

Project:  
Oremandsgaard

Description:  
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Calculated:  
11/04/2023 13.12/3.6.369

## SHADOW - Main Result

Calculation: V136 Skygge kast

### Assumptions for shadow calculations

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

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

Sunshine probability S (Average daily sunshine hours) []  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

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: EU-DEM 20\_20 10m  
Receptor grid resolution: 1,0 m

All coordinates are in  
UTM (north)-ETRS89 Zone: 32

### WTGs

Easting	Northing	Z	Row data/Description	WTG type			Shadow data				
				Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
1	695.079	6.106.744	34,9 23,2°, 410,0 m	Yes	VESTAS	V136-4.5-4.500	4.500	136,0	82,0	1.804	0,0
2	695.224	6.107.128	30,3	Yes	VESTAS	V136-4.5-4.500	4.500	136,0	82,0	1.804	0,0
3	695.369	6.107.511	30,6	Yes	VESTAS	V136-4.5-4.500	4.500	136,0	82,0	1.804	0,0



### Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Rekkendevej 24	694.802	6.107.828	36,1	15,0	15,0	1,0	0,0	"Green house mode"	1,0
B	Lygtevej 6	695.481	6.108.424	35,0	15,0	15,0	1,0	0,0	"Green house mode"	1,0
C	Oremandsgaard "ejer"	695.680	6.106.840	36,5	15,0	15,0	1,0	0,0	"Green house mode"	1,0
D	Allerslev	694.107	6.107.945	31,3	15,0	15,0	1,0	0,0	"Green house mode"	1,0
E	Oremandsgaard Alle 1	695.842	6.107.088	36,8	15,0	15,0	1,0	0,0	"Green house mode"	1,0
F	Oremandsgaard Alle 3	696.032	6.107.381	35,7	15,0	15,0	1,0	0,0	"Green house mode"	1,0
G	Mønvej 162	694.497	6.106.579	32,6	15,0	15,0	1,0	0,0	"Green house mode"	1,0
H	Mønvej 160	694.438	6.106.680	32,8	15,0	15,0	1,0	0,0	"Green house mode"	1,0
I	Mønvej 156	694.355	6.106.895	32,6	15,0	15,0	1,0	0,0	"Green house mode"	1,0
J	Mønvej 154	694.335	6.106.952	32,2	15,0	15,0	1,0	0,0	"Green house mode"	1,0
K	Mønvej 152	694.301	6.107.016	31,4	15,0	15,0	1,0	0,0	"Green house mode"	1,0
L	Lygtevej 4	695.486	6.108.357	34,3	15,0	15,0	1,0	0,0	"Green house mode"	1,0

### Calculation Results

#### Shadow receptor

No.	Name	Shadow, worst case			Shadow, expected values	
		Shadow hours per year	Shadow days per year	Max shadow hours per day	Shadow hours per year	
		[h/year]	[days/year]	[h/day]	[h/year]	
A	Rekkendevej 24	77:41	129	0:54	18:34	
B	Lygtevej 6	0:00	0	0:00	0:00	
C	Oremandsgaard "ejer"	97:46	147	0:58	43:08	
D	Allerslev	27:00	101	0:24	6:06	
E	Oremandsgaard Alle 1	69:29	125	0:56	28:19	
F	Oremandsgaard Alle 3	76:10	160	0:52	30:24	
G	Mønvej 162	96:12	148	0:58	43:48	
H	Mønvej 160	94:04	170	0:53	42:43	

To be continued on next page...

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## SHADOW - Main Result

Calculation: V136 Skygge kast

...continued from previous page

No.	Name	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]	Shadow hours per year [h/year]
I	Mønvej 156	70:17	171	0:47	29:49	
J	Mønvej 154	63:15	153	0:44	26:02	
K	Mønvej 152	55:35	140	0:42	21:50	
L	Lygtevej 4	0:00	0	0:00	0:00	

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

No.	Name	Worst case [h/year]	Expected [h/year]
2	3*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8)	268:17	110:03
3	3*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8)	132:54	51:21

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

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

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### SHADOW - Calendar per WTG

