real	202	185	149			

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
 Beneluxweg 125 Postbus 40
 NL-4900 AA OOSTERHOUT
 0513 634045
 Koen Wilmer / koen.wilmer@anteagroup.com
 Calculated:
 23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De GeerShadow receptor: H - Shadow Receptor: 20,0 × 15,0 Azimuth: 0,0° Slope: 90,0° (689)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	07:47 (2) 08:25 (1)	06:11 21:01
2	08:46 16:39	08:17 17:27	07:24 18:19	07:13 20:12	07:46 (2) 08:28 (1)	06:09 21:03
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	07:47 (2) 08:30 (1)	06:07 21:04
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	07:46 (2) 08:31 (1)	06:05 21:06
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	07:46 (2) 08:32 (1)	06:04 21:08
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	07:47 (2) 08:33 (1)	06:02 21:09
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	07:47 (1) 08:35 (1)	06:00 21:11
8	08:44 16:46	08:08 17:38	07:10 18:29	07:00 20:22	07:45 (1) 08:35 (1)	05:58 21:13
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	07:43 (1) 08:36 (1)	05:57 21:14
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	07:42 (1) 08:37 (1)	05:55 21:16
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	07:41 (1) 08:38 (1)	05:53 21:17
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	07:40 (1) 08:38 (1)	05:51 21:19
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	07:38 (1) 08:38 (1)	05:50 21:21
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	07:37 (1) 08:38 (1)	05:48 21:22
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	07:37 (1) 08:39 (1)	05:47 21:24
16	08:39 16:58	07:53 17:53	06:52 18:43	06:42 20:36	07:36 (1) 08:39 (1)	05:45 21:25
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	07:35 (1) 08:39 (1)	05:44 21:27
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	07:35 (1) 08:39 (1)	05:42 21:28
19	08:36 17:03	07:47 17:59	06:45 18:48	06:36 20:41	07:35 (1) 08:39 (1)	05:41 21:30
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	07:34 (1) 08:39 (1)	05:39 21:31
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	07:34 (1) 08:38 (1)	05:38 21:32
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	07:34 (1) 08:38 (1)	05:37 21:34
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	07:34 (1) 08:38 (1)	05:36 21:35
24	08:30 17:11	07:37 18:08	06:34 18:57	06:25 20:49	07:34 (1) 08:37 (1)	05:34 21:37
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	07:34 (1) 08:36 (1)	05:33 21:38
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	07:34 (1) 08:36 (1)	05:32 21:39
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	07:34 (1) 08:35 (1)	05:31 21:41
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	07:34 (1) 08:34 (1)	05:30 21:42
29	08:23 17:20	07:22 18:05	06:22 19:05	06:15 20:58	07:34 (1) 08:33 (1)	05:29 21:43
30	08:22 17:22	07:20 18:07	06:20 19:07	06:13 20:59	07:34 (1) 08:32 (1)	05:28 21:44
31	08:21 17:24	07:18 18:09	06:18 19:09	06:11 20:59	07:34 (1) 08:32 (1)	05:27 21:45
Potential sun hours	260	278	367	416	485	498
Total, worst case			228	1701	1206	1222
Sun reduction			0,30	0,38	0,42	0,38
Oper. time red.			0,97	0,97	0,97	0,97
Wind dir. red.			0,63	0,63	0,65	0,68
Total reduction			0,18	0,23	0,27	0,25
Total, real			42	393	322	304

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: H - Shadow Receptor: 20,0 × 15,0 Azimuth: 0,0° Slope: 90,0° (689) Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July	August	September	October	November	December
1	05:23 22:01 41	06:12 (3) 06:53 (3) 21:29	07:55 (1) 08:28 (1) 20:27	07:40 (1) 08:37 (1) 19:18	07:31 17:12 16:32	08:22 16:32 16:32
2	05:24 22:00 40	06:12 (3) 06:52 (3) 21:27	07:54 (1) 08:29 (1) 20:25	07:40 (1) 08:35 (1) 19:16	07:33 17:10 16:31	08:23 16:31 16:31
3	05:25 22:00 41	06:12 (3) 06:53 (3) 21:26	07:52 (1) 08:30 (1) 20:23	07:41 (1) 08:34 (1) 19:13	07:35 17:09 16:31	08:25 16:31 16:31
4	05:25 21:59 40	06:13 (3) 06:53 (3) 21:24	07:51 (1) 08:31 (1) 20:20	07:42 (1) 08:32 (1) 19:11	07:36 17:07 16:30	08:26 16:30 16:30
5	05:26 21:59 41	06:13 (3) 06:54 (3) 21:22	07:50 (1) 08:33 (1) 20:18	07:43 (1) 08:31 (1) 19:09	07:38 17:05 16:30	08:27 16:30 16:30
6	05:27 21:58 41	06:12 (3) 06:53 (3) 21:20	07:49 (1) 08:34 (1) 20:16	07:43 (2) 08:30 (1) 19:07	07:46 17:03 16:29	08:29 16:29 16:29
7	05:28 21:58 40	06:13 (3) 06:53 (3) 21:19	07:48 (1) 08:35 (1) 20:14	07:41 (2) 08:27 (1) 19:04	07:42 17:02 16:29	08:30 16:29 16:29
8	05:29 21:57 41	06:13 (3) 06:54 (3) 21:17	07:47 (1) 08:36 (1) 20:11	07:41 (2) 08:26 (1) 19:02	07:44 17:00 16:29	08:31 16:29 16:29
9	05:30 21:57 41	06:13 (3) 06:54 (3) 21:15	07:46 (1) 08:38 (1) 20:09	07:40 (2) 08:23 (1) 19:00	07:45 16:58 16:28	08:32 16:28 16:28
10	05:31 21:56 40	06:14 (3) 06:54 (3) 21:13	07:45 (1) 08:38 (1) 20:07	07:40 (2) 08:21 (1) 18:58	07:53 16:57 16:28	08:33 16:28 16:28
11	05:32 21:55 40	06:14 (3) 06:54 (3) 21:11	07:44 (1) 08:39 (1) 20:04	07:39 (2) 08:18 (1) 18:55	07:54 16:55 16:28	08:34 16:28 16:28
12	05:33 21:54 40	06:14 (3) 06:54 (3) 21:09	07:43 (1) 08:40 (1) 20:02	07:39 (2) 08:14 (1) 18:53	07:51 16:54 16:28	08:35 16:28 16:28
13	05:34 21:53 39	06:15 (3) 06:54 (3) 21:07	07:43 (1) 08:41 (1) 20:00	07:40 (2) 08:12 (2) 18:51	07:52 16:52 16:28	08:36 16:28 16:28
14	05:35 21:52 39	06:15 (3) 06:54 (3) 21:05	07:42 (1) 08:41 (1) 19:57	07:39 (2) 08:10 (2) 18:49	07:54 16:51 16:28	08:37 16:28 16:28
15	05:36 21:51 39	06:15 (3) 06:54 (3) 21:03	07:42 (1) 08:42 (1) 19:55	07:40 (2) 08:10 (2) 18:47	07:56 16:49 16:28	08:38 16:28 16:28
16	05:37 21:50 38	06:15 (3) 06:53 (3) 21:01	07:40 (1) 08:42 (1) 19:53	07:40 (2) 08:08 (2) 18:44	07:58 16:48 16:28	08:39 16:28 16:28
17	05:39 21:49 37	06:16 (3) 06:53 (3) 20:59	07:40 (1) 08:42 (1) 19:50	07:42 (2) 08:06 (2) 18:42	07:59 16:46 16:28	08:40 16:28 16:28
18	05:40 21:48 36	06:17 (3) 06:53 (3) 20:57	07:39 (1) 08:42 (1) 19:48	07:43 (2) 08:04 (2) 18:40	08:01 16:45 16:28	08:41 16:28 16:28
19	05:41 21:47 36	06:17 (3) 06:53 (3) 20:55	07:39 (1) 08:43 (1) 19:46	07:45 (2) 08:03 (2) 18:38	08:03 16:44 16:29	08:41 16:29 16:29
20	05:42 21:46 34	06:18 (3) 06:52 (3) 20:53	07:38 (1) 08:42 (1) 19:43	07:47 (2) 08:00 (2) 18:36	08:04 16:43 16:29	08:42 16:29 16:29
21	05:44 21:45 33	06:18 (3) 06:51 (3) 20:51	07:39 (1) 08:43 (1) 19:41	07:51 (2) 08:12 18:34	08:06 16:43 16:29	08:43 16:29 16:29
22	05:45 21:44 32	06:20 (3) 06:52 (3) 20:49	07:38 (1) 08:42 (1) 19:39	07:55 (2) 18:32 18:15	16:41 16:40 16:30	16:29 16:30 16:30
23	05:46 21:42 31	06:20 (3) 06:51 (3) 20:47	07:38 (1) 08:42 (1) 19:37	18:30 18:17 18:08	16:39 16:31 16:31	16:30 16:31 16:31
24	05:48 21:41 29	06:21 (3) 06:50 (3) 20:45	07:38 (1) 08:43 (1) 19:34	18:30 18:28 18:19	16:39 16:38 16:38	16:30 16:31 16:31
25	05:49 21:40 27	06:22 (3) 06:49 (3) 20:43	07:38 (1) 08:42 (1) 19:32	18:19 17:26 17:20	16:38 16:37 16:34	16:31 16:32 16:32
26	05:51 21:38 25	06:24 (3) 06:49 (3) 20:40	07:38 (1) 08:42 (1) 19:30	17:20 17:24 17:22	16:34 16:36 16:36	16:45 16:32 16:32
27	05:52 21:37 35	06:25 (3) 08:17 (1) 20:38	07:31 08:41 (1) 19:27	17:22 17:22 17:22	16:36 16:35 16:33	16:32 16:33 16:33
28	05:53 21:35 39	06:26 (3) 08:20 (1) 20:36	07:31 08:40 (1) 19:25	17:24 17:20 17:20	16:37 16:34 16:34	16:34 16:34 16:34
29	05:55 21:34 40	06:28 (3) 08:23 (1) 20:34	07:34 08:39 (1) 19:23	17:26 17:18 17:17	16:39 16:34 16:34	16:45 16:35 16:35
30	05:56 21:32 39	06:30 (3) 08:24 (1) 20:32	07:36 08:39 (1) 19:20	17:27 17:16 17:16	16:46 16:33 16:33	16:46 16:36 16:36
31	05:58 21:31 34	06:35 (3) 08:27 (1) 20:29	07:39 (1) 08:37 (1) 19:17	17:29 17:14 17:14	16:48 16:37 16:37	16:48 16:37 16:37
Potential sun hours	501	453	381	332	267	244
Total, worst case	1148	1728	760			
Sun reduction	0,38	0,42	0,35			
Oper. time red.	0,97	0,97	0,97			
Wind dir. red.	0,68	0,63	0,63			
Total reduction	0,25	0,26	0,21			
Total, real	288	442	163			

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: I - Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (691)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	08:17 (2) 10:32 (1)	06:11 21:01
2	08:46 16:39	08:17 17:27	07:24 18:19	07:13 20:12	08:18 (2) 10:33 (1)	06:09 21:03
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	08:19 (2) 10:33 (1)	06:07 21:04
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	08:20 (2) 10:33 (1)	06:05 21:06
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	08:21 (2) 10:33 (1)	06:04 21:08
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	08:23 (2) 10:33 (1)	06:02 21:09
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	08:27 (2) 10:33 (1)	06:00 21:11
8	08:44 16:46	08:07 17:38	07:10 18:29	07:00 20:22	08:42 (1) 10:32 (1)	05:58 21:13
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	08:41 (1) 10:32 (1)	05:56 21:14
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	08:41 (1) 10:32 (1)	05:55 21:16
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	08:41 (1) 10:31 (1)	05:53 21:17
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	08:41 (1) 10:31 (1)	05:51 21:19
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	08:40 (1) 10:30 (1)	05:50 21:21
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	08:40 (1) 10:29 (1)	05:48 21:22
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	08:40 (1) 10:29 (1)	05:47 21:24
16	08:38 16:58	07:53 17:53	06:52 18:43	06:42 20:36	08:40 (1) 10:28 (1)	05:45 21:25
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	08:40 (1) 10:27 (1)	05:44 21:27
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	08:40 (1) 10:27 (1)	05:42 21:28
19	08:36 17:03	07:47 17:59	06:45 18:48	06:35 20:41	08:40 (1) 10:26 (1)	05:41 21:30
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	08:41 (1) 10:25 (1)	05:39 21:31
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	08:41 (1) 10:24 (1)	05:38 21:32
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	08:41 (1) 10:23 (1)	05:37 21:34
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	08:41 (1) 10:22 (1)	05:36 21:35
24	08:30 17:11	07:37 18:08	06:34 18:57	06:25 20:49	08:42 (1) 10:21 (1)	05:34 21:37
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	08:42 (1) 10:20 (1)	05:33 21:38
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	08:42 (1) 10:19 (1)	05:32 21:39
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	08:43 (1) 10:17 (1)	05:31 21:41
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	08:43 (1) 10:16 (1)	05:30 21:42
29	08:23 17:20	07:22 18:15	06:22 19:05	06:15 20:58	08:44 (1) 10:14 (1)	05:29 21:43
30	08:22 17:22	07:20 18:15	06:20 19:07	06:13 20:59	08:44 (1) 10:13 (1)	05:28 21:44
31	08:20 17:24	07:18 18:15	06:18 19:09	06:11 20:59	05:27 21:45	06:08 (3) 21:45
Potential sun hours	260	278	367	416	485	498
Total, worst case			2616	3298	1659	1337
Sun reduction			0,30	0,38	0,42	0,38
Oper. time red.			0,97	0,97	0,97	0,97
Wind dir. red.			0,58	0,57	0,59	0,68
Total reduction			0,17	0,21	0,24	0,25
Total, real			447	693	398	334

