

## SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513

### Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence 3 °

Day step for calculation 1 days

Time step for calculation 1 minutes

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

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

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
591	488	417	431	453	653	880	1 025	878	778	643	602	7 839

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE\_Sysmä Rekolanvuoret

Area object(s) used in calculation:

Area object (Luke shadow): (4)

Obstacles used in calculation

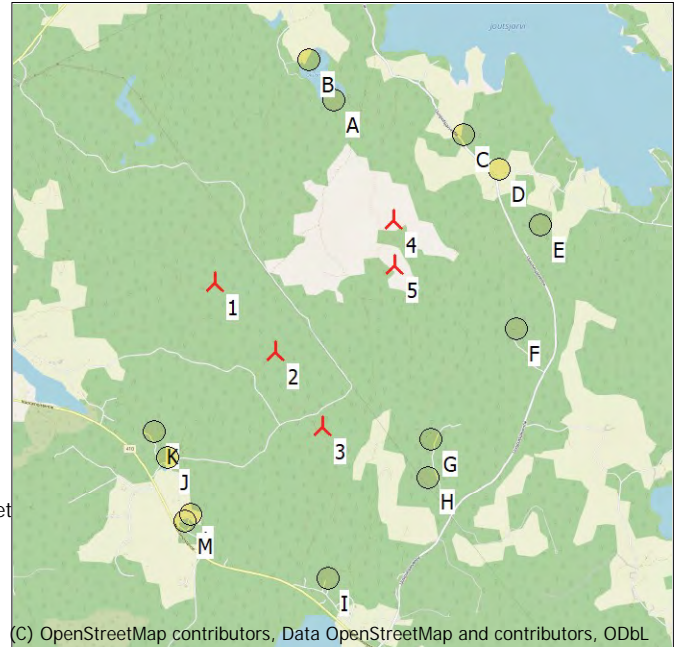
Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

### WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
1	434 606	6 818 356	128,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
2	435 203	6 817 657	125,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
3	435 657	6 816 908	120,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
4	436 398	6 818 946	134,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
5	436 394	6 818 500	139,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8



Scale 1:75 000  
 (C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL  
 ▲ New WTG      ● Shadow receptor

### Shadow receptor-Input

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

### Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	Kaavoitettu asunto/loma-asunto A (Okslampi)	0:00
B	Asuinrakennus B (Oksjärventie 150)	1:30

To be continued on next page...

## SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513

...continued from previous page

No.	Name	Shadow, expected values	
		Shadow hours	per year [h/year]
C	Lomarakennus C (Uusjoutsjärventie 312)	0:00	
D	Asuinrakennus D (Uusjoutsjärventie 362)	5:50	
E	Lomarakennus E (Uusjoutsjärventie 450)	0:00	
F	Asuinrakennus F (Ahorajantie 64)	0:00	
G	Asuinrakennus G (Uutelantie 82)	9:45	
H	Lomarakennus H (Nurmela)	0:00	
I	Lomarakennus I (Mikkolanmäentie 24)	0:00	
J	Asuinrakennus J (Työlammentie 24)	0:00	
K	Lomarakennus K (Viitostie 31)	0:00	
L	Asuinrakennus L (Mäntymäki)	0:00	
M	Lomarakennus M (Mäntymäki)	7:28	

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

No.	Name	Expected [h/year]
1	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (133)	0:00
2	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (134)	3:58
3	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (137)	13:15
4	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (136)	4:56
5	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (135)	2:24

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.







## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513Shadow receptor: D - Asuinrakennus D (Uusjoutsjärventie 362)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June
1	09.35	08.42	07.22	16.34 (4)	06.43	05.10
	15.06	16.20	17.39	15	16.49 (4)	20.01
2	09.35	08.40	07.19	16.30 (4)	06.40	05.07
	15.08	16.23	17.42	21	16.51 (4)	20.04
3	09.34	08.37	07.16	16.29 (4)	06.37	05.04
	15.09	16.26	17.45	24	16.53 (4)	20.06
4	09.33	08.34	07.12	16.27 (4)	06.34	05.01
	15.11	16.29	17.47	27	16.54 (4)	20.09
5	09.32	08.32	07.09	16.26 (4)	06.30	04.58
	15.13	16.32	17.50	29	16.55 (4)	20.12
6	09.31	08.29	07.06	16.25 (4)	06.27	04.55
	15.15	16.35	17.53	30	16.55 (4)	20.14
7	09.30	08.26	07.03	16.24 (4)	06.24	04.52
	15.17	16.37	17.55	32	16.56 (4)	20.17
8	09.29	08.24	15.40 (5)	07.00	16.23 (4)	06.21
	15.19	16.40	15.47 (5)	17.58	34	16.57 (4)
9	09.28	08.21	15.37 (5)	06.57	16.23 (4)	06.18
	15.21	16.43	15.51 (5)	18.01	34	16.57 (4)
10	09.27	08.18	15.34 (5)	06.54	16.22 (4)	06.15
	15.23	16.46	15.52 (5)	18.03	34	16.56 (4)
11	09.25	08.15	15.33 (5)	06.50	16.22 (4)	06.11
	15.25	16.49	15.54 (5)	18.06	34	16.56 (4)
12	09.24	08.12	15.32 (5)	06.47	16.22 (4)	06.08
	15.27	16.52	15.55 (5)	18.09	34	16.56 (4)
13	09.22	08.10	15.31 (5)	06.44	16.22 (4)	06.05
	15.30	16.55	15.56 (5)	18.11	34	16.56 (4)
14	09.21	08.07	15.31 (5)	06.41	16.21 (4)	06.02
	15.32	16.57	15.57 (5)	18.14	33	16.54 (4)
15	09.19	08.04	15.30 (5)	06.38	16.22 (4)	05.59
	15.34	17.00	15.58 (5)	18.17	32	16.54 (4)
16	09.17	08.01	15.30 (5)	06.35	16.23 (4)	05.56
	15.37	17.03	15.58 (5)	18.19	30	16.53 (4)
17	09.15	07.58	15.29 (5)	06.31	16.24 (4)	05.52
	15.39	17.06	15.58 (5)	18.22	28	16.52 (4)
18	09.14	07.55	15.29 (5)	06.28	16.24 (4)	05.49
	15.42	17.09	15.58 (5)	18.24	26	16.50 (4)
19	09.12	07.52	15.29 (5)	06.25	16.26 (4)	05.46
	15.45	17.11	15.58 (5)	18.27	22	16.48 (4)
20	09.10	07.49	15.30 (5)	06.22	16.28 (4)	05.43
	15.47	17.14	15.58 (5)	18.30	18	16.46 (4)
21	09.08	07.46	15.29 (5)	06.19	16.31 (4)	05.40
	15.50	17.17	15.57 (5)	18.32	12	16.43 (4)
22	09.06	07.43	15.30 (5)	06.15	05.37	04.13
	15.53	17.20	15.56 (5)	18.35	20.57	22.17
23	09.03	07.40	15.31 (5)	06.12	05.34	04.11
	15.55	17.23	15.56 (5)	18.38	20.59	22.19
24	09.01	07.37	15.32 (5)	06.09	05.31	04.08
	15.58	17.25	15.55 (5)	18.40	21.02	22.21
25	08.59	07.34	15.33 (5)	06.06	05.28	04.06
	16.01	17.28	15.54 (5)	18.43	21.05	22.24
26	08.57	07.31	15.34 (5)	06.03	05.25	04.04
	16.03	17.31	15.51 (5)	18.45	21.08	22.26
27	08.54	07.28	15.37 (5)	05.59	05.22	04.02
	16.06	17.34	15.49 (5)	18.48	21.10	22.28
28	08.52	07.25	16.39 (4)	05.56	05.19	04.00
	16.09	17.36	16.44 (4)	18.51	21.13	22.31
29	08.50		06.53	05.16	05.16	03.58
	16.12		19.53	21.16	22.33	23.03
30	08.47		06.50	05.13	05.13	03.56
	16.15		19.56	21.18	22.35	23.05
31	08.45		06.46			03.54
	16.17		19.58			22.37
Potential sun hours	198	249	364	441	543	579
Total, worst case		462		583		
Sun reduction		0,29		0,34		
Oper. time red.		0,89		0,89		
Wind dir. red.		0,63		0,63		
Total reduction		0,17		0,19		
Total, real		77		109		

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)

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513Shadow receptor: D - Asuinrakennus D (Uusjoutsjärventie 362)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7839

	July	August	September	October	November	December
1	03.40	04.44	06.05	07.21	17.01 (4)	07.44
	23.01	22.01	20.28	18.52	34 17.35 (4)	16.17
2	03.41	04.47	06.08	07.24	17.00 (4)	07.46
	23.00	21.58	20.25	18.48	34 17.34 (4)	16.14
3	03.42	04.50	06.11	07.26	17.00 (4)	07.49
	22.59	21.55	20.21	18.45	35 17.35 (4)	16.11
4	03.44	04.52	06.13	07.29	17.00 (4)	07.52
	22.58	21.53	20.18	18.42	34 17.34 (4)	16.09
5	03.45	04.55	06.16	07.32	17.00 (4)	07.55
	22.57	21.50	20.15	18.39	33 17.33 (4)	16.06
6	03.47	04.58	06.18	07.34	17.00 (4)	07.58
	22.56	21.47	20.12	18.36	33 17.33 (4)	16.03
7	03.48	05.00	06.21	07.37	17.01 (4)	08.00
	22.55	21.44	20.09	18.33	31 17.32 (4)	16.01
8	03.50	05.03	06.23	07.39	17.00 (4)	08.03
	22.53	21.41	20.06	18.29	30 17.30 (4)	15.58
9	03.52	05.05	06.26	07.42	17.01 (4)	08.06
	22.52	21.38	20.02	18.26	28 17.29 (4)	15.55
10	03.53	05.08	06.28	07.44	17.03 (4)	08.09
	22.50	21.35	19.59	18.23	25 17.28 (4)	15.53
11	03.55	05.11	06.31	07.47	17.04 (4)	08.11
	22.49	21.32	19.56	18.20	22 17.26 (4)	15.50
12	03.57	05.13	06.33	07.50	17.05 (4)	08.14
	22.47	21.30	19.53	18.17	18 17.23 (4)	15.48
13	03.59	05.16	06.36	07.52	17.08 (4)	08.17
	22.45	21.27	19.49	18.14	12 17.20 (4)	15.45
14	04.01	05.19	06.38	07.55	16.13 (5)	08.20
	22.43	21.24	19.46	18.11	6 16.19 (5)	15.43
15	04.03	05.21	06.41	07.58	16.09 (5)	08.23
	22.41	21.21	19.43	18.08	14 16.23 (5)	15.40
16	04.06	05.24	06.43	08.00	16.06 (5)	08.25
	22.39	21.18	19.40	18.05	19 16.25 (5)	15.38
17	04.08	05.26	06.46	08.03	16.04 (5)	08.28
	22.37	21.15	19.37	18.01	21 16.25 (5)	15.35
18	04.10	05.29	06.48	08.06	16.02 (5)	08.31
	22.35	21.12	19.33	17.58	24 16.26 (5)	15.33
19	04.12	05.32	06.51	08.08	16.01 (5)	08.33
	22.33	21.08	19.30	17.55	26 16.27 (5)	15.31
20	04.15	05.34	06.53	08.11	16.01 (5)	08.36
	22.31	21.05	19.27	17.52	27 16.28 (5)	15.29
21	04.17	05.37	06.56	08.14	16.00 (5)	08.39
	22.28	21.02	19.24	17.49	28 16.28 (5)	15.26
22	04.19	05.40	06.58	17.17 (4)	08.16	16.00 (5)
	22.26	20.59	19.21	17.46	28 16.28 (5)	15.24
23	04.22	05.42	07.01	17.13 (4)	08.19	15.59 (5)
	22.24	20.56	19.17	17.29 (4)	17.43	29 16.28 (5)
24	04.24	05.45	07.04	17.10 (4)	08.22	15.59 (5)
	22.21	20.53	19.14	17.32 (4)	17.40	29 16.28 (5)
25	04.27	05.47	07.06	17.07 (4)	07.24	14.59 (5)
	22.19	20.50	19.11	17.32 (4)	16.37	29 15.28 (5)
26	04.29	05.50	07.09	17.06 (4)	07.27	14.59 (5)
	22.16	20.47	19.08	17.34 (4)	16.34	29 15.28 (5)
27	04.32	05.53	07.11	17.04 (4)	07.30	15.00 (5)
	22.14	20.44	19.04	17.34 (4)	16.31	27 15.27 (5)
28	04.34	05.55	07.14	17.03 (4)	07.33	15.00 (5)
	22.11	20.40	19.01	17.35 (4)	16.29	26 15.26 (5)
29	04.37	05.58	07.16	17.03 (4)	07.35	15.01 (5)
	22.09	20.37	18.58	17.35 (4)	16.26	24 15.25 (5)
30	04.39	06.00	07.19	17.01 (4)	07.38	15.01 (5)
	22.06	20.34	18.55	17.35 (4)	16.23	23 15.24 (5)
31	04.42	06.03		07.41	15.02 (5)	
	22.03	20.31		16.20	21 15.23 (5)	
Potential sun hours	573	492	390	312	219	172
Total, worst case			229	799		36
Sun reduction			0,32	0,27		0,16
Oper. time red.			0,89	0,89		0,89
Wind dir. red.			0,63	0,63		0,63
Total reduction			0,18	0,15		0,09
Total, real			41	119		3

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

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





Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
15.5.2023 18.20/3.5.584

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513 Shadow receptor: F - Asuinrakennus F (Ahorajantie 64)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,16 2,61 3,94 5,80 8,65 8,98 8,14 6,70 4,15 2,67 1,18 0,89

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

Table with 13 columns: Month, and 12 rows of sun hour data per day from 1 to 31. Includes summary rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

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

Matrix with 4 columns: Day in month, Sun rise (hh:mm) / Sun set (hh:mm), Minutes with flicker, and First/Last time (hh:mm) with flicker (WTG causing flicker first/last time).



Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 15.5.2023 18.20/3.5.584

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513 Shadow receptor: G - Asuinrakennus G (Utelantie 82)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7839

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.43	05.10	19.10 (3) 03.52
	15.06	16.21	17.39	20.01	21.21	19 19.29 (3) 22.39
2	09.34	08.39	07.19	06.40	05.07	19.14 (3) 03.51
	15.08	16.23	17.42	20.04	21.24	13 19.27 (3) 22.41
3	09.34	08.37	07.16	06.37	05.04	19.19 (3) 03.49
	15.10	16.26	17.45	20.06	21.26	2 19.21 (3) 22.43
4	09.33	08.34	07.12	06.34	05.01	20.45 (2) 03.47
	15.11	16.29	17.47	20.09	21.29	5 20.50 (2) 22.45
5	09.32	08.32	07.09	06.31	04.58	20.42 (2) 03.46
	15.13	16.32	17.50	20.12	21.32	10 20.52 (2) 22.47
6	09.31	08.29	07.06	06.27	04.55	20.40 (2) 03.44
	15.15	16.35	17.53	20.14	21.34	14 20.54 (2) 22.48
7	09.30	08.26	07.03	06.24	19.18 (3) 04.53	20.39 (2) 03.43
	15.17	16.38	17.55	20.17	19.32 (3) 21.37	18 20.57 (2) 22.50
8	09.29	08.23	07.00	06.21	19.15 (3) 04.50	20.37 (2) 03.42
	15.19	16.40	17.58	20.19	20.35 (3) 21.40	20 20.57 (2) 22.52
9	09.28	08.21	06.57	06.18	19.12 (3) 04.47	20.37 (2) 03.41
	15.21	16.43	18.01	20.22	19.36 (3) 21.43	21 20.58 (2) 22.53
10	09.26	08.18	06.54	06.15	19.10 (3) 04.44	20.36 (2) 03.39
	15.23	16.46	18.03	20.25	19.37 (3) 21.45	22 20.58 (2) 22.55
11	09.25	08.15	06.50	06.12	19.09 (3) 04.41	20.36 (2) 03.38
	15.25	16.49	18.06	20.27	19.38 (3) 21.48	23 20.59 (2) 22.56
12	09.24	08.12	06.47	06.08	19.07 (3) 04.39	20.36 (2) 03.38
	15.28	16.52	18.09	20.30	19.39 (3) 21.51	23 20.59 (2) 22.57
13	09.22	08.09	06.44	06.05	19.06 (3) 04.36	20.35 (2) 03.37
	15.30	16.55	18.11	20.33	19.40 (3) 21.53	24 20.59 (2) 22.58
14	09.20	08.07	06.41	06.02	19.05 (3) 04.33	20.35 (2) 03.36
	15.32	16.58	18.14	20.35	19.40 (3) 21.56	24 20.59 (2) 22.59
15	09.19	08.04	06.38	05.59	19.05 (3) 04.31	20.35 (2) 03.35
	15.35	17.00	18.17	20.38	19.41 (3) 21.59	24 20.59 (2) 23.00
16	09.17	08.01	06.35	05.56	19.04 (3) 04.28	20.36 (2) 03.35
	15.37	17.03	18.19	20.41	19.41 (3) 22.01	24 21.00 (2) 23.01
17	09.15	07.58	06.31	05.53	19.03 (3) 04.25	20.36 (2) 03.34
	15.40	17.06	18.22	20.43	19.41 (3) 22.04	24 21.00 (2) 23.02
18	09.13	07.55	06.28	05.49	19.03 (3) 04.23	20.35 (2) 03.34
	15.42	17.09	18.25	20.46	19.41 (3) 22.06	23 20.58 (2) 23.03
19	09.11	07.52	06.25	05.46	19.03 (3) 04.20	20.36 (2) 03.34
	15.45	17.12	18.27	20.49	19.40 (3) 22.09	22 20.58 (2) 23.03
20	09.10	07.49	06.22	05.43	19.02 (3) 04.18	20.36 (2) 03.34
	15.47	17.14	18.30	20.51	19.40 (3) 22.11	22 20.58 (2) 23.03
21	09.07	07.46	06.19	05.40	19.02 (3) 04.16	20.37 (2) 03.34
	15.50	17.17	18.32	20.54	19.39 (3) 22.14	20 20.57 (2) 23.04
22	09.05	07.43	06.15	05.37	19.03 (3) 04.13	20.37 (2) 03.34
	15.53	17.20	18.35	20.57	19.40 (3) 22.16	20 20.57 (2) 23.04
23	09.03	07.40	06.12	05.34	19.03 (3) 04.11	20.39 (2) 03.34
	15.55	17.23	18.38	20.59	19.39 (3) 22.19	18 20.57 (2) 23.04
24	09.01	07.37	06.09	05.31	19.03 (3) 04.09	20.40 (2) 03.35
	15.58	17.25	18.40	21.02	19.38 (3) 22.21	16 20.56 (2) 23.04
25	08.59	07.34	06.06	05.28	19.04 (3) 04.06	20.41 (2) 03.35
	16.01	17.28	18.43	21.05	19.37 (3) 22.24	14 20.55 (2) 23.04
26	08.57	07.31	06.03	05.25	19.04 (3) 04.04	20.42 (2) 03.36
	16.04	17.31	18.45	21.07	19.36 (3) 22.26	12 20.54 (2) 23.04
27	08.54	07.28	05.59	05.22	19.05 (3) 04.02	20.44 (2) 03.36
	16.06	17.34	18.48	21.10	19.35 (3) 22.28	9 20.53 (2) 23.03
28	08.52	07.25	05.56	05.19	19.07 (3) 04.00	20.46 (2) 03.37
	16.09	17.36	18.51	21.13	19.35 (3) 22.30	5 20.51 (2) 23.03
29	08.49		06.53	05.16	19.07 (3) 03.58	03.38
	16.12		19.53	21.16	19.33 (3) 22.33	23.02
30	08.47		06.50	05.13	19.09 (3) 03.56	03.39
	16.15		19.56	21.18	19.31 (3) 22.35	23.02
31	08.44		06.47		03.54	
	16.18		19.59		22.37	
Potential sun hours	199	249	364	441	543	579
Total, worst case				755	491	
Sun reduction				0,39	0,49	
Oper. time red.				0,89	0,89	
Wind dir. red.				0,61	0,62	
Total reduction				0,21	0,28	
Total, real				161	135	

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513Shadow receptor: G - Asuinrakennus G (Uutelantie 82)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7839