Calculation: V136 Skygge kast WTG: 1 - 3\*VESTAS V136-4.5 4500 136.0 IO! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	January	February	March	April	May	June
1	08.38 09.21-09.41/20 15.54	08.05 16.47	07.05 07.30-08.10/40 17.46 16.39-17.18/39	06.46 07.11-07.46/35 19.48 18.12-19.05/53	05.34 06.14-07.11/57 20.46	04.41 21.39
2	08.38 09.22-09.41/19 15.55	08.03 16.49	07.02 07.28-08.11/43 17.48 16.39-17.20/41	06.44 07.08-07.46/38 19.50 18.12-19.04/52	05.32 06.14-07.11/57 20.48	04.40 21.41
3	08.37 09.23-09.42/19 15.56	08.01 16.52	07.00 07.25-08.10/45 17.50 16.39-17.20/41	06.41 07.06-07.47/41 19.52 18.13-19.03/50	05.30 06.14-07.10/56 20.50	04.39 21.42
4	08.37 09.23-09.41/18 15.57	08.00 16.18-16.21/3 16.54	06.57 07.23-08.10/47 17.52 16.39-17.19/40	06.39 07.03-07.47/44 19.54 18.13-19.02/49	05.28 06.14-07.10/56 20.52	04.38 21.43
5	08.37 09.24-09.41/17 15.58	07.58 16.18-16.23/5 16.56	06.55 07.20-08.09/49 17.54 16.40-17.19/39	06.36 07.01-07.47/46 19.56 18.15-19.01/46	05.25 06.14-07.09/55 20.54	04.38 21.44
6	08.36 09.25-09.41/16 16.00	07.56 16.17-16.26/9 16.58	06.52 07.17-08.07/50 17.56 16.40-17.18/38	06.34 06.58-07.47/49 19.58 18.15-18.59/44	05.23 06.14-07.08/54 20.56	04.37 21.45
7	08.36 09.26-09.40/14 16.01	07.54 16.17-16.28/11 17.00	06.50 07.15-08.07/52 17.58 16.42-17.17/35	06.31 06.56-07.47/51 19.59 18.17-18.59/42	05.21 06.14-07.07/53 20.58	04.36 21.47
8	08.35 09.27-09.39/12 16.03	07.52 16.17-16.31/14 17.02	06.47 07.12-08.05/53 18.00 16.42-17.16/34	06.29 06.54-07.46/52 20.01 18.18-18.56/38	05.19 06.15-07.06/51 21.00	04.35 21.48
9	08.35 09.29-09.38/9 16.04	07.50 16.16-16.32/16 17.04	06.45 07.10-08.04/54 18.02 16.44-17.15/31	06.26 06.51-07.47/56 20.03 18.20-18.55/35	05.17 06.15-07.05/50 21.02	04.35 21.48
10	08.34 09.31-09.37/6 16.06	07.48 16.16-16.35/19 17.06	06.42 07.07-08.02/55 17.34-17.37/3 18.04 16.46-17.13/27	06.24 06.48-07.46/58 20.05 18.22-18.53/31	05.15 06.15-07.04/49 21.03	04.34 21.49
11	08.33 16.07	07.46 16.16-16.37/21 17.08	06.40 07.05-08.00/55 17.31-17.39/8 18.06 16.48-17.12/24	06.21 06.46-07.46/60 20.07 18.24-18.51/27	05.13 06.17-07.04/47 21.05	04.34 21.50
12	08.32 16.09	07.43 16.16-16.40/24 17.11	06.37 07.02-07.57/55 17.27-17.41/14 18.08 16.50-17.09/19	06.19 06.43-07.45/62 20.09 18.26-18.47/21	05.11 06.17-07.03/46 21.07	04.33 21.51
13	08.31 16.11	07.41 16.16-16.42/26 17.13	06.35 07.01-07.55/54 17.24-17.43/19 18.10 16.53-17.04/11	06.16 06.41-07.44/63 20.11 18.30-18.43/13	05.10 06.17-07.01/44 21.09	04.33 21.52
14	08.30 16.12	07.39 16.16-16.44/28 17.15	06.32 07.00-07.54/54 18.12 17.23-17.45/22	06.14 06.39-07.44/65 20.13	05.08 06.19-07.01/42 21.11	04.33 21.52
15	08.29 16.14	07.37 16.17-16.46/29 17.17	06.30 06.59-07.52/53 18.14 17.20-17.47/27	06.11 06.36-07.43/67 20.15	05.06 06.19-06.59/40 21.13	04.32 21.53
16	08.28 16.16	07.35 16.17-16.45/28 17.19	06.27 06.59-07.51/52 18.16 17.19-17.49/30	06.09 06.34-07.42/68 20.17	05.04 06.20-06.57/37 21.14	04.32 21.54
17	08.27 16.18	07.33 16.18-16.45/27 17.21 16.50-16.51/1	06.25 06.59-07.48/49 18.18 17.18-17.51/33	06.06 06.32-07.41/69 20.19	05.02 06.21-06.57/36 21.16	04.32 21.54
18	08.26 16.20	07.30 07.57-08.02/5 16.48-16.54/6 17.23 16.20-16.44/24	06.22 07.00-07.46/46 18.20 17.17-17.53/36	06.04 06.29-07.39/70 20.21	05.01 06.22-06.55/33 21.18	04.32 21.55
19	08.25 16.21	07.28 07.55-08.05/10 16.46-16.55/9 17.25 16.21-16.42/21	06.20 06.59-07.43/44 18.22 17.16-17.55/39	06.02 06.27-07.39/72 20.23	04.59 06.23-06.54/31 21.20	04.32 21.55
20	08.24 16.23	07.26 07.52-08.06/14 16.45-16.58/13 17.27 16.24-16.41/17	06.17 06.59-07.40/41 18.24 17.14-17.57/43	05.59 06.25-07.37/72 20.25	04.57 06.24-06.52/28 21.21	04.32 21.55
21	08.22 16.25	07.24 07.50-08.07/17 16.44-17.01/17 17.30 16.27-16.39/12	06.15 07.00-07.39/39 18.26 17.14-17.59/45	05.57 06.22-07.35/73 20.27	04.56 06.26-06.51/25 21.23	04.32 21.56
22	08.21 16.27	07.21 07.47-08.08/21 17.32 16.42-17.02/20	06.12 07.01-07.37/36 18.28 17.13-18.01/48	05.55 06.20-07.34/74 20.29	04.54 06.28-06.50/22 21.25	04.32 21.56
23	08.20 16.29	07.19 07.45-08.09/24 17.34 16.42-17.05/23	06.09 07.02-07.35/33 18.30 17.13-18.03/50	05.52 06.18-07.32/74 20.31	04.53 06.30-06.47/17 21.26	04.33 21.56
24	08.18 16.31	07.17 07.42-08.09/27 17.36 16.41-17.07/26	06.07 07.03-07.32/29 18.32 17.12-18.05/53	05.50 06.16-07.30/74 20.33	04.51 06.33-06.44/11 21.28	04.33 21.56
25	08.17 16.33	07.14 07.40-08.10/30 17.38 16.40-17.09/29	06.04 07.05-07.30/25 17.12-18.07/55 18.34 06.29-06.35/6	05.48 06.15-07.27/72 20.35	04.50 21.29	04.33 21.56
26	08.15 16.35	07.12 07.38-08.11/33 17.40 16.39-17.11/32	06.02 07.07-07.27/20 17.11-18.07/56 18.36 06.26-06.38/12	05.45 06.14-07.25/71 20.37	04.49 21.31	04.34 21.56
27	08.14 16.37	07.09 07.35-08.11/36 17.42 16.40-17.14/34	05.59 07.09-07.23/14 17.11-18.06/55 18.38 06.23-06.40/17	05.43 06.14-07.22/68 20.39	04.47 21.32	04.34 21.56
28	08.12 16.39	07.07 07.33-08.11/38 17.44 16.39-17.15/36	05.57 06.21-06.42/21 18.40 17.11-18.07/56	05.41 06.14-07.18/64 20.40	04.46 21.34	04.35 21.56
29	08.10 16.41		06.54 07.18-07.43/25 19.42 18.11-19.06/55	05.38 06.14-07.12/58 20.42	04.45 21.35	04.35 21.56
30	08.09 16.43		06.52 07.16-07.44/28 19.44 18.11-19.06/55	05.36 06.14-07.11/57 20.44	04.44 21.37	04.36 21.55
31	08.07 16.45		06.49 07.13-07.45/32 19.46 18.11-19.05/54		04.42 21.38	
Potential sun hours	243	270	366	423	500	518
Sum of minutes with flicker	150	835	2603	2324	997	0