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
 Beneluxweg 125 Postbus 40
 NL-4900 AA OOSTERHOUT
 0513 634045
 Koen Wilmer / koen.wilmer@anteagroup.com
 Calculated:
 23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagschaduwberekening Bedrijventerrein De Geer Shadow receptor: I - Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (691)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July	August	September	October	November	December
1	05:23 22:01	06:09 (3) 06:54 (3)	05:59 21:29	09:05 (1) 10:06 (1)	06:49 20:27	110
2	05:24 22:00	06:09 (3) 06:53 (3)	06:01 21:27	09:04 (1) 10:08 (1)	06:50 20:25	111
3	05:25 22:00	06:09 (3) 06:53 (3)	06:02 21:26	09:03 (1) 10:09 (1)	06:52 20:23	111
4	05:25 21:59	06:10 (3) 06:53 (3)	06:04 21:24	09:01 (1) 10:10 (1)	06:54 20:20	110
5	05:26 21:59	06:11 (3) 06:54 (3)	06:06 21:22	09:01 (1) 10:12 (1)	06:55 20:18	121
6	05:27 21:58	06:11 (3) 06:53 (3)	06:07 21:20	08:59 (1) 10:13 (1)	06:57 20:16	128
7	05:28 21:58	06:12 (3) 06:53 (3)	06:09 21:19	08:59 (1) 10:15 (1)	06:59 20:14	131
8	05:29 21:57	06:13 (3) 06:53 (3)	06:10 21:17	08:57 (1) 10:15 (1)	07:00 20:11	133
9	05:30 21:57	06:13 (3) 06:52 (3)	06:12 21:15	08:57 (1) 10:17 (1)	07:02 20:09	133
10	05:31 21:56	06:14 (3) 06:52 (3)	06:13 21:13	08:55 (1) 10:18 (1)	07:03 20:07	134
11	05:32 21:55	06:15 (3) 06:52 (3)	06:15 21:11	08:54 (1) 10:20 (1)	07:05 20:04	135
12	05:33 21:54	06:16 (3) 06:51 (3)	06:17 21:09	08:53 (1) 10:20 (1)	07:07 20:02	136
13	05:34 21:53	06:17 (3) 06:51 (3)	06:18 21:07	08:52 (1) 10:22 (1)	07:08 20:00	137
14	05:35 21:52	06:18 (3) 06:50 (3)	06:20 21:05	08:51 (1) 10:22 (1)	07:10 19:57	136
15	05:36 21:51	06:19 (3) 06:49 (3)	06:21 21:03	08:51 (1) 10:24 (1)	07:11 19:55	136
16	05:37 21:50	06:20 (3) 06:48 (3)	06:23 21:01	08:49 (1) 10:24 (1)	07:13 19:53	135
17	05:39 21:49	06:21 (3) 09:33 (1)	06:25 20:59	08:49 (1) 10:25 (1)	07:15 19:50	135
18	05:40 21:48	06:24 (3) 09:40 (1)	06:26 20:57	08:47 (1) 10:26 (1)	07:16 19:48	134
19	05:41 21:47	06:25 (3) 09:43 (1)	06:28 20:55	08:47 (1) 10:27 (1)	07:18 19:46	134
20	05:42 21:46	06:27 (3) 09:46 (1)	06:29 20:53	08:46 (1) 10:27 (1)	07:20 19:43	133
21	05:44 21:45	06:31 (3) 09:48 (1)	06:31 20:51	08:46 (1) 10:28 (1)	07:21 19:41	132
22	05:45 21:44	09:16 (1) 09:51 (1)	06:33 20:49	08:44 (1) 10:28 (1)	07:23 19:39	131
23	05:46 21:42	09:15 (1) 09:52 (1)	06:34 20:47	08:44 (1) 10:29 (1)	07:24 19:36	128
24	05:48 21:41	09:13 (1) 09:54 (1)	06:36 20:45	08:44 (1) 10:30 (1)	07:26 19:34	123
25	05:49 21:40	09:11 (1) 09:55 (1)	06:38 20:43	08:43 (1) 10:30 (1)	07:28 19:32	120
26	05:51 21:38	09:11 (1) 09:58 (1)	06:39 20:40	08:43 (1) 10:30 (1)	07:29 19:30	115
27	05:52 21:37	09:09 (1) 09:59 (1)	06:41 20:38	08:42 (1) 10:30 (1)	07:31 19:27	109
28	05:53 21:35	09:08 (1) 10:00 (1)	06:42 20:36	08:42 (1) 10:31 (1)	07:33 19:25	102
29	05:55 21:34	09:08 (1) 10:02 (1)	06:44 20:34	08:41 (1) 10:30 (1)	07:34 19:23	95
30	05:56 21:32	09:06 (1) 10:03 (1)	06:46 20:32	08:41 (1) 10:31 (1)	07:36 19:20	87
31	05:58 21:31	09:06 (1) 10:05 (1)	06:47 20:29	08:40 (1) 10:30 (1)	07:29 17:14	
Potential sun hours	501	453	381	332	267	244
Total, worst case	1280	2837	3715	323		
Sun reduction	0,38	0,42	0,35	0,31		
Oper. time red.	0,97	0,97	0,97	0,97		
Wind dir. red.	0,63	0,57	0,58	0,58		
Total reduction	0,23	0,23	0,20	0,17		
Total, real	301	658	736	56		

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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshaduwberekening Bedrijventerrein De Geer Shadow receptor: J - Shadow Receptor: 25,0 × 8,0 Azimuth: 94,0° Slope: 90,0° (692)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46	08:19	07:26	07:16	06:11	05:26	05:23	05:59	06:49	07:38	07:31	08:22
	16:38	17:25	18:17	20:10	21:01	21:47	22:00	21:29	20:27	19:18	17:12	16:32
2	08:45	08:17	07:24	07:13	06:09	05:25	05:24	06:01	06:50	07:39	07:33	08:23
	16:39	17:27	18:19	20:12	21:03	21:48	22:00	21:27	20:25	19:16	17:10	16:31
3	08:45	08:16	07:21	07:11	06:07	05:24	05:25	06:02	06:52	07:41	07:35	08:25
	16:40	17:29	18:20	20:14	21:04	21:49	22:00	21:26	20:23	19:13	17:08	16:31
4	08:45	08:14	07:19	07:09	06:05	05:24	05:25	06:04	06:54	07:42	07:36	08:26
	16:41	17:31	18:22	20:15	21:06	21:50	21:59	21:24	20:20	19:11	17:07	16:30
5	08:45	08:13	07:17	07:06	06:04	05:23	05:26	06:06	06:55	07:44	07:38	08:27
	16:42	17:33	18:24	20:17	21:08	21:51	21:59	21:22	20:18	19:09	17:05	16:30
6	08:45	08:11	07:15	07:04	06:02	05:22	05:27	06:07	06:57	07:46	07:40	08:28
	16:44	17:35	18:26	20:19	21:09	21:52	21:58	21:20	20:16	19:07	17:03	16:29
7	08:44	08:09	07:13	07:02	06:00	05:22	05:28	06:09	06:59	07:48	07:42	08:30
	16:45	17:36	18:27	20:21	21:11	21:53	21:58	21:19	20:14	19:04	17:02	16:29
8	08:44	08:07	07:10	07:00	05:58	05:21	05:29	06:10	07:00	07:49	07:43	08:31
	16:46	17:38	18:29	20:22	21:13	21:53	21:57	21:17	20:11	19:02	17:00	16:29
9	08:43	08:06	07:08	06:57	05:56	05:21	05:30	06:12	07:02	07:51	07:45	08:32
	16:47	17:40	18:31	20:24	21:14	21:54	21:56	21:15	20:09	19:00	16:58	16:28
10	08:43	08:04	07:06	06:55	05:55	05:20	05:31	06:13	07:03	07:53	07:47	08:33
	16:49	17:42	18:33	20:26	21:16	21:55	21:56	21:13	20:07	18:58	16:57	16:28
11	08:42	08:02	07:04	06:53	05:53	05:20	05:32	06:15	07:05	07:54	07:49	08:34
	16:50	17:44	18:34	20:27	21:17	21:56	21:55	21:11	20:04	18:55	16:55	16:28
12	08:42	08:00	07:01	06:51	05:51	05:20	05:33	06:17	07:07	07:56	07:51	08:35
	16:52	17:46	18:36	20:29	21:19	21:57	21:54	21:09	20:02	18:53	16:54	16:28
13	08:41	07:58	06:59	06:48	05:50	05:19	21:06 (5)	05:34	06:18	07:08	07:58	08:36
	16:53	17:48	18:38	20:31	21:20	21:57	21:09 (5)	21:53	21:07	20:00	18:51	16:52
14	08:40	07:57	06:57	06:46	05:48	05:19	21:04 (5)	05:35	06:20	07:10	07:59	08:37
	16:55	17:49	18:40	20:32	21:22	21:58	21:11 (5)	21:52	21:05	19:57	18:49	16:51
15	08:39	07:55	06:55	06:44	05:47	05:19	21:03 (5)	05:36	06:21	07:11	08:01	08:38
	16:56	17:51	18:41	20:34	21:24	21:58	21:12 (5)	21:51	21:03	19:55	18:47	16:49
16	08:38	07:53	06:52	06:42	05:45	05:19	21:03 (5)	05:37	06:23	07:13	08:03	08:39
	16:58	17:53	18:43	20:36	21:25	21:59	21:13 (5)	21:50	21:01	19:53	18:44	16:48
17	08:38	07:51	06:50	06:40	05:44	05:19	21:03 (5)	05:39	06:25	07:15	08:05	08:40
	16:59	17:55	18:45	20:37	21:27	21:59	21:14 (5)	21:49	20:59	19:50	18:42	16:46
18	08:37	07:49	06:48	06:38	05:42	05:19	21:02 (5)	05:40	06:26	07:16	08:06	08:41
	17:01	17:57	18:47	20:39	21:28	22:00	21:14 (5)	21:48	20:57	19:48	18:40	16:45
19	08:36	07:47	06:45	06:35	05:41	05:19	21:02 (5)	05:41	06:28	07:18	08:08	08:41
	17:03	17:59	18:48	20:41	21:30	22:00	21:15 (5)	21:47	20:55	19:46	18:38	16:44
20	08:35	07:45	06:43	06:33	05:39	05:19	21:02 (5)	05:42	06:29	07:19	08:10	08:42
	17:04	18:00	18:50	20:43	21:31	22:00	21:15 (5)	21:46	20:53	19:43	18:36	16:43
21	08:34	07:43	06:41	06:31	05:38	05:19	21:02 (5)	05:44	06:31	07:21	08:11	08:43
	17:06	18:02	18:52	20:44	21:32	22:01	21:15 (5)	21:45	20:51	19:41	18:34	16:41
22	08:32	07:41	06:39	06:29	05:37	05:19	21:03 (5)	05:45	06:33	07:23	08:13	08:43
	17:08	18:04	18:53	20:46	21:34	22:01	21:16 (5)	21:43	20:49	19:39	18:32	16:40
23	08:31	07:39	06:36	06:27	05:36	05:19	21:03 (5)	05:46	06:34	07:24	08:15	08:44
	17:09	18:06	18:55	20:48	21:35	22:01	21:16 (5)	21:42	20:47	19:36	18:30	16:39
24	08:30	07:36	06:34	06:25	05:34	05:20	21:03 (5)	05:48	06:36	07:26	08:17	08:44
	17:11	18:08	18:57	20:49	21:37	22:01	21:15 (5)	21:41	20:45	19:34	18:28	16:38
25	08:29	07:34	06:32	06:23	05:33	05:20	21:05 (5)	05:49	06:37	07:28	08:19	08:44
	17:13	18:10	18:59	20:51	21:38	22:01	21:16 (5)	21:39	20:43	19:32	17:26	16:37
26	08:27	07:32	06:29	06:21	05:32	05:20	21:05 (5)	05:51	06:39	07:29	08:20	08:45
	17:15	18:11	19:00	20:53	21:39	22:01	21:15 (5)	21:38	20:40	19:29	17:24	16:36
27	08:26	07:30	06:27	06:19	05:31	05:21	21:05 (5)	05:52	06:41	07:31	08:22	08:45
	17:16	18:13	19:02	20:54	21:41	22:01	21:15 (5)	21:37	20:38	19:27	17:22	16:35
28	08:25	07:28	06:25	06:17	05:30	05:21	21:07 (5)	05:53	06:42	07:33	08:24	08:45
	17:18	18:15	19:04	20:56	21:42	22:01	21:14 (5)	21:35	20:36	19:25	17:20	16:34
29	08:23		07:22	06:15	05:29	05:22	21:08 (5)	05:55	06:44	07:34	08:26	08:45
	17:20		20:05	20:58	21:43	22:01	21:13 (5)	21:34	20:34	19:23	17:18	16:34
30	08:22		07:20	06:13	05:28	05:23		05:56	06:46	07:36	08:27	08:45
	17:22		20:07	20:59	21:44	22:01		21:32	20:32	19:20	17:16	16:33
31	08:20		07:18		05:27			05:58	06:47		07:29	08:46
	17:24		20:09		21:45			21:30	20:29		17:14	16:37
Potential sun hours	260	278	367	416	485	498	501	453	381	332	267	244
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)	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

Calendar

Calculation: Slagshadowberekening Bedrijventerrein De GeerShadow receptor: K - Shadow Receptor: 25,0 × 15,0 Azimuth: 94,0° Slope: 90,0° (693)
Assumptions for shadow calculations Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	06:11 21:01	06:54 (2) 21:47	06:34 (2) 22:00	06:41 (2) 21:29	06:48 (2) 21:29	07:38 19:18	07:31 17:12	08:22 16:32
2	08:45 16:39	08:17 17:27	07:24 18:19	07:13 20:12	06:09 21:03	06:52 (2) 21:48	06:34 (2) 22:00	06:40 (2) 21:27	06:49 (2) 21:25	07:39 19:16	07:33 17:10	08:23 16:31
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	06:07 21:04	06:50 (2) 21:49	06:34 (2) 22:00	06:40 (2) 21:26	06:50 (2) 21:23	07:41 19:13	07:35 17:09	08:25 16:31
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	06:05 21:06	06:48 (2) 21:50	06:35 (2) 21:59	06:41 (2) 21:24	06:51 (2) 21:20	07:43 19:11	07:36 17:07	08:26 16:30
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	06:04 21:08	06:47 (2) 21:51	06:34 (2) 21:59	06:41 (2) 21:22	06:53 (2) 21:18	07:44 19:09	07:38 17:05	08:27 16:30
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	06:02 21:09	06:46 (2) 21:52	06:35 (2) 21:58	06:40 (2) 21:20	06:54 (2) 21:16	07:46 19:07	07:40 17:03	08:28 16:29
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	06:00 21:11	06:44 (2) 21:53	06:35 (2) 21:58	06:41 (2) 21:19	06:56 (2) 21:14	07:48 19:04	07:42 17:02	08:30 16:29
8	08:44 16:46	08:07 17:38	07:10 18:29	07:00 20:22	05:58 21:13	06:42 (2) 21:54	06:36 (2) 21:57	06:41 (2) 21:17	06:57 (2) 21:11	07:49 19:02	07:44 17:00	08:31 16:29
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	05:56 21:14	06:41 (2) 21:54	06:35 (2) 21:57	06:41 (2) 21:15	06:58 (2) 21:09	07:51 19:00	07:45 16:58	08:32 16:28
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	05:55 21:16	06:39 (2) 21:55	06:36 (2) 21:56	06:41 (2) 21:13	06:59 (2) 21:07	07:53 18:58	07:47 16:57	08:33 16:28
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	05:53 21:17	06:39 (2) 21:56	06:36 (2) 21:55	06:41 (2) 21:11	07:01 (2) 21:04	07:54 18:55	07:49 16:55	08:34 16:28
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	05:51 21:19	06:38 (2) 21:57	06:36 (2) 21:54	06:42 (2) 21:09	07:03 (2) 21:02	07:56 18:53	07:51 16:54	08:35 16:28
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	05:50 21:20	06:37 (2) 21:57	06:36 (2) 21:53	06:42 (2) 21:07	07:06 (2) 21:00	07:58 18:51	07:52 16:52	08:36 16:28
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	05:48 21:22	06:36 (2) 21:58	06:37 (2) 21:52	06:42 (2) 21:05	07:09 (2) 21:01	07:59 18:49	07:54 16:51	08:37 16:28
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	05:47 21:24	06:36 (2) 21:58	06:37 (2) 21:51	06:42 (2) 21:03	07:11 19:55	07:56 18:47	07:56 16:49	08:38 16:28
16	08:38 16:58	07:53 17:53	06:52 18:43	06:42 20:36	05:45 21:25	06:35 (2) 21:59	06:37 (2) 21:50	06:42 (2) 21:01	07:13 19:53	07:58 18:44	07:58 16:48	08:39 16:28
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	05:44 21:27	06:35 (2) 21:59	06:38 (2) 21:49	06:42 (2) 21:05	07:15 19:50	07:59 18:42	07:59 16:46	08:40 16:28
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	05:42 21:28	06:35 (2) 22:00	06:38 (2) 21:48	06:43 (2) 21:07	07:16 19:48	08:06 18:40	08:01 16:45	08:41 16:28
19	08:36 17:03	07:47 17:59	06:45 18:48	06:35 20:41	05:41 21:30	06:33 (2) 22:00	06:38 (2) 21:47	06:43 (2) 21:05	07:17 19:46	08:08 18:38	08:03 16:44	08:41 16:29
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	05:39 21:31	06:33 (2) 22:00	06:38 (2) 21:46	06:43 (2) 21:03	07:20 19:43	08:10 18:36	08:04 16:43	08:42 16:29
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	05:38 21:32	06:33 (2) 22:01	06:38 (2) 21:45	06:43 (2) 21:01	07:21 19:41	08:11 18:34	08:06 16:41	08:43 16:29
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	05:37 21:34	06:33 (2) 22:01	06:39 (2) 21:44	06:44 (2) 21:05	07:23 19:39	08:13 18:32	08:08 16:40	08:43 16:30
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	05:36 21:35	06:33 (2) 22:01	06:39 (2) 21:42	06:44 (2) 21:07	07:24 19:36	08:15 18:30	08:09 16:39	08:44 16:30
24	08:30 17:11	07:36 18:08	06:34 18:57	06:25 20:49	05:34 21:37	06:33 (2) 22:01	06:39 (2) 21:41	06:44 (2) 21:08	07:26 19:34	08:17 18:28	08:11 16:38	08:44 16:31
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	05:33 21:38	06:33 (2) 22:01	06:40 (2) 21:39	06:44 (2) 21:09	07:28 19:32	08:19 17:26	08:13 16:37	08:44 16:32
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	05:32 21:39	06:33 (2) 22:01	06:39 (2) 21:38	06:45 (2) 21:09	07:29 19:30	08:20 17:24	08:14 16:36	08:45 16:32
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	05:31 21:41	06:33 (2) 22:01	06:39 (2) 21:37	06:45 (2) 21:08	07:31 19:27	08:22 17:22	08:16 16:35	08:45 16:33
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	05:30 21:42	06:33 (2) 22:01	06:40 (2) 21:35	06:45 (2) 21:09	07:33 19:25	08:24 17:20	08:17 16:34	08:45 16:34
29	08:23 17:20	7:22 20:05	06:15 20:58	06:15 21:43	05:29 21:43	06:33 (2) 22:01	06:40 (2) 21:34	06:46 (2) 21:08	07:34 19:23	08:26 17:18	08:19 16:34	08:45 16:35
30	08:22 17:22	7:20 20:07	06:13 20:59	06:13 21:44	05:28 21:44	06:33 (2) 22:01	06:40 (2) 21:32	06:47 (2) 21:09	07:36 19:20	08:27 17:16	08:20 16:33	08:46 16:36
31	08:20 17:24	7:18 20:09	06:11 20:59	06:11 21:45	05:27 21:45	06:33 (2) 22:01	06:40 (2) 21:30	06:48 (2) 21:09	07:37 19:21	08:28 17:14	08:21 16:37	08:46 16:37
Potential sun hours	260	278	367	416	485	498	501	453	381	332	267	244
Total, worst case				35	1652	1812	1882	515				
Sun reduction				0,38	0,42	0,38	0,38	0,42				
Oper. time red.				0,97	0,97	0,97	0,97	0,97				
Wind dir. red.				0,66	0,66	0,66	0,66	0,66				
Total reduction				0,24	0,27	0,24	0,25	0,27				
Total, real				8	446	439	462	138				