	July	August	September	October	November	December
1	03.40	04.45	20.46 (2)	06.06	19.08 (3)	07.21
	23.01	22.01	23 21.09 (2)	20.28	29 19.37 (3)	18.52
2	03.41	04.47	20.46 (2)	06.08	19.09 (3)	07.24
	23.00	21.58	23 21.09 (2)	20.25	27 19.36 (3)	18.49
3	03.43	04.50	20.47 (2)	06.11	19.10 (3)	07.26
	22.59	21.55	22 21.09 (2)	20.21	24 19.34 (3)	18.45
4	03.44	04.53	20.47 (2)	06.13	19.12 (3)	07.29
	22.58	21.52	21 21.08 (2)	20.18	20 19.32 (3)	18.42
5	03.45	04.55	20.48 (2)	06.16	19.14 (3)	07.32
	22.57	21.50	19 21.07 (2)	20.15	14 19.28 (3)	18.39
6	03.47	04.58	20.49 (2)	06.18		07.34
	22.56	21.47	17 21.06 (2)	20.12		18.36
7	03.49	05.00	20.50 (2)	06.21		07.37
	22.54	21.44	13 21.03 (2)	20.09		18.33
8	03.50	05.03	20.52 (2)	06.23		07.39
	22.53	21.41	9 21.01 (2)	20.06		18.30
9	03.52	05.06	20.56 (2)	06.26		07.42
	22.51	21.38	3 20.59 (2)	20.02		18.26
10	03.54	05.08	19.25 (3)	06.28		07.44
	22.50	21.35	8 19.33 (3)	19.59		18.23
11	03.56	05.11	19.21 (3)	06.31		07.47
	22.48	21.32	15 19.36 (3)	19.56		18.20
12	03.58	05.14	19.19 (3)	06.33		07.50
	22.47	21.29	20 19.39 (3)	19.53		18.17
13	04.00	05.16	19.17 (3)	06.36		07.52
	22.45	21.26	23 19.40 (3)	19.49		18.14
14	04.02	05.19	19.14 (3)	06.38		07.55
	22.43	21.23	27 19.41 (3)	19.46		18.11
15	04.04	05.21	19.14 (3)	06.41		07.58
	22.41	21.21	28 19.42 (3)	19.43		18.08
16	04.06	20.54 (2)	05.24	19.12 (3)	06.43	08.00
	22.39	7 21.01 (2)	21.17	31 19.43 (3)	19.40	18.05
17	04.08	20.52 (2)	05.27	19.10 (3)	06.46	08.03
	22.37	11 21.03 (2)	21.14	33 19.43 (3)	19.37	18.02
18	04.10	20.51 (2)	05.29	19.10 (3)	06.48	08.06
	22.35	14 21.05 (2)	21.11	34 19.44 (3)	19.33	17.59
19	04.13	20.50 (2)	05.32	19.09 (3)	06.51	08.08
	22.33	16 21.06 (2)	21.08	35 19.44 (3)	19.30	17.55
20	04.15	20.50 (2)	05.35	19.09 (3)	06.54	08.11
	22.30	17 21.07 (2)	21.05	36 19.45 (3)	19.27	17.52
21	04.17	20.49 (2)	05.37	19.08 (3)	06.56	08.14
	22.28	18 21.07 (2)	21.02	37 19.45 (3)	19.24	17.49
22	04.20	20.48 (2)	05.40	19.07 (3)	06.59	08.16
	22.26	20 21.08 (2)	20.59	37 19.44 (3)	19.21	17.46
23	04.22	20.48 (2)	05.42	19.07 (3)	07.01	08.19
	22.24	21 21.09 (2)	20.56	38 19.45 (3)	19.17	17.43
24	04.24	20.47 (2)	05.45	19.06 (3)	07.04	08.22
	22.21	22 21.09 (2)	20.53	38 19.44 (3)	19.14	17.40
25	04.27	20.47 (2)	05.48	19.07 (3)	07.06	07.24
	22.19	22 21.09 (2)	20.50	37 19.44 (3)	19.11	16.37
26	04.29	20.46 (2)	05.50	19.06 (3)	07.09	07.27
	22.16	24 21.10 (2)	20.47	37 19.43 (3)	19.08	16.35
27	04.32	20.46 (2)	05.53	19.06 (3)	07.11	07.30
	22.14	24 21.10 (2)	20.44	36 19.42 (3)	19.05	16.32
28	04.34	20.46 (2)	05.55	19.06 (3)	07.14	07.33
	22.11	24 21.10 (2)	20.40	36 19.42 (3)	19.01	16.29
29	04.37	20.45 (2)	05.58	19.06 (3)	07.16	07.35
	22.09	25 21.10 (2)	20.37	35 19.41 (3)	18.58	16.26
30	04.40	20.46 (2)	06.00	19.07 (3)	07.19	07.38
	22.06	24 21.10 (2)	20.34	34 19.41 (3)	18.55	16.23
31	04.42	20.46 (2)	06.03	19.07 (3)		07.41
	22.03	24 21.10 (2)	20.31	32 19.39 (3)		16.20
Potential sun hours	573	492		390	312	219
Total, worst case	313	837		114		172
Sun reduction	0,44	0,42		0,32		
Oper. time red.	0,89	0,89		0,89		
Wind dir. red.	0,62	0,61		0,61		
Total reduction	0,25	0,23		0,17		
Total, real	77	192		20		

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)







SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513 Shadow receptor: K - Lomarakennus K (Viitostie 31)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,16 2,61 3,94 5,80 8,65 8,98 8,14 6,70 4,15 2,67 1,18 0,89

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
591 488 417 431 453 653 880 1025 878 778 643 602 7839

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains two values representing sun rise and sun set times in hh:mm format.

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

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



Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
15.5.2023 18.20/3.5.584

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513 Shadow receptor: L - Asuinrakennus L (Mäntymäki)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1,16 2,61 3,94 5,80 8,65 8,98 8,14 6,70 4,15 2,67 1,18 0,89

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
591 488 417 431 453 653 880 1025 878 778 643 602 7839

Table with columns for months (January-December) and rows for days (1-31) and summary rows (Potential sun hours, Total, worst case, Sun reduction, Oper. time red., Wind dir. red., Total reduction, Total, real).

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

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



SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513Shadow receptor: M - Lomarakenus M (Mäntymäki)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7 839

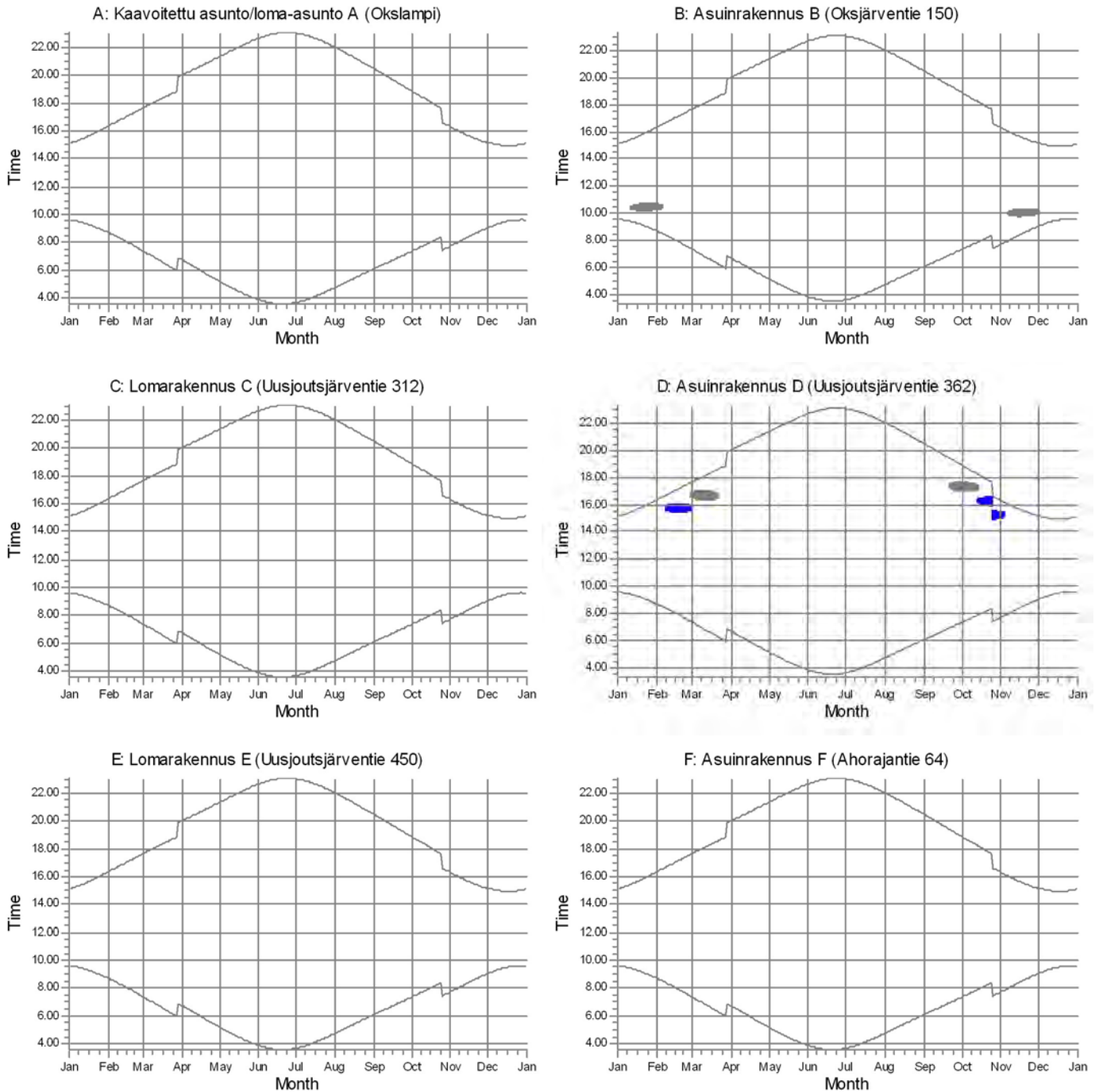
	January	February	March	April	May	June	July	August	September	October	November	December						
1	09.35	08.42	07.22	06.44	05.10	03.53	05.07 (3)	03.40	05.15 (3)	04.45	06.06	07.22	07.44	09.03				
	15.07	16.21	17.39	20.01	21.21	22.39	25	05.32 (3)	23.01	21	05.36 (3)	22.01	20.28	18.52	16.17	15.08		
2	09.34	08.40	07.19	06.40	05.07	03.51	05.07 (3)	03.42	05.15 (3)	04.48	06.08	07.24	07.47	09.06				
	15.08	16.24	17.42	20.04	21.24	22.41	24	05.31 (3)	23.00	21	05.36 (3)	21.58	20.25	18.49	16.15	15.07		
3	09.34	08.37	07.16	06.37	05.04	03.49	05.07 (3)	03.43	05.15 (3)	04.50	06.11	07.27	07.49	09.08				
	15.10	16.26	17.45	20.07	21.27	22.43	25	05.32 (3)	22.59	21	05.36 (3)	21.55	20.22	18.46	16.12	15.06		
4	09.33	08.34	07.13	06.34	05.01	03.48	05.08 (3)	03.44	05.15 (3)	04.53	06.13	07.29	07.52	09.10				
	15.12	16.29	17.48	20.09	21.29	22.45	24	05.32 (3)	22.58	22	05.37 (3)	21.53	20.18	18.42	16.09	15.04		
5	09.32	08.32	07.09	06.31	04.58	03.46	05.08 (3)	03.46	05.15 (3)	04.55	06.16	07.32	07.55	09.12				
	15.13	16.32	17.50	20.12	21.32	22.47	24	05.32 (3)	22.57	22	05.37 (3)	21.50	20.15	18.39	16.06	15.03		
6	09.31	08.29	07.06	06.28	04.56	03.45	05.09 (3)	03.47	05.14 (3)	04.58	06.18	07.34	07.58	09.14				
	15.15	16.35	17.53	20.14	21.35	22.49	23	05.32 (3)	22.56	23	05.37 (3)	21.47	20.12	18.36	16.04	15.02		
7	09.30	08.26	07.03	06.24	04.53	03.43	05.09 (3)	03.49	05.15 (3)	05.01	06.21	07.37	08.00	09.16				
	15.17	16.38	17.56	20.17	21.37	22.50	23	05.32 (3)	22.54	23	05.38 (3)	21.44	20.09	18.33	16.01	15.01		
8	09.29	08.24	07.00	06.21	04.50	03.42	05.09 (3)	03.50	05.14 (3)	05.03	06.24	07.39	08.03	09.18				
	15.19	16.41	17.58	20.20	21.40	22.52	22	05.31 (3)	22.53	24	05.38 (3)	21.41	20.06	18.30	15.58	15.00		
9	09.28	08.21	06.57	06.18	04.47	03.41	05.09 (3)	03.52	05.15 (3)	05.06	06.26	07.42	08.06	09.20				
	15.21	16.44	18.01	20.22	21.43	22.53	22	05.31 (3)	22.52	24	05.39 (3)	21.38	20.02	18.27	15.56	14.59		
10	09.27	08.18	06.54	06.15	04.44	03.40	05.11 (3)	03.54	05.14 (3)	05.09	06.29	07.45	08.09	09.21				
	15.23	16.46	18.04	20.25	21.45	22.55	21	05.32 (3)	22.50	25	05.39 (3)	21.35	19.59	18.23	15.53	14.58		
11	09.25	08.15	06.51	06.12	04.42	03.39	05.11 (3)	03.56	05.15 (3)	05.11	06.31	07.47	08.12	09.23				
	15.26	16.49	18.06	20.28	21.48	22.56	20	05.31 (3)	22.48	25	05.40 (3)	21.33	19.56	18.20	15.50	14.57		
12	09.24	08.12	06.47	06.09	04.39	03.38	05.11 (3)	03.58	05.14 (3)	05.14	06.34	07.50	08.14	09.25				
	15.28	16.52	18.09	20.30	21.51	22.57	20	05.31 (3)	22.47	25	05.39 (3)	21.30	19.53	18.17	15.48	14.57		
13	09.22	08.10	06.44	06.05	04.36	03.37	05.11 (3)	04.00	05.15 (3)	05.16	06.36	07.52	08.17	09.26				
	15.30	16.55	18.12	20.33	21.53	6	05.21 (3)	22.58	20	05.40 (3)	21.27	19.50	18.14	15.45	14.56			
14	09.21	08.07	06.41	06.02	04.34	03.36	05.12 (3)	03.36	05.15 (3)	05.19	06.39	07.55	08.20	09.27				
	15.33	16.58	18.14	20.36	21.56	11	05.23 (3)	22.59	20	05.41 (3)	21.24	19.46	18.11	15.43	14.56			
15	09.19	08.04	06.38	05.59	04.31	03.36	05.12 (3)	04.04	05.14 (3)	05.22	06.41	07.58	08.23	09.29				
	15.35	17.01	18.17	20.38	21.59	15	05.25 (3)	23.00	19	05.41 (3)	21.21	19.43	18.08	15.41	14.56			
16	09.17	08.01	06.35	05.56	04.28	03.35	05.13 (3)	04.06	05.14 (3)	05.24	06.44	08.00	08.25	09.30				
	15.37	17.03	18.19	20.41	22.01	18	05.27 (3)	23.01	18	05.41 (3)	21.18	19.40	18.05	15.38	14.55			
17	09.15	07.58	06.32	05.53	04.26	03.35	05.13 (3)	04.08	05.15 (3)	05.27	06.46	08.03	08.28	09.31				
	15.40	17.06	18.22	20.43	22.04	20	05.28 (3)	23.02	19	05.42 (3)	21.15	19.37	18.02	15.36	14.55			
18	09.14	07.55	06.28	05.50	04.23	03.34	05.13 (3)	04.11	05.15 (3)	05.30	06.49	08.06	08.31	09.32				
	15.43	17.09	18.25	20.46	22.06	21	05.29 (3)	23.03	19	05.43 (3)	21.12	19.34	17.59	15.34	14.55			
19	09.12	07.52	06.25	05.47	04.21	03.34	05.14 (3)	04.13	05.15 (3)	05.32	06.51	08.08	08.33	09.33				
	15.45	17.12	18.27	20.49	22.09	22	05.29 (3)	23.03	18	05.44 (3)	21.09	19.30	17.56	15.31	14.55			
20	09.10	07.49	06.22	05.43	04.18	03.34	05.14 (3)	04.15	05.16 (3)	05.35	06.54	08.11	08.36	09.34				
	15.48	17.15	18.30	20.51	22.11	23	05.30 (3)	23.04	18	05.45 (3)	21.05	19.27	17.53	15.29	14.56			
21	09.08	07.46	06.19	05.40	04.16	03.34	05.14 (3)	04.17	05.16 (3)	05.37	06.56	08.14	08.39	09.34				
	15.50	17.17	18.33	20.54	22.14	24	05.30 (3)	23.04	18	05.46 (3)	21.02	19.24	17.50	15.27	14.56			
22	09.06	07.43	06.16	05.37	04.13	03.34	05.14 (3)	04.20	05.16 (3)	05.40	06.59	08.16	08.41	09.35				
	15.53	17.20	18.35	20.57	22.16	24	05.32 (3)	23.04	18	05.47 (3)	20.59	19.21	17.47	15.25	14.56			
23	09.03	07.40	06.12	05.34	04.11	03.35	05.14 (3)	04.22	05.17 (3)	05.43	07.01	08.19	08.44	09.36				
	15.56	17.23	18.38	21.00	22.19	25	05.31 (3)	23.04	18	05.48 (3)	20.56	19.18	17.44	15.23	14.57			
24	09.01	07.37	06.09	05.31	04.09	03.35	05.15 (3)	04.25	05.17 (3)	05.45	07.04	08.22	08.46	09.36				
	15.58	17.26	18.40	21.02	22.21	26	05.31 (3)	23.04	18	05.49 (3)	20.53	19.14	17.41	15.21	14.57			
25	08.59	07.34	06.06	05.28	04.07	03.35	05.14 (3)	04.27	05.17 (3)	05.48	07.06	07.25	08.49	09.36				
	16.01	17.28	18.43	21.05	22.24	26	05.31 (3)	23.04	19	05.49 (3)	20.50	19.11	17.38	15.19	14.58			
26	08.57	07.31	06.03	05.25	04.04	03.36	05.15 (3)	04.30	05.18 (3)	05.50	07.09	07.27	08.52	09.36				
	16.04	17.31	18.46	21.08	22.26	26	05.32 (3)	23.04	18	05.49 (3)	20.47	19.08	17.35	15.17	14.59			
27	08.54	07.28	06.00	05.22	04.02	03.37	05.15 (3)	04.32	05.19 (3)	05.53	07.11	07.30	08.54	09.36				
	16.07	17.34	18.48	21.10	22.28	25	05.31 (3)	23.03	19	05.49 (3)	20.44	19.05	17.32	15.15	15.00			
28	08.52	07.25	05.56	05.19	04.00	03.38	05.15 (3)	04.35	05.20 (3)	05.55	07.14	07.33	08.56	09.36				
	16.09	17.37	18.51	21.13	22.31	26	05.31 (3)	23.03	19	05.50 (3)	20.41	19.01	17.29	15.13	15.01			
29	08.50	06.53	05.16	03.58	05.06 (3)	03.38	05.15 (3)	04.37	05.22 (3)	05.58	07.16	07.35	08.59	09.36				
	16.12	19.53	21.16	22.33	26	05.32 (3)	23.02	19	05.34 (3)	22.09	14	05.36 (3)	20.37	18.58	16.26	15.12	15.02	
30	08.47	06.50	05.13	03.56	05.06 (3)	03.39	05.15 (3)	04.40	05.24 (3)	06.01	07.19	07.38	09.01	09.36				
	16.15	19.56	21.18	22.35	25	05.31 (3)	23.02	20	05.35 (3)	22.06	10	05.34 (3)	20.34	18.55	16.23	15.10	15.03	
31	08.45	06.47	05.11	03.54	05.06 (3)	03.39		04.42		06.03		07.41		09.36				
	16.18	19.59	21.21	22.37	26	05.32 (3)		22.03		20.31		16.20		15.05				
Potential sun hours	199	249	364	441	543	579		573		492		390		312		219		172
Total, worst case					415	610		677										
Sun reduction					0.49	0.47		0.44										
Oper. time red.					0.89	0.89		0.89										
Wind dir. red.					0.64	0.64		0.64										
Total reduction					0.28	0.27		0.25										
Total, real					117	162		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)

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513

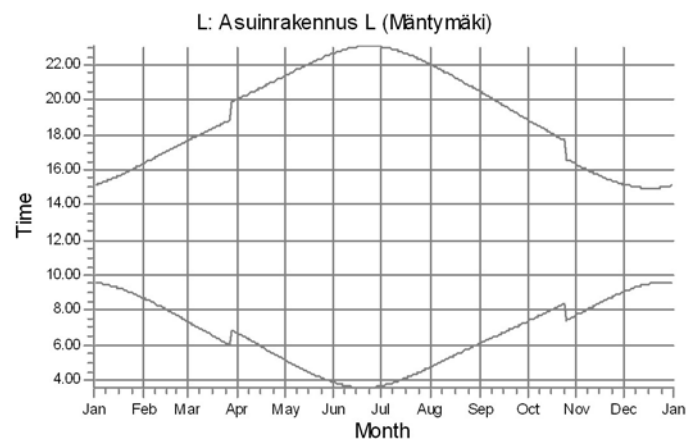
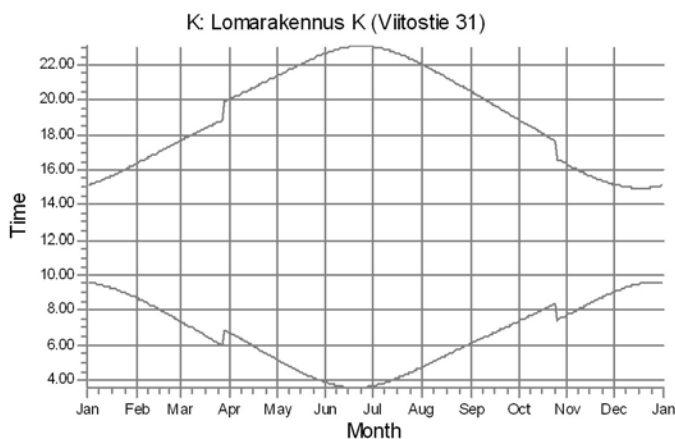
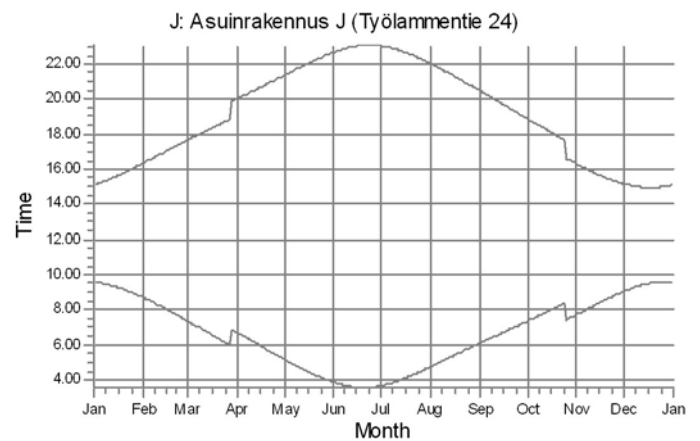
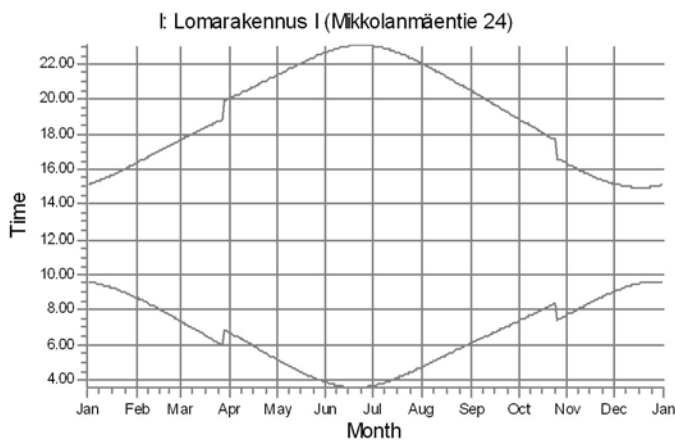
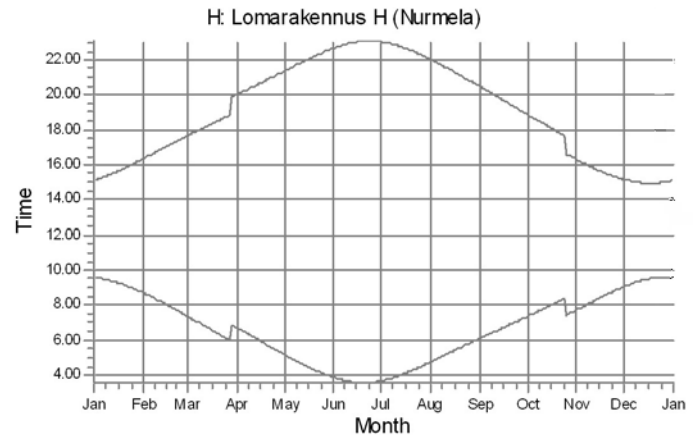
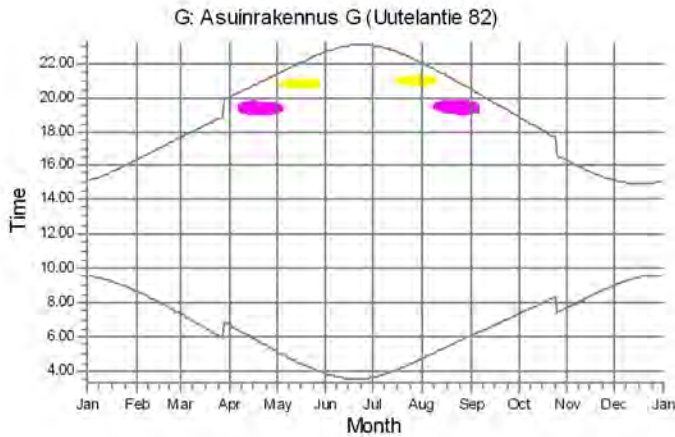