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

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

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Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	July	August	September	October	November	December
1	04.37 21.55	05.19 06.27-07.14/47 21.17	06.17 06.45-07.45/60 20.07 18.23-18.50/27	07.13 07.40-08.35/55 18.05-18.21/16 18.50 17.30-17.46/16	07.14 15.45-16.04/19 16.37	08.12 15.49
2	04.37 21.55	05.21 06.27-07.15/48 21.15	06.18 06.47-07.45/58 20.05 18.21-18.52/31	07.15 07.42-08.37/55 18.07-18.18/11 18.48 17.27-17.49/22	07.16 15.45-16.02/17 16.35	08.14 09.14-09.20/6 15.49
3	04.38 21.54	05.23 06.25-07.15/50 21.13	06.20 06.49-07.45/56 20.02 18.18-18.53/35	07.17 07.44-08.39/55 18.10-18.16/6 18.45 17.25-17.50/25	07.18 15.46-16.00/14 16.33	08.15 09.13-09.22/9 15.48
4	04.39 21.53	05.24 06.25-07.16/51 21.11	06.22 06.51-07.44/53 20.00 18.15-18.53/38	07.19 07.46-08.41/55 18.43 17.22-17.52/30	07.21 15.47-15.58/11 16.31	08.17 09.11-09.23/12 15.47
5	04.40 21.53	05.26 06.25-07.17/52 21.09	06.24 06.52-07.43/51 19.57 18.13-18.55/42	07.21 07.48-08.42/54 18.40 17.20-17.52/32	07.23 15.47-15.55/8 16.28	08.19 09.11-09.25/14 15.46
6	04.41 21.52	05.28 06.24-07.17/53 21.07	06.26 06.54-07.43/49 19.55 18.11-18.56/45	07.23 07.50-08.42/52 18.38 17.18-17.53/35	07.25 15.48-15.53/5 16.27	08.20 09.12-09.27/15 15.46
7	04.42 21.52	05.30 06.24-07.18/54 21.05	06.28 06.56-07.42/46 19.52 18.10-18.56/46	07.24 07.52-08.43/51 18.35 17.17-17.54/37	07.27 15.48-15.51/3 16.25	08.21 09.11-09.28/17 15.45
8	04.43 21.51	05.32 06.23-07.19/56 21.03	06.30 06.58-07.42/44 19.50 18.07-18.56/49	07.26 07.54-08.44/50 18.33 17.16-17.54/38	07.29 15.48-15.51/3 16.23	08.23 09.11-09.29/18 15.45
9	04.44 21.50	05.34 06.22-07.18/56 21.01	06.32 06.59-07.40/41 19.47 18.06-18.56/50	07.28 07.56-08.44/48 18.30 17.15-17.54/39	07.31 15.48-15.51/3 16.21	08.24 09.11-09.30/19 15.44
10	04.45 21.49	05.35 06.22-07.19/57 20.59	06.33 07.01-07.39/38 19.44 18.05-18.57/52	07.30 07.58-08.44/46 18.28 17.14-17.54/40	07.33 15.48-15.51/3 16.19	08.25 09.11-09.30/19 15.44
11	04.47 21.48	05.37 06.22-07.19/57 20.57	06.35 07.03-07.38/35 19.42 18.04-18.57/53	07.32 08.00-08.44/44 18.25 17.13-17.54/41	07.35 15.48-15.51/3 16.17	08.26 09.12-09.32/20 15.44
12	04.48 21.47	05.39 06.22-07.20/58 20.55	06.37 07.05-07.37/32 19.39 18.03-18.57/54	07.34 08.02-08.44/42 18.23 17.13-17.53/40	07.37 15.48-15.51/3 16.15	08.28 09.12-09.32/20 15.44
13	04.49 21.46	05.41 06.21-07.19/58 20.52	06.39 07.07-07.36/29 19.37 18.03-18.57/54	07.36 08.04-08.43/39 18.20 17.12-17.50/38	07.39 15.48-15.51/3 16.14	08.29 09.12-09.33/21 15.43
14	04.50 21.45	05.43 06.21-07.19/58 20.50	06.41 07.08-07.33/25 19.34 18.01-18.56/55	07.38 08.06-08.43/37 18.18 17.12-17.47/35	07.41 15.48-15.51/3 16.12	08.30 09.12-09.33/21 15.43
15	04.52 21.44	05.45 06.22-07.27/65 20.48	06.43 07.10-07.32/22 19.32 18.00-18.56/56	07.40 08.08-08.43/35 18.16 17.12-17.45/33	07.43 15.48-15.51/3 16.10	08.31 09.12-09.34/22 15.43
16	04.53 21.42	05.47 06.22-07.30/68 20.46	06.45 08.00-08.11/11 18.00-18.56/56 19.29 07.12-07.30/18	07.42 08.10-08.42/32 18.13 17.12-17.42/30	07.45 15.48-15.51/3 16.08	08.32 09.13-09.35/22 15.43
17	04.55 21.41	05.48 06.21-07.32/71 20.43	06.47 07.56-08.15/19 18.00-18.56/56 19.26 07.14-07.27/13	07.44 08.13-08.42/29 18.11 17.12-17.40/28	07.47 15.48-15.51/3 16.07	08.33 09.13-09.35/22 15.43
18	04.56 21.40	05.50 06.21-07.34/73 20.41	06.48 07.53-08.17/24 17.59-18.55/56 19.24 07.16-07.23/7	07.46 08.15-08.41/26 18.08 17.13-17.38/25	07.49 15.48-15.51/3 16.05	08.34 09.14-09.36/22 15.44
19	04.57 06.45-06.52/7 21.39	05.52 06.22-07.36/74 20.39	06.50 07.51-08.19/28 19.21 17.59-18.53/54	07.48 08.17-08.40/23 18.06 17.13-17.35/22	07.51 15.48-15.51/3 16.04	08.34 09.14-09.36/22 15.44
20	04.59 06.42-06.56/14 21.37	05.54 06.24-07.38/74 20.36	06.52 07.48-08.20/32 19.19 17.58-18.49/51	07.50 08.19-08.39/20 17.14-17.33/19 18.04 17.00-17.07/7	07.53 15.48-15.51/3 16.02	08.35 09.14-09.37/23 15.44
21	05.01 06.39-06.58/19 21.36	05.56 06.25-07.38/73 20.34	06.54 07.47-08.22/35 19.16 17.58-18.47/49	07.52 08.21-08.37/16 17.14-17.30/16 18.01 16.56-17.10/14	07.55 15.48-15.51/3 16.01	08.35 09.14-09.37/23 15.45
22	05.02 06.37-07.00/23 21.34	05.58 06.27-07.40/73 20.32	06.56 07.45-08.23/38 19.14 17.58-18.44/46	07.54 08.23-08.36/13 17.15-17.28/13 17.59 16.53-17.12/19	07.56 15.48-15.51/3 16.00	08.36 09.15-09.38/23 15.45
23	05.04 06.36-07.02/26 21.33	06.00 06.29-07.41/72 20.29	06.58 07.44-08.24/40 19.11 17.59-18.42/43	07.56 08.25-08.34/9 17.16-17.25/9 17.57 16.51-17.13/22	07.58 15.48-15.51/3 15.58	08.36 09.15-09.38/23 15.46
24	05.05 06.34-07.03/29 21.31	06.02 06.31-07.42/71 20.27	07.00 07.43-08.26/43 19.08 17.59-18.39/40	07.58 08.27-08.31/4 17.18-17.22/4 17.54 16.49-17.14/25	08.00 15.48-15.51/3 15.57	08.37 09.16-09.39/23 15.46
25	05.07 06.33-07.05/32 21.29	06.03 06.33-07.43/70 20.24	07.02 07.43-08.28/45 19.06 17.59-18.37/38	07.00 15.49-16.15/26 16.52	08.02 15.48-15.51/3 15.56	08.37 09.17-09.39/22 15.47
26	05.09 06.32-07.06/34 21.28	06.05 06.34-07.43/69 20.22	07.03 07.42-08.30/48 19.03 18.00-18.34/34	07.02 15.47-16.16/29 16.50	08.04 15.48-15.51/3 15.55	08.38 09.17-09.39/22 15.48
27	05.10 06.31-07.08/37 21.26	06.07 06.36-07.44/68 20.20	07.05 07.41-08.32/51 19.01 18.01-18.32/31	07.04 15.46-16.16/30 16.48	08.06 15.48-15.51/3 15.53	08.38 09.18-09.39/21 15.48
28	05.12 06.31-07.09/38 21.24	06.09 06.38-07.44/66 20.17	07.07 07.40-08.33/53 18.58 18.01-18.28/27	07.06 15.46-16.13/27 16.45	08.07 15.48-15.51/3 15.52	08.38 09.18-09.40/22 15.49
29	05.14 06.29-07.10/41 21.23	06.11 06.40-07.45/65 20.15	07.09 07.40-08.33/53 18.56 18.02-18.26/24	07.08 15.45-16.11/26 16.43	08.09 15.48-15.51/3 15.51	08.38 09.19-09.40/21 15.50
30	05.15 06.29-07.12/43 21.21	06.13 06.41-07.44/63 20.12 18.30-18.43/13	07.11 07.39-08.34/55 18.03-18.23/20 18.53 17.36-17.41/5	07.10 15.46-16.09/23 16.41	08.11 15.48-15.51/3 15.50	08.38 09.20-09.41/21 15.51
31	05.17 06.27-07.12/45 21.19	06.15 06.43-07.45/62 20.10 18.26-18.47/21		07.12 15.45-16.07/22 16.39	08.38 15.48-15.51/3 15.52	08.38 09.20-09.41/21 15.52
Potential sun hours	520	464	383	326	254	226
Sum of minutes with flicker	388	1966	2569	1860	77	586

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:

Oremandsgaard

Description:

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Calculated:

11/04/2023 13.12/3.6.369

### SHADOW - Calendar per WTG

Calculation: V136 Skygge kast WTG: 2 - 3\*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8) Sunshine probability S (Average daily sunshine hours) []