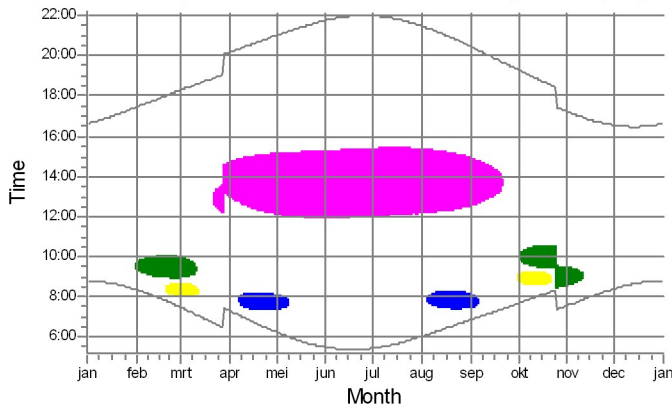
Table layout: For each day in each month the following matrix apply

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

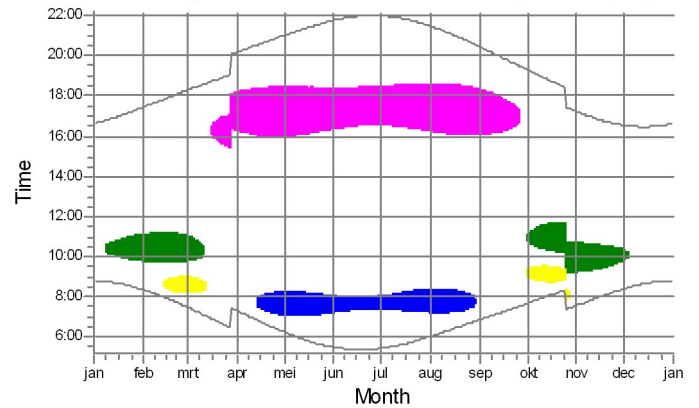
5. Calendar, graphical

Calculation: Slagschaduwberekening Bedrijventerrein De Geer

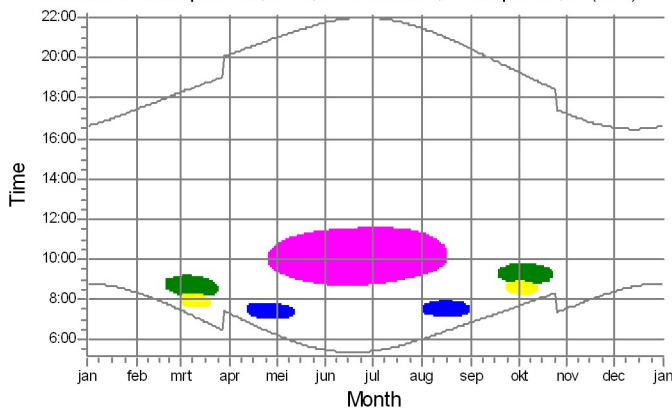
A: Shadow Receptor: 15,0 × 1,0 Azimuth: -35,0° Slope: 90,0° (682)



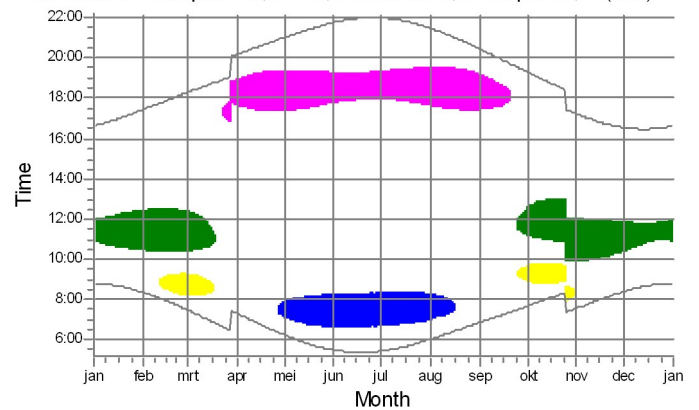
B: Shadow Receptor: 15,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (683)



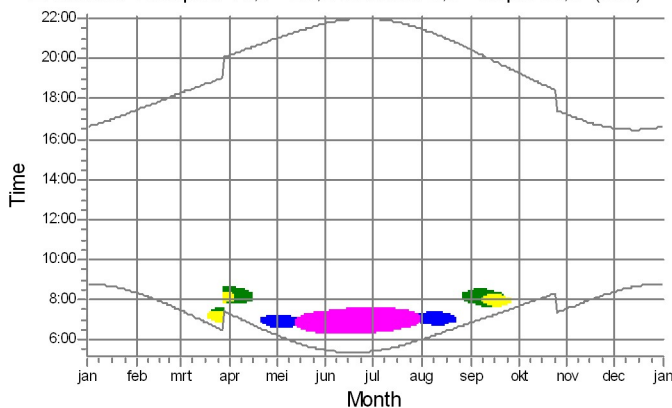
C: Shadow Receptor: 15,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (684)



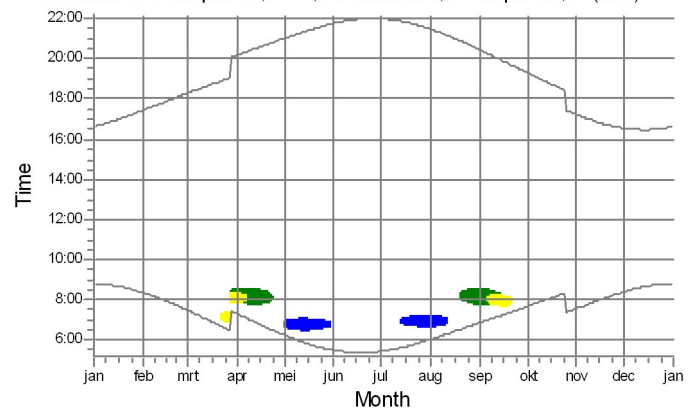
D: Shadow Receptor: 40,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (685)



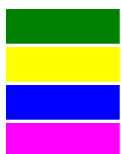
E: Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (686)



F: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (687)



WTGs



1: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (193)

2: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (194)

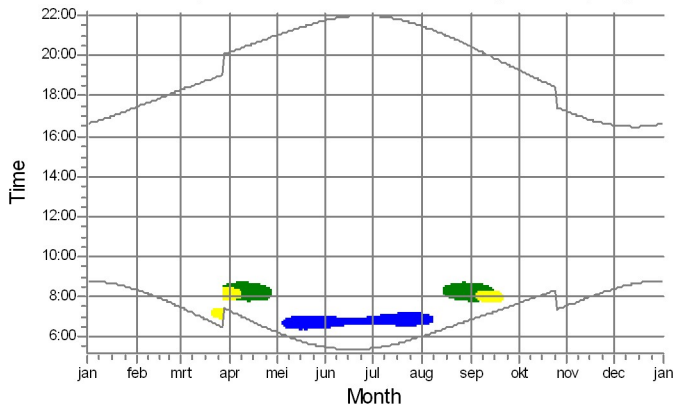
3: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (195)

5: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (197)

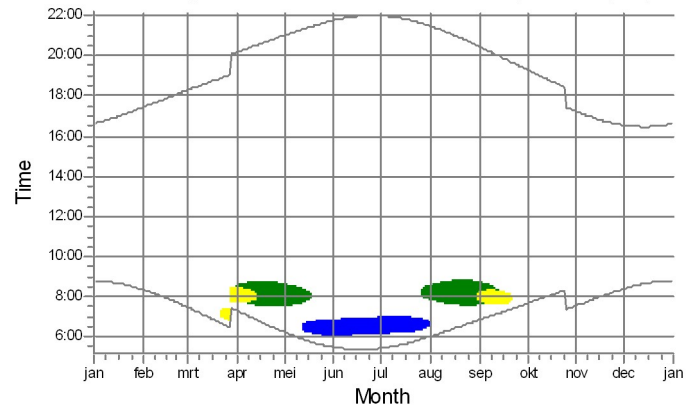
Calendar, graphical

Calculation: Slagschaduwberekening Bedrijventerrein De Geer

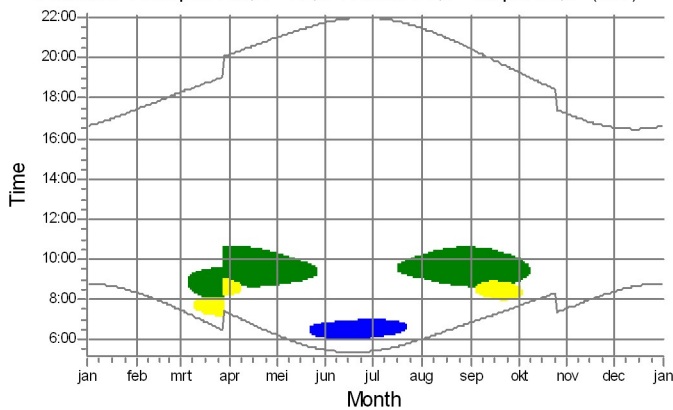
G: Shadow Receptor: 3,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (688)



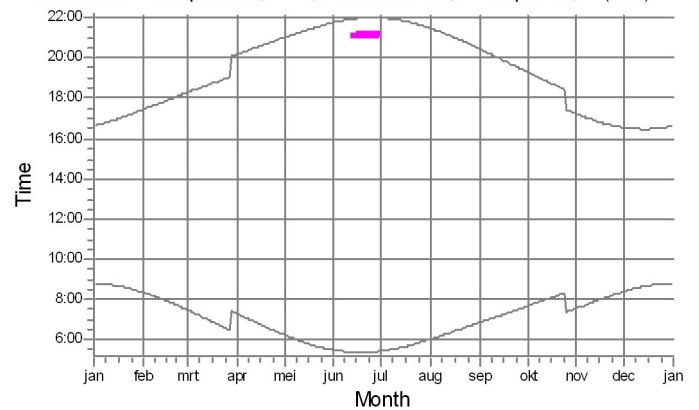
H: Shadow Receptor: 20,0 × 15,0 Azimuth: 0,0° Slope: 90,0° (689)



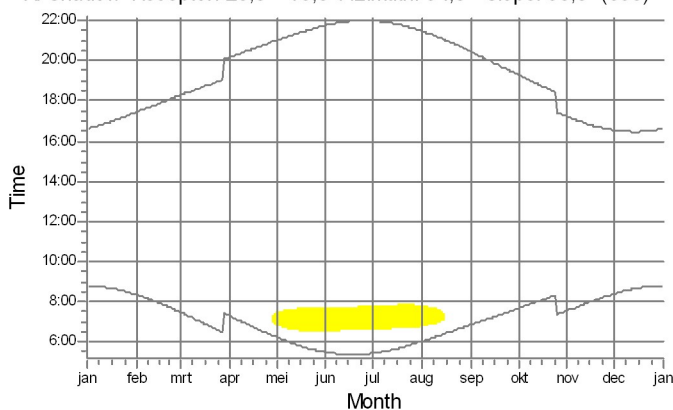
I: Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (691)



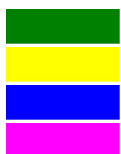
J: Shadow Receptor: 25,0 × 8,0 Azimuth: 94,0° Slope: 90,0° (692)



K: Shadow Receptor: 25,0 × 15,0 Azimuth: 94,0° Slope: 90,0° (693)



WTGs



1: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (193)

2: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (194)

3: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (195)

5: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (197)

Project:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group

Beneluxweg 125 Postbus 40

NL-4900 AA OOSTERHOUT

0513 634045

Koen Wilmer / koen.wilmer@anteagroup.com

Calculated:

23-10-2017 13:14/3.1.617

6. Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 1 - NORDEX N131/3300 DE 3300 131.0 !-I hub: 144,0 m (TOT: 209,5 m) (193)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,48	2,65	3,60	5,24	6,59	6,28	6,20	6,12	4,48	3,32	1,87	1,32

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
551	691	677	440	479	759	621	1.062	1.287	854	608	451	8.480