WTGs

- 5: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (135)
- 4: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (136)

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513



## WTGs



2: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (134)

3: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (137)

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

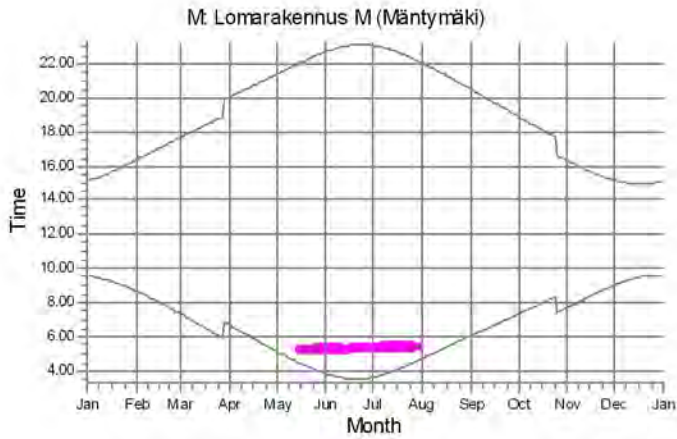
Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

15.5.2023 18.20/3.5.584

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513

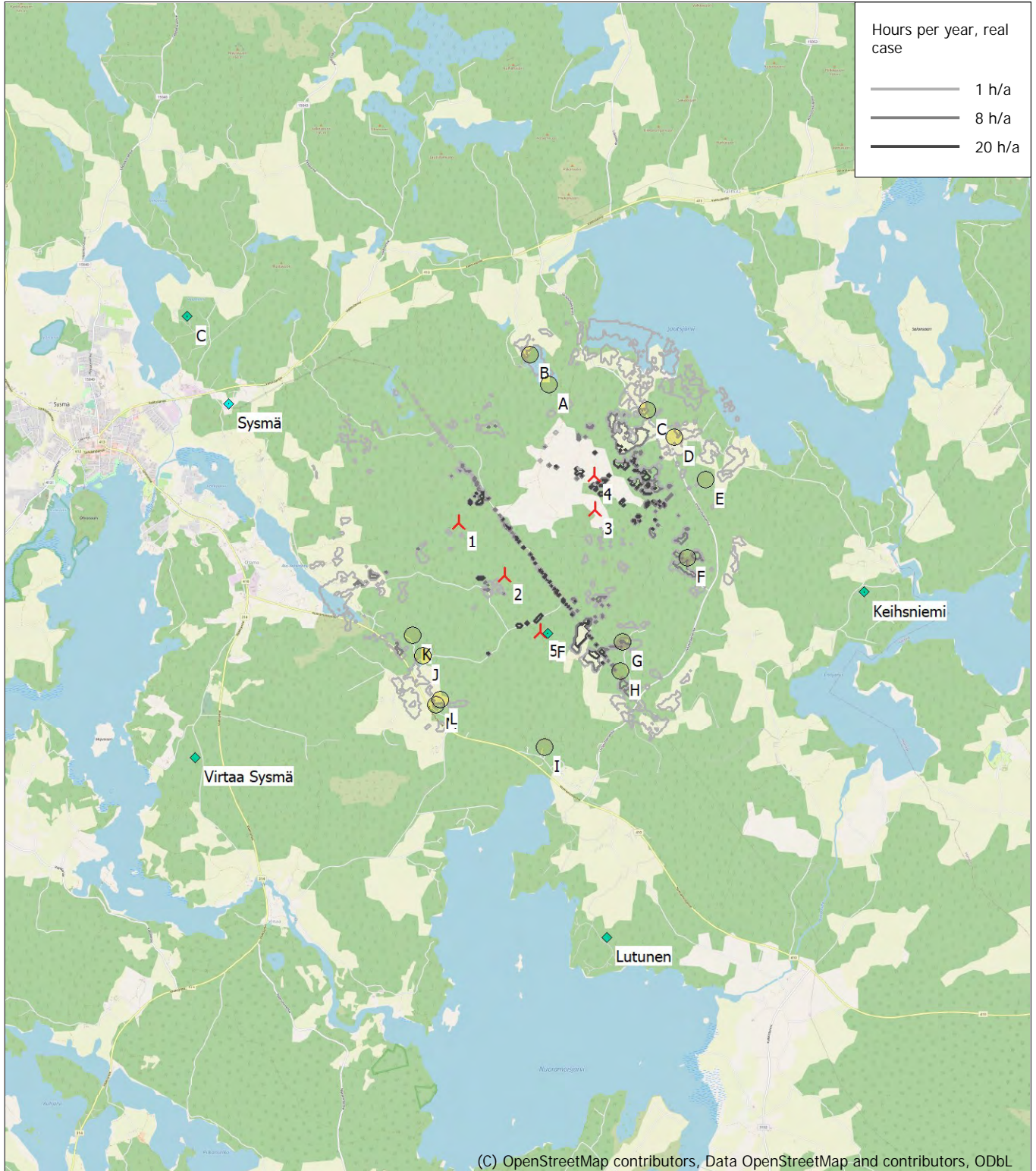


WTGs

3: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (137)

## SHADOW - Map

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case Luke forest\_20230513



Map: EMD OpenStreetMap , Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 435 495 North: 6 817 636  
 New WTG    Obstacle    Shadow receptor  
 Flicker map level: Height Contours: CONTOURLINE\_Sysmä Rekolanvuoret\_20200912\_0.wpo (1)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Rekolanvuori\_SG170x5xHH150\_20230513

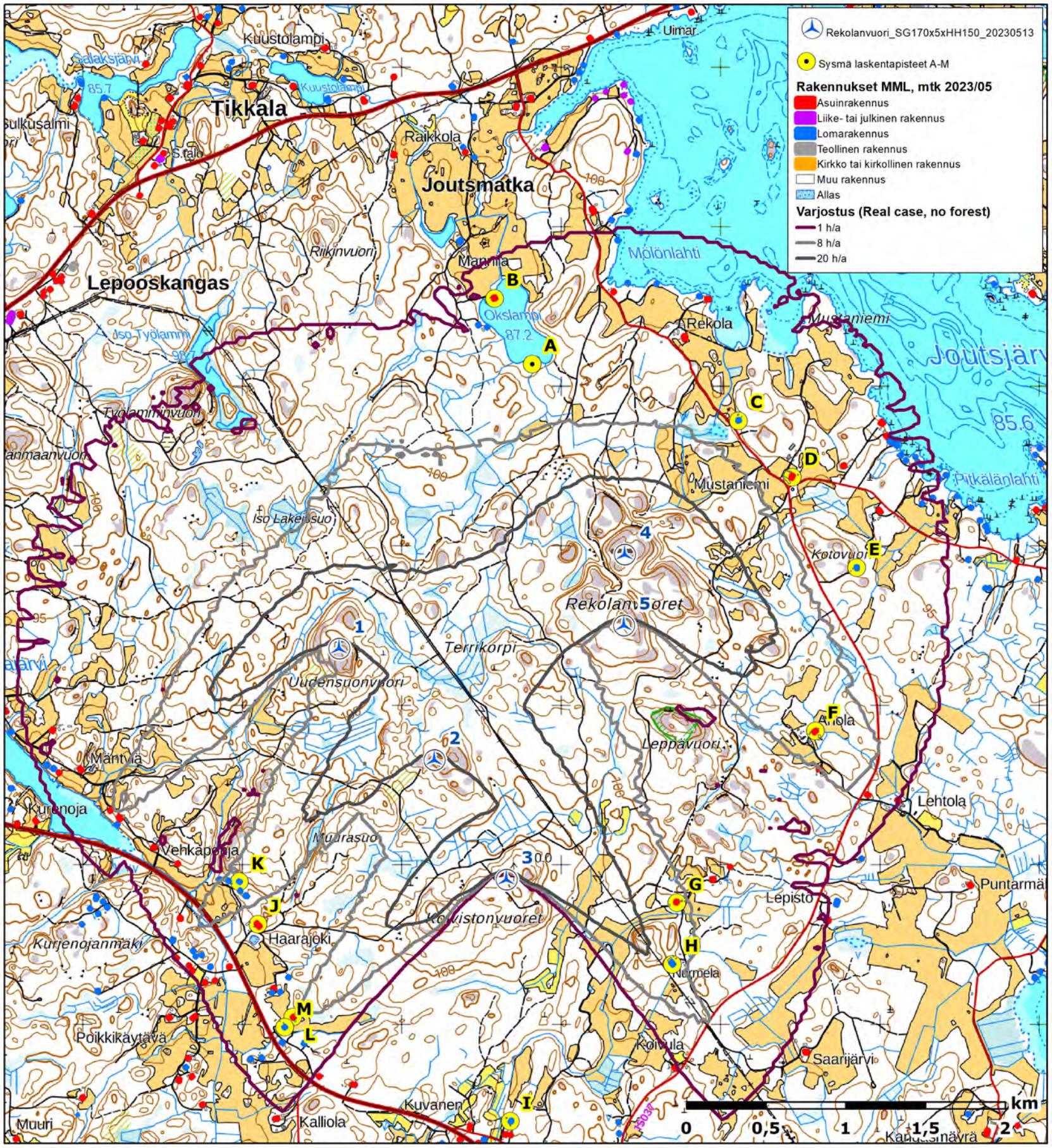
- Sysmä laskentapisteen A-M

**Rakennukset MML, mtk 2023/05**

- Asuinrakennus
- Liike- tai julkinen rakennus
- Lomarakennus
- Teollinen rakennus
- Kirkko tai kirkollinen rakennus
- Muu rakennus
- Allas

**Varjostus (Real case, no forest)**

- 1 h/a
- 8 h/a
- 20 h/a



## SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_

### Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence 3 °

Day step for calculation 1 days

Time step for calculation 1 minutes

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

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

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
591	488	417	431	453	653	880	1 025	878	778	643	602	7 839

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE\_Sysmä Rekolanvuoret

Obstacles used in calculation

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

### WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM
			[m]									
1	434 606	6 818 356	128,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
2	435 203	6 817 657	125,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
3	435 657	6 816 908	120,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
4	436 398	6 818 946	134,9	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8
5	436 394	6 818 500	139,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.0-170 HH150-6 200	6 200	170,0	150,0	2 039	8,8



Scale 1:75 000  
 ▲ New WTG      ● Shadow receptor

### Shadow receptor-Input

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

### Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours
		per year
		[h/year]
A	Kaavoitettu asunto/loma-asunto A (Okslampi)	4:33
B	Asuinrakennus B (Oksjärventie 150)	1:30
C	Lomarakennus C (Uusjoutsjärventie 312)	6:06
D	Asuinrakennus D (Uusjoutsjärventie 362)	5:50

To be continued on next page...



## SHADOW - Main Result

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_

...continued from previous page

No.	Name	Shadow, expected values	
		Shadow hours	per year [h/year]
E	Lomarakennus E (Uusjoutsjärventie 450)		4:45
F	Asuinrakennus F (Ahorajantie 64)		13:14
G	Asuinrakennus G (Uutelantie 82)		9:45
H	Lomarakennus H (Nurmela)		16:52
I	Lomarakennus I (Mikkolanmäentie 24)		0:00
J	Asuinrakennus J (Työlamentie 24)		5:25
K	Lomarakennus K (Viitostie 31)		11:13
L	Asuinrakennus L (Mäntymäki)		8:01
M	Lomarakennus M (Mäntymäki)		7:28

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

No.	Name		Expected
			[h/year]
1	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O!	hub: 150,0 m (TOT: 235,0 m) (133)	0:00
2	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O!	hub: 150,0 m (TOT: 235,0 m) (134)	21:20
3	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O!	hub: 150,0 m (TOT: 235,0 m) (137)	31:03
4	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O!	hub: 150,0 m (TOT: 235,0 m) (136)	17:19
5	Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O!	hub: 150,0 m (TOT: 235,0 m) (135)	17:36

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.

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: A - Kaavoitettu asunto/loma-asunto A (Okslampi)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January		February		March	April	May	June
1	09.35	10.50 (5)	08.42	10.21 (4)	07.22	06.43	05.10	03.52
	15.06	6 10.56 (5)	16.20	32 10.53 (4)	17.39	20.01	21.21	22.39
2	09.35	10.48 (5)	08.40	10.22 (4)	07.19	06.40	05.07	03.50
	15.08	9 10.57 (5)	16.23	31 10.53 (4)	17.42	20.04	21.24	22.42
3	09.34	10.48 (5)	08.37	10.22 (4)	07.16	06.37	05.04	03.49
	15.09	11 10.59 (5)	16.26	31 10.53 (4)	17.45	20.06	21.27	22.43
4	09.33	10.47 (5)	08.34	10.23 (4)	07.13	06.34	05.01	03.47
	15.11	13 11.00 (5)	16.29	30 10.53 (4)	17.47	20.09	21.29	22.45
5	09.32	10.48 (5)	08.32	10.23 (4)	07.09	06.31	04.58	03.45
	15.13	14 11.02 (5)	16.32	30 10.53 (4)	17.50	20.12	21.32	22.47
6	09.31	10.47 (5)	08.29	10.24 (4)	07.06	06.27	04.55	03.44
	15.15	16 11.03 (5)	16.35	28 10.52 (4)	17.53	20.14	21.35	22.49
7	09.30	10.47 (5)	08.26	10.25 (4)	07.03	06.24	04.52	03.43
	15.17	16 11.03 (5)	16.38	27 10.52 (4)	17.55	20.17	21.37	22.51
8	09.29	10.47 (5)	08.24	10.26 (4)	07.00	06.21	04.50	03.41
	15.19	17 11.04 (5)	16.40	25 10.51 (4)	17.58	20.20	21.40	22.52
9	09.28	10.47 (5)	08.21	10.27 (4)	06.57	06.18	04.47	03.40
	15.21	18 11.05 (5)	16.43	23 10.50 (4)	18.01	20.22	21.43	22.54
10	09.27	10.47 (5)	08.18	10.29 (4)	06.54	06.15	04.44	03.39
	15.23	19 11.06 (5)	16.46	20 10.49 (4)	18.03	20.25	21.46	22.55
11	09.25	10.47 (5)	08.15	10.31 (4)	06.51	06.11	04.41	03.38
	15.25	21 11.08 (5)	16.49	16 10.47 (4)	18.06	20.28	21.48	22.56
12	09.24	10.46 (5)	08.13	10.33 (4)	06.47	06.08	04.38	03.37
	15.27	22 11.08 (5)	16.52	10 10.43 (4)	18.09	20.30	21.51	22.58
13	09.22	10.46 (5)	08.10		06.44	06.05	04.36	03.36
	15.30	23 11.09 (5)	16.55		18.11	20.33	21.54	22.59
14	09.21	10.47 (5)	08.07		06.41	06.02	04.33	03.36
	15.32	23 11.10 (5)	16.57		18.14	20.36	21.56	23.00
15	09.19	10.46 (5)	08.04		06.38	05.59	04.30	03.35
	15.35	24 11.10 (5)	17.00		18.17	20.38	21.59	23.01
16	09.17	10.47 (5)	08.01		06.35	05.56	04.28	03.35
	15.37	24 11.11 (5)	17.03		18.19	20.41	22.01	23.02
17	09.16	10.29 (4)	07.58		06.31	05.53	04.25	03.34
	15.40	34 11.11 (5)	17.06		18.22	20.44	22.04	23.02
18	09.14	10.26 (4)	07.55		06.28	05.49	04.23	03.34
	15.42	39 11.11 (5)	17.09		18.25	20.46	22.07	23.03
19	09.12	10.26 (4)	07.52		06.25	05.46	04.20	03.34
	15.45	41 11.12 (5)	17.12		18.27	20.49	22.09	23.04
20	09.10	10.25 (4)	07.49		06.22	05.43	04.18	03.34
	15.47	43 11.12 (5)	17.14		18.30	20.52	22.12	23.04
21	09.08	10.24 (4)	07.46		06.19	05.40	04.15	03.34
	15.50	46 11.12 (5)	17.17		18.32	20.54	22.14	23.04
22	09.06	10.24 (4)	07.43		06.15	05.37	04.13	03.34
	15.53	48 11.13 (5)	17.20		18.35	20.57	22.17	23.04
23	09.04	10.23 (4)	07.40		06.12	05.34	04.11	03.34
	15.55	49 11.13 (5)	17.23		18.38	21.00	22.19	23.05
24	09.01	10.22 (4)	07.37		06.09	05.31	04.08	03.34
	15.58	50 11.13 (5)	17.25		18.40	21.02	22.22	23.05
25	08.59	10.22 (4)	07.34		06.06	05.28	04.06	03.35
	16.01	50 11.12 (5)	17.28		18.43	21.05	22.24	23.04
26	08.57	10.22 (4)	07.31		06.03	05.25	04.04	03.35
	16.04	49 11.12 (5)	17.31		18.46	21.08	22.26	23.04
27	08.54	10.21 (4)	07.28		05.59	05.22	04.02	03.36
	16.06	49 11.11 (5)	17.34		18.48	21.10	22.29	23.04
28	08.52	10.21 (4)	07.25		05.56	05.19	04.00	03.37
	16.09	47 11.10 (5)	17.36		18.51	21.13	22.31	23.03
29	08.50	10.21 (4)			06.53	05.16	03.58	03.38
	16.12	46 11.09 (5)			19.53	21.16	22.33	23.03
30	08.47	10.21 (4)			06.50	05.13	03.56	03.39
	16.15	42 11.07 (5)			19.56	21.19	22.35	23.02
31	08.45	10.21 (4)			06.47		03.54	
	16.18	34 11.03 (5)			19.59		22.37	
Potential sun hours	198		249		364	441	543	579
Total, worst case	943		303					
Sun reduction	0,18		0,29					
Oper. time red.	0,89		0,89					
Wind dir. red.	0,65		0,66					
Total reduction	0,11		0,17					
Total, real	100		52					

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: A - Kaavoitettu asunto/loma-asunto A (Okslampi)

Assumptions for shadow calculations

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

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

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
591	488	417	431	453	653	880	1 025	878	778	643	602	7 839