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	January	February	March	April	May	June	
1	08.38 09.46-10.28/42 15.53	08.05 08.34-08.56/22 16.47	07.05 17.08-17.18/10 17.46	06.46 07.11-07.30/19 19.48 18.59-19.20/21	05.34 06.27-06.47/20 20.46 19.03-19.29/26	04.41 05.14-06.04/50 21.39 20.19-21.04/45	
2	08.38 09.47-10.28/41 15.55	08.03 08.32-08.56/24 16.49	07.02 17.06-17.20/14 17.48	06.44 07.08-07.30/22 19.50 18.57-19.22/25	05.32 06.29-06.45/16 20.48 19.06-19.26/20	04.40 05.13-06.03/50 21.41 20.19-21.05/46	
3	08.37 09.47-10.28/41 15.56	08.01 08.33-08.55/22 16.52	07.00 17.05-17.22/17 17.50	06.41 07.06-07.30/24 19.52 18.56-19.24/28	05.30 06.32-06.42/10 20.50 05.57-06.01/4	04.39 05.12-06.03/51 21.42 20.19-21.06/47	
4	08.37 09.48-10.29/41 15.57	08.00 08.34-08.54/20 16.54	06.57 17.04-17.24/20 17.52	06.39 07.03-07.30/27 19.54 18.55-19.26/31	05.28 05.55-06.02/7 20.52 05.53-06.03/10	04.38 05.11-06.02/51 21.43 20.18-21.06/48	
5	08.37 09.48-10.28/40 15.58	07.58 08.35-08.53/18 16.56	06.55 17.04-17.26/22 17.54	06.36 07.01-07.30/29 19.56 18.54-19.28/34	05.25 05.53-06.03/10 20.54	04.38 05.11-06.02/51 21.44 20.19-21.08/49	
6	08.36 09.50-10.29/39 16.00	07.56 08.37-08.51/14 16.58	06.52 17.02-17.28/26 17.56	06.34 06.58-07.29/31 19.57 18.52-19.29/37	05.23 05.51-06.04/13 20.56	04.37 05.10-06.02/52 21.45 20.18-21.09/51	
7	08.36 09.50-10.29/39 16.01	07.54 08.39-08.49/10 17.00	06.50 17.02-17.31/29 17.58	06.31 06.56-07.29/33 19.59 18.52-19.32/40	05.21 05.49-06.05/16 20.58	04.36 05.09-06.01/52 21.47 20.18-21.09/51	
8	08.35 09.51-10.28/37 16.03	07.52 17.02 17.02	06.47 17.02-17.32/30 18.00	06.29 06.53-07.28/35 20.01 18.51-19.33/42	05.19 05.47-06.05/18 21.00	04.35 05.09-06.01/52 21.48 20.19-21.11/52	
9	08.35 09.52-10.28/36 16.04	07.50 17.04 17.04	06.45 17.02-17.35/33 18.02	06.26 06.51-07.28/37 20.03 18.51-19.35/44	05.17 05.45-06.06/21 21.02	04.35 05.08-06.00/52 21.48 20.18-21.11/53	
10	08.34 09.53-10.28/35 16.06	07.48 17.06 17.06	06.42 17.01-17.37/36 18.04	06.24 06.48-07.27/39 20.05 18.49-19.37/48	05.15 05.43-06.06/23 21.03	04.34 05.08-06.00/52 21.49 20.19-21.12/53	
11	08.33 09.54-10.28/34 16.07	07.46 17.08 17.08	06.40 17.02-17.39/37 18.06	06.21 06.46-07.26/40 20.07 18.49-19.39/50	05.13 05.42-06.07/25 21.05	04.34 05.08-06.00/52 21.50 20.19-21.13/54	
12	08.32 09.55-10.27/32 16.09	07.43 17.11 17.11	06.37 17.01-17.41/40 18.08	06.19 06.43-07.24/41 20.09 18.49-19.40/51	05.11 05.40-06.07/27 21.07	04.33 05.07-05.59/52 21.51 20.18-21.13/55	
13	08.31 09.56-10.27/31 16.11	07.41 17.13 17.13	06.35 17.01-17.40/39 18.10	06.16 06.41-07.23/42 20.11 18.49-19.43/54	05.10 05.38-06.07/29 21.09	04.33 05.07-05.59/52 21.52 20.19-21.14/55	
14	08.30 09.57-10.26/29 16.12	07.39 17.15 17.15	06.32 17.02-17.40/38 18.12	06.14 06.39-07.22/43 20.13 18.49-19.45/56	05.08 05.37-06.08/31 21.11 20.36-20.37/1	04.33 05.07-05.59/52 21.53 20.19-21.15/56	
15	08.29 09.59-10.25/26 16.14	07.37 17.17 17.17	06.30 17.02-17.39/37 18.14	06.11 06.36-07.19/43 20.15 18.48-19.44/56	05.06 05.35-06.07/32 21.13 20.33-20.39/6	04.32 05.07-05.59/52 21.53 20.19-21.16/57	
16	08.28 10.00-10.23/23 16.16	07.35 17.19 17.19	06.27 17.04-17.38/34 18.16	06.09 06.34-07.17/43 20.17 18.49-19.44/55	05.04 05.33-06.07/34 21.14 20.31-20.41/10	04.32 05.07-05.59/52 21.54 20.20-21.16/56	
17	08.27 10.02-10.21/19 16.18	07.33 17.21 17.21	06.25 17.04-17.37/33 18.18	06.06 06.32-07.15/43 20.19 18.48-19.43/55	05.02 05.32-06.07/35 21.16 20.30-20.43/13	04.32 05.07-05.59/52 21.54 20.19-21.16/57	
18	08.26 10.04-10.18/14 16.20	07.30 17.23 17.23	06.22 17.06-17.36/30 18.20	06.04 06.29-07.11/42 20.21 18.49-19.43/54	05.01 05.30-06.07/37 21.18 20.28-20.44/16	04.32 05.07-05.59/52 21.55 20.19-21.16/57	
19	08.25 10.08-10.16/8 16.21	07.28 17.25 17.25	06.20 17.08-17.34/26 18.22	06.02 06.27-07.10/43 20.23 18.49-19.42/53	04.59 05.29-06.07/38 21.20 20.27-20.46/19	04.32 05.07-05.59/52 21.55 20.20-21.18/58	
20	08.24 16.23 16.23	07.26 17.27 17.27	06.17 17.09-17.31/22 18.24	05.59 06.25-07.09/44 20.25 18.50-19.42/52	04.57 05.27-06.07/40 21.21 20.25-20.47/22	04.32 05.07-05.59/52 21.55 20.20-21.18/58	
21	08.22 16.25 16.25	07.24 17.29 17.29	06.15 17.12-17.29/17 18.26	05.57 06.22-07.07/45 20.27 18.50-19.41/51	04.56 05.26-06.07/41 21.23 20.24-20.49/25	04.32 05.07-05.59/52 21.56 20.20-21.18/58	
22	08.21 08.52-08.53/1 16.27	07.21 17.32 17.32	06.12 17.17-17.23/6 18.28	05.54 06.21-07.05/44 20.29 18.51-19.40/49	04.54 05.25-06.07/42 21.25 20.24-20.50/26	04.32 05.07-05.59/52 21.56 20.20-21.18/58	
23	08.20 08.51-08.54/3 16.29	07.19 17.34 17.34	06.09 18.30 18.30	05.52 06.21-07.03/42 20.31 18.52-19.40/48	04.53 05.23-06.06/43 21.26 20.22-20.51/29	04.32 05.07-05.59/52 21.56 20.20-21.18/58	
24	08.18 08.49-08.55/6 16.31	07.17 17.36 17.36	06.07 18.32 18.32	05.50 06.22-07.01/39 20.33 18.53-19.39/46	04.51 05.22-06.06/44 21.28 20.22-20.53/31	04.33 05.08-06.00/52 21.56 20.21-21.18/57	
25	08.17 08.47-08.55/8 16.33	07.14 17.38 17.38	06.04 18.34 18.34	05.48 06.21-06.58/37 20.35 18.53-19.37/44	04.50 05.21-06.06/45 21.29 20.22-20.55/33	04.33 05.08-06.00/52 21.56 20.21-21.18/57	
26	08.15 08.46-08.56/10 16.35	07.12 17.40 17.40	06.02 18.36 18.36	05.45 06.22-06.55/33 20.37 18.54-19.36/42	04.49 05.20-06.06/46 21.31 20.21-20.56/35	04.34 05.09-06.01/52 21.56 20.22-21.19/57	
27	08.14 08.44-08.57/13 16.37	07.09 17.42 17.42	05.59 18.38 18.38	05.43 06.22-06.54/32 20.39 18.56-19.35/39	04.47 05.19-06.06/47 21.32 20.20-20.57/37	04.34 05.09-06.01/52 21.56 20.21-21.18/57	
28	08.12 08.42-08.57/15 16.39	07.07 17.09-17.15/6 17.44	05.57 06.21-06.26/5 18.40 18.10-18.13/3	05.41 06.23-06.53/30 20.40 18.58-19.34/36	04.46 05.17-06.05/48 21.34 20.20-20.58/38	04.35 05.10-06.02/52 21.56 20.22-21.18/56	
29	08.10 08.40-08.57/17 16.41		06.54 07.18-07.27/9 19.42 19.06-19.14/8	05.38 06.24-06.51/27 20.42 19.00-19.32/32	04.45 05.16-06.04/48 21.35 20.19-20.59/40	04.35 05.10-06.02/52 21.56 20.22-21.18/56	
30	08.09 08.38-08.57/19 16.43		06.51 07.16-07.28/12 19.44 19.03-19.17/14	05.36 06.25-06.49/24 20.44 19.01-19.31/30	04.44 05.15-06.04/49 21.37 20.19-21.00/41	04.36 05.11-06.03/52 21.55 20.23-21.18/55	
31	08.07 08.36-08.56/20 16.45		06.49 07.13-07.29/16 19.46 19.01-19.18/17		04.42 05.15-06.05/50 21.38 20.19-21.02/43		
Potential sun hours	243	270	366	423	500	518	
Sum of minutes with flicker	719	138	680	2376	1514	3180	

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:

Oremandsgaard

Description:

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Calculated:

11/04/2023 13.12/3.6.369

### SHADOW - Calendar per WTG

Calculation: V136 Skygge kast WTG: 2 - 3\*VESTAS V136-4.5 4500 136.0 IO! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) []