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

	January	February	March	April	May	June
1	08:46 10:56-11:52/56 16:38	08:19 09:49-12:22/153 17:25 09:25-09:34/9	07:26 08:16-12:18/242 18:17	07:16 08:46-10:32/106 20:10 07:51-08:32/41	06:11 08:45-10:11/86 21:01 07:35-08:31/56	05:26 21:47
2	08:45 10:56-11:53/57 16:39	08:17 09:48-12:22/154 17:27 09:20-09:39/19	07:24 08:15-12:17/242 18:19	07:13 08:46-10:33/107 20:12 07:51-08:33/42	06:09 08:46-10:11/85 21:03 07:36-08:31/55	05:25 21:48
3	08:45 10:54-11:53/59 16:40	08:16 09:49-12:23/154 17:29 09:18-09:42/24	07:22 09:52-12:16/144 18:20 08:15-09:50/95	07:11 08:45-10:33/108 20:14 07:51-08:34/43	06:07 08:47-10:09/82 21:04 07:37-08:29/52	05:24 21:49
4	08:45 10:53-11:55/62 16:41	08:14 09:48-12:23/155 17:31 09:16-09:44/28	07:19 09:53-12:14/141 18:22 08:14-09:49/95	07:09 08:44-10:33/109 20:16 07:50-08:34/44	06:05 08:47-10:07/80 21:06 07:37-08:28/51	05:24 21:50
5	08:45 10:52-11:55/63 16:42	08:13 09:47-12:24/157 17:33 09:13-09:46/33	07:17 09:53-12:12/139 18:24 08:13-09:46/93	07:06 08:43-10:33/110 20:17 07:51-08:35/44	06:04 08:48-10:05/77 21:08 07:38-08:26/48	05:23 21:51
6	08:45 10:51-11:57/66 16:44	08:11 09:11-12:24/193 17:35	07:15 09:55-12:10/135 18:26 08:12-09:44/92	07:04 08:43-10:33/110 20:19 07:49-08:36/47	06:02 08:50-10:05/75 21:09 07:39-08:26/47	05:22 21:52
7	08:44 10:49-11:58/69 16:45	08:09 09:10-12:25/195 17:36	07:13 08:12-09:42/90 18:27 09:57-12:08/131	07:02 08:43-10:33/110 20:21 07:47-08:36/49	06:00 08:50-10:03/73 21:11 07:40-08:24/44	05:22 21:53
8	08:44 10:48-11:59/71 16:46	08:07 09:08-12:25/197 17:38	07:10 08:11-09:04/53 09:05-09:38/33 18:29 09:58-12:05/127	07:00 08:42-10:32/110 20:22 07:45-08:36/51	05:58 08:51-10:01/70 21:13 07:40-08:22/42	05:21 21:54
9	08:43 10:47-12:00/73 16:47	08:06 09:07-12:25/198 17:40	07:08 08:11-09:35/84 18:31 10:00-12:02/122	06:57 08:41-10:32/111 20:24 07:43-08:36/53	05:56 08:52-10:00/68 21:14 07:42-08:21/39	05:21 21:54
10	08:43 10:46-12:02/76 16:49	08:04 09:05-12:25/200 17:42	07:06 08:11-09:31/80 10:03-10:31/28 18:33 10:34-11:59/85	06:55 08:41-10:32/111 20:26 07:42-08:37/55	05:55 08:53-09:58/65 21:16 07:42-08:19/37	05:20 21:55
11	08:42 10:45-12:03/78 16:50	08:02 09:04-12:25/201 17:44	07:04 08:11-09:14/63 10:08-10:25/17 18:34 10:35-11:55/80 09:16-09:26/10	06:53 08:41-10:31/110 20:27 07:41-08:38/57	05:53 08:54-09:57/63 21:17 07:44-08:19/35	05:20 21:56
12	08:42 10:44-12:04/80 16:52	08:00 09:03-12:25/202 17:46	07:01 08:10-09:42/66 18:36 10:35-11:50/75	06:51 08:41-10:31/110 20:29 07:40-08:38/58	05:51 08:55-09:55/60 21:19 07:45-08:17/32	05:20 21:57
13	08:41 10:43-12:05/82 16:53	07:58 09:02-12:25/203 17:48	06:59 08:11-09:18/67 18:38 10:37-11:44/67	06:49 08:40-10:30/110 20:31 07:38-08:38/60	05:50 08:56-09:54/58 21:20 07:47-08:16/29	05:19 21:57
14	08:40 10:42-12:06/84 16:55	07:57 09:01-12:26/205 17:49	06:57 08:11-09:20/69 18:40 10:39-11:37/58	06:46 08:40-10:29/109 20:32 07:37-08:38/61	05:48 08:56-09:52/56 21:22 07:48-08:13/25	05:19 21:58
15	08:39 10:05-12:07/122 16:56	07:55 09:01-12:26/205 17:51	06:55 08:11-09:20/69 18:41 10:41-11:30/49	06:44 08:40-10:29/109 20:34 07:37-08:39/62	05:47 08:58-09:51/53 21:24 07:50-08:11/21	05:19 21:58
16	08:38 10:04-12:08/124 16:58	07:53 09:00-12:26/206 17:53	06:52 08:09-09:22/73 18:43 10:44-11:23/39	06:42 08:40-10:28/108 20:36 07:36-08:39/63	05:45 08:58-09:49/51 21:25 07:52-08:08/16	05:19 21:59
17	08:38 10:03-12:09/126 16:59	07:51 09:00-12:26/206 17:55	06:50 08:07-09:23/76 18:45 10:48-11:17/29	06:40 08:40-10:27/107 20:38 07:35-08:39/64	05:44 08:59-09:48/49 21:27 07:56-08:05/9	05:19 21:59
18	08:37 10:01-12:10/129 17:01	07:49 08:59-12:25/206 17:57	06:48 08:04-09:24/80 18:47 10:54-11:08/14	06:38 08:40-10:27/107 20:39 07:35-08:39/64	05:42 09:01-09:47/46 21:28	05:19 22:00
19	08:36 10:00-12:12/132 17:03	07:47 08:59-12:25/206 17:59	06:45 08:03-09:25/82 18:48	06:35 08:40-10:26/106 20:41 07:35-08:39/64	05:41 09:01-09:44/43 21:30	05:19 22:00
20	08:35 09:59-12:13/134 17:04	07:45 08:59-12:25/206 18:00 08:36-08:48/12	06:43 08:01-09:26/85 18:50	06:33 08:41-10:25/104 20:43 07:34-08:39/65	05:39 09:03-09:43/40 21:31	05:19 22:00
21	08:34 09:57-12:13/136 17:06	07:43 08:59-12:25/206 18:02 08:32-08:53/21	06:41 07:59-09:26/87 18:52 07:09-07:19/10	06:31 08:41-10:24/103 20:44 07:34-08:38/64	05:38 09:05-09:41/36 21:32	05:19 22:01
22	08:32 09:56-12:14/138 17:08	07:41 08:59-12:25/206 18:04 08:30-08:55/25	06:39 07:57-09:27/90 18:53 07:06-07:23/17	06:29 08:41-10:23/102 20:46 07:34-08:38/64	05:37 09:07-09:39/32 21:34	05:19 22:01
23	08:31 09:56-12:15/139 17:09	07:39 08:58-12:23/205 18:06 08:26-08:56/30	06:36 07:56-09:28/92 18:55 07:03-07:25/22	06:27 08:41-10:22/101 20:48 07:34-08:38/64	05:36 09:09-09:37/28 21:35	05:19 22:01
24	08:30 09:54-12:16/142 17:11	07:36 08:24-12:23/239 18:08	06:34 07:54-09:28/94 18:57 07:01-07:27/26	06:25 08:42-10:21/99 20:49 07:34-08:37/63	05:34 09:11-09:35/24 21:37	05:20 22:01
25	08:29 09:54-12:17/143 17:13	07:34 08:22-12:22/240 18:10	06:32 07:53-09:29/96 18:59 06:59-07:27/28	06:23 08:42-10:20/98 20:51 07:34-08:36/62	05:33 09:13-09:32/19 21:38	05:20 22:01
26	08:28 09:53-12:18/145 17:15	07:32 08:21-12:22/241 18:11	06:29 07:52-09:30/98 19:00 06:57-07:28/31	06:21 08:42-10:19/97 20:53 07:34-08:36/62	05:32 09:17-09:28/11 21:39	05:20 22:01
27	08:26 09:52-12:19/147 17:16	07:30 08:19-12:21/242 18:13	06:27 07:51-09:31/100 19:02 06:56-07:29/33	06:19 08:43-10:17/94 20:54 07:34-08:35/61	05:31 21:41	05:21 22:01
28	08:25 09:52-12:20/148 17:18	07:28 08:17-12:19/242 18:15	06:25 07:50-09:31/101 19:04 06:54-07:30/36	06:17 08:43-10:16/93 20:56 07:34-08:34/60	05:30 21:42	05:21 22:01
29	08:23 09:51-12:20/149 17:20		07:22 08:49-10:31/102 20:05 07:53-08:30/37	06:15 08:44-10:14/90 20:58 07:34-08:33/59	05:29 21:43	05:22 22:01
30	08:22 09:50-12:20/150 17:22		07:20 08:48-10:32/104 20:07 07:53-08:31/38	06:13 08:44-10:13/89 20:59 07:34-08:32/58	05:28 21:44	05:23 22:01
31	08:20 09:50-12:22/152 17:24		07:18 08:47-10:32/105 20:09 07:52-08:30/38		05:27 21:45	
Potential sun hours	260	278	367	416	485	498
Sum of minutes with flicker	3465	5824	4804	4842	2068	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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 1 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (193)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,48	2,65	3,60	5,24	6,59	6,28	6,20	6,12	4,48	3,32	1,87	1,32

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
551	691	677	440	479	759	621	1.062	1.287	854	608	451	8.480

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

	July	August	September	October	November	December
1	05:23 22:00	05:59 09:05-10:06/61 21:29 07:55-08:28/33	06:49 08:40-10:30/110 20:27 07:40-08:37/57	07:38 08:50-09:56/66 19:18 11:16-12:27/71	07:31 08:35-11:55/200 17:12	08:22 10:27-11:45/78 16:32 09:54-10:15/21
2	05:24 22:00	06:01 09:04-10:08/64 21:27 07:54-08:29/35	06:50 08:39-10:30/111 20:25 07:40-08:35/55	07:39 08:49-09:53/64 10:49-11:00/11 19:16 11:13-12:31/78	07:33 08:36-11:55/199 17:10	08:23 10:28-11:44/76 16:31 09:56-10:12/16
3	05:25 22:00	06:02 09:03-10:09/66 21:26 07:52-08:30/38	06:52 08:39-10:30/111 20:23 07:41-08:34/53	07:41 08:49-10:07/78 10:43-11:06/23 19:13 11:12-12:35/83	07:35 08:38-11:55/197 17:09	08:25 10:31-11:44/73 16:31 10:00-10:10/10
4	05:25 21:59	06:04 09:01-10:10/69 21:24 07:51-08:31/40	06:54 08:39-10:29/110 20:20 07:42-08:33/51	07:43 08:49-10:11/82 19:11 10:39-12:38/119	07:36 08:40-11:55/195 17:07	08:26 10:32-11:43/71 16:30
5	05:26 21:59	06:06 09:01-10:12/71 21:22 07:50-08:33/43	06:55 08:39-10:29/110 20:18 07:43-08:32/49	07:44 08:48-10:14/86 19:09 10:36-12:40/124	07:38 08:41-11:53/192 17:05	08:27 10:35-11:44/69 16:30
6	05:27 21:58	06:07 08:59-10:13/74 21:20 07:49-08:34/45	06:57 08:39-10:29/110 20:16 07:45-08:32/47	07:46 08:48-09:40/52 09:41-10:17/36 19:07 10:33-12:43/130	07:40 09:17-11:53/156 17:03 08:43-09:16/33	08:28 10:37-11:43/66 16:29
7	05:28 21:58	06:09 08:59-10:15/76 21:19 07:48-08:35/47	06:59 08:39-10:28/109 20:14 07:46-08:30/44	07:48 08:48-10:19/91 19:04 10:32-12:45/133	07:42 09:18-11:53/155 17:02 08:46-09:14/28	08:30 10:39-11:42/63 16:29
8	05:29 21:57	06:10 08:57-10:15/78 21:17 07:47-08:36/49	07:00 08:39-10:28/109 20:11 07:46-08:29/43	07:49 10:30-12:46/136 19:02 08:48-10:21/93	07:44 09:18-11:53/155 17:00 08:48-09:12/24	08:31 10:40-11:42/62 16:29
9	05:30 21:57	06:12 08:57-10:17/80 21:15 07:46-08:38/52	07:02 08:38-10:26/108 20:09 07:44-08:28/44	07:51 10:28-12:47/139 19:00 08:48-10:22/94	07:45 09:19-11:53/154 16:58 08:51-09:09/18	08:32 10:43-11:42/59 16:28
10	05:31 21:56	06:13 08:55-10:18/83 21:13 07:45-08:38/53	07:03 08:39-10:26/107 20:07 07:44-08:26/42	07:53 10:27-12:49/142 18:58 08:48-10:23/95	07:47 09:20-11:53/153 16:57 08:56-09:05/9	08:33 10:45-11:42/57 16:28
11	05:32 21:55	06:15 08:54-10:20/86 21:11 07:44-08:39/55	07:05 08:38-10:25/107 20:04 07:44-08:24/40	07:54 10:26-12:50/144 18:55 08:49-10:25/96	07:49 09:21-11:52/151 16:55	08:34 10:46-11:42/56 16:28
12	05:33 21:54	06:17 08:53-10:20/87 21:09 07:43-08:40/57	07:07 08:39-10:24/105 20:02 07:44-08:23/39	07:56 08:50-12:51/241 18:53	07:51 09:22-11:52/150 16:54	08:35 10:48-11:42/54 16:28
13	05:34 21:53	06:18 08:52-10:22/90 21:07 07:43-08:41/58	07:08 08:39-10:24/105 20:00 07:44-08:22/38	07:58 08:50-12:52/242 18:51	07:52 09:23-11:52/149 16:52	08:36 10:49-11:41/52 16:28
14	05:35 21:52	06:20 08:51-10:22/91 21:05 07:42-08:41/59	07:10 08:39-10:22/103 19:57 07:44-08:21/37	07:59 08:51-12:52/241 18:49	07:54 09:24-11:52/148 16:51	08:37 10:51-11:41/50 16:28
15	05:36 21:51	06:21 08:51-10:24/93 21:03 07:42-08:42/60	07:11 08:40-10:21/101 19:55 07:44-08:20/36	08:01 08:52-12:53/241 18:47	07:56 09:25-11:51/146 16:49	08:38 10:52-11:42/50 16:28
16	05:37 21:50	06:23 08:49-10:24/95 21:01 07:40-08:42/62	07:13 08:40-10:19/99 19:53 07:44-08:18/34	08:03 08:53-12:54/241 18:44	07:58 09:26-11:51/145 16:48	08:39 10:54-11:42/48 16:28
17	05:39 09:29-09:33/4 21:49	06:25 08:49-10:25/96 20:59 07:40-08:42/62	07:15 08:40-10:18/98 19:50 07:45-08:17/32	08:05 08:55-12:54/239 18:42	07:59 09:27-11:50/143 16:46	08:40 10:55-11:42/47 16:28
18	05:40 09:25-09:40/15 21:48	06:26 08:47-10:26/99 20:57 07:39-08:42/63	07:16 08:40-10:16/96 19:48 07:46-08:15/29	08:06 08:56-12:54/238 18:40	08:01 09:28-11:50/142 16:45	08:41 10:55-11:42/47 16:28
19	05:41 09:22-09:43/21 21:47	06:28 08:47-10:27/100 20:55 07:39-08:43/64	07:18 08:41-10:16/95 19:46 07:47-08:14/27	08:08 09:29-12:55/206 18:38 08:58-09:27/29	08:03 09:30-11:49/139 16:44	08:41 10:57-11:42/45 16:29
20	05:42 09:19-09:46/27 21:46	06:29 08:46-10:27/101 20:53 07:38-08:42/64	07:20 08:42-10:15/93 19:43 07:49-08:12/23	08:10 09:29-12:55/206 18:36 09:01-09:25/24	08:04 09:31-11:49/138 16:43	08:42 10:58-11:43/45 16:29
21	05:44 09:17-09:48/31 21:45	06:31 08:46-10:28/102 20:51 07:39-08:43/64	07:21 08:43-10:13/90 19:41 07:51-08:09/18	08:11 09:29-12:55/206 18:34 09:04-09:22/18	08:06 09:33-11:49/136 16:41	08:43 10:58-11:43/45 16:29
22	05:45 09:16-09:51/35 21:44	06:33 08:44-10:28/104 20:49 07:38-08:42/64	07:23 08:44-10:12/88 19:39 07:54-08:06/12	08:13 09:29-12:56/207 18:32 09:08-09:17/9	08:08 09:35-11:49/134 16:40	08:43 10:59-11:44/45 16:30
23	05:46 09:15-09:52/37 21:42	06:34 08:44-10:29/105 20:47 07:38-08:42/64	07:24 08:44-10:10/86 19:36	08:15 09:30-12:56/206 18:30	08:09 09:36-11:48/132 16:39	08:44 10:59-11:44/45 16:30
24	05:48 09:13-09:54/41 21:41	06:36 08:44-10:30/106 20:45 07:38-08:43/65	07:26 08:46-10:09/83 19:34	08:17 09:29-12:55/206 18:28	08:11 09:38-11:47/129 16:38	08:44 10:59-11:44/45 16:31
25	05:49 09:11-09:55/44 21:39	06:38 08:43-10:30/107 20:43 07:38-08:42/64	07:28 08:47-10:08/81 19:32	07:19 08:29-11:55/206 17:26	08:13 09:41-11:47/126 16:37	08:44 10:59-11:45/46 16:32
26	05:51 09:11-09:58/47 21:38	06:39 08:43-10:30/107 20:40 07:38-08:42/64	07:29 08:48-10:06/78 19:30 11:31-11:57/26	07:20 08:30-11:55/205 17:24	08:14 09:43-11:47/124 16:36	08:45 10:59-11:46/47 16:32
27	05:52 09:09-09:59/50 21:37 08:04-08:17/13	06:41 08:42-10:30/108 20:38 07:38-08:41/63	07:31 08:50-10:04/74 19:27 11:27-12:03/36	07:22 08:30-11:55/205 17:22	08:16 09:44-11:46/122 16:35	08:45 10:59-11:47/48 16:33
28	05:53 08:01-08:00/52 21:35 08:01-08:20/19	06:42 08:42-10:31/109 20:36 07:38-08:40/62	07:33 08:52-10:03/71 19:25 11:24-12:09/45	07:24 08:31-11:55/204 17:20	08:17 10:22-11:46/84 16:34 09:47-10:19/32	08:45 10:59-11:47/48 16:34
29	05:55 08:08-10:02/54 21:34 08:00-08:23/23	06:44 08:41-10:30/109 20:34 07:38-08:39/61	07:34 08:51-10:00/69 19:23 11:20-12:14/54	07:26 08:32-11:55/203 17:18	08:19 10:24-11:46/82 16:34 09:49-10:18/29	08:45 10:58-11:48/50 16:35
30	05:56 09:06-10:03/57 21:32 07:57-08:24/27	06:46 08:41-10:31/110 20:32 07:39-08:39/60	07:36 08:51-09:58/67 19:20 11:18-12:21/63	07:27 08:33-11:55/202 17:16	08:20 10:25-11:45/80 16:33 09:51-10:16/25	08:46 10:58-11:49/51 16:36
31	05:58 09:06-10:05/59 21:30 07:56-08:27/31	06:47 08:40-10:30/110 20:29 07:39-08:37/58		07:29 08:34-11:55/201 17:14		08:46 10:57-11:50/53 16:37
Potential sun hours	501	453	381	332	267	244
Sum of minutes with flicker	687	4565	3958	6692	4554	1738