	July	August	September	October	November	December
1	03.40	04.45	06.05	07.21	07.44	09.58 (4) 09.04 10.29 (5)
	23.01	22.01	20.28	18.52	16.17	21 10.19 (4) 15.08 21 10.50 (5)
2	03.41	04.47	06.08	07.24	07.47	09.56 (4) 09.06 10.30 (5)
	23.01	21.58	20.25	18.49	16.14	24 10.20 (4) 15.07 20 10.50 (5)
3	03.42	04.50	06.11	07.27	07.49	09.55 (4) 09.08 10.30 (5)
	23.00	21.55	20.22	18.45	16.12	26 10.21 (4) 15.05 19 10.49 (5)
4	03.44	04.52	06.13	07.29	07.52	09.54 (4) 09.10 10.31 (5)
	22.59	21.53	20.18	18.42	16.09	27 10.21 (4) 15.04 18 10.49 (5)
5	03.45	04.55	06.16	07.32	07.55	09.53 (4) 09.12 10.32 (5)
	22.57	21.50	20.15	18.39	16.06	29 10.22 (4) 15.03 17 10.49 (5)
6	03.47	04.58	06.18	07.34	07.58	09.54 (4) 09.14 10.33 (5)
	22.56	21.47	20.12	18.36	16.03	29 10.23 (4) 15.01 16 10.49 (5)
7	03.48	05.00	06.21	07.37	08.01	09.53 (4) 09.16 10.34 (5)
	22.55	21.44	20.09	18.33	16.01	31 10.24 (4) 15.00 14 10.48 (5)
8	03.50	05.03	06.23	07.39	08.03	09.53 (4) 09.18 10.36 (5)
	22.53	21.41	20.06	18.30	15.58	31 10.24 (4) 14.59 12 10.48 (5)
9	03.52	05.06	06.26	07.42	08.06	09.52 (4) 09.20 10.36 (5)
	22.52	21.38	20.02	18.26	15.55	32 10.24 (4) 14.58 11 10.47 (5)
10	03.53	05.08	06.28	07.45	08.09	09.53 (4) 09.22 10.39 (5)
	22.50	21.36	19.59	18.23	15.53	32 10.25 (4) 14.58 9 10.48 (5)
11	03.55	05.11	06.31	07.47	08.12	09.53 (4) 09.23 10.40 (5)
	22.49	21.33	19.56	18.20	15.50	34 10.35 (5) 14.57 7 10.47 (5)
12	03.57	05.13	06.33	07.50	08.14	09.53 (4) 09.25 10.42 (5)
	22.47	21.30	19.53	18.17	15.48	42 10.39 (5) 14.56 3 10.45 (5)
13	03.59	05.16	06.36	07.52	08.17	09.53 (4) 09.26 10.45 (5)
	22.45	21.27	19.50	18.14	15.45	46 10.41 (5) 14.56
14	04.01	05.19	06.38	07.55	08.20	09.54 (4) 09.28 10.46 (5)
	22.43	21.24	19.46	18.11	15.43	47 10.43 (5) 14.55
15	04.03	05.21	06.41	07.58	08.23	09.54 (4) 09.29 10.47 (5)
	22.41	21.21	19.43	18.08	15.40	49 10.44 (5) 14.55
16	04.06	05.24	06.43	08.00	08.25	09.54 (4) 09.30 10.48 (5)
	22.39	21.18	19.40	18.05	15.38	50 10.45 (5) 14.55
17	04.08	05.27	06.46	08.03	08.28	09.56 (4) 09.31 10.49 (5)
	22.37	21.15	19.37	18.02	15.35	50 10.46 (5) 14.55
18	04.10	05.29	06.49	08.06	08.31	09.56 (4) 09.32 10.50 (5)
	22.35	21.12	19.34	17.59	15.33	50 10.47 (5) 14.55
19	04.12	05.32	06.51	08.08	08.34	09.57 (4) 09.33 10.51 (5)
	22.33	21.09	19.30	17.55	15.31	49 10.47 (5) 14.55
20	04.15	05.34	06.54	08.11	08.36	09.59 (4) 09.34 10.52 (5)
	22.31	21.06	19.27	17.52	15.29	48 10.48 (5) 14.55
21	04.17	05.37	06.56	08.14	08.39	10.00 (4) 09.35 10.53 (5)
	22.29	21.02	19.24	17.49	15.27	46 10.48 (5) 14.55
22	04.19	05.40	06.59	08.16	08.41	10.01 (4) 09.35 10.54 (5)
	22.26	20.59	19.21	17.46	15.24	44 10.48 (5) 14.56
23	04.22	05.42	07.01	08.19	08.44	10.02 (4) 09.36 10.55 (5)
	22.24	20.56	19.17	17.43	15.22	41 10.48 (5) 14.56
24	04.24	05.45	07.04	08.22	08.47	10.05 (4) 09.36 10.56 (5)
	22.22	20.53	19.14	17.40	15.20	38 10.49 (5) 14.57
25	04.27	05.47	07.06	07.25	08.49	10.07 (4) 09.36 10.57 (5)
	22.19	20.50	19.11	16.37	15.18	34 10.49 (5) 14.58
26	04.29	05.50	07.09	07.27	08.52	10.11 (4) 09.37 10.58 (5)
	22.17	20.47	19.08	16.34	15.16	26 10.49 (5) 14.58
27	04.32	05.53	07.11	07.30	08.54	10.26 (5) 09.37 10.59 (5)
	22.14	20.44	19.05	16.32	15.15	23 10.49 (5) 14.59
28	04.34	05.55	07.14	07.33	08.57	10.26 (5) 09.37 10.60 (5)
	22.12	20.41	19.01	16.29	15.13	23 10.49 (5) 15.01
29	04.37	05.58	07.16	07.36	08.59	10.27 (5) 09.37 10.61 (5)
	22.09	20.37	18.58	16.26	15.11	22 10.49 (5) 15.02
30	04.39	06.00	07.19	07.38	10.01 (4) 09.01 10.28 (5) 09.36 10.62 (5)	
	22.06	20.34	18.55	16.23	12 10.13 (4) 15.10 22 10.50 (5) 15.03	
31	04.42	06.03	07.21	07.41	10.00 (4) 09.01 09.36 10.63 (5)	
	22.04	20.31	18.52	16.20	17 10.17 (4) 15.04	
Potential sun hours	573	493	390	312	218	172
Total, worst case				29	1066	167
Sun reduction				0,27	0,16	0,16
Oper. time red.				0,89	0,89	0,89
Wind dir. red.				0,66	0,65	0,65
Total reduction				0,16	0,09	0,09
Total, real				5	101	16

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

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

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: B - Asuinrakennus B (Oksjärventie 150)
Assumptions for shadow calculations

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

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

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
591 488 417 431 453 653 880 1025 878 778 643 602 7839

Table with columns for months (January to December) and rows for days (1-31) and summary rows (Total sun hours, Sun reduction, Oper. time red., Wind dir. red., Total reduction, Total, real).

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

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





Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 15.5.2023 18.17/3.5.584

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: D - Asuinrakennus D (Uusjoutsjärventie 362)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June	
1	09.35 15.06	08.42 16.20	07.22 17.39	16.34 (4) 20.01	06.43 21.21	03.52 22.39	
2	09.35 15.08	08.40 16.23	07.19 17.42	16.30 (4) 20.04	06.40 21.24	03.50 22.41	
3	09.34 15.09	08.37 16.26	07.16 17.45	16.29 (4) 20.06	06.37 21.26	03.49 22.43	
4	09.33 15.11	08.34 16.29	07.12 17.47	16.27 (4) 20.09	06.34 21.29	03.47 22.45	
5	09.32 15.13	08.32 16.32	07.09 17.50	16.26 (4) 20.12	06.30 21.32	03.45 22.47	
6	09.31 15.15	08.29 16.35	07.06 17.53	16.25 (4) 20.14	06.27 21.35	03.44 22.49	
7	09.30 15.17	08.26 16.37	07.03 17.55	16.24 (4) 20.17	06.24 21.37	03.43 22.50	
8	09.29 15.19	08.24 16.40	15.40 (5) 15.47 (5)	07.00 17.58	16.23 (4) 20.20	06.21 21.40	03.41 22.52
9	09.28 15.21	08.21 16.43	15.37 (5) 15.51 (5)	06.57 18.01	16.23 (4) 20.22	06.18 21.43	03.40 22.53
10	09.27 15.23	08.18 16.46	15.34 (5) 15.52 (5)	06.54 18.03	16.22 (4) 20.25	06.15 21.45	03.39 22.55
11	09.25 15.25	08.15 16.49	15.33 (5) 15.54 (5)	06.50 18.06	16.22 (4) 20.27	06.11 21.48	03.38 22.56
12	09.24 15.27	08.12 16.52	15.32 (5) 15.55 (5)	06.47 18.09	16.22 (4) 20.30	06.08 21.51	03.37 22.57
13	09.22 15.30	08.10 16.55	15.31 (5) 15.56 (5)	06.44 18.11	16.22 (4) 20.33	06.05 21.53	03.36 22.59
14	09.21 15.32	08.07 16.57	15.31 (5) 15.57 (5)	06.41 18.14	16.21 (4) 20.35	06.02 21.56	03.36 23.00
15	09.19 15.34	08.04 17.00	15.30 (5) 15.58 (5)	06.38 18.17	16.22 (4) 20.38	05.59 21.59	03.35 23.01
16	09.17 15.37	08.01 17.03	15.30 (5) 15.58 (5)	06.35 18.19	16.23 (4) 20.41	05.56 22.01	03.35 23.01
17	09.15 15.39	07.58 17.06	15.29 (5) 15.58 (5)	06.31 18.22	16.24 (4) 20.43	05.52 22.04	03.34 23.02
18	09.14 15.42	07.55 17.09	15.29 (5) 15.58 (5)	06.28 18.24	16.24 (4) 20.46	05.49 22.06	03.34 23.03
19	09.12 15.45	07.52 17.11	15.29 (5) 15.58 (5)	06.25 18.27	16.26 (4) 20.49	05.46 22.09	03.34 23.03
20	09.10 15.47	07.49 17.14	15.30 (5) 15.58 (5)	06.22 18.30	16.28 (4) 20.51	05.43 22.12	03.34 23.04
21	09.08 15.50	07.46 17.17	15.29 (5) 15.57 (5)	06.19 18.32	16.31 (4) 20.54	05.40 22.14	03.34 23.04
22	09.06 15.53	07.43 17.20	15.30 (5) 15.56 (5)	06.15 18.35	05.37 20.57	04.13 22.17	03.34 23.04
23	09.03 15.55	07.40 17.23	15.31 (5) 15.56 (5)	06.12 18.38	05.34 20.59	04.11 22.19	03.34 23.04
24	09.01 15.58	07.37 17.25	15.32 (5) 15.55 (5)	06.09 18.40	05.31 21.02	04.08 22.21	03.34 23.04
25	08.59 16.01	07.34 17.28	15.33 (5) 15.54 (5)	06.06 18.43	05.28 21.05	04.06 22.24	03.35 23.04
26	08.57 16.03	07.31 17.31	15.34 (5) 15.51 (5)	06.03 18.45	05.25 21.08	04.04 22.26	03.35 23.04
27	08.54 16.06	07.28 17.34	15.37 (5) 15.49 (5)	05.59 18.48	05.22 21.10	04.02 22.28	03.36 23.04
28	08.52 16.09	07.25 17.36	16.39 (4) 16.44 (4)	05.56 18.51	05.19 21.13	04.00 22.31	03.37 23.03
29	08.50 16.12		06.53 19.53	05.16 21.16	03.58 22.33	03.38 23.03	
30	08.47 16.15		06.50 19.56	05.13 21.18	03.56 22.35	03.39 23.02	
31	08.45 16.17		06.46 19.58		03.54 22.37		
Potential sun hours	198	249	364	441	543	579	
Total, worst case		462		583			
Sun reduction		0,29		0,34			
Oper. time red.		0,89		0,89			
Wind dir. red.		0,63		0,63			
Total reduction		0,17		0,19			
Total, real		77		109			

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)

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: D - Asuinrakennus D (Uusjoutsjärventie 362)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	July	August	September	October	November	December
1	03.40	04.44	06.05	07.21	17.01 (4)	07.44
	23.01	22.01	20.28	18.52	34 17.35 (4)	16.17
2	03.41	04.47	06.08	07.24	17.00 (4)	07.46
	23.00	21.58	20.25	18.48	34 17.34 (4)	16.14
3	03.42	04.50	06.11	07.26	17.00 (4)	07.49
	22.59	21.55	20.21	18.45	35 17.35 (4)	16.11
4	03.44	04.52	06.13	07.29	17.00 (4)	07.52
	22.58	21.53	20.18	18.42	34 17.34 (4)	16.09
5	03.45	04.55	06.16	07.32	17.00 (4)	07.55
	22.57	21.50	20.15	18.39	33 17.33 (4)	16.06
6	03.47	04.58	06.18	07.34	17.00 (4)	07.58
	22.56	21.47	20.12	18.36	33 17.33 (4)	16.03
7	03.48	05.00	06.21	07.37	17.01 (4)	08.00
	22.55	21.44	20.09	18.33	31 17.32 (4)	16.01
8	03.50	05.03	06.23	07.39	17.00 (4)	08.03
	22.53	21.41	20.06	18.29	30 17.30 (4)	15.58
9	03.52	05.05	06.26	07.42	17.01 (4)	08.06
	22.52	21.38	20.02	18.26	28 17.29 (4)	15.55
10	03.53	05.08	06.28	07.44	17.03 (4)	08.09
	22.50	21.35	19.59	18.23	25 17.28 (4)	15.53
11	03.55	05.11	06.31	07.47	17.04 (4)	08.11
	22.49	21.32	19.56	18.20	22 17.26 (4)	15.50
12	03.57	05.13	06.33	07.50	17.05 (4)	08.14
	22.47	21.30	19.53	18.17	18 17.23 (4)	15.48
13	03.59	05.16	06.36	07.52	17.08 (4)	08.17
	22.45	21.27	19.49	18.14	12 17.20 (4)	15.45
14	04.01	05.19	06.38	07.55	16.13 (5)	08.20
	22.43	21.24	19.46	18.11	6 16.19 (5)	15.43
15	04.03	05.21	06.41	07.58	16.09 (5)	08.23
	22.41	21.21	19.43	18.08	14 16.23 (5)	15.40
16	04.06	05.24	06.43	08.00	16.06 (5)	08.25
	22.39	21.18	19.40	18.05	19 16.25 (5)	15.38
17	04.08	05.26	06.46	08.03	16.04 (5)	08.28
	22.37	21.15	19.37	18.01	21 16.25 (5)	15.35
18	04.10	05.29	06.48	08.06	16.02 (5)	08.31
	22.35	21.12	19.33	17.58	24 16.26 (5)	15.33
19	04.12	05.32	06.51	08.08	16.01 (5)	08.33
	22.33	21.08	19.30	17.55	26 16.27 (5)	15.31
20	04.15	05.34	06.53	08.11	16.01 (5)	08.36
	22.31	21.05	19.27	17.52	27 16.28 (5)	15.29
21	04.17	05.37	06.56	08.14	16.00 (5)	08.39
	22.28	21.02	19.24	17.49	28 16.28 (5)	15.26
22	04.19	05.40	06.58	17.17 (4)	08.16	16.00 (5)
	22.26	20.59	19.21	17.46	28 16.28 (5)	15.24
23	04.22	05.42	07.01	17.13 (4)	08.19	15.59 (5)
	22.24	20.56	19.17	17.29 (4)	17.43	29 16.28 (5)
24	04.24	05.45	07.04	17.10 (4)	08.22	15.59 (5)
	22.21	20.53	19.14	17.32 (4)	17.40	29 16.28 (5)
25	04.27	05.47	07.06	17.07 (4)	07.24	14.59 (5)
	22.19	20.50	19.11	17.32 (4)	16.37	29 15.28 (5)
26	04.29	05.50	07.09	17.06 (4)	07.27	14.59 (5)
	22.16	20.47	19.08	17.34 (4)	16.34	29 15.28 (5)
27	04.32	05.53	07.11	17.04 (4)	07.30	15.00 (5)
	22.14	20.44	19.04	17.34 (4)	16.31	27 15.27 (5)
28	04.34	05.55	07.14	17.03 (4)	07.33	15.00 (5)
	22.11	20.40	19.01	17.35 (4)	16.29	26 15.26 (5)
29	04.37	05.58	07.16	17.03 (4)	07.35	15.01 (5)
	22.09	20.37	18.58	17.35 (4)	16.26	24 15.25 (5)
30	04.39	06.00	07.19	17.01 (4)	07.38	15.01 (5)
	22.06	20.34	18.55	17.35 (4)	16.23	23 15.24 (5)
31	04.42	06.03		07.41	15.02 (5)	
	22.03	20.31		16.20	21 15.23 (5)	
Potential sun hours	573	492	390	312	219	172
Total, worst case			229	799		36
Sun reduction			0,32	0,27		0,16
Oper. time red.			0,89	0,89		0,89
Wind dir. red.			0,63	0,63		0,63
Total reduction			0,18	0,15		0,09
Total, real			41	119		3

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

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

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 15.5.2023 18.17/3.5.584

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: E - Lomarakennus E (Uusjoutsjärventie 450)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.43	19.06 (4)	05.10
	15.06	16.20	17.39	20.01	16	19.22 (4)
2	09.35	08.39	07.19	06.40	19.04 (4)	05.07
	15.08	16.23	17.42	20.04	20	19.24 (4)
3	09.34	08.37	07.15	06.37	19.03 (4)	05.04
	15.09	16.26	17.45	20.06	22	19.25 (4)
4	09.33	08.34	07.12	06.34	19.02 (4)	05.01
	15.11	16.29	17.47	20.09	24	19.26 (4)
5	09.32	08.32	07.09	06.30	19.01 (4)	04.58
	15.13	16.32	17.50	20.12	25	19.26 (4)
6	09.31	08.29	07.06	06.27	19.00 (4)	04.55
	15.15	16.35	17.53	20.14	27	19.27 (4)
7	09.30	08.26	07.03	06.24	18.59 (4)	04.52
	15.17	16.37	17.55	20.17	28	19.27 (4)
8	09.29	08.24	07.00	06.21	18.58 (4)	04.49
	15.19	16.40	17.58	20.19	28	19.26 (4)
9	09.28	08.21	06.57	06.18	18.58 (4)	04.47
	15.21	16.43	18.01	20.22	28	19.26 (4)
10	09.27	08.18	06.54	06.15	18.58 (4)	04.44
	15.23	16.46	18.03	20.25	27	19.25 (4)
11	09.25	08.15	06.50	17.14 (5)	06.11	18.58 (4)
	15.25	16.49	18.06	12	17.26 (5)	20.27
12	09.24	08.12	06.47	17.12 (5)	06.08	18.58 (4)
	15.27	16.52	18.09	17	17.29 (5)	20.30
13	09.22	08.09	06.44	17.10 (5)	06.05	18.59 (4)
	15.30	16.55	18.11	21	17.31 (5)	20.33
14	09.21	08.07	06.41	17.08 (5)	06.02	19.00 (4)
	15.32	16.57	18.14	23	17.31 (5)	20.35
15	09.19	08.04	06.38	17.07 (5)	05.59	19.01 (4)
	15.35	17.00	18.17	25	17.32 (5)	20.38
16	09.17	08.01	06.34	17.07 (5)	05.56	19.02 (4)
	15.37	17.03	18.19	25	17.32 (5)	20.41
17	09.15	07.58	06.31	17.06 (5)	05.52	19.05 (4)
	15.39	17.06	18.22	27	17.33 (5)	20.43
18	09.13	07.55	06.28	17.05 (5)	05.49	04.23
	15.42	17.09	18.24	27	17.32 (5)	20.46
19	09.12	07.52	06.25	17.05 (5)	05.46	04.20
	15.45	17.11	18.27	27	17.32 (5)	20.49
20	09.10	07.49	06.22	17.05 (5)	05.43	04.18
	15.47	17.14	18.30	26	17.31 (5)	20.51
21	09.08	07.46	06.19	17.05 (5)	05.40	04.15
	15.50	17.17	18.32	26	17.31 (5)	20.54
22	09.05	07.43	06.15	17.05 (5)	05.37	04.13
	15.53	17.20	18.35	24	17.29 (5)	20.57
23	09.03	07.40	06.12	17.06 (5)	05.34	04.11
	15.55	17.23	18.38	22	17.28 (5)	20.59
24	09.01	07.37	06.09	17.07 (5)	05.31	04.08
	15.58	17.25	18.40	20	17.27 (5)	21.02
25	08.59	07.34	06.06	17.09 (5)	05.28	04.06
	16.01	17.28	18.43	16	17.25 (5)	21.05
26	08.57	07.31	06.02	17.10 (5)	05.25	04.04
	16.03	17.31	18.45	12	17.22 (5)	21.07
27	08.54	07.28	05.59	05.22	04.02	03.36
	16.06	17.34	18.48	21.10	22.28	23.04
28	08.52	07.25	05.56	05.19	04.00	03.37
	16.09	17.36	18.51	21.13	22.31	23.03
29	08.49	07.22	06.53	05.16	03.58	03.38
	16.12	17.37	19.53	21.16	22.33	23.03
30	08.47	07.19	06.50	05.13	03.56	03.39
	16.15	17.38	19.56	21.18	22.35	23.02
31	08.45	07.16	06.46	19.10 (4)	03.54	03.39
	16.17	17.39	19.58	10	19.20 (4)	22.37
Potential sun hours	198	249	364	441	543	579
Total, worst case			360	390		
Sun reduction			0,34	0,39		
Oper. time red.			0,89	0,89		
Wind dir. red.			0,60	0,61		
Total reduction			0,18	0,22		
Total, real			65	84		

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)



## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: E - Lomarakenus E (Uusjoutsjärventie 450)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	July	August	September	October	November	December			
1	03.40	04.44	06.05	18.57 (4)	07.21	17.51 (5)	07.44	09.03	
	23.01	22.01	20.28	27 19.24 (4)	18.52	18	18.09 (5)	16.17	15.08
2	03.41	04.47	06.08	18.57 (4)	07.24	17.51 (5)	07.46	09.06	
	23.00	21.58	20.25	27 19.24 (4)	18.48	15	18.06 (5)	16.14	15.06
3	03.42	04.50	06.10	18.56 (4)	07.26	17.55 (5)	07.49	09.08	
	22.59	21.55	20.21	28 19.24 (4)	18.45	8	18.03 (5)	16.11	15.05
4	03.44	04.52	06.13	18.56 (4)	07.29			07.52	09.10
	22.58	21.52	20.18	28 19.24 (4)	18.42			16.09	15.04
5	03.45	04.55	06.16	18.56 (4)	07.32			07.55	09.12
	22.57	21.50	20.15	27 19.23 (4)	18.39			16.06	15.02
6	03.47	04.58	06.18	18.55 (4)	07.34			07.58	09.14
	22.56	21.47	20.12	27 19.22 (4)	18.36			16.03	15.01
7	03.48	05.00	06.21	18.56 (4)	07.37			08.00	09.16
	22.55	21.44	20.09	26 19.22 (4)	18.33			16.01	15.00
8	03.50	05.03	06.23	18.56 (4)	07.39			08.03	09.18
	22.53	21.41	20.05	24 19.20 (4)	18.29			15.58	14.59
9	03.52	05.05	06.26	18.57 (4)	07.42			08.06	09.20
	22.52	21.38	20.02	22 19.19 (4)	18.26			15.55	14.58
10	03.53	05.08	06.28	18.57 (4)	07.44			08.09	09.21
	22.50	21.35	19.59	20 19.17 (4)	18.23			15.53	14.58
11	03.55	05.11	06.31	18.59 (4)	07.47			08.11	09.23
	22.48	21.32	19.56	16 19.15 (4)	18.20			15.50	14.57
12	03.57	05.13	06.33	19.01 (4)	07.50			08.14	09.25
	22.47	21.29	19.53	11 19.12 (4)	18.17			15.48	14.56
13	03.59	05.16	06.36		07.52			08.17	09.26
	22.45	21.27	19.49		18.14			15.45	14.56
14	04.01	05.19	06.38		07.55			08.20	09.27
	22.43	21.24	19.46		18.11			15.43	14.55
15	04.03	05.21	06.41		07.58			08.22	09.29
	22.41	21.21	19.43		18.08			15.40	14.55
16	04.06	05.24	06.43		08.00			08.25	09.30
	22.39	21.18	19.40		18.05			15.38	14.55
17	04.08	05.26	06.46	18.00 (5)	08.03			08.28	09.31
	22.37	21.14	19.37	10 18.10 (5)	18.01			15.35	14.55
18	04.10	05.29	06.48	17.57 (5)	08.05			08.31	09.32
	22.35	21.11	19.33	15 18.12 (5)	17.58			15.33	14.55
19	04.12	05.32	06.51	17.54 (5)	08.08			08.33	09.33
	22.33	21.08	19.30	19 18.13 (5)	17.55			15.31	14.55
20	04.15	05.34	06.53	17.53 (5)	08.11			08.36	09.34
	22.31	21.05	19.27	22 18.15 (5)	17.52			15.29	14.55
21	04.17	05.37	06.56	17.51 (5)	08.14			08.39	09.34
	22.28	21.02	19.24	24 18.15 (5)	17.49			15.26	14.55
22	04.19	05.40	06.58	17.50 (5)	08.16			08.41	09.35
	22.26	20.59	19.20	25 18.15 (5)	17.46			15.24	14.56
23	04.22	05.42	07.01	17.49 (5)	08.19			08.44	09.36
	22.24	20.56	19.17	26 18.15 (5)	17.43			15.22	14.56
24	04.24	05.45	07.03	17.49 (5)	08.22			08.46	09.36
	22.21	20.53	19.14	26 18.15 (5)	17.40			15.20	14.57
25	04.27	05.47	07.06	17.48 (5)	07.24			08.49	09.36
	22.19	20.50	19.11	27 18.15 (5)	16.37			15.18	14.58
26	04.29	05.50	19.07 (4)	07.09	17.48 (5)	07.27		08.51	09.36
	22.16	20.47	19.19 (4)	19.08	27 18.15 (5)	16.34		15.16	14.58
27	04.32	05.53	19.04 (4)	07.11	17.48 (5)	07.30		08.54	09.36
	22.14	20.44	19.20 (4)	19.04	25 18.13 (5)	16.31		15.15	14.59
28	04.34	05.55	19.02 (4)	07.14	17.48 (5)	07.33		08.56	09.36
	22.11	20.40	19.22 (4)	19.01	25 18.13 (5)	16.29		15.13	15.00
29	04.37	05.58	19.00 (4)	07.16	17.48 (5)	07.35		08.59	09.36
	22.09	20.37	19.23 (4)	18.58	23 18.11 (5)	16.26		15.11	15.02
30	04.39	06.00	18.59 (4)	07.19	17.49 (5)	07.38		09.01	09.36
	22.06	20.34	19.23 (4)	18.55	21 18.10 (5)	16.23		15.10	15.03
31	04.42	06.03	18.58 (4)		07.41				09.36
	22.03	20.31	19.24 (4)		16.20				15.04
Potential sun hours	573	492	390		312		219		172
Total, worst case			121		598				41
Sun reduction			0,42		0,32				0,27
Oper. time red.			0,89		0,89				0,89
Wind dir. red.			0,61		0,60				0,60
Total reduction			0,23		0,17				0,14
Total, real			28		103				6

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

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

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henna-Riikka / henna-riikka.rintamaki@fcg.fi
Calculated:
15.5.2023 18.17/3.5.584

SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: F - Asuinrakennus F (Ahorajantie 64)
Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

Table with columns for months (January to December) and rows for sun hours, sun reduction, and operational time. Includes a summary row for 'Total, real'.

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

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



## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: G - Asuinrakennus G (Uutelantie 82)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.43	05.10	19.10 (3) 03.52
	15.06	16.21	17.39	20.01	21.21	19 19.29 (3) 22.39
2	09.34	08.39	07.19	06.40	05.07	19.14 (3) 03.51
	15.08	16.23	17.42	20.04	21.24	13 19.27 (3) 22.41
3	09.34	08.37	07.16	06.37	05.04	19.19 (3) 03.49
	15.10	16.26	17.45	20.06	21.26	2 19.21 (3) 22.43
4	09.33	08.34	07.12	06.34	05.01	20.45 (2) 03.47
	15.11	16.29	17.47	20.09	21.29	5 20.50 (2) 22.45
5	09.32	08.32	07.09	06.31	04.58	20.42 (2) 03.46
	15.13	16.32	17.50	20.12	21.32	10 20.52 (2) 22.47
6	09.31	08.29	07.06	06.27	04.55	20.40 (2) 03.44
	15.15	16.35	17.53	20.14	21.34	14 20.54 (2) 22.48
7	09.30	08.26	07.03	06.24	19.18 (3) 04.53	20.39 (2) 03.43
	15.17	16.38	17.55	20.17	19.32 (3) 21.37	18 20.57 (2) 22.50
8	09.29	08.23	07.00	06.21	19.15 (3) 04.50	20.37 (2) 03.42
	15.19	16.40	17.58	20.19	20.35 (3) 21.40	20 20.57 (2) 22.52
9	09.28	08.21	06.57	06.18	19.12 (3) 04.47	20.37 (2) 03.41
	15.21	16.43	18.01	20.22	19.36 (3) 21.43	21 20.58 (2) 22.53
10	09.26	08.18	06.54	06.15	19.10 (3) 04.44	20.36 (2) 03.39
	15.23	16.46	18.03	20.25	19.37 (3) 21.45	22 20.58 (2) 22.55
11	09.25	08.15	06.50	06.12	19.09 (3) 04.41	20.36 (2) 03.38
	15.25	16.49	18.06	20.27	19.38 (3) 21.48	23 20.59 (2) 22.56
12	09.24	08.12	06.47	06.08	19.07 (3) 04.39	20.36 (2) 03.38
	15.28	16.52	18.09	20.30	19.39 (3) 21.51	23 20.59 (2) 22.57
13	09.22	08.09	06.44	06.05	19.06 (3) 04.36	20.35 (2) 03.37
	15.30	16.55	18.11	20.33	19.40 (3) 21.53	24 20.59 (2) 22.58
14	09.20	08.07	06.41	06.02	19.05 (3) 04.33	20.35 (2) 03.36
	15.32	16.58	18.14	20.35	19.40 (3) 21.56	24 20.59 (2) 22.59
15	09.19	08.04	06.38	05.59	19.05 (3) 04.31	20.35 (2) 03.35
	15.35	17.00	18.17	20.38	19.41 (3) 21.59	24 20.59 (2) 23.00
16	09.17	08.01	06.35	05.56	19.04 (3) 04.28	20.36 (2) 03.35
	15.37	17.03	18.19	20.41	19.41 (3) 22.01	24 21.00 (2) 23.01
17	09.15	07.58	06.31	05.53	19.03 (3) 04.25	20.36 (2) 03.34
	15.40	17.06	18.22	20.43	19.41 (3) 22.04	24 21.00 (2) 23.02
18	09.13	07.55	06.28	05.49	19.03 (3) 04.23	20.35 (2) 03.34
	15.42	17.09	18.25	20.46	19.41 (3) 22.06	23 20.58 (2) 23.03
19	09.11	07.52	06.25	05.46	19.03 (3) 04.20	20.36 (2) 03.34
	15.45	17.12	18.27	20.49	19.40 (3) 22.09	22 20.58 (2) 23.03
20	09.10	07.49	06.22	05.43	19.02 (3) 04.18	20.36 (2) 03.34
	15.47	17.14	18.30	20.51	19.40 (3) 22.11	22 20.58 (2) 23.03
21	09.07	07.46	06.19	05.40	19.02 (3) 04.16	20.37 (2) 03.34
	15.50	17.17	18.32	20.54	19.39 (3) 22.14	20 20.57 (2) 23.04
22	09.05	07.43	06.15	05.37	19.03 (3) 04.13	20.37 (2) 03.34
	15.53	17.20	18.35	20.57	19.40 (3) 22.16	20 20.57 (2) 23.04
23	09.03	07.40	06.12	05.34	19.03 (3) 04.11	20.39 (2) 03.34
	15.55	17.23	18.38	20.59	19.39 (3) 22.19	18 20.57 (2) 23.04
24	09.01	07.37	06.09	05.31	19.03 (3) 04.09	20.40 (2) 03.35
	15.58	17.25	18.40	21.02	19.38 (3) 22.21	16 20.56 (2) 23.04
25	08.59	07.34	06.06	05.28	19.04 (3) 04.06	20.41 (2) 03.35
	16.01	17.28	18.43	21.05	19.37 (3) 22.24	14 20.55 (2) 23.04
26	08.57	07.31	06.03	05.25	19.04 (3) 04.04	20.42 (2) 03.36
	16.04	17.31	18.45	21.07	19.36 (3) 22.26	12 20.54 (2) 23.04
27	08.54	07.28	05.59	05.22	19.05 (3) 04.02	20.44 (2) 03.36
	16.06	17.34	18.48	21.10	19.35 (3) 22.28	9 20.53 (2) 23.03
28	08.52	07.25	05.56	05.19	19.07 (3) 04.00	20.46 (2) 03.37
	16.09	17.36	18.51	21.13	19.35 (3) 22.30	5 20.51 (2) 23.03
29	08.49		06.53	05.16	19.07 (3) 03.58	03.38
	16.12		19.53	21.16	19.33 (3) 22.33	23.02
30	08.47		06.50	05.13	19.09 (3) 03.56	03.39
	16.15		19.56	21.18	19.31 (3) 22.35	23.02
31	08.44		06.47		03.54	
	16.18		19.59		22.37	
Potential sun hours	199	249	364	441	543	579
Total, worst case				755	491	
Sun reduction				0,39	0,49	
Oper. time red.				0,89	0,89	
Wind dir. red.				0,61	0,62	
Total reduction				0,21	0,28	
Total, real				161	135	

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: G - Asuinrakennus G (Uutelantie 82)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	July	August	September	October	November	December		
1	03.40	04.45	20.46 (2)	06.06	19.08 (3)	07.21	07.44	09.03
	23.01	22.01	23 21.09 (2)	20.28	29 19.37 (3)	18.52	16.17	15.08
2	03.41	04.47	20.46 (2)	06.08	19.09 (3)	07.24	07.46	09.06
	23.00	21.58	23 21.09 (2)	20.25	27 19.36 (3)	18.49	16.14	15.07
3	03.43	04.50	20.47 (2)	06.11	19.10 (3)	07.26	07.49	09.08
	22.59	21.55	22 21.09 (2)	20.21	24 19.34 (3)	18.45	16.12	15.05
4	03.44	04.53	20.47 (2)	06.13	19.12 (3)	07.29	07.52	09.10
	22.58	21.52	21 21.08 (2)	20.18	20 19.32 (3)	18.42	16.09	15.04
5	03.45	04.55	20.48 (2)	06.16	19.14 (3)	07.32	07.55	09.12
	22.57	21.50	19 21.07 (2)	20.15	14 19.28 (3)	18.39	16.06	15.03
6	03.47	04.58	20.49 (2)	06.18		07.34	07.57	09.14
	22.56	21.47	17 21.06 (2)	20.12		18.36	16.03	15.02
7	03.49	05.00	20.50 (2)	06.21		07.37	08.00	09.16
	22.54	21.44	13 21.03 (2)	20.09		18.33	16.01	15.01
8	03.50	05.03	20.52 (2)	06.23		07.39	08.03	09.18
	22.53	21.41	9 21.01 (2)	20.06		18.30	15.58	15.00
9	03.52	05.06	20.56 (2)	06.26		07.42	08.06	09.20
	22.51	21.38	3 20.59 (2)	20.02		18.26	15.55	14.59
10	03.54	05.08	19.25 (3)	06.28		07.44	08.09	09.21
	22.50	21.35	8 19.33 (3)	19.59		18.23	15.53	14.58
11	03.56	05.11	19.21 (3)	06.31		07.47	08.11	09.23
	22.48	21.32	15 19.36 (3)	19.56		18.20	15.50	14.57
12	03.58	05.14	19.19 (3)	06.33		07.50	08.14	09.25
	22.47	21.29	20 19.39 (3)	19.53		18.17	15.48	14.56
13	04.00	05.16	19.17 (3)	06.36		07.52	08.17	09.26
	22.45	21.26	23 19.40 (3)	19.49		18.14	15.45	14.56
14	04.02	05.19	19.14 (3)	06.38		07.55	08.20	09.27
	22.43	21.23	27 19.41 (3)	19.46		18.11	15.43	14.56
15	04.04	05.21	19.14 (3)	06.41		07.58	08.22	09.29
	22.41	21.21	28 19.42 (3)	19.43		18.08	15.40	14.55
16	04.06	20.54 (2)	05.24	19.12 (3)	06.43	08.00	08.25	09.30
	22.39	7 21.01 (2)	21.17	19.43 (3)	19.40	18.05	15.38	14.55
17	04.08	20.52 (2)	05.27	19.10 (3)	06.46	08.03	08.28	09.31
	22.37	11 21.03 (2)	21.14	19.43 (3)	19.37	18.02	15.36	14.55
18	04.10	20.51 (2)	05.29	19.10 (3)	06.48	08.06	08.31	09.32
	22.35	14 21.05 (2)	21.11	19.44 (3)	19.33	17.59	15.33	14.55
19	04.13	20.50 (2)	05.32	19.09 (3)	06.51	08.08	08.33	09.33
	22.33	16 21.06 (2)	21.08	19.44 (3)	19.30	17.55	15.31	14.55
20	04.15	20.50 (2)	05.35	19.09 (3)	06.54	08.11	08.36	09.34
	22.30	17 21.07 (2)	21.05	19.45 (3)	19.27	17.52	15.29	14.55
21	04.17	20.49 (2)	05.37	19.08 (3)	06.56	08.14	08.39	09.34
	22.28	18 21.07 (2)	21.02	19.45 (3)	19.24	17.49	15.27	14.56
22	04.20	20.48 (2)	05.40	19.07 (3)	06.59	08.16	08.41	09.35
	22.26	20 21.08 (2)	20.59	19.44 (3)	19.21	17.46	15.25	14.56
23	04.22	20.48 (2)	05.42	19.07 (3)	07.01	08.19	08.44	09.35
	22.24	21 21.09 (2)	20.56	19.45 (3)	19.17	17.43	15.23	14.57
24	04.24	20.47 (2)	05.45	19.06 (3)	07.04	08.22	08.46	09.36
	22.21	22 21.09 (2)	20.53	19.44 (3)	19.14	17.40	15.21	14.57
25	04.27	20.47 (2)	05.48	19.07 (3)	07.06	07.24	08.49	09.36
	22.19	22 21.09 (2)	20.50	19.44 (3)	19.11	16.37	15.19	14.58
26	04.29	20.46 (2)	05.50	19.06 (3)	07.09	07.27	08.51	09.36
	22.16	24 21.10 (2)	20.47	19.43 (3)	19.08	16.35	15.17	14.59
27	04.32	20.46 (2)	05.53	19.06 (3)	07.11	07.30	08.54	09.36
	22.14	24 21.10 (2)	20.44	19.42 (3)	19.05	16.32	15.15	15.00
28	04.34	20.46 (2)	05.55	19.06 (3)	07.14	07.33	08.56	09.36
	22.11	24 21.10 (2)	20.40	19.42 (3)	19.01	16.29	15.13	15.01
29	04.37	20.45 (2)	05.58	19.06 (3)	07.16	07.35	08.59	09.36
	22.09	25 21.10 (2)	20.37	19.41 (3)	18.58	16.26	15.11	15.02
30	04.40	20.46 (2)	06.00	19.07 (3)	07.19	07.38	09.01	09.36
	22.06	24 21.10 (2)	20.34	19.41 (3)	18.55	16.23	15.10	15.03
31	04.42	20.46 (2)	06.03	19.07 (3)		07.41		09.36
	22.03	24 21.10 (2)	20.31	19.39 (3)		16.20		15.05
Potential sun hours	573	492		390		312	219	172
Total, worst case	313	837		114				
Sun reduction	0,44	0,42		0,32				
Oper. time red.	0,89	0,89		0,89				
Wind dir. red.	0,62	0,61		0,61				
Total reduction	0,25	0,23		0,17				
Total, real	77	192		20				

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: H - Lomarakennus H (Nurmela)  
Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

## Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
591 488 417 431 453 653 880 1025 878 778 643 602 7 839