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	July		August		September		October		November		December	
1	04.37	05.12-06.04/52	05.19	05.51-06.17/26	06.17	06.45-07.25/40	07.13	17.41-18.20/39	07.14		08.12	09.36-10.10/34
	21.55	20.23-21.18/55	21.17		20.07	18.48-19.38/50	18.50		16.37		15.49	
2	04.37	05.12-06.04/52	05.21	05.53-06.17/24	06.18	06.47-07.26/39	07.15	17.40-18.18/38	07.16		08.14	09.36-10.11/35
	21.55	20.23-21.17/54	21.15		20.05	18.48-19.36/48	18.48		16.35		15.49	
3	04.38	05.13-06.05/52	05.23	05.54-06.16/22	06.20	06.49-07.26/37	07.17	17.39-18.16/37	07.18		08.15	09.36-10.12/36
	21.54	20.23-21.16/53	21.13		20.02	18.49-19.33/44	18.45		16.33		15.48	
4	04.39	05.14-06.06/52	05.24	05.56-06.16/20	06.22	06.50-07.25/35	07.19	17.39-18.13/34	07.21	08.09-08.19/10	08.17	09.35-10.13/38
	21.53	20.24-21.16/52	21.11		20.00	18.48-19.30/42	18.43		16.30		15.47	
5	04.40	05.15-06.07/52	05.26	05.58-06.15/17	06.24	06.52-07.25/33	07.21	17.39-18.11/32	07.23	08.06-08.21/15	08.19	09.35-10.14/39
	21.53	20.24-21.16/52	21.09		19.57	18.48-19.28/40	18.40		16.28		15.46	
6	04.41	05.16-06.08/52	05.28	05.59-06.14/15	06.26	06.54-07.25/31	07.23	17.38-18.08/30	07.25	08.05-08.23/18	08.20	09.36-10.15/39
	21.52	20.25-21.15/50	21.07		19.55	18.49-19.26/37	18.38		16.26		15.46	
7	04.42	05.17-06.08/51	05.30	06.01-06.13/12	06.28	06.56-07.25/29	07.24	17.38-18.05/27	07.27	08.05-08.25/20	08.21	09.36-10.15/39
	21.52	20.25-21.15/50	21.05		19.52	18.49-19.23/34	18.35		16.25		15.45	
8	04.43	05.18-06.09/51	05.32	06.03-06.12/9	06.30	06.58-07.25/27	07.26	17.38-18.03/25	07.29	08.04-08.26/22	08.23	09.35-10.16/41
	21.51	20.26-21.14/48	21.03		19.50	18.49-19.20/31	18.33		16.23		15.45	
9	04.44	05.19-06.10/51	05.34	06.04-06.10/6	06.32	06.59-07.23/24	07.28	17.39-18.00/21	07.31	08.03-08.27/24	08.24	09.36-10.17/41
	21.50	20.26-21.13/47	21.01	19.22-19.27/5	19.47	18.49-19.18/29	18.30		16.21		15.44	
10	04.45	05.20-06.11/51	05.35	06.39-06.52/13	06.33	07.01-07.23/22	07.30	17.39-17.58/19	07.33	08.05-08.27/22	08.25	09.36-10.17/41
	21.49	20.26-21.13/47	20.59	06.06-06.09/3	19.44	18.50-19.15/25	18.28		16.19		15.44	
11	04.47	05.21-06.11/50	05.37	06.37-06.54/17	06.35	07.03-07.22/19	07.32	17.40-17.55/15	07.35	08.08-08.28/20	08.26	09.37-10.19/42
	21.48	20.27-21.12/45	20.57	19.13-19.35/22	19.42	18.51-19.13/22	18.25		16.17		15.44	
12	04.48	05.22-06.12/50	05.39	06.35-06.56/21	06.37	07.05-07.21/16	07.34	17.41-17.53/12	07.37	08.10-08.29/19	08.28	09.37-10.19/42
	21.47	20.27-21.11/44	20.55	19.11-19.38/27	19.39	18.53-19.11/18	18.23		16.15		15.43	
13	04.49	05.23-06.12/49	05.41	06.33-06.57/24	06.39	07.07-07.20/13	07.36	17.42-17.50/8	07.39	08.12-08.29/17	08.29	09.37-10.20/43
	21.46	20.27-21.10/43	20.52	19.08-19.39/31	19.37	18.54-19.08/14	18.20		16.13		15.43	
14	04.50	05.25-06.14/49	05.43	06.31-06.59/28	06.41	07.08-07.17/9	07.38	17.43-17.47/4	07.41	08.14-08.29/15	08.30	09.37-10.20/43
	21.45	20.28-21.08/40	20.50	19.07-19.40/33	19.34	18.56-19.05/9	18.18		16.12		15.43	
15	04.52	05.26-06.14/48	05.45	06.31-07.01/30	06.43	07.10-07.15/5	07.40		07.43	08.17-08.30/13	08.31	09.38-10.21/43
	21.44	20.29-21.08/39	20.48	19.05-19.42/37	19.32	18.58-19.02/4	18.16		16.10		15.43	
16	04.53	05.27-06.14/47	05.47	06.30-07.02/32	06.45	07.12-07.13/1	07.42		07.45	08.19-08.29/10	08.32	09.38-10.21/43
	21.42	20.29-21.07/38	20.46	19.03-19.43/40	19.29		18.13		16.08		15.43	
17	04.55	05.28-06.14/46	05.48	06.28-07.02/34	06.47		07.44		07.47	08.21-08.29/8	08.33	09.39-10.22/43
	21.41	20.30-21.05/35	20.43	19.01-19.43/42	19.26		18.11		16.07		15.43	
18	04.56	05.30-06.16/46	05.50	06.28-07.05/37	06.48		07.46		07.49	08.23-08.29/6	08.33	09.39-10.23/44
	21.40	20.31-21.05/34	20.41	18.59-19.44/45	19.24		18.08		16.05		15.44	
19	04.57	05.31-06.16/45	05.52	06.27-07.07/40	06.50		07.48		07.51	08.25-08.28/3	08.34	09.39-10.22/43
	21.39	20.31-21.03/32	20.39	18.58-19.45/47	19.21		18.06		16.04		15.44	
20	04.59	05.33-06.17/44	05.54	06.27-07.09/42	06.52		07.50		07.53	08.27-08.28/1	08.35	09.40-10.23/43
	21.37	20.32-21.02/30	20.36	18.57-19.45/48	19.19		18.04		16.02		15.44	
21	05.01	05.34-06.17/43	05.56	06.26-07.10/44	06.54		07.52		07.55		08.35	09.40-10.23/43
	21.36	20.33-21.01/28	20.34	18.55-19.45/50	19.16		18.01		16.01		15.45	
22	05.02	05.35-06.17/42	05.58	06.27-07.12/45	06.56	17.58-18.12/14	07.54		07.56		08.36	09.41-10.24/43
	21.34	20.34-20.59/25	20.32	18.54-19.45/51	19.14		17.59		16.00		15.45	
23	05.04	05.37-06.17/40	06.00	06.29-07.13/44	06.58	17.55-18.15/20	07.56		07.58	09.45-09.53/8	08.36	09.41-10.24/43
	21.33	20.35-20.58/23	20.29	18.54-19.46/52	19.11		17.57		15.58		15.46	
24	05.05	05.38-06.17/39	06.02	06.31-07.14/43	07.00	17.52-18.17/25	07.58		08.00	09.42-09.56/14	08.37	09.42-10.25/43
	21.31	20.36-20.56/20	20.27	18.53-19.46/53	19.08		17.54		15.57		15.46	
25	05.07	05.40-06.18/38	06.03	06.33-07.15/42	07.02	17.50-18.18/28	07.50		08.02	09.40-09.59/19	08.37	09.42-10.26/44
	21.29	20.38-20.55/17	20.24	18.51-19.45/54	19.06		16.52		15.56		15.47	
26	05.09	05.41-06.17/36	06.05	06.34-07.17/43	07.03	17.48-18.19/31	07.02		08.04	09.39-10.02/23	08.38	09.42-10.26/44
	21.28	20.39-20.53/14	20.22	18.51-19.46/55	19.03		16.50		15.54		15.48	
27	05.10	05.43-06.18/35	06.07	06.36-07.19/43	07.05	17.45-18.19/34	07.04		08.06	09.38-10.04/26	08.38	09.43-10.26/43
	21.26	20.41-20.52/11	20.20	18.50-19.46/56	19.01		16.48		15.53		15.48	
28	05.12	05.45-06.18/33	06.09	06.38-07.21/43	07.07	17.44-18.19/35	07.06		08.07	09.38-10.06/28	08.38	09.43-10.26/43
	21.24	20.42-20.50/8	20.17	18.50-19.46/56	18.58		16.45		15.52		15.49	
29	05.14	05.46-06.18/32	06.11	06.40-07.23/43	07.09	17.42-18.20/38	07.08		08.09	09.36-10.07/31	08.38	09.44-10.27/43
	21.23	20.45-20.49/4	20.15	18.50-19.45/55	18.56		16.43		15.51		15.50	
30	05.15	05.48-06.18/30	06.13	06.41-07.23/42	07.11	17.41-18.20/39	07.10		08.11	09.36-10.08/32	08.38	09.45-10.27/42
	21.21		20.12	18.49-19.42/53	18.53		16.41		15.50		15.51	
31	05.17	05.49-06.17/28	06.15	06.43-07.24/41			07.12				08.38	09.46-10.28/42
	21.19		20.10	18.48-19.40/52			16.39				15.52	
Potential sun hours	520		464		383		326		254		226	
Sum of minutes with flicker	2424		1925		1091		341		424		1285	

