

Project:

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Calculated:

16.4.2014 10:59/2.9.269

SHADOW - Main Result**Calculation:** 8x V126 - Worst Case**Assumptions for shadow calculations**

Maximum distance for influence

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

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

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

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

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

The WTG is always operating

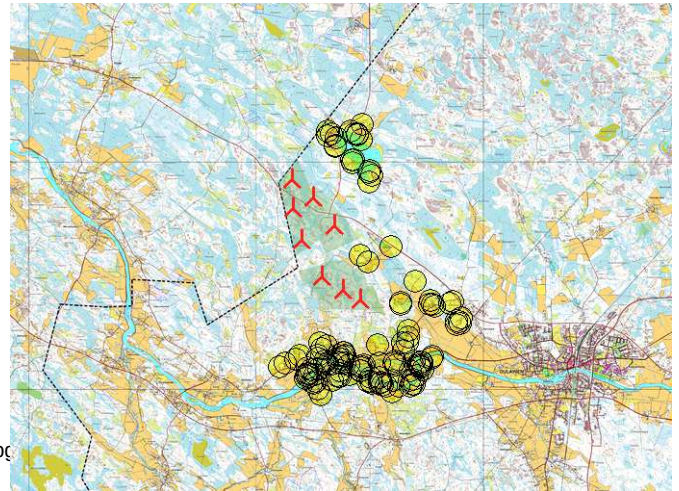
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpd

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 20,0 m



Scale 1:200 000

New WTG

Shadow receptor

WTGs

ETRS 89 Zone: 35				WTG type						Shadow data		
East	North	Z	Row	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM	[RPM]
		[m]	data/Description									
01	386 956	7 133 556	65,7 WTG 01	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
02	387 504	7 133 073	67,9 WTG 02	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
03	386 985	7 132 785	65,5 WTG 03	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
04	388 067	7 132 322	69,8 WTG 04	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
05	387 208	7 131 952	63,2 WTG 05	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
06	387 735	7 130 978	65,2 WTG 06	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
07	388 283	7 130 621	71,9 WTG 07	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
08	388 758	7 130 378	70,3 WTG 08	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	

Shadow receptor-Input

ETRS 89 Zone: 35											
No.	East	North	Z	Width	Height	Height	Degrees from	Slope of	Direction mode		
			[m]	[m]	[m]	a.g.l.	south cw	window			
			[m]	[m]	[m]	[m]	°	°			
A	388 561	7 133 978	70,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
B	389 065	7 133 651	69,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
C	389 554	7 131 763	66,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
D	390 195	7 130 843	64,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
E	389 822	7 130 295	64,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
F	390 603	7 130 349	64,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
G	390 651	7 130 233	65,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
H	390 581	7 130 237	64,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
I	389 817	7 130 233	65,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
J	391 201	7 130 311	72,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
K	391 121	7 130 261	70,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
L	391 302	7 129 810	65,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
M	391 369	7 129 774	65,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
N	391 411	7 129 881	68,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
O	391 289	7 129 707	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
P	390 714	7 130 195	65,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
Q	389 869	7 129 233	65,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
R	389 883	7 129 035	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
S	390 025	7 129 558	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
T	390 015	7 129 387	64,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
U	389 986	7 129 237	62,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		
V	390 062	7 128 487	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"		

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SHADOW - Main Result**Calculation: 8x V126 - Worst Case**