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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
 Beneluxweg 125 Postbus 40
 NL-4900 AA OOSTERHOUT
 0513 634045
 Koen Wilmer / koen.wilmer@anteagroup.com
 Calculated:
 23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 2 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (194)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 08:02-09:09/67 18:17	07:16 07:47-08:52/65 20:10	06:11 06:54-07:19/25 21:01	05:26 06:34-07:36/62 21:47
2	08:45 16:39	08:17 17:27	07:24 07:51-09:09/78 18:19	07:13 07:46-08:51/65 20:12	06:09 06:52-07:22/30 21:03	05:25 06:34-07:36/62 21:48
3	08:45 16:40	08:16 17:29	07:21 07:49-09:08/79 18:20	07:11 07:47-08:49/62 20:14	06:07 06:50-07:23/33 21:04	05:24 06:34-07:36/62 21:49
4	08:45 16:41	08:14 17:31	07:19 07:47-09:08/81 18:22	07:09 08:20-08:46/26 20:15	06:05 06:48-07:24/36 21:06	05:24 06:35-07:36/61 21:50
5	08:45 16:42	08:13 17:33	07:17 07:44-09:06/82 18:24	07:06 08:21-08:44/23 20:17	06:04 06:47-07:25/38 21:08	05:23 06:34-07:36/62 21:51
6	08:45 16:43	08:11 17:35	07:15 07:43-09:06/83 18:26	07:04 08:23-08:42/19 20:19	06:02 06:46-07:27/41 21:09	05:22 06:35-07:37/62 21:52
7	08:44 16:45	08:09 17:36	07:13 07:42-09:05/83 18:27	07:02 08:27-08:39/12 20:21	06:00 06:44-07:27/43 21:11	05:22 06:35-07:36/61 21:53
8	08:44 16:46	08:07 17:38	07:10 07:40-09:03/83 18:29	07:00 07:47-08:14/27 20:22	05:58 06:42-07:28/46 21:13	05:21 06:36-07:37/61 21:53
9	08:43 16:47	08:06 17:40	07:08 07:40-09:01/81 18:31	06:57 07:49-08:12/23 20:24	05:56 06:41-07:29/48 21:14	05:21 06:35-07:36/61 21:54
10	08:43 16:49	08:04 17:42	07:06 07:40-08:59/79 18:33	06:55 07:50-08:10/20 20:26	05:55 06:39-07:30/51 21:16	05:20 06:36-07:36/60 21:55
11	08:42 16:50	08:02 17:44	07:04 07:35-08:57/82 18:34	06:53 07:51-08:08/17 20:27	05:53 06:39-07:31/52 21:17	05:20 06:36-07:37/61 21:56
12	08:42 16:52	08:00 08:42-08:54/12 17:46	07:01 07:31-08:08/37 18:36	06:51 07:54-08:06/12 20:29	05:51 06:38-07:31/53 21:19	05:20 06:36-07:36/60 21:57
13	08:41 16:53	07:58 08:39-08:57/18 17:48	06:59 07:29-08:07/38 18:38	06:48 07:50-08:10/20 20:31	05:50 06:37-07:32/55 21:20	05:19 06:36-07:36/60 21:57
14	08:40 16:55	07:56 08:36-09:00/24 17:49	06:57 07:27-08:07/40 18:40	06:46 07:50-08:10/20 20:32	05:48 06:36-07:32/56 21:22	05:19 06:37-07:37/60 21:58
15	08:39 16:56	07:55 08:30-09:02/32 17:51	06:55 07:24-08:05/41 18:41	06:44 07:50-08:10/20 20:34	05:47 06:36-07:33/57 21:24	05:19 06:37-07:37/60 21:58
16	08:38 16:58	07:53 08:27-09:03/36 17:53	06:52 07:22-08:03/41 18:43	06:42 07:50-08:10/20 20:36	05:45 06:35-07:33/58 21:25	05:19 06:37-07:37/60 21:59
17	08:38 16:59	07:51 08:25-09:05/40 17:55	06:50 07:21-08:01/40 18:45	06:40 07:50-08:10/20 20:37	05:44 06:35-07:34/59 21:27	05:19 06:38-07:37/59 21:59
18	08:37 17:01	07:49 08:23-09:06/43 17:57	06:48 07:19-07:58/39 18:47	06:38 07:50-08:10/20 20:39	05:42 06:35-07:34/59 21:28	05:19 06:38-07:37/59 22:00
19	08:36 17:03	07:47 08:21-09:07/46 17:59	06:45 07:18-07:58/40 18:48	06:35 07:50-08:10/20 20:41	05:41 06:33-07:34/61 21:30	05:19 06:38-07:38/60 22:00
20	08:35 17:04	07:45 08:19-09:07/48 18:00	06:43 07:18-07:59/41 18:50	06:33 07:50-08:10/20 20:43	05:39 06:33-07:34/61 21:31	05:19 06:38-07:38/60 22:00
21	08:34 17:06	07:43 08:15-09:08/53 18:02	06:41 07:03-07:58/55 18:52	06:31 07:50-08:10/20 20:44	05:38 06:33-07:35/62 21:32	05:19 06:38-07:38/60 22:01
22	08:32 17:08	07:41 08:12-09:09/57 18:04	06:39 07:01-07:59/58 18:53	06:29 07:50-08:10/20 20:46	05:37 06:33-07:35/62 21:34	05:19 06:39-07:39/60 22:01
23	08:31 17:09	07:39 08:09-09:09/60 18:06	06:36 06:59-07:59/60 18:55	06:27 07:50-08:10/20 20:48	05:36 06:33-07:35/62 21:35	05:19 06:39-07:39/60 22:01
24	08:30 17:11	07:36 08:07-09:09/62 18:08	06:34 06:57-07:58/61 18:57	06:25 07:50-08:10/20 20:49	05:34 06:33-07:36/63 21:37	05:20 06:39-07:38/59 22:01
25	08:29 17:13	07:34 08:06-09:10/64 18:10	06:32 06:55-07:58/63 18:58	06:23 07:50-08:10/20 20:51	05:33 06:33-07:36/63 21:38	05:20 06:40-07:39/59 22:01
26	08:27 17:15	07:32 08:05-09:10/65 18:11	06:29 06:54-07:58/64 19:00	06:21 07:50-08:10/20 20:53	05:32 06:33-07:36/63 21:39	05:20 06:39-07:39/60 22:01
27	08:26 17:16	07:30 08:04-09:10/66 18:13	06:27 06:52-07:58/66 19:02	06:19 07:50-08:10/20 20:54	05:31 06:33-07:36/63 21:41	05:21 06:39-07:39/60 22:01
28	08:25 17:18	07:28 08:03-09:09/66 18:15	06:25 06:50-07:57/67 19:04	06:17 07:50-08:10/20 20:56	05:30 06:33-07:36/63 21:42	05:21 06:40-07:40/60 22:01
29	08:23 17:20		07:22 07:49-08:56/67 20:05	06:15 07:00-07:14/14 20:58	05:29 06:33-07:36/63 21:43	05:22 06:40-07:41/61 22:01
30	08:22 17:22		07:20 07:48-08:55/67 20:07	06:13 06:56-07:17/21 20:59	05:28 06:33-07:36/63 21:44	05:22 06:40-07:40/60 22:01
31	08:20 17:24		07:18 07:47-08:54/67 20:09		05:27 06:33-07:36/63 21:45	
Potential sun hours	260	278	367	416	485	498
Sum of minutes with flicker	0	792	2106	530	1652	1812

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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 2 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (194)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July	August	September	October	November	December
1	05:23 06:41-07:41/60 22:00	05:59 06:48-07:41/53 21:29	06:49 07:50-08:07/17 20:27	07:37 08:10-08:47/37 19:18 08:58-09:33/35	07:31 08:22 17:12 16:32	
2	05:24 06:40-07:41/61 22:00	06:01 06:49-07:40/51 21:27	06:50 07:48-08:08/20 20:25	07:39 08:12-09:34/82 19:16	07:33 08:23 17:10 16:31	
3	05:24 06:40-07:41/61 22:00	06:02 06:50-07:40/50 21:26	06:52 07:47-08:10/23 20:23	07:41 08:17-09:36/79 19:13	07:35 08:24 17:08 16:31	
4	05:25 06:41-07:42/61 21:59	06:04 06:51-07:38/47 21:24	06:54 07:45-08:11/26 20:20	07:42 08:18-09:38/80 19:11	07:36 08:26 17:07 16:30	
5	05:26 06:41-07:42/61 21:59	06:06 06:53-07:38/45 21:22	06:55 08:23-08:34/11 20:18 07:44-08:12/28	07:44 08:17-09:39/82 19:09	07:38 08:27 17:05 16:30	
6	05:27 06:40-07:42/62 21:58	06:07 06:54-07:36/42 21:20	06:57 08:20-08:38/18 20:16 07:43-08:13/30	07:46 08:18-09:40/82 19:07	07:40 08:28 17:03 16:29	
7	05:28 06:41-07:42/61 21:58	06:09 06:56-07:36/40 21:19	06:58 08:17-08:39/22 20:14 07:41-08:13/32	07:47 08:18-09:41/83 19:04	07:42 08:30 17:02 16:29	
8	05:29 06:41-07:43/62 21:57	06:10 06:57-07:34/37 21:17	07:00 08:15-08:41/26 20:11 07:41-08:14/33	07:49 08:19-09:41/82 19:02	07:43 08:31 17:00 16:29	
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11	05:32 06:41-07:44/63 21:55	06:15 07:01-07:30/29 21:11	07:05 07:39-08:45/66 20:04	07:54 08:24-09:43/79 18:55	07:49 08:34 16:55 16:28	
12	05:33 06:42-07:44/62 21:54	06:17 07:03-07:27/24 21:09	07:07 07:39-08:46/67 20:02	07:56 08:36-09:43/67 18:53 08:27-08:35/8	07:51 08:35 16:54 16:28	
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15	05:36 06:42-07:44/62 21:51	06:21 07:03-07:20/11 21:03	07:11 07:40-08:47/67 19:55	08:01 08:37-09:42/65 18:47	07:56 08:38 16:49 16:28	
16	05:37 06:42-07:44/62 21:50	06:23 07:03-07:20/11 21:01	07:13 07:40-08:46/66 19:53	08:03 08:37-09:42/65 18:44	07:58 08:39 16:48 16:28	
17	05:39 06:42-07:44/62 21:49	06:25 07:03-07:20/11 20:59	07:15 07:42-08:47/65 19:50	08:05 08:38-09:41/63 18:42	07:59 08:40 16:46 16:28	
18	05:40 06:43-07:45/62 21:48	06:26 07:03-07:20/11 20:57	07:16 07:42-08:46/64 19:48	08:06 08:39-09:40/61 18:40	08:01 08:41 16:45 16:28	
19	05:41 06:43-07:45/62 21:47	06:28 07:03-07:20/11 20:55	07:18 07:43-08:46/63 19:46	08:08 08:41-09:40/59 18:38	08:03 08:42 16:44 16:29	
20	05:42 06:43-07:45/62 21:46	06:29 07:03-07:20/11 20:53	07:19 07:45-08:46/61 19:43	08:10 08:43-09:39/56 18:36	08:04 08:43 16:43 16:29	
21	05:44 06:43-07:45/62 21:45	06:31 07:03-07:20/11 20:51	07:21 07:46-08:45/59 19:41	08:11 08:46-09:38/52 18:34	08:06 08:43 16:41 16:29	
22	05:45 06:44-07:45/61 21:43	06:33 07:03-07:20/11 20:49	07:23 07:48-08:44/56 19:39	08:13 08:50-09:38/48 18:32	08:08 08:43 16:40 16:30	
23	05:46 06:44-07:45/61 21:42	06:34 07:03-07:20/11 20:47	07:24 07:49-08:43/54 19:36	08:15 08:52-09:37/45 18:30	08:09 08:44 16:39 16:30	
24	05:48 06:44-07:45/61 21:41	06:36 07:03-07:20/11 20:45	07:26 08:02-08:42/40 19:34 07:51-07:59/8	08:17 08:53-09:35/42 18:28	08:11 08:44 16:38 16:31	
25	05:49 06:44-07:44/60 21:39	06:37 07:03-07:20/11 20:43	07:28 08:02-08:41/39 19:32 07:53-07:56/3	07:19 07:55-08:34/39 17:26	08:13 08:44 16:37 16:32	
26	05:51 06:45-07:45/60 21:38	06:39 07:03-07:20/11 20:40	07:29 08:02-08:42/40 19:29 09:12-09:18/6	07:20 07:57-08:32/35 17:24	08:14 08:45 16:36 16:32	
27	05:52 06:45-07:44/59 21:37	06:41 07:03-07:20/11 20:38	07:31 08:03-08:44/41 19:27 09:07-09:24/17	07:22 08:01-08:31/30 17:22	08:16 08:45 16:35 16:33	
28	05:53 06:45-07:43/58 21:35	06:42 07:03-07:20/11 20:36	07:33 08:05-08:46/41 19:25 09:04-09:27/23	07:24 08:06-08:29/23 17:20	08:17 08:45 16:34 16:34	
29	05:55 06:46-07:43/57 21:34	06:44 07:03-07:20/11 20:34	07:34 08:06-08:46/40 19:23 09:01-09:28/27	07:26 08:09-08:26/17 17:18	08:19 08:45 16:34 16:35	
30	05:56 06:47-07:42/55 21:32	06:46 07:03-07:20/11 20:32	07:36 08:08-08:47/39 19:20 08:59-09:30/31	07:27 08:13-08:22/9 17:16	08:20 08:45 16:33 16:36	
31	05:58 06:48-07:42/54 21:30	06:47 07:52-08:05/13 20:29		07:29 17:14	08:46 16:36	
Potential sun hours	501	453	381	332	267	244
Sum of minutes with flicker	1882	528	1629	1799	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