	January	February	March	April	May	June	July	August	September	October	November	December								
1	09.35	08.42	07.22	06.43	05.10	03.52	20.16 (3)	03.40	20.28 (3)	04.45	20.23 (3)	06.06	07.21	07.44	09.03					
2	15.06	16.21	17.39	20.01	21.21	22.39	50	21.39 (2)	23.01	40	21.46 (2)	22.01	34	20.57 (3)	20.28	18.52	16.17	15.08		
3	09.34	08.39	07.19	06.40	05.07	8	20.26 (3)	03.51	20.17 (3)	03.41	20.28 (3)	04.47	20.23 (3)	06.08	07.24	07.46	09.06	09.06		
4	15.08	16.23	17.42	20.04	21.24	8	20.34 (3)	22.41	50	21.40 (2)	23.00	41	21.46 (2)	21.58	33	20.56 (3)	20.25	18.49	16.14	15.07
5	09.34	08.37	07.16	06.37	05.04	20.22 (3)	03.49	20.18 (3)	03.43	20.28 (3)	04.50	20.24 (3)	06.11	07.26	07.49	09.08	09.08	09.08		
6	15.10	16.26	17.45	20.06	21.26	15	20.37 (3)	22.43	49	21.40 (2)	22.59	41	21.46 (2)	21.55	32	20.56 (3)	20.21	18.45	16.12	15.05
7	09.33	08.34	07.12	06.34	05.01	20.21 (3)	03.47	20.19 (3)	03.44	20.27 (3)	04.53	20.25 (3)	06.13	07.29	07.52	09.10	09.10	09.10		
8	15.11	16.29	17.47	20.09	21.29	19	20.40 (3)	22.45	48	21.41 (2)	22.58	43	21.46 (2)	21.52	30	20.55 (3)	20.18	18.42	16.09	15.04
9	09.32	08.32	07.09	06.31	04.58	20.18 (3)	03.46	20.19 (3)	03.45	20.26 (3)	04.55	20.25 (3)	06.16	07.32	07.55	09.12	09.12	09.12		
10	15.13	16.32	17.50	20.12	21.32	23	20.41 (3)	22.47	48	21.41 (2)	22.57	45	21.47 (2)	21.50	29	20.54 (3)	20.15	18.39	16.06	15.03
11	09.31	08.29	07.06	06.27	04.55	20.17 (3)	03.44	20.20 (3)	03.47	20.26 (3)	04.58	20.27 (3)	06.18	07.34	07.57	09.14	09.14	09.14		
12	15.15	16.35	17.53	20.14	21.34	25	20.42 (3)	22.48	47	21.41 (2)	22.56	46	21.46 (2)	21.47	27	20.54 (3)	20.12	18.36	16.03	15.02
13	09.30	08.26	07.03	06.24	04.53	20.16 (3)	03.43	20.21 (3)	03.49	20.26 (3)	05.00	20.27 (3)	06.21	07.37	08.00	09.16	09.16	09.16		
14	15.17	16.38	17.55	20.17	21.37	28	20.44 (3)	22.50	45	21.41 (2)	22.54	47	21.47 (2)	21.44	25	20.52 (3)	20.09	18.33	16.01	15.01
15	09.29	08.23	07.00	06.21	04.50	20.15 (3)	03.42	20.21 (3)	03.50	20.25 (3)	05.03	20.28 (3)	06.23	07.39	08.03	09.18	09.18	09.18		
16	15.19	16.41	17.58	20.19	21.40	29	20.44 (3)	22.52	45	21.41 (2)	22.53	48	21.47 (2)	21.41	22	20.50 (3)	20.06	18.30	15.58	15.00
17	09.28	08.21	06.57	06.18	04.47	20.14 (3)	03.41	20.22 (3)	03.52	20.25 (3)	05.06	20.26 (3)	06.26	07.42	08.06	09.20	09.20	09.20		
18	15.21	16.43	18.01	20.22	21.43	31	20.45 (3)	22.53	43	21.41 (2)	22.51	49	21.47 (2)	21.38	19	20.49 (3)	20.02	18.26	15.55	14.59
19	09.26	08.18	06.54	06.15	04.44	20.14 (3)	03.39	20.22 (3)	03.54	20.25 (3)	05.08	20.26 (3)	06.28	07.44	08.09	09.21	09.21	09.21		
20	15.23	16.46	18.03	20.25	21.45	32	20.46 (3)	22.55	43	21.41 (2)	22.50	51	21.48 (2)	21.35	14	20.46 (3)	19.59	18.23	15.53	14.58
21	09.25	08.15	06.50	06.12	04.41	20.13 (3)	03.38	20.24 (3)	03.56	20.24 (3)	05.11	20.26 (3)	06.31	07.47	08.11	09.23	09.23	09.23		
22	15.25	16.49	18.06	20.27	21.48	33	20.46 (3)	22.56	41	21.42 (2)	22.48	51	21.47 (2)	21.32	5	20.41 (3)	19.56	18.20	15.50	14.57
23	09.24	08.12	06.47	06.08	04.39	20.13 (3)	03.38	20.24 (3)	03.58	20.24 (3)	05.14	20.26 (3)	06.33	07.50	08.14	09.24	09.24	09.24		
24	15.28	16.52	18.09	20.30	21.51	34	20.47 (3)	22.57	39	21.41 (2)	22.47	52	21.48 (2)	21.29	19.53	18.17	15.48	14.57	14.57	
25	09.22	08.09	06.44	06.05	04.36	20.12 (3)	03.37	20.25 (3)	04.00	20.24 (3)	05.16	20.25 (3)	06.36	07.52	08.17	09.26	09.26	09.26		
26	15.30	16.55	18.11	20.33	21.53	34	20.46 (3)	22.58	39	21.42 (2)	22.45	52	21.48 (2)	21.26	19.49	18.14	15.45	14.56	14.56	
27	09.20	08.07	06.41	06.02	04.33	20.12 (3)	03.36	20.25 (3)	04.02	20.23 (3)	05.19	20.23 (3)	06.38	07.55	08.20	09.27	09.27	09.27		
28	15.32	16.58	18.14	20.35	21.56	35	20.47 (3)	22.59	38	21.41 (2)	22.43	52	21.47 (2)	21.23	19.46	18.11	15.43	14.56	14.56	
29	09.19	08.04	06.38	05.59	04.31	20.12 (3)	03.35	20.26 (3)	04.04	20.23 (3)	05.21	20.23 (3)	06.41	07.58	08.22	09.29	09.29	09.29		
30	15.35	17.00	18.17	20.38	21.58	35	20.47 (3)	23.00	37	21.42 (2)	22.41	52	21.47 (2)	21.20	19.43	18.08	15.40	14.55	14.55	
31	09.17	08.01	06.35	05.56	04.28	20.12 (3)	03.35	20.27 (3)	04.06	20.23 (3)	05.24	20.23 (3)	06.43	08.00	08.25	09.30	09.30	09.30		
32	15.37	17.03	18.19	20.41	22.01	36	20.48 (3)	23.01	35	21.42 (2)	22.39	53	21.47 (2)	21.17	19.40	18.05	15.38	14.55	14.55	
33	09.15	07.58	06.31	05.53	04.25	20.12 (3)	03.35	20.28 (3)	04.08	20.23 (3)	05.27	20.23 (3)	06.46	08.03	08.28	09.31	09.31	09.31		
34	15.40	17.06	18.22	20.43	22.04	36	20.48 (3)	23.02	34	21.42 (2)	22.37	52	21.47 (2)	21.14	19.37	18.02	15.36	14.55	14.55	
35	09.13	07.55	06.28	05.50	04.23	20.11 (3)	03.34	20.28 (3)	04.10	20.23 (3)	05.29	20.23 (3)	06.48	08.06	08.31	09.32	09.32	09.32		
36	15.42	17.09	18.25	20.46	22.06	36	20.47 (3)	23.02	35	21.42 (2)	22.35	52	21.47 (2)	21.11	19.33	17.59	15.33	14.53	14.53	
37	09.11	07.52	06.25	05.46	04.20	20.11 (3)	03.34	20.28 (3)	04.13	20.23 (3)	05.32	20.23 (3)	06.51	08.08	08.33	09.33	09.33	09.33		
38	15.45	17.12	18.27	20.49	22.09	36	20.47 (3)	23.03	33	21.42 (2)	22.33	50	21.45 (2)	21.08	19.30	17.55	15.31	14.55	14.55	
39	09.09	07.49	06.22	05.43	04.18	20.11 (3)	03.34	20.29 (3)	04.15	20.23 (3)	05.35	20.23 (3)	06.54	08.11	08.36	09.34	09.34	09.34		
40	15.47	17.14	18.30	20.51	22.11	38	21.26 (2)	23.03	33	21.43 (2)	22.30	48	21.43 (2)	21.05	19.27	17.52	15.29	14.55	14.55	
41	09.07	07.46	06.19	05.40	04.16	20.11 (3)	03.34	20.29 (3)	04.17	20.23 (3)	05.37	20.23 (3)	06.56	08.14	08.39	09.34	09.34	09.34		
42	15.50	17.17	18.32	20.54	22.14	42	21.28 (2)	23.04	33	21.43 (2)	22.28	46	21.42 (2)	21.02	19.24	17.49	15.27	14.56	14.56	
43	09.05	07.43	06.15	05.37	04.13	20.12 (3)	03.34	20.29 (3)	04.20	20.22 (3)	05.40	20.22 (3)	06.59	08.16	08.41	09.35	09.35	09.35		
44	15.53	17.20	18.35	20.57	22.16	46	21.31 (2)	23.04	33	21.43 (2)	22.26	44	21.40 (2)	20.59	19.21	17.46	15.25	14.56	14.56	
45	09.03	07.40	06.12	05.34	04.11	20.13 (3)	03.34	20.29 (3)	04.22	20.22 (3)	05.42	20.22 (3)	07.01	08.19	08.44	09.35	09.35	09.35		
46	15.55	17.23	18.38	20.59	22.19	47	21.32 (2)	23.04	33	21.43 (2)	22.24	41	21.38 (2)	20.56	19.17	17.43	15.23	14.57	14.57	
47	09.01	07.37	06.09	05.31	04.09	20.13 (3)	03.35	20.29 (3)	04.24	20.22 (3)	05.45	20.22 (3)	07.04	08.22	08.46	09.36	09.36	09.36		
48	15.58	17.26	18.40	21.02	22.21	48	21.34 (2)	23.04	34	21.44 (2)	22.21	36	20.58 (3)	20.53	19.14	17.40	15.21	14.57	14.57	
49	08.59	07.34	06.06	05.28	04.06	20.13 (3)	03.35	20.29 (3)	04.27	20.22 (3)	05.48	20.22 (3)	07.06	07.24	08.49	09.36	09.36	09.36		
50	16.01	17.28	18.43	21.05	22.24	51	21.36 (2)	23.04	35	21.44 (2)	22.19	36	20.58 (3)	20.50	19.11	16.37	15.19	14.58	14.58	
51	08.57	07.31	06.03	05.25	04.04	20.13 (3)	03.36	20.29 (3)	04.29	20.22 (3)	05.50	20.22 (3)	07.09	07.27	08.51	09.36	09.36	09.36		
52	16.04	17.31	18.45	21.07	22.26	53	21.37 (2)	23.04	35	21.44 (2)	22.16	36	20.58 (3)	20.47	19.08	16.35	15.17	14.59	14.59	
53	08.54	07.28	05.59	05.22	04.02	20.14 (3)	03.36	20.28 (3)	04.32	20.22 (3)	05.53	20.22 (3)	07.11	07.30	08.54	09.36	09.36	09.36		
54	16.06	17.34	18.48	21.10	22.28	52	21.38 (2)	23.03	37	21.44 (2)	22.14	36	20.58 (3)	20.44	19.05	16.32	15.15	15.00	15.00	
55	08.52	07.25	05.56	05.19	04.00	20.14 (3)	03.37	20.29 (3)	04.34	20.22 (3)	05.55	20.22 (3)	07.14	07.33	08.56	09.36	09.36	09.36		
56	16.09	17.36	18.51	21.13	22.30	52	21.38 (2)	23.03	36	21.44 (2)	22.11	36	20.58 (3)	20.40	19.01	16.29	15.13	15.01	15.01	
57	08.49	07.21	05.53	05.16	03.58	20.15 (3)	03.38	20.29 (3)	04.37	20.22 (3)	05.58	20.22 (3)	07.16	07.35	08.59	09.36	09.36	09.36		
58	16.12	17.39																		

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
15.5.2023 18.17/3.5.584

# SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: I - Lomarakenus I (Mikkolanmäentie 24)  
Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

## Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

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

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: J - Asuinrakennus J (Työlammentie 24)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June	
1	09.35	08.42	07.22	06.44	05.10	03.53	
	15.07	16.21	17.39	20.01	21.21	22.39	
2	09.35	08.40	07.19	06.40	05.07	03.51	
	15.08	16.24	17.42	20.04	21.24	22.41	
3	09.34	08.37	07.16	06.37	05.04	03.49	
	15.10	16.26	17.45	20.07	21.27	22.43	
4	09.33	08.34	07.13	06.34	05.01	03.48	04.41 (2)
	15.12	16.29	17.48	20.09	21.29	22.45	6 04.47 (2)
5	09.32	08.32	07.10	06.31	04.58	03.46	04.39 (2)
	15.13	16.32	17.50	20.12	21.32	22.47	10 04.49 (2)
6	09.31	08.29	07.06	06.28	04.56	03.45	04.38 (2)
	15.15	16.35	17.53	20.14	21.35	22.49	12 04.50 (2)
7	09.30	08.26	07.03	06.24	04.53	03.43	04.38 (2)
	15.17	16.38	17.56	20.17	21.37	22.50	13 04.51 (2)
8	09.29	08.24	07.00	06.21	04.50	03.42	04.37 (2)
	15.19	16.41	17.58	20.20	21.40	22.52	15 04.52 (2)
9	09.28	08.21	06.57	06.18	04.47	03.41	04.36 (2)
	15.21	16.44	18.01	20.22	21.43	22.53	17 04.53 (2)
10	09.27	08.18	06.54	06.15	04.44	03.40	04.36 (2)
	15.23	16.46	18.04	20.25	06.46 (3) 21.45	22.55	17 04.53 (2)
11	09.25	08.15	06.51	06.12	04.42	03.39	04.36 (2)
	15.26	16.49	18.06	20.28	06.57 (3) 21.48	22.56	18 04.54 (2)
12	09.24	08.13	06.47	06.09	04.39	03.38	04.35 (2)
	15.28	16.52	18.09	20.30	06.40 (3) 21.51	22.57	19 04.54 (2)
13	09.22	08.10	06.44	06.05	04.36	03.37	04.36 (2)
	15.30	16.55	18.12	20.33	06.39 (3) 21.53	22.58	19 04.55 (2)
14	09.21	08.07	06.41	06.02	04.33	03.36	04.35 (2)
	15.33	16.58	18.14	20.36	06.37 (3) 21.56	23.00	20 04.55 (2)
15	09.19	08.04	06.38	05.59	04.31	03.36	04.35 (2)
	15.35	17.01	18.17	20.38	06.36 (3) 21.59	23.00	21 04.56 (2)
16	09.17	08.01	06.35	05.56	04.28	03.35	04.36 (2)
	15.37	17.03	18.19	20.41	07.01 (3) 22.01	23.01	21 04.57 (2)
17	09.15	07.58	06.32	05.53	04.26	03.35	04.36 (2)
	15.40	17.06	18.22	20.44	06.35 (3) 22.04	23.02	21 04.57 (2)
18	09.14	07.55	06.28	05.50	04.23	03.34	04.36 (2)
	15.42	17.09	18.25	20.46	06.35 (3) 22.06	23.03	21 04.57 (2)
19	09.12	07.52	06.25	05.47	04.21	03.34	04.36 (2)
	15.45	17.12	18.27	20.49	06.36 (3) 22.09	23.03	22 04.58 (2)
20	09.10	07.49	06.22	05.43	04.18	03.34	04.36 (2)
	15.48	17.15	18.30	20.52	06.35 (3) 22.12	23.04	22 04.58 (2)
21	09.08	07.46	06.19	05.40	04.16	03.34	04.36 (2)
	15.50	17.17	18.33	20.54	06.36 (3) 22.14	23.04	22 04.58 (2)
22	09.06	07.43	06.16	05.37	04.13	03.34	04.36 (2)
	15.53	17.20	18.35	20.57	06.36 (3) 22.17	23.04	22 04.58 (2)
23	09.03	07.40	06.12	05.34	04.11	03.35	04.36 (2)
	15.56	17.23	18.38	21.00	06.36 (3) 22.19	23.04	22 04.58 (2)
24	09.01	07.37	06.09	05.31	04.09	03.35	04.37 (2)
	15.58	17.26	18.40	21.02	06.37 (3) 22.21	23.04	22 04.59 (2)
25	08.59	07.34	06.06	05.28	04.07	03.35	04.37 (2)
	16.01	17.28	18.43	21.05	06.38 (3) 22.24	23.04	21 04.58 (2)
26	08.57	07.31	06.03	05.25	04.04	03.36	04.38 (2)
	16.04	17.31	18.46	21.08	06.39 (3) 22.26	23.04	21 04.59 (2)
27	08.54	07.28	06.00	05.22	04.02	03.37	04.38 (2)
	16.07	17.34	18.48	21.10	06.42 (3) 22.28	23.04	21 04.59 (2)
28	08.52	07.25	05.56	05.19	04.00	03.37	04.38 (2)
	16.09	17.37	18.51	21.13	06.51 (3) 22.31	23.03	20 04.58 (2)
29	08.50		05.53	05.16	03.58	03.38	04.39 (2)
	16.12		19.53	21.16	03.58	23.03	20 04.59 (2)
30	08.47		06.50	05.13	03.56	03.39	04.39 (2)
	16.15		19.56	21.18	03.56	23.02	20 04.59 (2)
31	08.45		06.47		03.54		
	16.18		19.59		22.37		
Potential sun hours	199	249	364	441	543	579	
Total, worst case				369		505	
Sun reduction				0,39		0,47	
Oper. time red.				0,89		0,89	
Wind dir. red.				0,61		0,63	
Total reduction				0,21		0,26	
Total, real				79		133	

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)

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 15.5.2023 18.17/3.5.584

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: J - Asuinrakennus J (Työlamentie 24)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	July		August		September		October	November	December
1	03.40	04.40 (2)	04.45		06.06	06.42 (3)	07.22	07.44	09.04
	23.01	19 04.59 (2)	22.01		20.28	15 06.57 (3)	18.52	16.17	15.08
2	03.42	04.41 (2)	04.48		06.08	06.44 (3)	07.24	07.47	09.06
	23.00	18 04.59 (2)	21.58		20.25	10 06.54 (3)	18.49	16.15	15.07
3	03.43	04.41 (2)	04.50		06.11		07.27	07.49	09.08
	22.59	17 04.58 (2)	21.55		20.22		18.46	16.12	15.06
4	03.44	04.42 (2)	04.53		06.13		07.29	07.52	09.10
	22.58	16 04.58 (2)	21.53		20.18		18.42	16.09	15.04
5	03.46	04.43 (2)	04.55		06.16		07.32	07.55	09.12
	22.57	14 04.57 (2)	21.50		20.15		18.39	16.06	15.03
6	03.47	04.43 (2)	04.58		06.18		07.34	07.58	09.14
	22.56	13 04.56 (2)	21.47		20.12		18.36	16.04	15.02
7	03.49	04.45 (2)	05.01		06.21		07.37	08.00	09.16
	22.55	11 04.56 (2)	21.44		20.09		18.33	16.01	15.01
8	03.50	04.47 (2)	05.03		06.24		07.39	08.03	09.18
	22.53	8 04.55 (2)	21.41		20.06		18.30	15.58	15.00
9	03.52	04.50 (2)	05.06		06.26		07.42	08.06	09.20
	22.52	3 04.53 (2)	21.38		20.03		18.27	15.56	14.59
10	03.54		05.08		06.29		07.45	08.09	09.22
	22.50		21.35		19.59		18.23	15.53	14.58
11	03.56		05.11		06.31		07.47	08.12	09.23
	22.48		21.33		19.56		18.20	15.50	14.57
12	03.58		05.14		06.34		07.50	08.14	09.25
	22.47		21.30		19.53		18.17	15.48	14.57
13	04.00		05.16		06.36		07.53	08.17	09.26
	22.45		21.27		19.50		18.14	15.45	14.56
14	04.02		05.19		06.39		07.55	08.20	09.28
	22.43		21.24		19.46		18.11	15.43	14.56
15	04.04		05.22		06.41		07.58	08.23	09.29
	22.41		21.21		19.43		18.08	15.41	14.55
16	04.06		05.24	06.48 (3)	06.44		08.00	08.25	09.30
	22.39		21.18	10 06.58 (3)	19.40		18.05	15.38	14.55
17	04.08		05.27	06.46 (3)	06.46		08.03	08.28	09.31
	22.37		21.15	15 07.01 (3)	19.37		18.02	15.36	14.55
18	04.10		05.29	06.44 (3)	06.49		08.06	08.31	09.32
	22.35		21.12	18 07.02 (3)	19.34		17.59	15.34	14.55
19	04.13		05.32	06.42 (3)	06.51		08.08	08.33	09.33
	22.33		21.09	21 07.03 (3)	19.30		17.56	15.31	14.55
20	04.15		05.35	06.42 (3)	06.54		08.11	08.36	09.34
	22.31		21.06	22 07.04 (3)	19.27		17.53	15.29	14.55
21	04.17		05.37	06.40 (3)	06.56		08.14	08.39	09.35
	22.28		21.02	24 07.04 (3)	19.24		17.50	15.27	14.56
22	04.20		05.40	06.40 (3)	06.59		08.16	08.41	09.35
	22.26		20.59	25 07.05 (3)	19.21		17.47	15.25	14.56
23	04.22		05.43	06.39 (3)	07.01		08.19	08.44	09.36
	22.24		20.56	25 07.04 (3)	19.18		17.44	15.23	14.57
24	04.25		05.45	06.38 (3)	07.04		08.22	08.47	09.36
	22.21		20.53	26 07.04 (3)	19.14		17.41	15.21	14.57
25	04.27		05.48	06.38 (3)	07.06		07.25	08.49	09.36
	22.19		20.50	26 07.04 (3)	19.11		16.38	15.19	14.58
26	04.30		05.50	06.38 (3)	07.09		07.27	08.52	09.36
	22.16		20.47	26 07.04 (3)	19.08		16.35	15.17	14.59
27	04.32		05.53	06.38 (3)	07.11		07.30	08.54	09.36
	22.14		20.44	25 07.03 (3)	19.05		16.32	15.15	15.00
28	04.35		05.55	06.38 (3)	07.14		07.33	08.56	09.36
	22.11		20.41	24 07.02 (3)	19.02		16.29	15.13	15.01
29	04.37		05.58	06.38 (3)	07.16		07.36	08.59	09.36
	22.09		20.38	23 07.01 (3)	18.58		16.26	15.12	15.02
30	04.40		06.01	06.39 (3)	07.19		07.38	09.01	09.36
	22.06		20.34	21 07.00 (3)	18.55		16.23	15.10	15.03
31	04.42		06.03	06.40 (3)			07.41		09.36
	22.04		20.31	18 06.58 (3)			16.20		15.05
Potential sun hours	573		492		390		312	219	172
Total, worst case		119		349		25			
Sun reduction		0,44		0,42		0,32			
Oper. time red.		0,89		0,89		0,89			
Wind dir. red.		0,63		0,61		0,61			
Total reduction		0,25		0,23		0,17			
Total, real		30		80		4			

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

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



## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: K - Lomarakenus K (Viitostie 31)  
Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

## Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
591 488 417 431 453 653 880 1 025 878 778 643 602 7 839

	January	February	March	April	May	June
1	09.35	08.42	07.22	06.44	07.16 (3)	05.10
	15.07	16.21	17.39	20.01	22	07.38 (3)
2	09.35	08.40	07.19	06.40	07.14 (3)	05.07
	15.08	16.24	17.42	20.04	23	07.37 (3)
3	09.34	08.37	07.16	06.37	07.14 (3)	05.04
	15.10	16.26	17.45	20.07	23	07.37 (3)
4	09.33	08.34	07.13	06.34	07.13 (3)	05.01
	15.11	16.29	17.48	20.09	24	07.37 (3)
5	09.32	08.32	07.10	06.31	07.13 (3)	04.58
	15.13	16.32	17.50	20.12	24	07.37 (3)
6	09.31	08.29	07.06	06.28	07.13 (3)	04.56
	15.15	16.35	17.53	20.14	24	07.37 (3)
7	09.30	08.26	07.03	06.24	07.13 (3)	04.53
	15.17	16.38	17.56	20.17	23	07.36 (3)
8	09.29	08.24	07.00	06.21	07.14 (3)	04.50
	15.19	16.41	17.58	20.20	21	07.35 (3)
9	09.28	08.21	06.57	06.18	07.15 (3)	04.47
	15.21	16.44	18.01	20.22	19	07.34 (3)
10	09.27	08.18	06.54	06.15	07.16 (3)	04.44
	15.23	16.46	18.04	20.25	17	07.33 (3)
11	09.25	08.15	06.51	06.12	07.16 (3)	04.42
	15.26	16.49	18.06	20.28	14	07.30 (3)
12	09.24	08.13	06.47	06.09	07.19 (3)	04.39
	15.28	16.52	18.09	20.30	7	07.26 (3)
13	09.22	08.10	06.44	06.05	04.36	05.21 (2)
	15.30	16.55	18.12	20.33	14	05.33 (2)
14	09.21	08.07	06.41	06.02	04.33	05.17 (2)
	15.33	16.58	18.14	20.36	17	05.34 (2)
15	09.19	08.04	06.38	05.59	04.31	05.16 (2)
	15.35	17.01	18.17	20.38	20	05.36 (2)
16	09.17	08.01	06.35	05.56	04.28	05.15 (2)
	15.37	17.03	18.20	20.41	22	05.37 (2)
17	09.15	07.58	06.32	05.53	04.26	05.14 (2)
	15.40	17.06	18.22	20.44	24	05.38 (2)
18	09.14	07.55	06.28	05.50	04.23	05.14 (2)
	15.42	17.09	18.25	20.46	25	05.39 (2)
19	09.12	07.52	06.25	05.47	04.21	05.13 (2)
	15.45	17.12	18.27	20.49	26	05.39 (2)
20	09.10	07.49	06.22	05.43	04.18	05.13 (2)
	15.48	17.15	18.30	20.52	27	05.40 (2)
21	09.08	07.46	06.19	05.40	04.16	05.12 (2)
	15.50	17.17	18.33	20.54	28	05.40 (2)
22	09.06	07.43	06.16	05.37	04.13	05.12 (2)
	15.53	17.20	18.35	20.57	28	05.40 (2)
23	09.03	07.40	06.12	05.34	04.11	05.12 (2)
	15.56	17.23	18.38	21.00	29	05.41 (2)
24	09.01	07.37	06.09	05.31	04.09	05.11 (2)
	15.58	17.26	18.40	21.02	30	05.41 (2)
25	08.59	07.34	06.06	05.28	04.07	05.11 (2)
	16.01	17.28	18.43	21.05	30	05.41 (2)
26	08.57	07.31	06.03	05.25	04.04	05.12 (2)
	16.04	17.31	18.46	21.08	30	05.42 (2)
27	08.54	07.28	06.00	05.22	04.02	05.12 (2)
	16.07	17.34	18.48	21.10	30	05.42 (2)
28	08.52	07.25	05.56	06.25 (3)	04.00	05.11 (2)
	16.09	17.37	18.51	6	06.31 (3)	21.13
29	08.50	07.22	05.53	07.22 (3)	03.58	05.12 (2)
	16.12	17.40	19.53	12	07.34 (3)	21.16
30	08.47	07.19	05.50	07.19 (3)	03.56	05.12 (2)
	16.15	17.43	19.56	17	07.36 (3)	21.18
31	08.45	07.17	05.47	07.17 (3)	03.54	05.12 (2)
	16.18	17.46	19.59	20	07.37 (3)	21.20
Potential sun hours	199	249	364	441	543	579
Total, worst case			55	241	509	778
Sun reduction			0,34	0,39	0,49	0,47
Oper. time red.			0,89	0,89	0,89	0,89
Wind dir. red.			0,61	0,61	0,64	0,64
Total reduction			0,18	0,22	0,28	0,26
Total, real			10	52	143	206