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:

Oremandsgaard

Description:

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Calculated:

11/04/2023 13.12/3.6.369

### SHADOW - Calendar per WTG

Calculation: V136 Skygge kast WTG: 3 - 3\*VESTAS V136-4.5 4500 136.0 IO! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8) Sunshine probability S (Average daily sunshine hours) []

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	January	February	March	April	May	June
1	08.38 15.53	08.05 08.34-08.42/8 16.47	07.05 07.32-07.54/22 17.46 08.04-08.44/40	06.46 19.48	05.34 06.01-06.18/17 20.46 19.15-20.04/49	04.41 05.31-05.48/17 21.39
2	08.38 15.55	08.03 08.32-08.44/12 16.49	07.02 07.33-07.53/20 17.48 08.06-08.42/36	06.44 19.50	05.32 05.59-06.18/19 20.48 19.16-20.03/47	04.40 05.31-05.47/16 21.41
3	08.37 15.56	08.01 08.30-08.45/15 16.52	07.00 07.34-07.50/16 17.50 08.07-08.39/32	06.41 19.52	05.30 05.57-06.18/21 20.50 19.16-20.03/47	04.39 05.32-05.46/14 21.42 05.12-05.13/1
4	08.37 15.57	08.00 08.28-08.47/19 16.54	06.57 07.36-07.48/12 17.52 08.08-08.35/27	06.39 19.54	05.28 05.55-06.17/22 20.52 19.17-20.02/45	04.38 05.33-05.45/12 21.43 05.11-05.14/3
5	08.37 15.58	07.58 08.26-08.48/22 16.56	06.55 08.11-08.33/22 17.54	06.36 19.56	05.25 05.53-06.17/24 20.54 19.18-20.01/43	04.38 05.35-05.45/10 21.44 05.11-05.15/4
6	08.36 16.00	07.56 08.24-08.49/25 16.58	06.52 08.15-08.28/13 17.56	06.34 19.57	05.23 05.51-06.17/26 20.56 19.18-20.01/43	04.37 05.36-05.43/7 21.45 05.10-05.15/5
7	08.36 16.01	07.54 08.22-08.50/28 17.00	06.50 17.58	06.31 19.59	05.21 05.49-06.16/27 20.58 19.19-20.00/41	04.36 05.09-05.15/6 21.47
8	08.35 16.03	07.52 08.20-08.51/31 17.02	06.47 18.00	06.29 20.01	05.19 05.47-06.16/29 21.00 19.20-19.59/39	04.35 05.09-05.16/7 21.48
9	08.35 16.04	07.50 08.17-08.51/34 17.04	06.45 18.02	06.26 19.31-19.35/4 20.03	05.17 05.45-06.15/30 21.02 19.22-19.57/35	04.35 05.08-05.16/8 21.49
10	08.34 16.06	07.48 08.15-08.52/37 17.06	06.42 18.04	06.24 19.27-19.37/10 20.05	05.15 05.43-06.14/31 21.03 19.23-19.56/33	04.34 05.08-05.17/9 21.49
11	08.33 16.07	07.46 08.13-08.53/40 17.08	06.40 18.06	06.21 19.25-19.39/14 20.07	05.13 05.42-06.14/32 21.05 19.25-19.56/31	04.34 05.08-05.17/9 21.50
12	08.32 16.09	07.43 08.11-08.53/42 17.11	06.37 18.08	06.19 19.23-19.40/17 20.09	05.11 05.40-06.12/32 21.07 19.26-19.54/28	04.33 05.07-05.17/10 21.51
13	08.31 16.11	07.41 08.09-08.54/45 17.13	06.35 18.10	06.16 19.22-19.43/21 20.11	05.10 05.38-06.11/33 21.09 19.28-19.52/24	04.33 05.07-05.17/10 21.52
14	08.30 16.12	07.39 08.06-08.54/48 17.15	06.32 18.12	06.14 19.21-19.45/24 20.13	05.08 05.37-06.10/33 21.11 19.29-19.50/21	04.33 05.07-05.18/11 21.53
15	08.29 16.14	07.37 08.04-08.54/50 17.17	06.30 18.14	06.11 19.19-19.46/27 20.15	05.06 05.35-06.08/33 21.13 19.32-19.48/16	04.32 05.07-05.18/11 21.53
16	08.28 16.16	07.35 08.02-08.54/52 17.19	06.27 18.16	06.09 19.18-19.48/30 20.17	05.04 05.33-06.06/33 21.14 19.35-19.44/9	04.32 05.07-05.19/12 21.54
17	08.27 16.18	07.33 08.00-08.54/54 17.21	06.25 18.18	06.06 19.17-19.50/33 20.19	05.02 05.32-06.03/31 21.16	04.32 05.07-05.19/12 21.54
18	08.26 16.19	07.30 08.00-08.54/54 17.23	06.22 18.20	06.04 19.16-19.52/36 20.21	05.01 05.30-06.02/32 21.18	04.32 05.07-05.19/12 21.55
19	08.25 16.21	07.28 08.00-08.54/54 17.25	06.20 18.22	06.02 19.16-19.54/38 20.23	04.59 05.29-06.01/32 21.20	04.32 05.07-05.19/12 21.55
20	08.24 16.23	07.26 07.52-07.56/4 17.27	06.17 18.24	05.59 19.14-19.55/41 20.25	04.57 05.27-06.00/33 21.21	04.32 05.07-05.19/12 21.55
21	08.22 16.25	07.24 07.50-07.57/7 17.29	06.15 18.26	05.57 19.14-19.57/43 20.27	04.56 05.26-05.59/33 21.23	04.32 05.07-05.20/13 21.56
22	08.21 16.27	07.21 07.47-07.57/10 17.32	06.12 18.28	05.54 19.14-19.59/45 20.29	04.54 05.25-05.59/34 21.25	04.32 05.07-05.19/12 21.56
23	08.20 16.29	07.19 07.45-07.57/12 17.34	06.09 18.30	05.52 19.14-20.01/47 20.31	04.53 05.24-05.57/33 21.26	04.32 05.07-05.19/12 21.56
24	08.18 16.31	07.17 07.42-07.57/15 17.36	06.07 18.32	05.50 19.13-20.02/49 20.33	04.51 05.25-05.56/31 21.28	04.33 05.08-05.20/12 21.56
25	08.17 16.33	07.14 07.40-07.57/17 17.38	06.04 18.34	05.47 19.13-20.04/51 20.35	04.50 05.26-05.55/29 21.29	04.33 05.08-05.20/12 21.56
26	08.15 16.35	07.12 07.38-07.57/19 17.40	06.02 18.36	05.45 06.11-06.15/4 20.37 19.13-20.05/52	04.49 05.26-05.53/27 21.31	04.34 05.09-05.21/12 21.56
27	08.14 16.37	07.09 07.35-07.56/21 17.42	05.59 18.38	05.43 06.09-06.16/7 20.39 19.14-20.05/51	04.47 05.27-05.52/25 21.32	04.34 05.09-05.20/11 21.56
28	08.12 16.39	07.07 07.33-07.56/23 17.44	05.57 18.40	05.41 06.07-06.16/9 20.40 19.14-20.05/51	04.46 05.27-05.50/23 21.34	04.35 05.10-05.21/11 21.56
29	08.10 16.41		06.54 19.42	05.38 06.05-06.17/12 20.42 19.14-20.05/51	04.45 05.27-05.49/22 21.35	04.35 05.10-05.21/11 21.56
30	08.09 16.43		06.51 19.44	05.36 06.03-06.17/14 20.44 19.15-20.04/49	04.44 05.28-05.49/21 21.37	04.36 05.11-05.21/10 21.55
31	08.07 08.36-08.40/4 16.45		06.49 19.46		04.42 05.30-05.49/19 21.38	
Potential sun hours	243	270	366	423	500	518
Sum of minutes with flicker	4	1240	240	830	1418	346