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ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
W	388 749	7 131 550	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
X	388 962	7 131 373	67,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Y	388 332	7 128 968	64,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Z	389 204	7 129 165	62,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AA	388 354	7 128 898	64,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AB	388 342	7 128 693	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AC	388 462	7 128 387	59,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AD	387 696	7 129 226	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AE	388 284	7 128 980	63,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AF	387 852	7 129 146	58,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AG	388 006	7 128 661	58,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AH	388 161	7 128 889	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AI	388 294	7 128 871	62,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AJ	388 275	7 128 784	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AK	388 178	7 128 815	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AL	388 228	7 128 483	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AM	388 166	7 128 350	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AN	388 153	7 128 356	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AO	387 140	7 128 896	60,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AP	387 063	7 128 796	58,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AQ	387 645	7 128 893	58,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AR	387 458	7 128 518	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AS	387 661	7 128 530	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AT	387 550	7 128 379	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AU	387 354	7 128 579	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AV	387 357	7 128 409	57,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AW	386 782	7 128 705	56,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AX	386 617	7 128 596	56,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AY	388 012	7 128 241	58,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AZ	387 526	7 128 168	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BA	387 482	7 128 185	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BB	387 637	7 128 018	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BC	387 699	7 127 865	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BD	389 060	7 128 171	59,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BE	389 046	7 128 158	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BF	387 883	7 134 812	72,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BG	387 993	7 134 748	69,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BH	387 879	7 134 678	70,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BI	388 094	7 134 417	69,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BJ	388 101	7 134 436	68,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BK	388 810	7 135 005	70,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BL	389 018	7 133 770	68,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BM	388 989	7 133 714	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BN	388 978	7 133 482	67,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BO	391 390	7 129 731	65,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BP	390 653	7 128 863	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BQ	390 624	7 128 834	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BR	390 177	7 128 741	60,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BS	390 379	7 128 718	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BT	390 343	7 128 724	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BU	390 307	7 128 684	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BV	390 305	7 128 640	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BW	390 317	7 128 619	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BX	390 347	7 128 599	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BY	390 410	7 128 514	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BZ	390 240	7 128 352	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CA	389 656	7 128 752	59,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CB	389 641	7 128 698	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CC	389 684	7 128 649	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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SHADOW - Main Result**Calculation: 8x V126 - Worst Case**

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ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
CD	389 271	7 128 308	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CE	389 251	7 128 706	59,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CF	389 034	7 128 324	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CG	388 843	7 128 648	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CH	388 740	7 128 606	59,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CI	388 838	7 128 597	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CJ	388 790	7 128 559	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CK	388 778	7 128 490	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CL	388 740	7 128 496	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CM	388 448	7 128 631	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CN	387 733	7 129 071	60,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CO	387 801	7 128 738	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CP	387 896	7 128 681	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CQ	388 207	7 128 699	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CR	388 172	7 128 711	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CS	388 228	7 128 343	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CT	387 641	7 128 826	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CU	387 465	7 128 507	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CV	387 410	7 128 414	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CW	387 341	7 128 352	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CX	387 377	7 128 329	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CY	387 293	7 128 298	56,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CZ	387 584	7 128 203	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DA	389 291	7 128 181	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DB	389 322	7 128 181	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DC	389 255	7 128 166	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DD	389 029	7 128 223	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DE	389 618	7 128 241	61,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DF	389 433	7 128 085	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DG	389 583	7 127 921	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DH	389 340	7 128 122	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DI	388 967	7 128 212	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DJ	390 143	7 128 263	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DK	390 060	7 128 245	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DL	390 061	7 128 092	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DM	390 174	7 128 126	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DN	390 128	7 128 132	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DO	389 772	7 128 079	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DP	388 130	7 134 643	67,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DQ	388 492	7 134 826	66,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DR	388 611	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DS	388 666	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DT	388 669	7 134 714	67,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DU	388 787	7 134 583	67,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DV	388 520	7 134 052	69,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DW	388 578	7 134 042	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	0:00	0	0:00
E	13:26	38	0:28

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SHADOW - Main Result**Calculation: 8x V126 - Worst Case**