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 3 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (195)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	06:11 21:01	06:38-08:08/90 21:47
2	08:45 16:39	08:17 17:27	07:24 18:19	07:13 20:12	06:09 21:03	06:38-08:09/91 21:48
3	08:45 16:40	08:16 17:29	07:21 18:20	07:11 20:14	06:07 21:04	06:37-08:08/91 21:49
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:15	06:05 21:06	06:35-08:08/93 21:50
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	06:04 21:08	06:34-08:08/94 21:51
6	08:45 16:43	08:11 17:35	07:15 18:26	07:04 20:19	06:02 21:09	06:33-08:09/96 21:52
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	06:00 21:11	06:32-08:08/96 21:53
8	08:44 16:46	08:07 17:38	07:10 18:29	07:00 20:22	05:58 21:13	06:30-08:08/98 21:54
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	05:56 21:14	06:30-08:08/98 21:54
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	05:55 21:16	06:28-08:07/99 21:55
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	05:53 21:17	06:28-08:08/100 21:56
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	05:51 21:19	06:26-08:07/101 21:57
13	08:41 16:53	07:58 17:48	06:59 18:38	06:48 20:31	05:50 21:20	06:22-08:07/105 21:57
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	05:48 21:22	06:19-08:06/107 21:58
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	05:47 21:24	06:17-08:06/109 21:58
16	08:38 16:58	07:53 17:53	06:52 18:43	06:42 20:36	05:45 21:25	06:15-08:05/110 21:59
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	05:44 21:27	06:14-08:05/111 21:59
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	05:42 21:28	06:13-08:05/112 22:00
19	08:36 17:03	07:47 17:59	06:45 18:48	06:35 20:41	05:41 21:30	06:11-08:04/113 22:00
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	05:39 21:31	06:10-08:04/114 22:00
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	05:38 21:32	06:10-08:05/115 22:01
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	05:37 21:34	06:09-08:05/116 22:01
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	05:36 21:35	06:08-08:06/118 22:01
24	08:30 17:11	07:36 18:08	06:34 18:57	06:25 20:49	05:34 21:37	06:08-08:06/118 22:01
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	05:33 21:38	06:08-08:06/118 22:01
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	05:32 21:39	06:07-08:07/120 22:01
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	05:31 21:41	06:07-08:07/120 22:01
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	05:30 21:42	06:07-08:07/120 22:01
29	08:23 17:20		07:22 20:05	06:15 20:58	05:29 21:43	06:06-08:07/121 22:01
30	08:22 17:22		07:20 20:07	06:13 20:59	05:28 21:44	06:06-08:07/121 22:01
31	08:20 17:24		07:18 20:09		05:27 21:45	06:06-08:07/121 22:01
Potential sun hours	259	278	367	416	485	498
Sum of minutes with flicker	0	0	0	1310	3336	3746

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

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 3 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (195)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:23 06:09-08:14/125 22:00	05:59 06:37-08:17/100 21:29	06:49 07:31-08:01/30 20:27	07:38 19:18	07:31 17:12	08:22 16:32
2	05:24 06:09-08:13/124 22:00	06:01 06:38-08:17/99 21:27	06:50 07:32-07:59/27 20:25	07:39 19:16	07:33 17:10	08:23 16:31
3	05:24 06:09-08:14/125 22:00	06:02 06:39-08:18/99 21:26	06:52 07:35-07:57/22 20:23	07:41 19:13	07:35 17:08	08:25 16:31
4	05:25 06:10-08:14/124 21:59	06:04 06:39-08:17/98 21:24	06:54 07:37-07:53/16 20:20	07:42 19:11	07:36 17:07	08:26 16:30
5	05:26 06:11-08:15/124 21:59	06:06 06:41-08:18/97 21:22	06:55 07:42-07:47/5 20:18	07:44 19:09	07:38 17:05	08:27 16:30
6	05:27 06:11-08:14/123 21:58	06:07 06:42-08:18/96 21:20	06:57 20:16	07:46 19:07	07:40 17:03	08:28 16:29
7	05:28 06:12-08:15/123 21:58	06:09 06:43-08:18/95 21:19	06:59 20:14	07:48 19:04	07:42 17:02	08:30 16:29
8	05:29 06:13-08:15/122 21:57	06:10 06:44-08:17/93 21:17	07:00 20:11	07:49 19:02	07:43 17:00	08:31 16:29
9	05:30 06:13-08:15/122 21:57	06:12 06:45-08:18/93 21:15	07:02 20:09	07:51 19:00	07:45 16:58	08:32 16:28
10	05:31 06:14-08:15/121 21:56	06:13 06:46-08:17/91 21:13	07:03 20:07	07:53 18:58	07:47 16:57	08:33 16:28
11	05:32 06:14-08:15/121 21:55	06:15 06:47-08:17/90 21:11	07:05 20:04	07:54 18:55	07:49 16:55	08:34 16:28
12	05:33 06:14-08:15/121 21:54	06:17 06:46-08:16/90 21:09	07:07 20:02	07:56 18:53	07:51 16:54	08:35 16:28
13	05:34 06:15-08:16/121 21:53	06:18 06:47-08:16/89 21:07	07:08 20:00	07:58 18:51	07:52 16:52	08:36 16:28
14	05:35 06:15-08:16/121 21:52	06:20 06:47-08:15/88 21:05	07:10 19:57	07:59 18:49	07:54 16:51	08:37 16:28
15	05:36 06:15-08:15/120 21:51	06:21 06:49-08:15/86 21:03	07:11 19:55	08:01 18:47	07:56 16:49	08:38 16:28
16	05:37 06:15-08:15/120 21:50	06:23 06:50-08:13/83 21:01	07:13 19:53	08:03 18:44	07:58 16:48	08:39 16:28
17	05:39 06:16-08:15/119 21:49	06:25 06:52-07:11/19 20:59	07:15 19:50	08:05 18:42	07:59 16:46	08:40 16:28
18	05:40 06:17-08:16/119 21:48	06:26 06:53-07:10/17 20:57	07:16 19:48	08:06 18:40	08:01 16:45	08:41 16:28
19	05:41 06:17-08:16/119 21:47	06:28 06:55-07:09/14 20:55	07:18 19:46	08:08 18:38	08:03 16:44	08:41 16:29
20	05:42 06:18-08:15/117 21:46	06:29 06:56-07:06/10 20:53	07:19 19:43	08:10 18:36	08:04 16:43	08:42 16:29
21	05:44 06:18-08:15/117 21:45	06:31 06:58-07:03/5 20:51	07:21 19:41	08:11 18:34	08:06 16:41	08:43 16:29
22	05:45 06:20-08:15/115 21:44	06:33 07:12-08:10/58 20:49	07:23 19:39	08:13 18:32	08:08 16:40	08:43 16:30
23	05:46 06:20-08:15/115 21:42	06:34 07:13-08:10/57 20:47	07:24 19:36	08:15 18:30	08:09 16:39	08:44 16:30
24	05:48 06:21-08:14/113 21:41	06:36 07:14-08:10/56 20:45	07:26 19:34	08:17 18:28	08:11 16:38	08:44 16:31
25	05:49 06:22-08:14/112 21:39	06:37 07:14-08:09/55 20:43	07:28 19:32	07:19 17:26	08:13 16:37	08:44 16:32
26	05:51 06:24-08:15/111 21:38	06:39 07:16-08:08/52 20:40	07:29 19:29	07:20 17:24	08:14 16:36	08:45 16:32
27	05:52 06:25-08:16/111 21:37	06:41 07:17-08:07/50 20:38	07:31 19:27	07:22 17:22	08:16 16:35	08:45 16:33
28	05:53 06:26-08:16/110 21:35	06:42 07:19-08:07/48 20:36	07:33 19:25	07:24 17:20	08:17 16:34	08:45 16:34
29	05:55 06:28-08:17/109 21:34	06:44 07:20-08:05/45 20:34	07:34 19:23	07:26 17:18	08:19 16:34	08:45 16:35
30	05:56 06:30-08:17/107 21:32	06:46 07:23-08:04/41 20:32	07:36 19:20	07:27 17:16	08:20 16:33	08:46 16:36
31	05:58 06:35-08:17/102 21:30	06:47 07:29-08:02/33 20:29		07:29 17:14		08:46 16:36
Potential sun hours	501	453	381	332	267	244
Sum of minutes with flicker	3653	2344	100	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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
 Beneluxweg 125 Postbus 40
 NL-4900 AA OOSTERHOUT
 0513 634045
 Koen Wilmer / koen.wilmer@anteagroup.com
 Calculated:
 23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 4 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (196)
 Sunshine probability S (Average daily sunshine hours) [DE BILT]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
 Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	08:46 16:38	08:19 17:25	07:26 18:17	07:16 20:10	06:11 21:01	05:26 21:47	05:23 22:01	05:59 21:29	06:49 20:27	07:38 19:18	07:31 17:12	08:22 16:32
2	08:46 16:39	08:17 17:27	07:24 18:19	07:13 20:12	06:09 21:03	05:25 21:48	05:24 22:00	06:01 21:27	06:50 20:25	07:39 19:16	07:33 17:10	08:23 16:31
3	08:45 16:40	08:16 17:29	07:22 18:20	07:11 20:14	06:07 21:04	05:24 21:49	05:24 22:00	06:02 21:26	06:52 20:23	07:41 19:13	07:35 17:08	08:25 16:31
4	08:45 16:41	08:14 17:31	07:19 18:22	07:09 20:16	06:05 21:06	05:24 21:50	05:25 21:59	06:04 21:24	06:54 20:20	07:43 19:11	07:36 17:07	08:26 16:30
5	08:45 16:42	08:13 17:33	07:17 18:24	07:06 20:17	06:04 21:08	05:23 21:51	05:26 21:59	06:06 21:22	06:55 20:18	07:44 19:09	07:38 17:05	08:27 16:30
6	08:45 16:44	08:11 17:35	07:15 18:26	07:04 20:19	06:02 21:09	05:22 21:52	05:27 21:58	06:07 21:20	06:57 20:16	07:46 19:07	07:40 17:03	08:29 16:29
7	08:44 16:45	08:09 17:36	07:13 18:27	07:02 20:21	06:00 21:11	05:22 21:53	05:28 21:58	06:09 21:19	06:59 20:14	07:48 19:04	07:42 17:02	08:30 16:29
8	08:44 16:46	08:08 17:38	07:10 18:29	07:00 20:22	05:58 21:13	05:21 21:54	05:29 21:57	06:10 21:17	07:00 20:11	07:49 19:02	07:44 17:00	08:31 16:29
9	08:43 16:47	08:06 17:40	07:08 18:31	06:57 20:24	05:56 21:14	05:21 21:54	05:30 21:57	06:12 21:15	07:02 20:09	07:51 19:00	07:45 16:58	08:32 16:28
10	08:43 16:49	08:04 17:42	07:06 18:33	06:55 20:26	05:55 21:16	05:20 21:55	05:31 21:56	06:13 21:13	07:03 20:07	07:53 18:58	07:47 16:57	08:33 16:28
11	08:42 16:50	08:02 17:44	07:04 18:34	06:53 20:27	05:53 21:17	05:20 21:56	05:32 21:55	06:15 21:11	07:05 20:04	07:54 18:55	07:49 16:55	08:34 16:28
12	08:42 16:52	08:00 17:46	07:01 18:36	06:51 20:29	05:51 21:19	05:20 21:57	05:33 21:54	06:17 21:09	07:07 20:02	07:56 18:53	07:51 16:54	08:35 16:28
13	08:41 16:53	07:58 17:48	06:59 18:38	06:49 20:31	05:50 21:21	05:19 21:57	05:34 21:53	06:18 21:07	07:08 20:00	07:58 18:51	07:52 16:52	08:36 16:28
14	08:40 16:55	07:57 17:49	06:57 18:40	06:46 20:32	05:48 21:22	05:19 21:58	05:35 21:52	06:20 21:05	07:10 20:57	07:59 18:49	07:54 16:51	08:37 16:28
15	08:39 16:56	07:55 17:51	06:55 18:41	06:44 20:34	05:47 21:24	05:19 21:58	05:36 21:51	06:21 21:03	07:11 20:55	08:01 18:47	07:56 16:49	08:38 16:28
16	08:39 16:58	07:53 17:53	06:52 18:43	06:42 20:36	05:45 21:25	05:19 21:59	05:37 21:50	06:23 21:01	07:13 20:53	08:03 18:44	07:58 16:48	08:39 16:28
17	08:38 16:59	07:51 17:55	06:50 18:45	06:40 20:38	05:44 21:27	05:19 21:59	05:39 21:49	06:25 20:59	07:15 20:50	08:05 18:42	07:59 16:46	08:40 16:28
18	08:37 17:01	07:49 17:57	06:48 18:47	06:38 20:39	05:42 21:28	05:19 22:00	05:40 21:48	06:26 20:57	07:16 20:48	08:06 18:40	08:01 16:45	08:41 16:28
19	08:36 17:03	07:47 17:59	06:45 18:48	06:35 20:41	05:41 21:30	05:19 22:00	05:41 21:47	06:28 20:55	07:18 20:46	08:08 18:38	08:03 16:44	08:41 16:29
20	08:35 17:04	07:45 18:00	06:43 18:50	06:33 20:43	05:39 21:31	05:19 22:01	05:42 21:46	06:29 20:53	07:20 20:43	08:10 18:36	08:04 16:43	08:42 16:29
21	08:34 17:06	07:43 18:02	06:41 18:52	06:31 20:44	05:38 21:32	05:19 22:01	05:44 21:45	06:31 20:51	07:21 20:41	08:12 18:34	08:06 16:41	08:43 16:29
22	08:32 17:08	07:41 18:04	06:39 18:53	06:29 20:46	05:37 21:34	05:19 22:01	05:45 21:44	06:33 20:49	07:23 20:39	08:13 18:32	08:08 16:40	08:43 16:30
23	08:31 17:09	07:39 18:06	06:36 18:55	06:27 20:48	05:36 21:35	05:19 22:01	05:46 21:42	06:34 20:47	07:24 20:36	08:15 18:30	08:09 16:39	08:44 16:30
24	08:30 17:11	07:37 18:08	06:34 18:57	06:25 20:49	05:34 21:37	05:20 22:01	05:48 21:41	06:36 20:45	07:26 20:34	08:17 18:28	08:11 16:38	08:44 16:31
25	08:29 17:13	07:34 18:10	06:32 18:59	06:23 20:51	05:33 21:38	05:20 22:01	05:49 21:40	06:38 20:43	07:28 20:32	07:19 18:26	08:13 16:37	08:44 16:32
26	08:28 17:15	07:32 18:11	06:29 19:00	06:21 20:53	05:32 21:39	05:20 22:01	05:51 21:38	06:39 20:40	07:29 20:30	07:20 18:24	08:14 16:36	08:45 16:32
27	08:26 17:16	07:30 18:13	06:27 19:02	06:19 20:54	05:31 21:41	05:21 22:01	05:52 21:37	06:41 20:38	07:31 20:27	07:22 18:22	08:16 16:35	08:45 16:33
28	08:25 17:18	07:28 18:15	06:25 19:04	06:17 20:56	05:30 21:42	05:21 22:01	05:53 21:35	06:42 20:36	07:33 20:25	07:24 18:20	08:17 16:34	08:45 16:34
29	08:23 17:20		07:22 20:05	06:15 20:58	05:29 21:43	05:22 22:01	05:55 21:34	06:44 20:34	07:34 20:23	07:26 18:18	08:19 16:34	08:45 16:35
30	08:22 17:22		07:20 20:07	06:13 20:59	05:28 21:44	05:22 22:01	05:56 21:32	06:46 20:32	07:36 20:20	07:27 18:16	08:20 16:33	08:46 16:36
31	08:21 17:24		07:18 20:09		05:27 21:45		05:58 21:31	06:47 20:29		07:29 17:14		08:46 16:36
Potential sun hours	259	278	367	416	485	498	501	453	381	332	267	244
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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 5 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (197)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480
Idle start wind speed: Cut in wind speed from power curve