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:

Oremandsgaard

Description:

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Calculated:

11/04/2023 13.12/3.6.369

### SHADOW - Calendar per WTG

Calculation: V136 Skygge kast WTG: 3 - 3\*VESTAS V136-4.5 4500 136.0 IO! hub: 82,0 m (TOT: 150,0 m) dist: 410 m (3,0 RD) angle: 23° (8) Sunshine probability S (Average daily sunshine hours) []

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
1,61 2,18 4,71 7,03 7,65 8,00 7,81 6,03 5,03 3,29 1,73 1,42

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

	July	August	September	October	November	December
1	04.37 05.12-05.21/9 21.55	05.19 05.51-06.23/32 21.17 19.36-20.05/29	06.17 19.24-19.38/14 20.07	07.13 18.50	07.14 07.45-08.21/36 16.37	08.12 15.49
2	04.37 05.12-05.21/9 21.55	05.21 05.53-06.24/31 21.15 19.35-20.06/31	06.18 19.26-19.36/10 20.05	07.15 18.48	07.16 07.47-08.21/34 16.35	08.14 15.49
3	04.38 05.13-05.21/8 21.54	05.23 05.54-06.24/30 21.13 19.33-20.07/34	06.20 19.28-19.33/5 20.02	07.17 18.45	07.18 07.50-08.21/31 16.32	08.15 15.48
4	04.39 05.14-05.21/7 21.54	05.24 05.56-06.25/29 21.11 19.31-20.08/37	06.22 20.00	07.19 18.43	07.21 07.52-08.20/28 16.30	08.17 15.47
5	04.40 05.15-05.21/6 21.53	05.26 05.58-06.26/28 21.09 19.30-20.09/39	06.24 19.57	07.21 18.40	07.23 07.54-08.19/25 16.28	08.19 15.46
6	04.41 05.16-05.21/5 21.52	05.28 05.59-06.26/27 21.07 19.28-20.09/41	06.26 19.55	07.22 18.38	07.25 07.56-08.18/22 16.26	08.20 15.46
7	04.42 05.17-05.21/4 21.52	05.30 06.01-06.26/25 21.05 19.27-20.10/43	06.28 19.52	07.24 08.55-09.00/5 18.35	07.27 07.59-08.17/18 16.25	08.21 15.45
8	04.43 05.18-05.21/3 21.51	05.32 06.03-06.27/24 21.03 19.27-20.11/44	06.30 19.50	07.26 08.48-09.06/18 18.33	07.29 08.01-08.16/15 16.23	08.23 15.45
9	04.44 05.19-05.21/2 21.50	05.33 06.04-06.26/22 21.01 19.25-20.11/46	06.32 19.47	07.28 08.12-08.20/8 18.30	07.31 08.03-08.14/11 16.21	08.24 15.44
10	04.45 05.20-05.21/1 21.49	05.35 06.06-06.26/20 20.59 19.24-20.11/47	06.33 19.44	07.30 08.09-08.23/14 18.28	07.33 08.05-08.12/7 18.42-09.12/30	08.25 16.19
11	04.46 05.21-05.21/0 21.48	05.37 06.08-06.26/18 20.57 19.24-20.12/48	06.35 19.42	07.32 08.07-08.25/18 18.25	07.35 08.08-08.11/3 18.40-09.14/34	08.26 16.17
12	04.48 05.22-05.21/0 21.47	05.39 06.10-06.26/16 20.55 19.23-20.12/49	06.37 19.39	07.34 08.06-08.26/20 18.23	07.37 18.38-09.16/38	08.28 16.15
13	04.49 05.23-05.21/0 21.46	05.41 06.11-06.25/14 20.52 19.22-20.12/50	06.39 19.37	07.36 08.05-08.27/22 18.20	07.39 18.37-09.18/41	08.29 16.13
14	04.50 05.24-05.21/0 21.45	05.43 06.13-06.24/11 20.50 19.22-20.12/50	06.41 19.34	07.38 08.06-08.28/22 18.18	07.41 18.35-09.19/44	08.30 16.12
15	04.52 05.25-05.21/0 21.44	05.45 06.15-06.24/9 20.48 19.21-20.12/51	06.43 19.32	07.40 08.08-08.28/20 18.15	07.43 18.34-09.20/46	08.31 16.10
16	04.53 05.26-05.21/0 21.43	05.47 06.17-06.23/6 20.46 19.21-20.12/51	06.45 19.29	07.42 08.10-08.28/18 18.13	07.45 18.33-09.21/48	08.32 16.08
17	04.54 05.27-05.21/0 21.41	05.48 06.18-06.21/3 20.43 19.20-20.11/51	06.46 19.26	07.44 08.13-08.29/16 18.11	07.47 18.33-09.22/49	08.33 16.07
18	04.56 05.28-05.21/0 21.40	05.50 19.20-20.10/50 20.41	06.48 19.24	07.46 08.15-08.29/14 18.08	07.49 18.32-09.23/51	08.33 16.05
19	04.57 05.29-05.21/0 21.39	05.52 19.20-20.09/49 20.39	06.50 19.21	07.48 08.17-08.28/11 18.06	07.51 18.32-09.23/51	08.34 16.04
20	04.59 05.30-05.21/0 21.37	05.54 19.20-20.07/47 20.36	06.52 19.19	07.50 08.19-08.28/9 18.04	07.53 18.31-09.23/52	08.35 16.02
21	05.00 05.31-05.21/0 21.36	05.56 19.19-20.04/45 20.34	06.54 19.16	07.52 08.21-08.27/6 18.01	07.55 18.31-09.23/52	08.35 16.01
22	05.02 05.32-05.21/0 21.34	05.58 19.19-20.01/42 20.32	06.56 19.14	07.54 08.23-08.26/3 17.59	07.56 18.30-09.24/54	08.36 15.59
23	05.04 05.33-05.21/0 21.33	06.00 19.19-19.59/40 20.29	06.58 19.11	07.56 08.30-09.24/54 17.57	07.58 18.30-09.24/54	08.36 15.58
24	05.05 05.34-05.21/0 21.31	06.02 19.20-19.57/37 20.27	07.00 19.08	07.58 08.30-09.23/53 17.54	08.00 18.30-09.23/53	08.37 15.57
25	05.07 05.35-05.21/0 21.29	06.03 19.19-19.54/35 20.24	07.02 19.06	07.00 07.30-08.24/54 16.52	08.02 18.30-09.24/54	08.37 15.56
26	05.09 05.36-05.21/0 21.28	06.05 19.19-19.52/33 20.22	07.03 19.03	07.02 07.32-08.24/52 16.50	08.04 18.30-09.24/54	08.38 15.54
27	05.10 05.37-05.21/0 21.26	06.07 19.20-19.50/30 20.20	07.05 19.01	07.04 07.34-08.23/49 16.47	08.06 18.30-09.24/54	08.38 15.53
28	05.12 05.38-05.21/0 21.24	06.09 19.21-19.48/27 20.17	07.07 18.58	07.06 07.36-08.23/47 16.45	08.07 18.30-09.24/54	08.38 15.52
29	05.14 05.39-05.21/0 21.23	06.11 19.22-19.46/24 20.15	07.09 18.56	07.08 07.38-08.23/45 16.43	08.09 18.30-09.24/54	08.38 15.51
30	05.15 05.40-05.21/0 21.21	06.13 19.22-19.42/20 20.12	07.11 18.53	07.10 07.41-08.23/42 16.41	08.11 18.30-09.24/54	08.38 15.50
31	05.17 05.41-05.21/0 21.19	06.15 19.23-19.40/17 20.10	07.12 18.51	07.12 07.43-08.22/39 16.39	08.11 18.30-09.24/54	08.38 15.49
Potential sun hours	520	464	383	326	254	226
Sum of minutes with flicker	782	1582	29	1273	230	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:

Oremandsgaard

Description:

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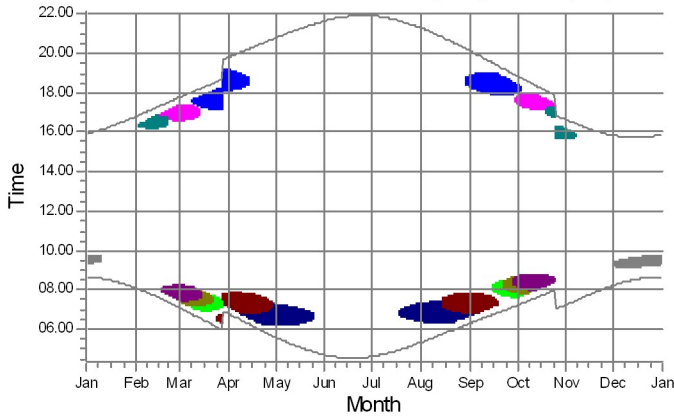
Calculated:

11/04/2023 13.12/3.6.369

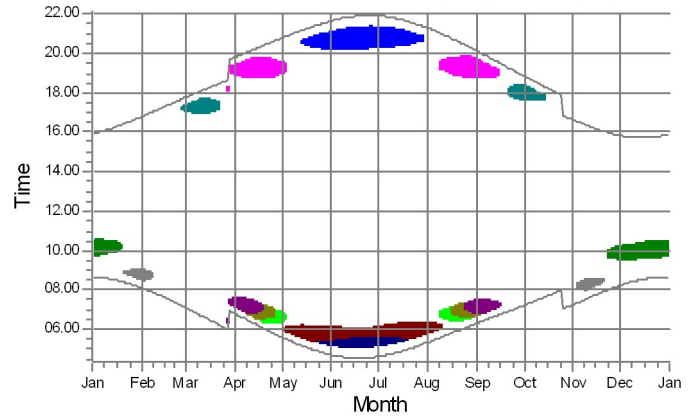
## SHADOW - Calendar per WTG, graphical

Calculation: V136 Skygge kast

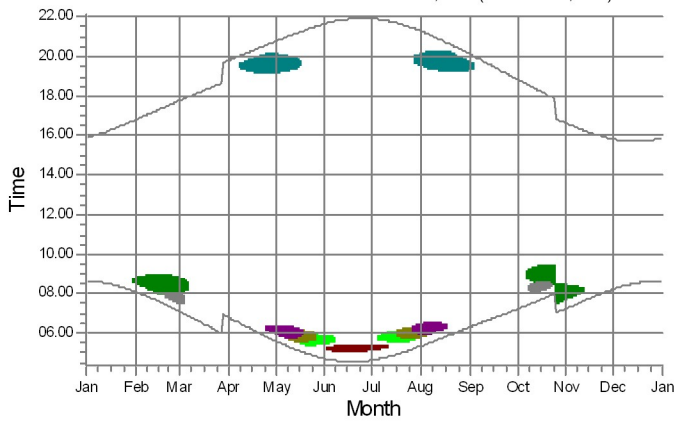
1: 3\*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 4



2: 3\*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 4



3: 3\*VESTAS V136-4.5 4500 136.0 !O! hub: 82,0 m (TOT: 150,0 m) dist: 4



### Shadow receptors

	A: Rekkendevej 24		F: Oremandsgaard Alle 3		J: Mønvej 154
	C: Oremandsgaard "ejer"		G: Mønvej 162		K: Mønvej 152
	D: Allerslev		H: Mønvej 160		
	E: Oremandsgaard Alle 1		I: Mønvej 156		

Project:

Oremandsgaard

Description:

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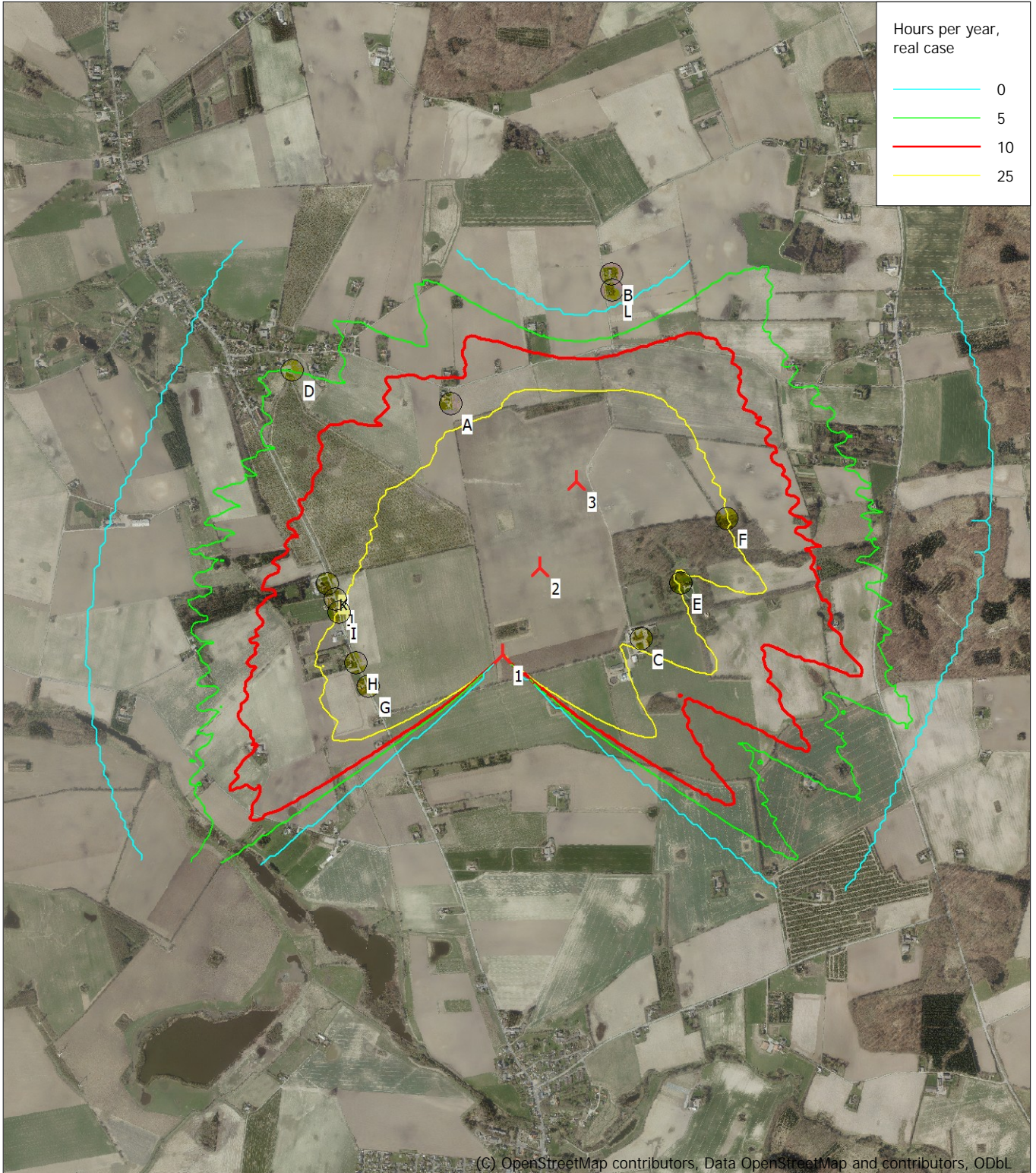
HSP / hsp@emd.dk

Calculated:

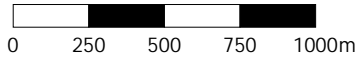
11/04/2023 13.12/3.6.369

## SHADOW - Map

Calculation: V136 Skygge kast



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



Map: Danish Orthophoto Mosaic , Print scale 1:25.000, Map center UTM (north)-ETRS89 Zone: 32 East: 695.220 North: 6.107.140

▲ New WTG      ● Shadow receptor

Flicker map level: EU-DEM 20\_20 10m

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