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

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

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: K - Lomarakennus K (Viitostie 31)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7839

	July		August		September		October	November	December			
1	03.40	05.20 (2)	04.45	05.33 (2)	06.06	07.16 (3)	07.22	07.44	09.04			
	23.01	26	05.46 (2)	22.01	7	05.40 (2)	20.28	14	07.30 (3)	18.52	16.17	15.08
2	03.42	05.20 (2)	04.48		06.08	07.13 (3)	07.24	07.47	09.06			
	23.00	27	05.47 (2)	21.58	20.25	18	07.31 (3)	18.49	16.15	15.07		
3	03.43	05.20 (2)	04.50		06.11	07.12 (3)	07.27	07.49	09.08			
	22.59	27	05.47 (2)	21.55	20.22	19	07.31 (3)	18.46	16.12	15.06		
4	03.44	05.20 (2)	04.53		06.13	07.11 (3)	07.29	07.52	09.10			
	22.58	27	05.47 (2)	21.53	20.19	21	07.32 (3)	18.42	16.09	15.04		
5	03.46	05.20 (2)	04.55		06.16	07.10 (3)	07.32	07.55	09.12			
	22.57	27	05.47 (2)	21.50	20.15	22	07.32 (3)	18.39	16.06	15.03		
6	03.47	05.20 (2)	04.58		06.18	07.09 (3)	07.34	07.58	09.14			
	22.56	28	05.48 (2)	21.47	20.12	24	07.33 (3)	18.36	16.04	15.02		
7	03.49	05.20 (2)	05.01		06.21	07.08 (3)	07.37	08.00	09.16			
	22.55	29	05.49 (2)	21.44	20.09	24	07.32 (3)	18.33	16.01	15.01		
8	03.50	05.20 (2)	05.03		06.24	07.09 (3)	07.40	08.03	09.18			
	22.53	29	05.49 (2)	21.41	20.06	24	07.33 (3)	18.30	15.58	15.00		
9	03.52	05.21 (2)	05.06		06.26	07.08 (3)	07.42	08.06	09.20			
	22.52	28	05.49 (2)	21.38	20.03	24	07.32 (3)	18.27	15.56	14.59		
10	03.54	05.20 (2)	05.08		06.29	07.07 (3)	07.45	08.09	09.22			
	22.50	29	05.49 (2)	21.36	19.59	23	07.30 (3)	18.23	15.53	14.58		
11	03.56	05.21 (2)	05.11		06.31	07.08 (3)	07.47	08.12	09.23			
	22.48	29	05.50 (2)	21.33	19.56	22	07.30 (3)	18.20	15.50	14.57		
12	03.58	05.20 (2)	05.14		06.34	07.08 (3)	07.50	08.14	09.25			
	22.47	30	05.50 (2)	21.30	19.53	20	07.28 (3)	18.17	15.48	14.57		
13	04.00	05.20 (2)	05.16		06.36	07.10 (3)	07.53	08.17	09.26			
	22.45	30	05.50 (2)	21.27	19.50	17	07.27 (3)	18.14	15.45	14.56		
14	04.02	05.21 (2)	05.19		06.39	07.12 (3)	07.55	08.20	09.28			
	22.43	30	05.51 (2)	21.24	19.46	13	07.25 (3)	18.11	15.43	14.56		
15	04.04	05.20 (2)	05.22		06.41	07.15 (3)	07.58	08.23	09.29			
	22.41	30	05.50 (2)	21.21	19.43	7	07.22 (3)	18.08	15.41	14.55		
16	04.06	05.20 (2)	05.24		06.44		08.00	08.25	09.30			
	22.39	30	05.50 (2)	21.18	19.40		18.05	15.38	14.55			
17	04.08	05.21 (2)	05.27		06.46		08.03	08.28	09.31			
	22.37	30	05.51 (2)	21.15	19.37		18.02	15.36	14.55			
18	04.10	05.21 (2)	05.29		06.49		08.06	08.31	09.32			
	22.35	30	05.51 (2)	21.12	19.34		17.59	15.33	14.55			
19	04.13	05.21 (2)	05.32		06.51		08.08	08.33	09.33			
	22.33	30	05.51 (2)	21.09	19.30		17.56	15.31	14.55			
20	04.15	05.22 (2)	05.35		06.54		08.11	08.36	09.34			
	22.31	29	05.51 (2)	21.06	19.27		17.53	15.29	14.55			
21	04.17	05.22 (2)	05.37		06.56		08.14	08.39	09.35			
	22.28	29	05.51 (2)	21.02	19.24		17.50	15.27	14.56			
22	04.20	05.22 (2)	05.40		06.59		08.16	08.41	09.35			
	22.26	28	05.50 (2)	20.59	19.21		17.47	15.25	14.56			
23	04.22	05.23 (2)	05.43		07.01		08.19	08.44	09.36			
	22.24	27	05.50 (2)	20.56	19.18		17.44	15.23	14.57			
24	04.25	05.23 (2)	05.45		07.04		08.22	08.47	09.36			
	22.21	27	05.50 (2)	20.53	19.14		17.41	15.21	14.57			
25	04.27	05.23 (2)	05.48		07.06		07.25	08.49	09.36			
	22.19	26	05.49 (2)	20.50	19.11		16.38	15.19	14.58			
26	04.30	05.24 (2)	05.50		07.09		07.27	08.52	09.36			
	22.16	24	05.48 (2)	20.47	19.08		16.35	15.17	14.59			
27	04.32	05.25 (2)	05.53		07.11		07.30	08.54	09.37			
	22.14	23	05.48 (2)	20.44	19.05		16.32	15.15	15.00			
28	04.35	05.25 (2)	05.55		07.14		07.33	08.57	09.36			
	22.11	22	05.47 (2)	20.41	19.02		16.29	15.13	15.01			
29	04.37	05.27 (2)	05.58		07.16		07.36	08.59	09.36			
	22.09	19	05.46 (2)	20.38	18.58		16.26	15.12	15.02			
30	04.40	05.28 (2)	06.01		07.19		07.38	09.01	09.36			
	22.06	17	05.45 (2)	20.34	18.55		16.23	15.10	15.03			
31	04.42	05.30 (2)	06.03	07.18 (3)			07.41		09.36			
	22.04	13	05.43 (2)	20.31	9	07.27 (3)		16.20	15.05			
Potential sun hours	573		492		390		312	219	172			
Total, worst case	830		16		292							
Sun reduction	0,44		0,42		0,32							
Oper. time red.	0,89		0,89		0,89							
Wind dir. red.	0,64		0,62		0,61							
Total reduction	0,25		0,23		0,17							
Total, real	208		4		51							

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

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

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
Osmontie 34, PO Box 950  
FI-00601 Helsinki  
+358104095666  
Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
Calculated:  
15.5.2023 18.17/3.5.584

## SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: L - Asuinrakennus L (Mäntymäki)  
Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
591 488 417 431 453 653 880 1025 878 778 643 602 7839

	January	February	March	April	May	June	July	August	September	October	November	December				
1	09.35	08.42	07.22	06.44	05.10	03.53	05.10 (3)	03.40	05.18 (3)	04.45	06.06	07.22	07.44	09.03		
	15.07	16.21	17.39	20.01	21.21	22.39	27	05.37 (3)	23.01	22	05.40 (3)	22.01	20.28	18.52	16.17	15.08
2	09.34	08.40	07.19	06.40	05.07	03.51	05.10 (3)	03.42	05.18 (3)	04.48	06.08	07.24	07.47	09.06		
	15.08	16.24	17.42	20.04	21.24	22.41	26	05.36 (3)	23.00	23	05.41 (3)	21.58	20.25	18.49	16.15	15.07
3	09.34	08.37	07.16	06.37	05.04	03.49	05.10 (3)	03.43	05.18 (3)	04.50	06.11	07.27	07.49	09.08		
	15.10	16.26	17.45	20.07	21.27	22.43	26	05.36 (3)	22.59	23	05.41 (3)	21.55	20.22	18.46	16.12	15.06
4	09.33	08.34	07.13	06.34	05.01	03.48	05.11 (3)	03.44	05.18 (3)	04.53	06.13	07.29	07.52	09.10		
	15.12	16.29	17.48	20.09	21.29	22.45	25	05.36 (3)	22.58	23	05.41 (3)	21.53	20.18	18.42	16.09	15.04
5	09.32	08.32	07.09	06.31	04.58	03.46	05.11 (3)	03.46	05.18 (3)	04.55	06.16	07.32	07.55	09.12		
	15.13	16.32	17.50	20.12	21.32	22.47	25	05.36 (3)	22.57	23	05.41 (3)	21.50	20.15	18.39	16.06	15.03
6	09.31	08.29	07.06	06.28	04.56	03.45	05.12 (3)	03.47	05.17 (3)	04.58	06.18	07.34	07.58	09.14		
	15.15	16.35	17.53	20.14	21.35	22.49	24	05.36 (3)	22.56	25	05.42 (3)	21.47	20.12	18.36	16.04	15.02
7	09.30	08.26	07.03	06.24	04.53	03.43	05.12 (3)	03.49	05.18 (3)	05.01	06.21	07.37	08.00	09.16		
	15.17	16.38	17.56	20.17	21.37	22.50	24	05.36 (3)	22.54	25	05.43 (3)	21.44	20.09	18.33	16.01	15.01
8	09.29	08.24	07.00	06.21	04.50	03.42	05.12 (3)	03.50	05.18 (3)	05.03	06.24	07.39	08.03	09.18		
	15.19	16.41	17.58	20.20	21.40	22.52	24	05.36 (3)	22.53	25	05.43 (3)	21.41	20.06	18.30	15.58	15.00
9	09.28	08.21	06.57	06.18	04.47	03.41	05.13 (3)	03.52	05.18 (3)	05.06	06.26	07.42	08.06	09.20		
	15.21	16.44	18.01	20.22	21.43	22.53	23	05.36 (3)	22.52	26	05.44 (3)	21.38	20.02	18.27	15.56	14.59
10	09.27	08.18	06.54	06.15	04.44	03.40	05.14 (3)	03.54	05.18 (3)	05.08	06.29	07.45	08.09	09.21		
	15.23	16.46	18.04	20.25	21.45	22.55	22	05.36 (3)	22.50	25	05.43 (3)	21.35	19.59	18.23	15.53	14.58
11	09.25	08.15	06.51	06.12	04.42	03.39	05.14 (3)	03.56	05.18 (3)	05.11	06.31	07.47	08.12	09.23		
	15.26	16.49	18.06	20.28	21.48	22.56	22	05.36 (3)	22.48	26	05.44 (3)	21.33	19.56	18.20	15.50	14.57
12	09.24	08.12	06.47	06.09	04.39	03.38	05.14 (3)	03.58	05.17 (3)	05.14	06.34	07.50	08.14	09.25		
	15.28	16.52	18.09	20.30	21.51	22.57	21	05.23 (3)	22.57	27	05.44 (3)	21.30	19.53	18.17	15.48	14.57
13	09.22	08.10	06.44	06.05	04.36	03.37	05.17 (3)	03.37	05.18 (3)	05.16	06.36	07.52	08.17	09.26		
	15.30	16.55	18.12	20.33	21.53	22.58	21	05.27 (3)	22.58	26	05.44 (3)	21.27	19.50	18.14	15.45	14.56
14	09.21	08.07	06.41	06.02	04.33	03.36	05.14 (3)	04.02	05.18 (3)	05.19	06.39	07.55	08.20	09.27		
	15.33	16.58	18.14	20.36	21.56	22.59	21	05.29 (3)	22.43	27	05.45 (3)	21.24	19.46	18.11	15.43	14.56
15	09.19	08.04	06.38	05.59	04.31	03.36	05.15 (3)	04.04	05.17 (3)	05.22	06.41	07.58	08.23	09.29		
	15.35	17.01	18.17	20.38	21.59	22.60	21	05.30 (3)	23.00	27	05.44 (3)	21.21	19.43	18.08	15.41	14.55
16	09.17	08.01	06.35	05.56	04.28	03.35	05.16 (3)	04.06	05.18 (3)	05.24	06.44	08.00	08.25	09.30		
	15.37	17.03	18.19	20.41	22.01	23.01	20	05.36 (3)	22.39	27	05.45 (3)	21.18	19.40	18.05	15.38	14.55
17	09.15	07.58	06.32	05.53	04.26	03.35	05.16 (3)	04.08	05.18 (3)	05.27	06.46	08.03	08.28	09.31		
	15.40	17.06	18.22	20.43	22.04	23.02	20	05.36 (3)	22.37	27	05.45 (3)	21.15	19.37	18.02	15.36	14.55
18	09.14	07.55	06.28	05.50	04.23	03.34	05.17 (3)	04.11	05.18 (3)	05.29	06.49	08.06	08.31	09.32		
	15.43	17.09	18.25	20.46	22.06	23.03	19	05.36 (3)	22.35	27	05.45 (3)	21.12	19.34	17.59	15.34	14.55
19	09.12	07.52	06.25	05.47	04.21	03.34	05.17 (3)	04.13	05.19 (3)	05.32	06.51	08.08	08.33	09.33		
	15.45	17.12	18.27	20.49	22.09	23.03	19	05.36 (3)	22.33	26	05.45 (3)	21.09	19.30	17.56	15.31	14.55
20	09.10	07.49	06.22	05.43	04.18	03.34	05.17 (3)	04.15	05.19 (3)	05.35	06.54	08.11	08.36	09.34		
	15.48	17.15	18.30	20.51	22.11	23.04	20	05.37 (3)	22.31	26	05.45 (3)	21.05	19.27	17.53	15.29	14.55
21	09.08	07.46	06.19	05.40	04.16	03.34	05.19 (3)	04.17	05.19 (3)	05.37	06.56	08.14	08.39	09.34		
	15.50	17.17	18.33	20.54	22.14	23.04	20	05.37 (3)	22.28	26	05.45 (3)	21.02	19.24	17.50	15.27	14.56
22	09.06	07.43	06.16	05.37	04.13	03.34	05.17 (3)	04.20	05.19 (3)	05.40	06.59	08.16	08.41	09.35		
	15.53	17.20	18.35	20.57	22.16	23.04	20	05.37 (3)	22.26	26	05.45 (3)	20.59	19.21	17.47	15.25	14.56
23	09.03	07.40	06.12	05.34	04.11	03.35	05.17 (3)	04.22	05.20 (3)	05.43	07.01	08.19	08.44	09.36		
	15.56	17.23	18.38	21.00	22.19	23.04	20	05.37 (3)	22.24	25	05.45 (3)	20.56	19.18	17.44	15.23	14.57
24	09.01	07.37	06.09	05.31	04.09	03.35	05.18 (3)	04.25	05.20 (3)	05.45	07.04	08.22	08.46	09.36		
	15.58	17.26	18.40	21.02	22.21	23.04	19	05.37 (3)	22.21	24	05.44 (3)	20.53	19.14	17.41	15.21	14.57
25	08.59	07.34	06.06	05.28	04.07	03.35	05.17 (3)	04.27	05.21 (3)	05.48	07.06	07.25	08.49	09.36		
	16.01	17.28	18.43	21.05	22.24	23.04	20	05.37 (3)	22.19	23	05.44 (3)	20.50	19.11	17.38	15.19	14.58
26	08.57	07.31	06.03	05.25	04.04	03.36	05.18 (3)	04.30	05.21 (3)	05.50	07.09	07.27	08.52	09.36		
	16.04	17.31	18.46	21.08	22.26	23.04	20	05.38 (3)	22.16	22	05.43 (3)	20.47	19.08	17.35	15.17	14.59
27	08.54	07.28	06.00	05.22	04.02	03.37	05.18 (3)	04.32	05.22 (3)	05.53	07.11	07.30	08.54	09.36		
	16.07	17.34	18.48	21.10	22.28	23.03	21	05.39 (3)	22.14	20	05.42 (3)	20.44	19.05	17.32	15.15	15.00
28	08.52	07.25	05.56	05.19	04.00	03.37	05.18 (3)	04.35	05.22 (3)	05.55	07.14	07.33	08.56	09.36		
	16.09	17.37	18.51	21.13	22.31	23.03	20	05.38 (3)	22.11	19	05.41 (3)	20.41	19.01	17.29	15.13	15.01
29	08.50	07.23	05.53	05.16	03.58	03.38	05.18 (3)	04.37	05.24 (3)	05.58	07.16	07.35	08.59	09.36		
	16.12	17.40	18.54	21.16	22.33	23.02	21	05.39 (3)	22.09	17	05.41 (3)	20.37	18.58	17.26	15.12	15.02
30	08.47	07.20	05.50	05.13	03.56	03.39	05.18 (3)	04.40	05.26 (3)	06.01	07.19	07.38	09.01	09.36		
	16.15	17.43	18.57	21.18	22.35	23.02	22	05.40 (3)	22.06	13	05.39 (3)	20.34	18.55	17.23	15.10	15.03
31	08.45	07.18	05.47	05.10	03.54	03.40		04.42	05.28 (3)	06.03	07.41	07.60	09.36	09.36		
	16.18	17.46	18.60	21.21	22.37	23.02	26	05.36 (3)	22.03	8	05.36 (3)	20.31	18.52	17.20	15.05	15.05
Potential sun hours	199	249	364	441	543	579		573	492	390	312	219	172			
Total, worst case						446		653								
Sun reduction						0.49		0.47								
Oper. time red.						0.89		0.89								
Wind dir. red.						0.64		0.64								
Total reduction						0.28		0.27								
Total, real						125		173								

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

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

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy  
 Osmontie 34, PO Box 950  
 FI-00601 Helsinki  
 +358104095666  
 Henna-Riikka / henna-riikka.rintamaki@fcg.fi  
 Calculated:  
 15.5.2023 18.17/3.5.584

### SHADOW - Calendar

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_Shadow receptor: M - Lomarakennus M (Mäntymäki)  
 Sunshine probability S (Average daily sunshine hours) [JOKIOINEN]

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

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 591 488 417 431 453 653 880 1025 878 778 643 602 7839