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Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
F	0:00	0	0:00
G	0:00	0	0:00
H	0:00	0	0:00
I	13:47	38	0:28
J	0:00	0	0:00
K	0:00	0	0:00
L	0:00	0	0:00
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	41:53	100	0:47
X	54:18	151	0:35
Y	0:00	0	0:00
Z	0:00	0	0:00
AA	0:00	0	0:00
AB	0:00	0	0:00
AC	0:00	0	0:00
AD	0:00	0	0:00
AE	0:00	0	0:00
AF	0:00	0	0:00
AG	0:00	0	0:00
AH	0:00	0	0:00
AI	0:00	0	0:00
AJ	0:00	0	0:00
AK	0:00	0	0:00
AL	0:00	0	0:00
AM	0:00	0	0:00
AN	0:00	0	0:00
AO	0:00	0	0:00
AP	0:00	0	0:00
AQ	0:00	0	0:00
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	0:00	0	0:00
AU	0:00	0	0:00
AV	0:00	0	0:00
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	0:00	0	0:00
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	0:00	0	0:00
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	0:00	0	0:00
BJ	0:00	0	0:00
BK	0:00	0	0:00
BL	0:00	0	0:00

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SHADOW - Main Result**Calculation:** 8x V126 - Worst Case

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Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00
BT	0:00	0	0:00
BU	0:00	0	0:00
BV	0:00	0	0:00
BW	0:00	0	0:00
BX	0:00	0	0:00
BY	0:00	0	0:00
BZ	0:00	0	0:00
CA	0:00	0	0:00
CB	0:00	0	0:00
CC	0:00	0	0:00
CD	0:00	0	0:00
CE	0:00	0	0:00
CF	0:00	0	0:00
CG	0:00	0	0:00
CH	0:00	0	0:00
CI	0:00	0	0:00
CJ	0:00	0	0:00
CK	0:00	0	0:00
CL	0:00	0	0:00
CM	0:00	0	0:00
CN	0:00	0	0:00
CO	0:00	0	0:00
CP	0:00	0	0:00
CQ	0:00	0	0:00
CR	0:00	0	0:00
CS	0:00	0	0:00
CT	0:00	0	0:00
CU	0:00	0	0:00
CV	0:00	0	0:00
CW	0:00	0	0:00
CX	0:00	0	0:00
CY	0:00	0	0:00
CZ	0:00	0	0:00
DA	0:00	0	0:00
DB	0:00	0	0:00
DC	0:00	0	0:00
DD	0:00	0	0:00
DE	0:00	0	0:00
DF	0:00	0	0:00
DG	0:00	0	0:00
DH	0:00	0	0:00
DI	0:00	0	0:00
DJ	0:00	0	0:00
DK	0:00	0	0:00
DL	0:00	0	0:00
DM	0:00	0	0:00
DN	0:00	0	0:00
DO	0:00	0	0:00
DP	0:00	0	0:00
DQ	0:00	0	0:00
DR	0:00	0	0:00
DS	0:00	0	0:00

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SHADOW - Main Result**Calculation:** 8x V126 - Worst Case

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
DT	0:00	0	0:00
DU	0:00	0	0:00
DV	0:00	0	0:00
DW	0:00	0	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
01	WTG 01	0:00	
02	WTG 02	0:00	
03	WTG 03	0:00	
04	WTG 04	12:53	
05	WTG 05	0:00	
06	WTG 06	18:52	
07	WTG 07	30:43	
08	WTG 08	55:31	

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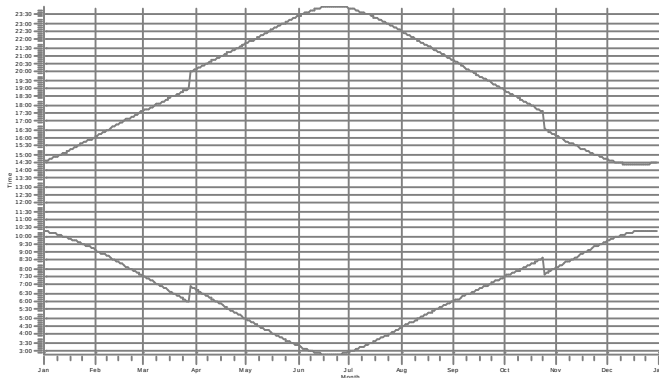
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Calculated:

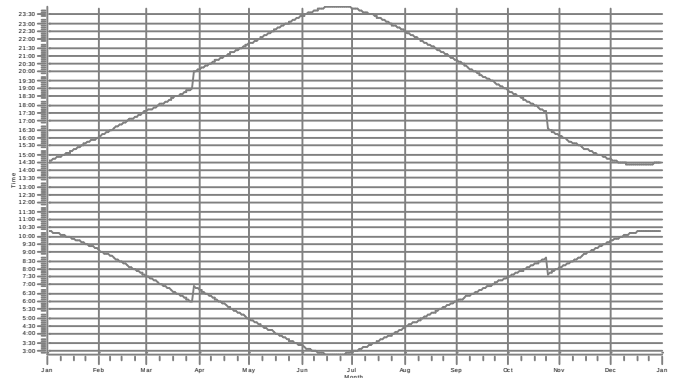
16.4.2014 10:59/2.9.269

SHADOW - Calendar per WTG, graphical**Calculation: 8x V126 - Worst Case**

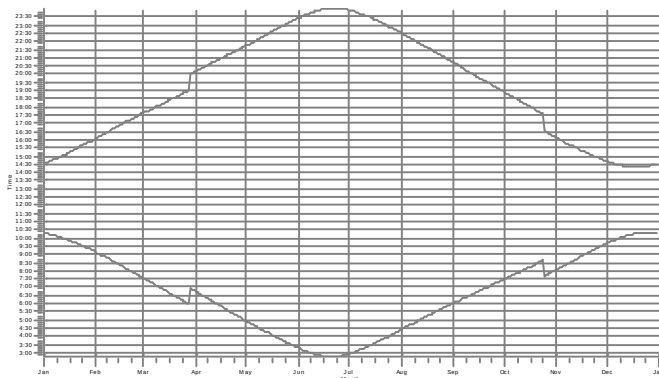
01: WTG 01



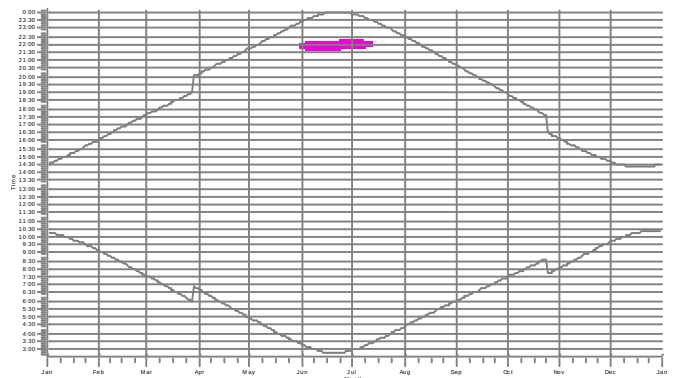
02: WTG 02



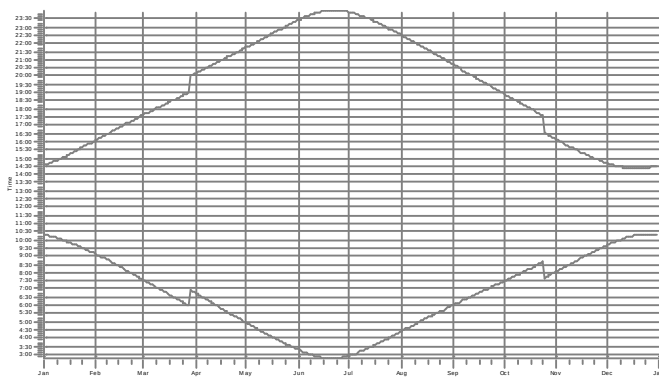
03: WTG 03



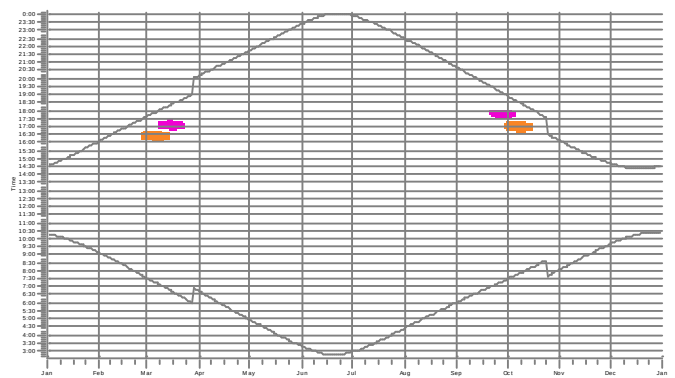
04: WTG 04



05: WTG 05



06: WTG 06



Shadow receptors

■ W: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (23)
 ■ X: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (24)