	January	February	March		April		May		June				
1	08:46	08:19	07:26		07:16	16:21-18:51/150	06:11	16:01-19:17/196	12:09-15:03/174	05:26	06:22-07:20/58	08:48-11:19/151	
	16:38	17:25	18:17		20:10	13:03-14:38/95	21:01	09:28-10:36/68		21:47	16:25-19:13/168	11:59-15:13/194	
2	08:46	08:17	07:24		07:13	16:19-18:52/153	06:09	16:03-19:18/195	12:09-15:05/176	05:25	06:21-07:21/60	08:47-11:20/153	
	16:39	17:27	18:19		20:12	13:00-14:40/100	21:03	09:26-10:40/74		21:48	16:25-19:13/168	11:59-15:13/194	
3	08:45	08:16	07:22		07:11	16:18-18:54/156	06:07	16:03-19:18/195	12:08-15:05/177	05:24	06:21-07:21/60	08:46-11:20/154	
	16:40	17:29	18:20		20:14	12:58-14:42/104	21:04	09:23-10:43/80		21:49	16:26-19:12/166	11:59-15:12/193	
4	08:45	08:14	07:19		07:09	16:16-18:55/159	06:05	16:03-19:17/194	12:07-15:05/178	05:24	06:21-07:22/61	08:46-11:21/155	
	16:41	17:31	18:22		20:16	12:54-14:43/109	21:06	09:20-10:45/85		21:50	16:27-19:13/166	11:59-15:13/194	
5	08:45	08:13	07:17		07:06	16:15-18:57/162	06:04	16:03-19:17/194	12:06-15:05/179	05:23	06:20-07:22/62	08:45-11:21/156	
	16:42	17:33	18:24		20:17	12:51-14:44/113	21:08	09:17-10:48/91		21:51	16:27-19:12/165	11:59-15:13/194	
6	08:45	08:11	07:15		07:04	16:14-18:59/165	06:02	16:04-19:18/194	12:07-15:06/179	05:22	06:21-07:23/62	08:45-11:22/157	
	16:44	17:35	18:26		20:19	12:49-14:46/117	21:09	09:16-10:50/94		21:52	16:27-19:12/165	12:00-15:14/194	
7	08:44	08:09	07:13		07:02	16:13-19:01/168	06:00	16:04-19:17/193	12:06-15:06/180	05:22	06:20-07:23/63	08:45-11:22/157	
	16:45	17:36	18:27		20:21	12:46-14:47/121	21:11	09:13-10:52/99		21:53	16:29-19:12/163	11:59-15:13/194	
8	08:44	08:08	07:10		07:00	16:11-19:02/171	05:58	16:05-19:17/192	12:05-15:06/181	05:21	06:20-07:24/64	08:45-11:23/158	
	16:46	17:38	18:29		20:22	12:43-14:48/125	21:13	09:11-10:54/103		21:54	16:30-19:12/162	12:00-15:14/194	
9	08:43	08:06	07:08		06:57	16:11-19:04/173	05:56	16:06-19:17/191	12:05-15:07/182	05:21	06:20-07:24/64	08:44-11:23/159	
	16:47	17:40	18:31		20:24	12:41-14:49/128	21:14	09:10-10:56/106		21:54	16:30-19:12/162	11:59-15:14/195	
10	08:43	08:04	07:06		06:55	16:10-19:05/175	05:55	16:06-19:17/191	12:04-15:07/183	05:20	06:20-07:25/65	08:44-11:23/159	
	16:49	17:42	18:33		20:26	12:39-14:50/131	21:16	09:08-10:58/110		21:55	16:31-19:12/161	12:00-15:14/194	
11	08:42	08:02	07:04		06:53	16:09-19:07/178	05:53	16:07-19:17/190	12:04-15:07/183	05:20	06:20-07:26/66	08:44-11:24/160	
	16:50	17:44	18:34		20:27	12:37-14:52/135	21:17	09:07-11:00/113		21:56	16:31-19:12/161	12:00-15:15/195	
12	08:42	08:00	07:01		06:51	16:08-19:09/181	05:51	16:08-19:17/189	12:03-15:07/184	05:20	06:20-07:25/65	08:43-11:24/161	
	16:52	17:46	18:36		20:29	12:35-14:53/138	21:19	09:05-11:01/116		21:57	16:31-19:11/160	11:59-15:14/195	
13	08:41	07:58	06:59		06:49	16:06-19:09/183	05:50	16:09-19:17/188	12:03-15:08/185	05:19	21:06-21:09/13	16:32-19:12/160	12:00-15:15/195
	16:53	17:48	18:38		20:31	12:32-14:53/141	21:21	09:04-11:03/119		21:57	06:20-07:26/66	08:44-11:24/160	
14	08:40	07:57	06:57		06:46	16:05-19:10/185	05:48	06:43-06:57/14	09:02-11:03/121	05:19	21:04-21:11/7	16:33-19:12/159	12:00-15:15/195
	16:55	17:49	18:40		20:32	12:31-14:54/143	21:22	16:09-19:16/187	12:02-15:08/186	21:58	06:20-07:26/66	08:44-11:24/160	
15	08:39	07:55	06:55		06:44	16:05-19:11/186	05:47	06:40-07:01/21	09:01-11:05/124	05:19	21:03-21:12/9	16:33-19:12/159	12:00-15:15/195
	16:56	17:51	18:41		20:34	12:29-14:55/146	21:24	16:10-19:16/186	12:02-15:08/186	21:58	06:20-07:27/67	08:44-11:25/161	
16	08:39	07:53	06:52		06:42	16:04-19:12/188	05:45	06:37-07:03/26	09:00-11:06/126	05:19	21:03-21:13/10	16:34-19:12/158	12:01-15:16/195
	16:58	17:53	18:43		20:36	12:28-14:56/148	21:25	16:10-19:16/186	12:01-15:08/187	21:59	06:20-07:27/67	08:44-11:25/161	
17	08:38	07:51	06:50	16:08-16:28/20	06:40	16:04-19:13/189	05:44	06:35-07:06/31	08:59-11:07/128	05:19	21:03-21:14/11	16:34-19:12/158	12:01-15:16/195
	16:59	17:55	18:45		20:38	12:26-14:56/150	21:27	16:12-19:16/184	12:01-15:09/188	21:59	06:20-07:28/68	08:44-11:26/162	
18	08:37	07:49	06:48	15:59-16:34/35	06:38	16:03-19:14/191	05:42	06:34-07:08/34	08:58-11:09/131	05:19	21:02-21:14/12	16:34-19:12/158	12:01-15:16/195
	17:01	17:57	18:47		20:39	12:25-14:57/152	21:28	16:13-19:16/183	12:01-15:09/188	22:00	06:21-07:28/67	08:44-11:26/162	
19	08:36	07:47	06:45	15:54-16:39/45	06:35	16:03-19:14/191	05:41	06:32-07:08/36	08:57-11:09/132	05:19	21:02-21:15/13	16:34-19:12/158	12:01-15:16/195
	17:03	17:59	18:48		20:41	12:23-14:58/155	21:30	16:13-19:15/182	12:00-15:09/189	22:00	06:21-07:28/67	08:44-11:26/162	
20	08:35	07:45	06:43	15:50-16:43/53	06:33	16:02-19:15/193	05:39	06:31-07:10/39	08:56-11:10/134	05:19	21:02-21:15/13	16:35-19:12/157	12:01-15:16/195
	17:04	18:00	18:50		20:43	12:22-14:59/157	21:31	16:14-19:15/181	12:00-15:09/189	22:01	06:21-07:28/67	08:44-11:26/162	
21	08:34	07:43	06:41	15:46-16:45/59	06:31	16:02-19:15/193	05:38	06:30-07:11/41	08:55-11:11/136	05:19	21:02-21:15/13	16:35-19:12/157	12:01-15:16/195
	17:06	18:02	18:52		20:44	12:21-14:59/158	21:32	16:15-19:15/180	12:00-15:10/190	22:01	06:21-07:28/67	08:44-11:26/162	
22	08:32	07:41	06:39	15:43-16:48/65	06:29	16:02-19:16/194	05:37	06:29-07:12/43	08:54-11:12/138	05:19	21:03-21:16/13	16:36-19:13/158	12:02-15:17/195
	17:08	18:04	18:53		20:46	12:19-15:00/161	21:34	16:16-19:15/179	12:00-15:10/190	22:01	06:22-07:29/67	08:45-11:27/162	
23	08:31	07:39	06:36	15:40-16:51/71	06:27	16:02-19:16/194	05:36	06:28-07:14/46	08:54-11:13/139	05:19	21:03-21:16/13	16:35-19:13/158	12:02-15:17/195
	17:09	18:06	18:55	12:40-13:08/28	20:48	12:18-15:00/162	21:35	16:17-19:15/178	12:00-15:10/190	22:01	06:22-07:29/67	08:45-11:27/162	
24	08:30	07:37	06:34	17:10-17:30/20	06:25	16:01-19:16/195	05:34	06:27-07:15/48	08:53-11:14/141	05:20	21:03-21:15/12	16:35-19:13/158	12:02-15:17/195
	17:11	18:08	18:57	15:37-16:52/75	20:49	12:17-15:01/164	21:37	16:18-19:15/177	12:00-15:11/191	22:01	06:22-07:29/67	08:45-11:27/162	
25	08:29	07:34	06:32	17:05-17:35/30	06:23	16:01-19:17/196	05:33	06:26-07:15/49	08:52-11:15/143	05:20	21:05-21:16/11	16:36-19:14/158	12:03-15:18/195
	17:13	18:10	18:59	15:34-16:54/80	20:51	12:16-15:01/165	21:38	16:19-19:14/175	12:00-15:11/191	22:01	06:23-07:30/67	08:46-11:28/162	
26	08:28	07:32	06:29	17:01-17:39/38	06:21	16:01-19:17/196	05:32	06:25-07:16/51	08:51-11:16/145	05:20	21:05-21:15/10	16:36-19:14/158	12:03-15:18/195
	17:15	18:11	19:00	15:32-16:56/84	20:53	12:15-15:02/167	21:39	16:20-19:14/174	12:00-15:11/191	22:01	06:22-07:29/67	08:46-11:27/161	
27	08:26	07:30	06:27	15:30-17:42/132	06:19	16:01-19:17/196	05:31	06:24-07:17/53	08:51-11:16/145	05:21	21:05-21:15/10	16:35-19:14/159	12:02-15:18/196
	17:16	18:13	19:02	12:19-13:27/68	20:54	09:49-10:16/27	21:41	16:20-19:14/174	11:59-15:11/192	22:01	06:23-07:30/67	08:46-11:27/161	
28	08:25	07:28	06:25	15:27-17:44/137	06:17	16:01-19:17/196	05:30	06:24-07:17/53	08:50-11:17/147	05:21	21:07-21:14/7	16:36-19:15/159	12:03-15:18/195
	17:18	18:15	19:04	12:15-13:29/74	20:56	09:42-10:23/41	21:42	16:21-19:14/173	11:59-15:11/192	22:01	06:23-07:30/67	08:47-11:28/161	
29	08:23		07:22	16:26-18:46/140	06:15	16:01-19:17/196	05:29	06:23-07:18/55	08:49-11:17/148	05:22	21:08-21:13/5	16:35-19:15/160	12:04-15:19/195
	17:20		20:05	13:12-14:32/80	20:58	09:36-10:29/53	21:43	16:22-19:13/171	11:59-15:12/193	22:01	06:24-07:30/66	08:48-11:28/160	
30	08:22		07:20	16:24-18:48/144	06:13	16:01-19:17/196	05:28	06:22-07:18/56	08:48-11:18/150	05:23	06:24-07:30/66	08:47-11:28/161	
	17:22		20:07	13:10-14:34/84	20:59	09:32-10:33/61	21:44	16:23-19:13/170	11:59-15:12/193	22:01	16:35-19:15/160	12:04-15:18/194	
31	08:21		07:18	16:22-18:49/147			05:27	06:22-07:19/57	08:47-11:18/151				
	17:24		20:09	13:06-14:36/90			21:45	16:23-19:13/170	11:59-15:12/193				
Potential sun hours	259	278	367		416		485		498				
Sum of minutes with flicker	0	0	1953		9898		15962		17567				

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:

Windpark Oss (Elzenburg)

Licensed user:

Antea Group
Beneluxweg 125 Postbus 40
NL-4900 AA OOSTERHOUT
0513 634045
Koen Wilmer / koen.wilmer@anteagroup.com
Calculated:
23-10-2017 13:14/3.1.617