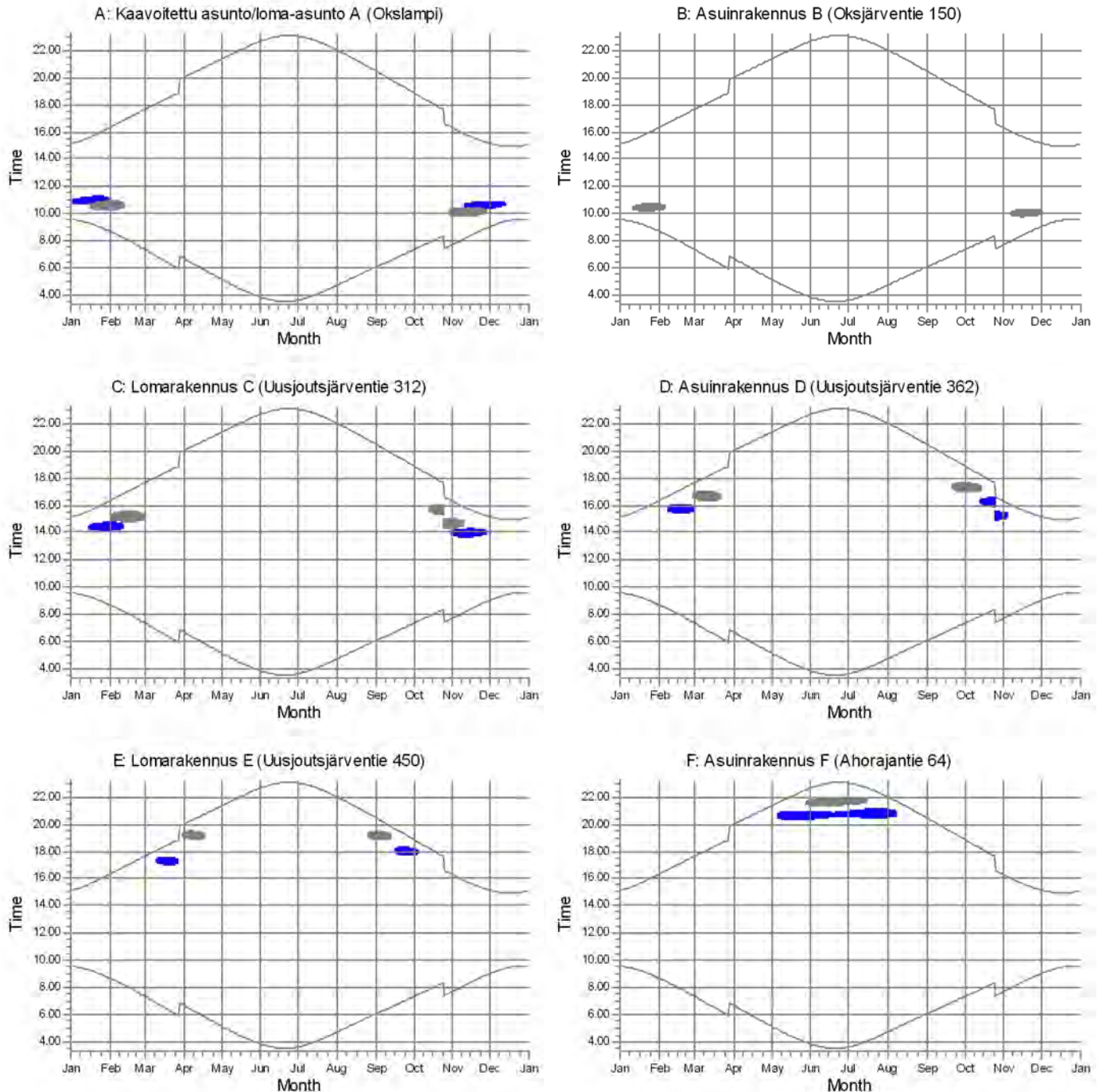
	January	February	March	April	May	June	July	August	September	October	November	December
1	09.35 15.07	08.42 16.21	07.22 17.39	06.44 20.01	05.10 21.21	03.53 22.39	05.07 (3) 03.40	05.15 (3) 04.45	06.06 07.22	07.44 07.44	09.03 15.08	09.03 15.08
2	09.34 15.08	08.40 16.24	07.19 17.42	06.40 20.04	05.07 21.24	03.51 22.41	05.07 (3) 03.42	05.15 (3) 04.48	06.08 07.24	07.47 07.47	09.06 15.07	09.06 15.07
3	09.34 15.10	08.37 16.26	07.16 17.45	06.37 20.07	05.04 21.27	03.49 22.43	05.07 (3) 03.43	05.15 (3) 04.50	06.11 07.27	07.49 07.49	09.08 15.06	09.08 15.06
4	09.33 15.12	08.34 16.29	07.13 17.48	06.34 20.09	05.01 21.29	03.48 22.45	05.08 (3) 03.44	05.15 (3) 04.53	06.13 07.29	07.52 07.52	09.10 15.04	09.10 15.04
5	09.32 15.13	08.32 16.32	07.09 17.50	06.31 20.12	04.58 21.32	03.46 22.47	05.09 (3) 03.47	05.15 (3) 04.58	06.16 07.32	07.55 07.55	09.12 15.03	09.12 15.03
6	09.31 15.15	08.29 16.35	07.06 17.53	06.28 20.14	04.56 21.35	03.45 22.49	05.14 (3) 03.47	05.14 (3) 04.58	06.18 07.34	07.58 07.58	09.14 15.02	09.14 15.02
7	09.30 15.17	08.26 16.38	07.03 17.56	06.24 20.17	04.53 21.37	03.43 22.50	05.09 (3) 03.49	05.15 (3) 05.01	06.21 07.37	08.00 08.00	09.16 15.01	09.16 15.01
8	09.29 15.19	08.24 16.41	07.00 17.58	06.21 20.20	04.50 21.40	03.42 22.52	05.09 (3) 03.50	05.14 (3) 05.03	06.24 07.39	08.03 08.03	09.18 15.00	09.18 15.00
9	09.28 15.21	08.21 16.44	06.57 18.01	06.18 20.22	04.47 21.43	03.41 22.53	05.09 (3) 03.52	05.15 (3) 05.06	06.26 07.42	08.06 08.06	09.20 14.59	09.20 14.59
10	09.27 15.23	08.18 16.46	06.54 18.04	06.15 20.25	04.44 21.45	03.40 22.55	05.11 (3) 03.54	05.14 (3) 05.09	06.29 07.45	08.09 08.09	09.21 14.58	09.21 14.58
11	09.25 15.26	08.15 16.49	06.51 18.06	06.12 20.28	04.42 21.48	03.39 22.56	05.11 (3) 03.56	05.15 (3) 05.11	06.31 07.47	08.12 08.12	09.23 14.57	09.23 14.57
12	09.24 15.28	08.12 16.52	06.47 18.09	06.09 20.30	04.39 21.51	03.38 22.57	05.11 (3) 03.58	05.14 (3) 05.14	06.34 07.50	08.14 08.14	09.25 14.57	09.25 14.57
13	09.22 15.30	08.10 16.55	06.44 18.12	06.05 20.33	04.36 21.53	03.37 22.58	05.11 (3) 04.00	05.15 (3) 05.16	06.36 07.52	08.17 08.17	09.26 14.56	09.26 14.56
14	09.21 15.33	08.07 16.58	06.41 18.14	06.02 20.36	04.34 21.56	03.36 22.59	05.11 (3) 04.02	05.15 (3) 05.19	06.39 07.55	08.20 08.20	09.27 14.56	09.27 14.56
15	09.19 15.35	08.04 17.01	06.38 18.17	05.59 20.38	04.31 21.59	03.36 23.00	05.12 (3) 04.04	05.14 (3) 05.22	06.41 07.58	08.23 08.23	09.29 14.56	09.29 14.56
16	09.17 15.37	08.01 17.03	06.35 18.19	05.56 20.41	04.28 22.01	03.35 23.01	05.13 (3) 04.06	05.14 (3) 05.24	06.44 08.00	08.25 08.25	09.30 14.55	09.30 14.55
17	09.15 15.40	07.58 17.06	06.32 18.22	05.53 20.43	04.26 22.04	03.35 23.02	05.13 (3) 04.08	05.15 (3) 05.27	06.46 08.03	08.28 08.28	09.31 14.55	09.31 14.55
18	09.14 15.43	07.55 17.09	06.28 18.25	05.50 20.46	04.23 22.06	03.34 23.03	05.13 (3) 04.11	05.15 (3) 05.30	06.49 08.06	08.31 08.31	09.32 14.55	09.32 14.55
19	09.12 15.45	07.52 17.12	06.25 18.27	05.47 20.49	04.21 22.09	03.34 23.03	05.14 (3) 04.13	05.15 (3) 05.32	06.51 08.08	08.33 08.33	09.33 14.55	09.33 14.55
20	09.10 15.48	07.49 17.15	06.22 18.30	05.43 20.51	04.18 22.11	03.34 23.04	05.14 (3) 04.15	05.16 (3) 05.35	06.54 08.11	08.36 08.36	09.34 14.55	09.34 14.55
21	09.08 15.50	07.46 17.17	06.19 18.33	05.40 20.54	04.16 22.14	03.34 23.04	05.14 (3) 04.17	05.16 (3) 05.37	06.56 08.14	08.39 08.39	09.34 14.56	09.34 14.56
22	09.06 15.53	07.43 17.20	06.16 18.35	05.37 20.57	04.13 22.16	03.34 23.04	05.14 (3) 04.20	05.16 (3) 05.40	06.59 08.16	08.41 08.41	09.35 14.56	09.35 14.56
23	09.03 15.56	07.40 17.23	06.12 18.38	05.34 21.00	04.11 22.19	03.35 23.04	05.14 (3) 04.22	05.17 (3) 05.43	07.01 08.19	08.44 08.44	09.36 14.56	09.36 14.56
24	09.01 15.58	07.37 17.26	06.09 18.40	05.31 21.02	04.09 22.21	03.35 23.04	05.15 (3) 04.25	05.17 (3) 05.45	07.04 08.22	08.46 08.46	09.36 14.57	09.36 14.57
25	08.59 16.01	07.34 17.28	06.06 18.43	05.28 21.05	04.07 22.24	03.35 23.04	05.14 (3) 04.27	05.17 (3) 05.48	07.06 08.25	08.49 08.49	09.36 14.58	09.36 14.58
26	08.57 16.04	07.31 17.31	06.03 18.46	05.25 21.08	04.04 22.26	03.36 23.04	05.15 (3) 04.30	05.18 (3) 05.50	07.09 08.27	08.52 08.52	09.36 14.59	09.36 14.59
27	08.54 16.07	07.28 17.34	06.00 18.48	05.22 21.10	04.02 22.28	03.37 23.03	05.15 (3) 04.32	05.19 (3) 05.53	07.11 08.30	08.54 08.54	09.36 15.00	09.36 15.00
28	08.52 16.09	07.25 17.37	05.56 18.51	05.19 21.13	04.00 22.31	03.38 23.03	05.15 (3) 04.35	05.20 (3) 05.55	07.14 08.33	08.56 08.56	09.36 15.01	09.36 15.01
29	08.50 16.12	07.25 18.53	05.56 19.53	05.19 21.16	04.00 22.33	03.38 23.02	05.15 (3) 04.37	05.22 (3) 05.58	07.16 08.35	08.59 08.59	09.36 15.02	09.36 15.02
30	08.47 16.15	07.25 19.56	05.56 21.18	05.19 22.35	04.00 22.35	03.39 23.02	05.15 (3) 04.40	05.24 (3) 06.01	07.19 08.38	08.59 08.59	09.36 15.03	09.36 15.03
31	08.45 16.18	07.25 19.59	05.56 21.18	05.19 22.37	04.00 22.37	03.40 23.02	05.15 (3) 04.42	05.24 (3) 06.03	07.19 08.38	08.59 08.59	09.36 15.05	09.36 15.05
Potential sun hours	199	249	364	441	543	579	573	492	390	312	219	172
Total, worst case					415	610	677					
Sun reduction					0.49	0.47	0.44					
Oper. time red.					0.89	0.89	0.89					
Wind dir. red.					0.64	0.64	0.64					
Total reduction					0.28	0.27	0.25					
Total, real					117	162	170					

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

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

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_



### WTGs

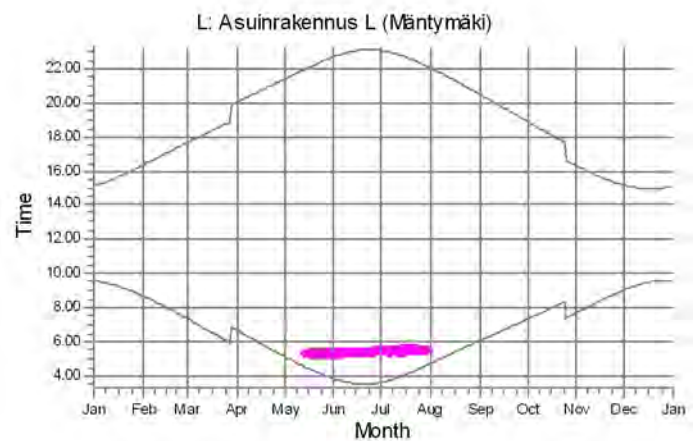
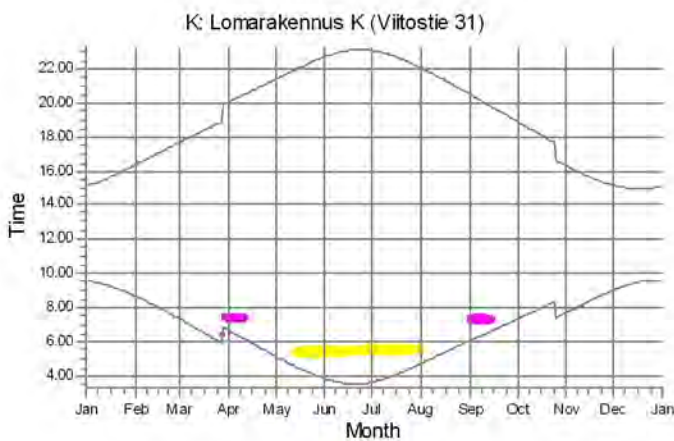
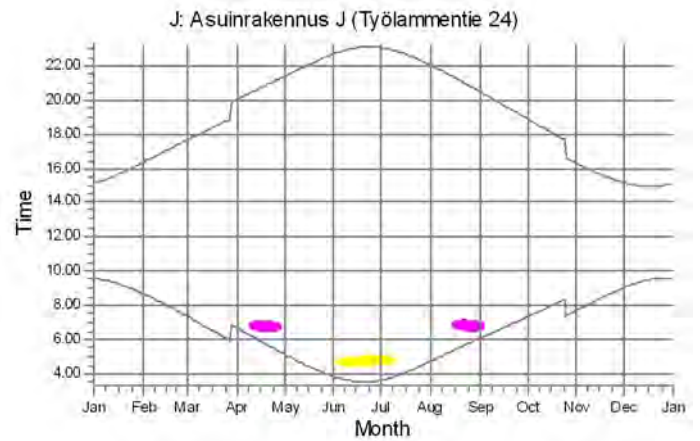
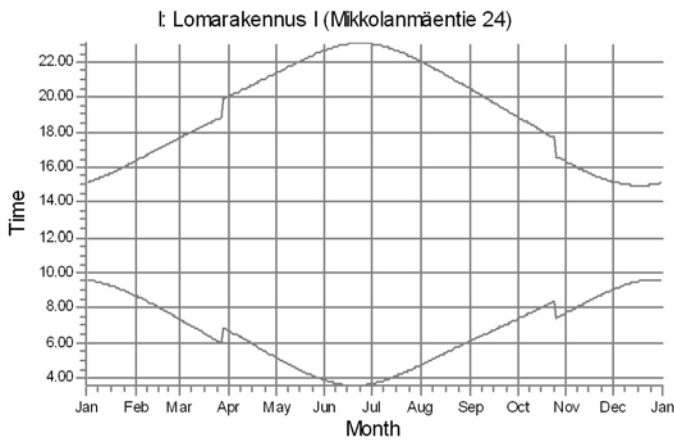
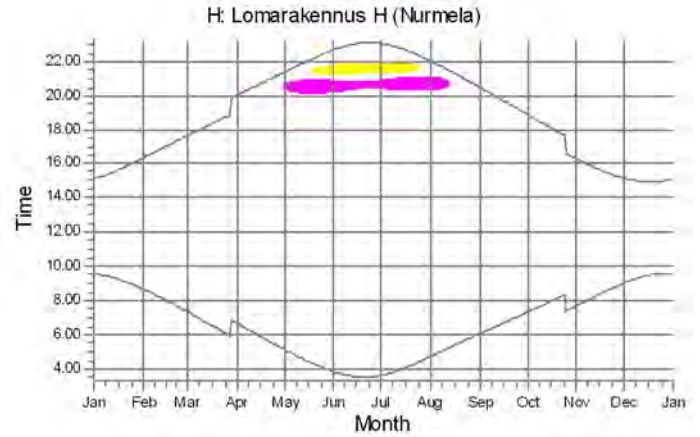
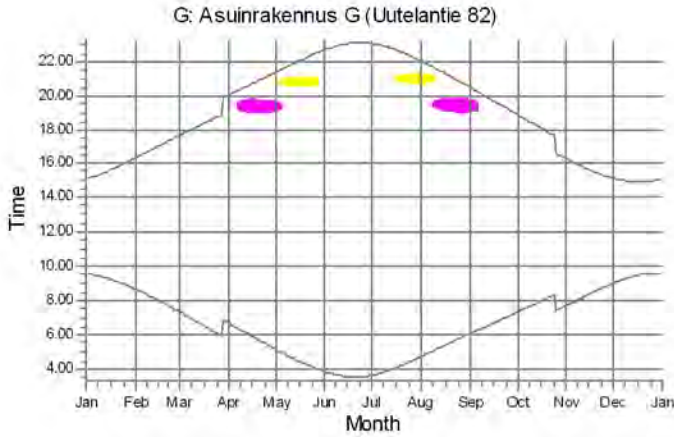


5: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (135)

4: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 !O! hub: 150,0 m (TOT: 235,0 m) (136)

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_



## WTGs

- 2: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (134)
- 3: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (137)

Project:

Sysmä Rekolanvuoret\_20200912

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

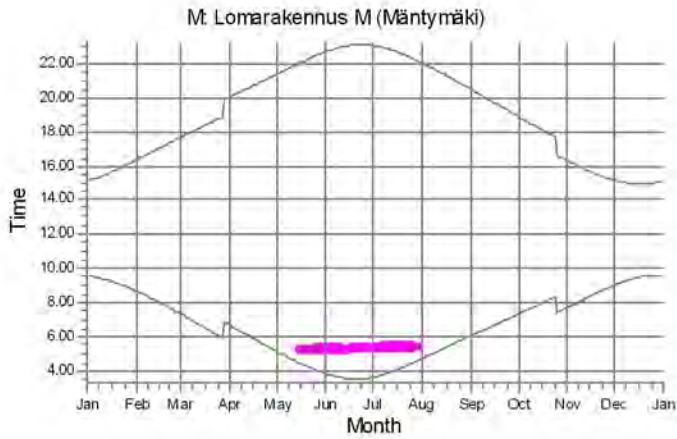
Henna-Riikka / henna-riikka.rintamaki@fcg.fi

Calculated:

15.5.2023 18.17/3.5.584

## SHADOW - Calendar, graphical

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_

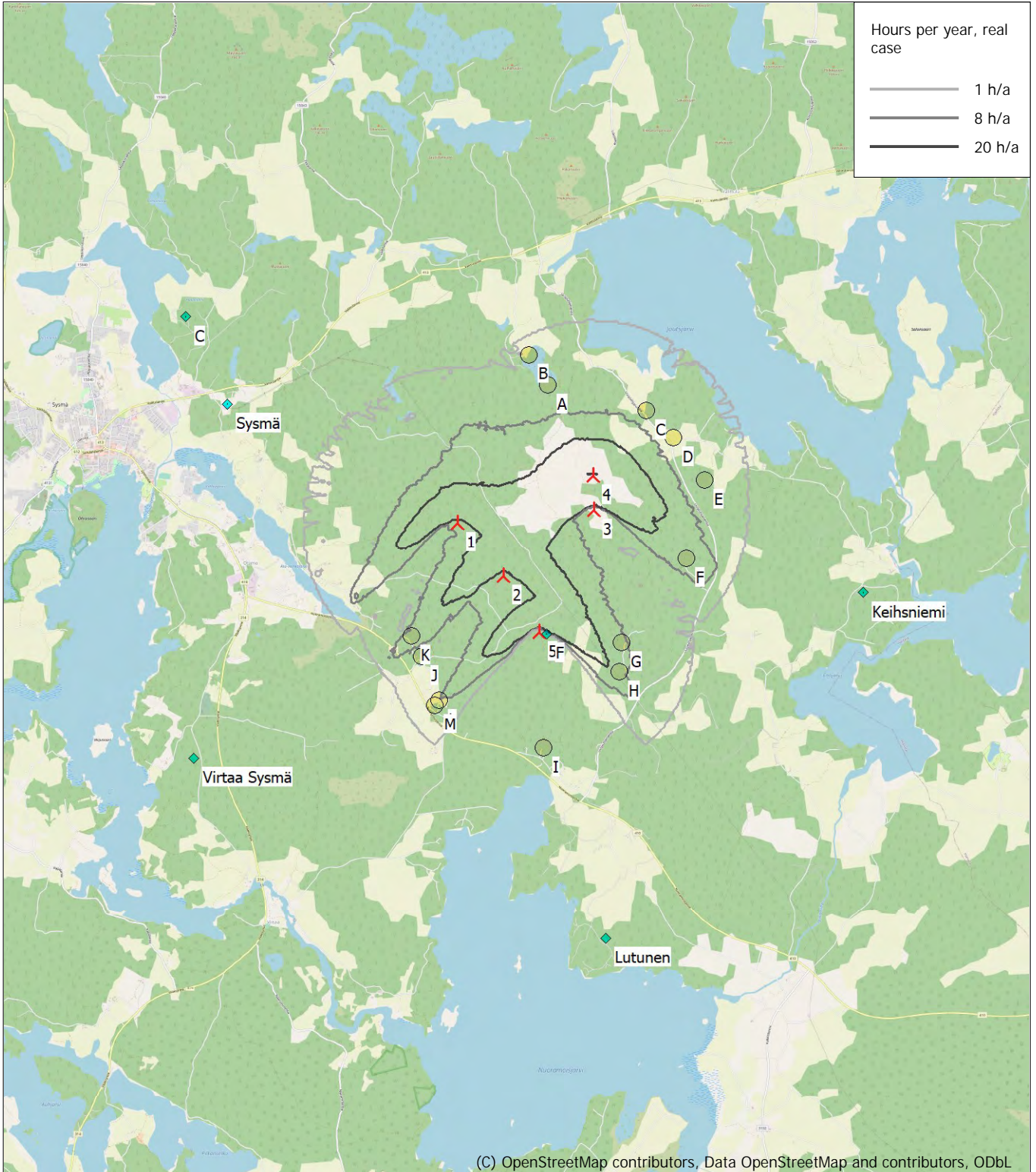


WTGs

3: Siemens Gamesa SG 6.0-170 HH150 6200 170.0 IO! hub: 150,0 m (TOT: 235,0 m) (137)

## SHADOW - Map

Calculation: Rekolanvuori SG170-6.0MW x 5 x HH150\_real case no forest\_20230513\_



Map: EMD OpenStreetMap , Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 435 495 North: 6 817 636  
 New WTG    Obstacle    Shadow receptor  
 Flicker map level: Height Contours: CONTOURLINE\_Sysmä Rekolanvuoret\_20200912\_0.wpo (1)  
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m