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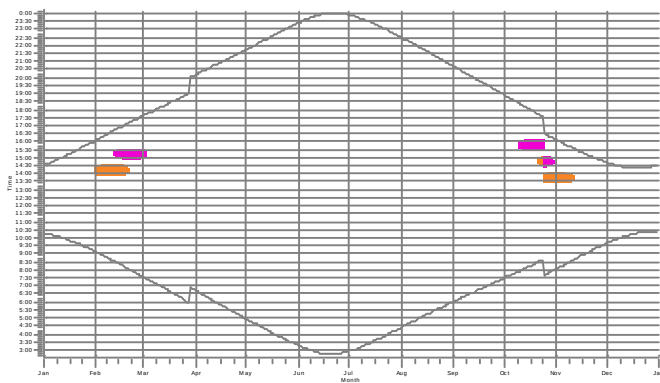
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Calculated:

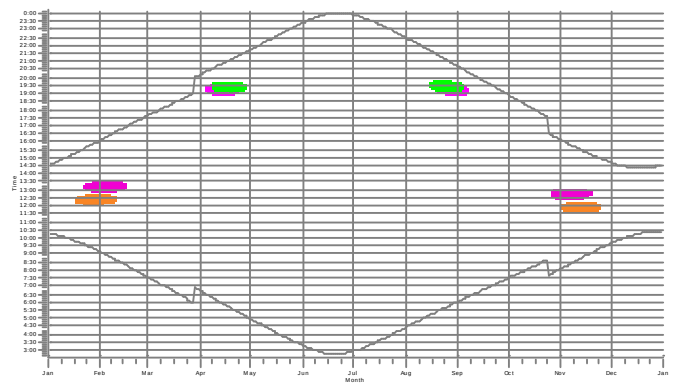
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SHADOW - Calendar per WTG, graphical**Calculation: 8x V126 - Worst Case**

07: WTG 07



08: WTG 08



Shadow receptors

E Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (E)

S Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (S)

W Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (W)

N Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (N)