Calendar per WTG

Calculation: Slagschaduwberekening Bedrijventerrein De GeerWTG: 5 - NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (197)
Sunshine probability S (Average daily sunshine hours) [DE BILT]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
551 691 677 440 479 759 621 1.062 1.287 854 608 451 8.480

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

	July	August	September	October	November	December
1	05:23 06:24-07:30/66 08:48-11:28/160 22:01 16:36-19:16/160 12:04-15:19/195	05:59 16:18-19:27/189 12:13-15:17/184 21:29 09:16-11:11/115	06:49 16:08-19:06/178 20:27 12:36-14:50/134	07:38 19:18	07:31 17:12	08:22 16:32
2	05:24 06:24-07:29/65 08:48-11:28/160 22:00 16:35-19:16/161 12:04-15:19/195	06:01 16:17-19:27/190 12:14-15:18/184 21:27 09:18-11:10/112	06:50 16:08-19:03/175 20:25 12:37-14:48/131	07:39 19:16	07:33 17:10	08:23 16:31
3	05:25 06:25-07:29/64 08:49-11:28/159 22:00 16:35-19:17/162 12:04-15:19/195	06:02 16:16-19:27/191 12:14-15:17/183 21:26 09:19-11:07/108	06:52 16:09-19:02/173 20:23 12:39-14:47/128	07:41 19:13	07:35 17:09	08:25 16:31
4	05:25 06:26-07:30/64 08:50-11:28/158 21:59 16:35-19:17/162 12:05-15:19/194	06:04 16:15-19:27/192 12:14-15:16/182 21:24 09:20-11:05/105	06:54 16:08-18:59/171 20:20 12:40-14:45/125	07:43 19:11	07:36 17:07	08:26 16:30
5	05:26 06:26-07:30/64 08:51-11:28/157 21:59 16:35-19:18/163 12:05-15:20/195	06:06 16:15-19:27/192 12:15-15:16/181 21:22 09:22-11:04/102	06:55 16:09-18:57/168 20:18 12:42-14:43/121	07:44 19:09	07:38 17:05	08:27 16:30
6	05:27 06:26-07:29/63 08:51-11:27/156 21:58 16:34-19:18/164 12:05-15:19/194	06:07 16:14-19:27/193 12:15-15:15/180 21:20 09:23-11:01/98	06:57 16:10-18:55/165 20:16 12:45-14:42/117	07:46 19:07	07:40 17:03	08:29 16:29
7	05:28 06:27-07:29/62 08:51-11:27/156 21:58 16:34-19:18/164 12:05-15:19/194	06:09 16:14-19:27/193 12:16-15:15/179 21:19 09:26-10:59/93	06:59 16:10-18:52/162 20:14 12:46-14:39/113	07:48 19:04	07:42 17:02	08:30 16:29
8	05:29 06:27-07:29/62 08:52-11:27/155 21:57 16:34-19:19/165 12:06-15:20/194	06:10 16:12-19:26/194 12:16-15:14/178 21:17 09:27-10:56/89	07:00 16:11-18:51/160 20:11 12:49-14:38/109	07:49 19:02	07:44 17:00	08:31 16:29
9	05:30 06:28-07:28/60 08:53-11:27/154 21:57 16:33-19:19/166 12:06-15:20/194	06:12 16:12-19:27/195 12:17-15:14/177 21:15 09:30-10:54/84	07:02 16:11-18:48/157 20:09 12:51-14:35/104	07:51 19:00	07:45 16:58	08:32 16:28
10	05:31 06:28-07:28/60 08:54-11:27/153 21:56 16:33-19:20/167 12:06-15:20/194	06:13 16:11-19:26/195 12:17-15:13/176 21:13 09:32-10:51/79	07:03 16:12-18:46/154 20:07 12:53-14:33/100	07:53 18:58	07:47 16:57	08:33 16:28
11	05:32 06:29-07:28/59 08:55-11:27/152 21:55 16:32-19:20/168 12:07-15:20/193	06:15 16:11-19:26/195 12:18-15:13/175 21:11 09:35-10:48/73	07:05 16:13-18:43/150 20:04 12:55-14:30/95	07:54 18:55	07:49 16:55	08:34 16:28
12	05:33 06:30-07:28/58 08:55-11:27/152 21:54 16:32-19:21/169 12:07-15:20/193	06:17 16:10-19:25/195 12:18-15:12/174 21:09 09:38-10:44/66	07:07 16:14-18:41/147 20:02 12:58-14:28/90	07:56 18:53	07:51 16:54	08:35 16:28
13	05:34 06:30-07:27/57 08:56-11:27/151 21:53 16:31-19:21/170 12:07-15:20/193	06:18 16:10-19:26/196 12:19-15:12/173 21:07 09:42-10:40/58	07:08 16:15-18:38/143 20:00 13:00-14:26/86	07:58 18:51	07:52 16:52	08:36 16:28
14	05:35 06:31-07:27/56 08:57-11:26/149 21:52 16:31-19:22/171 12:07-15:20/193	06:20 16:09-19:25/196 12:19-15:10/171 21:05 09:45-10:35/50	07:10 16:16-18:36/140 19:57 13:02-14:22/80	07:59 18:49	07:54 16:51	08:37 16:28
15	05:36 06:32-07:26/54 08:58-11:26/148 21:51 16:30-19:22/172 12:08-15:20/192	06:21 16:09-19:25/196 12:20-15:10/170 21:03 09:51-10:29/38	07:11 16:18-18:34/136 19:55 13:05-14:20/75	08:01 18:47	07:56 16:49	08:38 16:28
16	05:37 06:33-07:26/53 08:59-11:25/146 21:50 16:29-19:22/173 12:08-15:20/192	06:23 16:08-19:24/196 12:20-15:09/169 21:01 09:58-10:20/22	07:13 16:18-18:31/133 19:53 13:07-14:16/69	08:03 18:44	07:58 16:48	08:39 16:28
17	05:39 06:33-07:25/52 08:59-11:25/146 21:49 16:29-19:23/174 12:08-15:20/192	06:25 16:08-19:23/195 20:59 12:22-15:08/166	07:15 17:48-18:28/40 13:10-14:12/62 19:50 16:20-17:45/85	08:05 18:42	07:59 16:46	08:40 16:28
18	05:40 06:35-07:25/50 09:01-11:25/144 21:48 16:29-19:24/175 12:09-15:21/192	06:26 16:07-19:22/195 20:57 12:22-15:07/165	07:16 17:51-18:23/32 13:13-14:08/55 19:48 16:21-17:42/81	08:06 18:40	08:01 16:45	08:41 16:28
19	05:41 06:36-07:24/48 09:02-11:24/142 21:47 16:28-19:24/176 12:09-15:20/191	06:28 16:07-19:22/195 20:55 12:23-15:06/163	07:18 17:56-18:19/23 13:18-14:03/45 19:46 16:23-17:40/77	08:08 18:38	08:03 16:44	08:41 16:29
20	05:42 06:37-07:24/47 09:03-11:23/140 21:46 16:27-19:24/177 12:09-15:20/191	06:29 16:06-19:21/195 20:53 12:23-15:05/162	07:20 16:26-17:38/72 19:43 13:24-13:57/33	08:10 18:36	08:04 16:43	08:42 16:29
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23	05:46 06:41-07:21/40 09:06-11:21/135 21:42 16:25-19:25/180 12:10-15:20/190	06:34 16:06-19:19/193 20:47 12:26-15:02/156	07:24 16:33-17:28/55 19:37	08:15 18:30	08:09 16:39	08:44 16:30
24	05:48 06:42-07:20/38 09:07-11:20/133 21:41 16:24-19:25/181 12:10-15:19/189	06:36 16:06-19:17/191 20:45 12:27-15:02/155	07:26 16:37-17:24/47 19:34	08:17 18:28	08:11 16:38	08:44 16:31
25	05:49 06:43-07:18/35 09:07-11:19/132 21:40 16:23-19:25/182 12:11-15:19/188	06:38 16:06-19:16/190 20:43 12:28-15:00/152	07:28 16:41-17:19/38 19:32	07:19 17:26	08:13 16:37	08:44 16:32
26	05:51 06:45-07:17/32 09:09-11:19/130 21:38 16:23-19:26/183 12:12-15:19/187	06:39 16:06-19:16/190 20:40 12:29-14:59/150	07:29 16:47-17:12/25 19:30	07:20 17:24	08:14 16:36	08:45 16:32
27	05:52 06:46-07:15/29 09:10-11:17/127 21:37 16:22-19:26/184 12:12-15:19/187	06:41 16:06-19:14/188 20:38 12:30-14:57/147	07:31 19:27	07:22 17:22	08:16 16:35	08:45 16:33
28	05:53 06:49-07:14/25 09:11-11:16/125 21:35 16:21-19:26/185 12:11-15:18/187	06:42 16:07-19:13/186 20:36 12:31-14:56/145	07:33 19:25	07:24 17:20	08:17 16:34	08:45 16:34
29	05:55 06:52-07:11/19 09:12-11:15/123 21:34 16:20-19:27/187 12:12-15:19/187	06:44 16:06-19:11/185 20:34 12:32-14:55/143	07:34 19:23	07:26 17:18	08:19 16:34	08:45 16:35
30	05:56 06:56-07:06/10 09:13-11:13/120 21:32 16:19-19:27/188 12:12-15:18/186	06:46 16:07-19:10/183 20:32 12:33-14:54/141	07:36 19:20	07:27 17:16	08:20 16:33	08:46 16:36
31	05:58 16:19-19:27/188 12:13-15:18/185 21:31 09:15-11:13/118	06:47 16:07-19:07/180 20:29 12:34-14:52/138	 381	07:29 17:14	 267	 16:37
Potential sun hours	501	453		332	0	244
Sum of minutes with flicker	17242	12380	5099	0	0	0

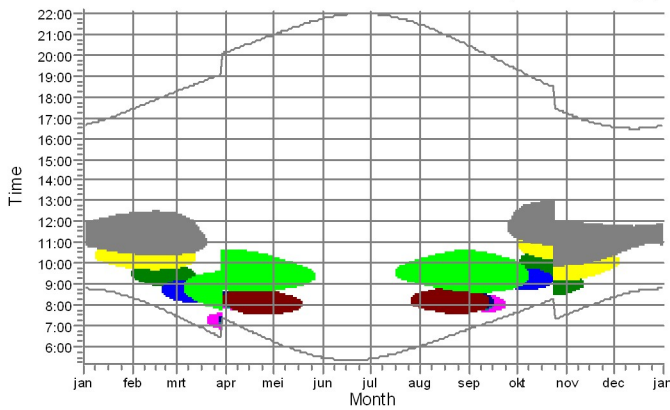
Table layout: For each day in each month the following matrix apply

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

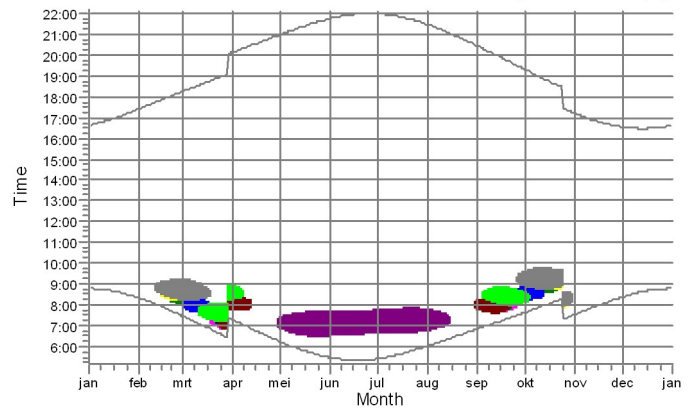
7. Calendar per WTG, graphical

Calculation: Slagschaduwberekening Bedrijventerrein De Geer

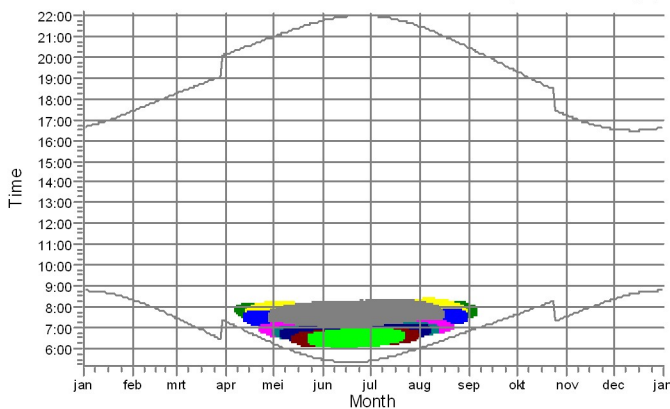
1: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (19



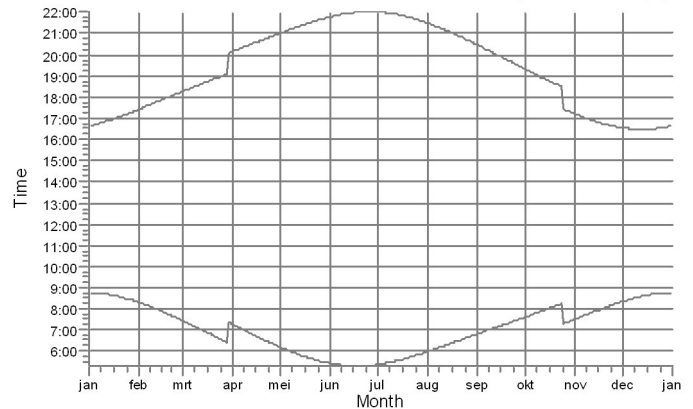
2: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (19



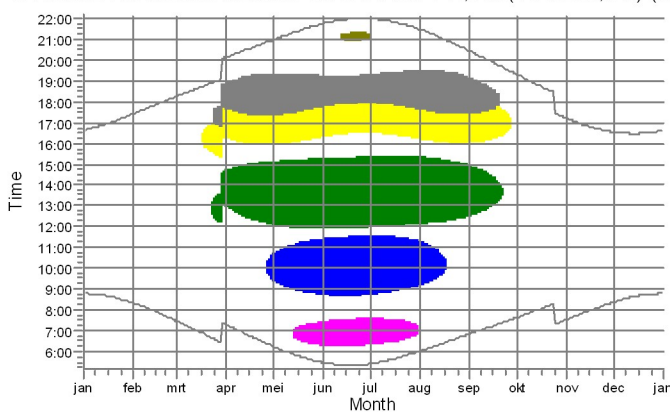
3: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (19



4: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (19



5: NORDEX N131/3300 DE 3300 131.0 !-! hub: 144,0 m (TOT: 209,5 m) (19



Shadow receptors

A: Shadow Receptor: 15,0 × 1,0 Azimuth: -35,0° Slope: 90,0° (682)	G: Shadow Receptor: 3,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (688)
B: Shadow Receptor: 15,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (683)	H: Shadow Receptor: 20,0 × 15,0 Azimuth: 0,0° Slope: 90,0° (689)
C: Shadow Receptor: 15,0 × 3,0 Azimuth: 0,0° Slope: 90,0° (684)	I: Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (691)
D: Shadow Receptor: 40,0 × 10,0 Azimuth: 0,0° Slope: 90,0° (685)	J: Shadow Receptor: 25,0 × 8,0 Azimuth: 94,0° Slope: 90,0° (692)
E: Shadow Receptor: 15,0 × 20,0 Azimuth: 0,0° Slope: 90,0° (686)	K: Shadow Receptor: 25,0 × 15,0 Azimuth: 94,0° Slope: 90,0° (693)
F: Shadow Receptor: 2,0 × 2,0 Azimuth: 0,0° Slope: 90,0° (687)	