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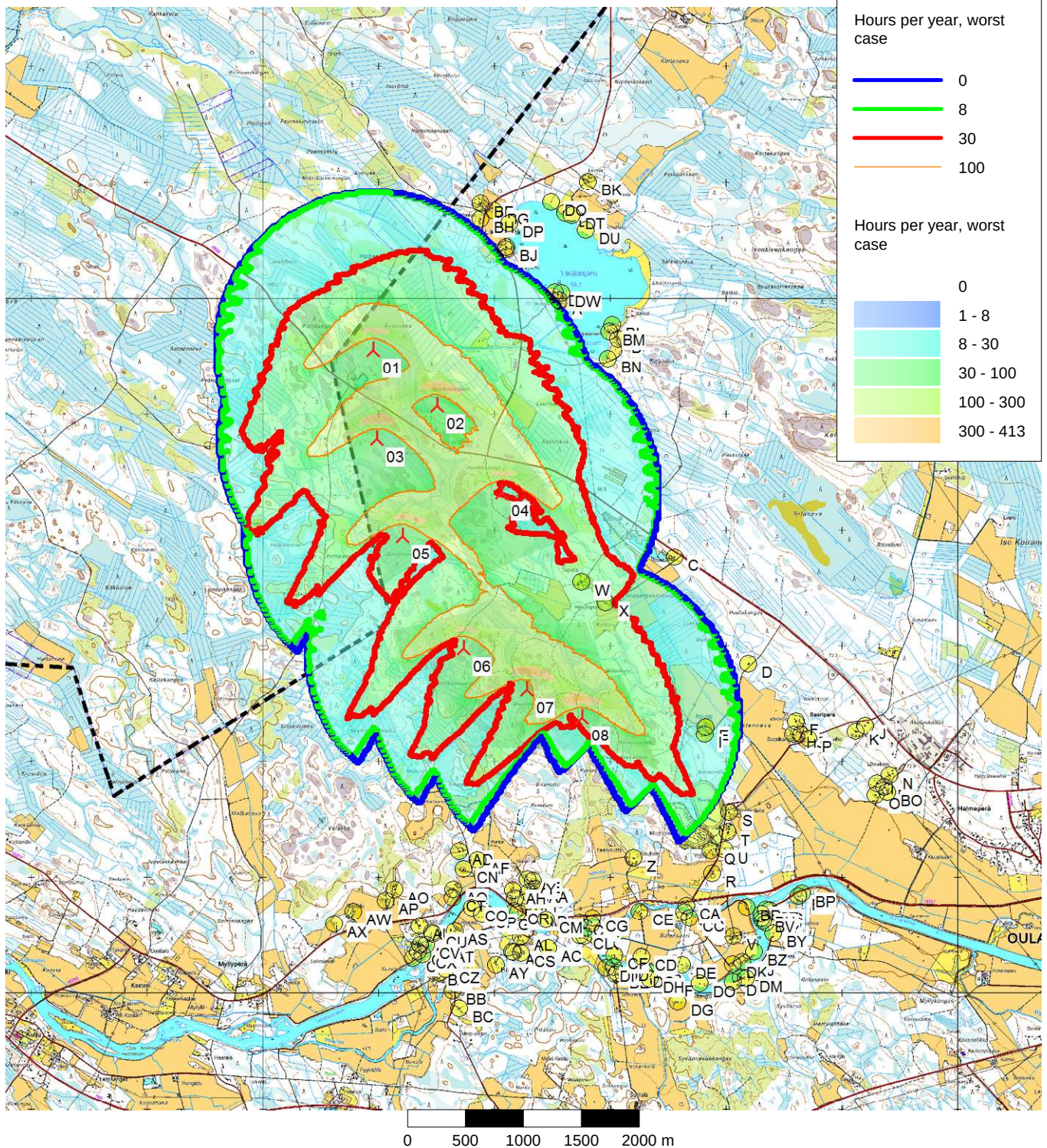
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SHADOW - Map

Calculation: 8x V126 - Worst Case



New WTG

Shadow receptor

Flicker map level: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpg (11)

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask**Assumptions for shadow calculations**

Maximum distance for influence

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

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,42	6,93	8,81	9,87	9,13	6,84	4,29	2,30	0,90	0,27

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

Wind Atlas

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
640	629	629	663	752	786	786	786	775	730	629	674	8 479

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

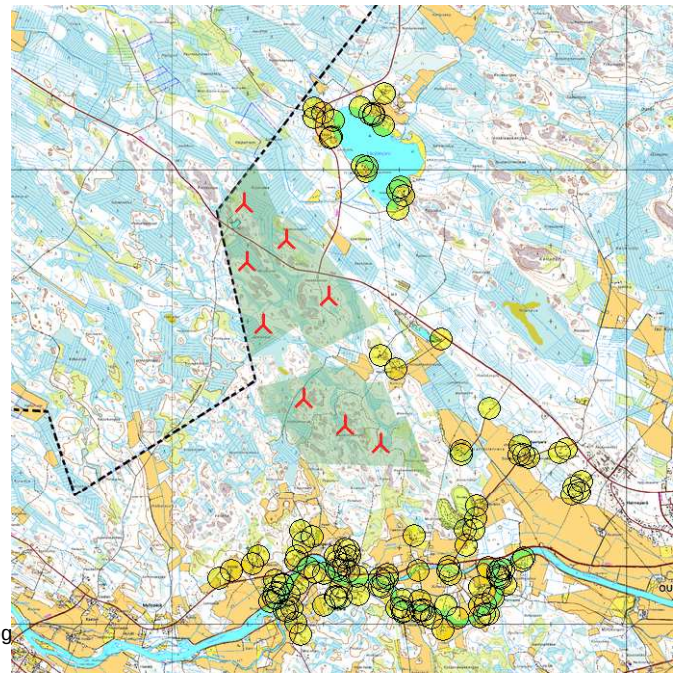
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpg

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 20,0 m



Scale 1:100 000

New WTG

Shadow receptor

WTGs

ETRS 89 Zone: 35						WTG type					Shadow data		
East	North	Z	Row		Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation	RPM	
				data/Description									
				[m]									
				65,7	WTG 01	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5
02	387 504	7 133 073	67,9	WTG 02	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
03	386 985	7 132 785	65,5	WTG 03	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
04	388 067	7 132 322	69,8	WTG 04	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
05	387 208	7 131 952	63,2	WTG 05	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
06	387 735	7 130 978	65,2	WTG 06	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
07	388 283	7 130 621	71,9	WTG 07	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
08	388 758	7 130 378	70,3	WTG 08	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask

...continued from previous page

ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
O	391 289	7 129 707	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
P	390 714	7 130 195	65,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Q	389 869	7 129 233	65,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
R	389 883	7 129 035	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
S	390 025	7 129 558	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
T	390 015	7 129 387	64,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
U	389 986	7 129 237	62,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
V	390 062	7 128 487	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
W	388 749	7 131 550	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
X	388 962	7 131 373	67,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Y	388 332	7 128 968	64,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Z	389 204	7 129 165	62,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AA	388 354	7 128 898	64,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AB	388 342	7 128 693	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AC	388 462	7 128 387	59,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AD	387 696	7 129 226	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AE	388 284	7 128 980	63,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AF	387 852	7 129 146	58,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AG	388 006	7 128 661	58,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AH	388 161	7 128 889	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AI	388 294	7 128 871	62,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AJ	388 275	7 128 784	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AK	388 178	7 128 815	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AL	388 228	7 128 483	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AM	388 166	7 128 350	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AN	388 153	7 128 356	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AO	387 140	7 128 896	60,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AP	387 063	7 128 796	58,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AQ	387 645	7 128 893	58,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AR	387 458	7 128 518	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AS	387 661	7 128 530	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AT	387 550	7 128 379	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AU	387 354	7 128 579	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AV	387 357	7 128 409	57,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AW	386 782	7 128 705	56,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AX	386 617	7 128 596	56,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AY	388 012	7 128 241	58,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AZ	387 526	7 128 168	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BA	387 482	7 128 185	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BB	387 637	7 128 018	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BC	387 699	7 127 865	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BD	389 060	7 128 171	59,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BE	389 046	7 128 158	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BF	387 883	7 134 812	72,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BG	387 993	7 134 748	69,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BH	387 879	7 134 678	70,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BI	388 094	7 134 417	69,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BJ	388 101	7 134 436	68,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BK	388 810	7 135 005	70,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BL	389 018	7 133 770	68,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BM	388 989	7 133 714	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BN	388 978	7 133 482	67,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BO	391 390	7 129 731	65,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BP	390 653	7 128 863	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BQ	390 624	7 128 834	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BR	390 177	7 128 741	60,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BS	390 379	7 128 718	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BT	390 343	7 128 724	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BU	390 307	7 128 684	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask

...continued from previous page

ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
BV	390 305	7 128 640	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BW	390 317	7 128 619	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BX	390 347	7 128 599	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BY	390 410	7 128 514	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BZ	390 240	7 128 352	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CA	389 656	7 128 752	59,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CB	389 641	7 128 698	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CC	389 684	7 128 649	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CD	389 271	7 128 308	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CE	389 251	7 128 706	59,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CF	389 034	7 128 324	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CG	388 843	7 128 648	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CH	388 740	7 128 606	59,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CI	388 838	7 128 597	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CJ	388 790	7 128 559	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CK	388 778	7 128 490	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CL	388 740	7 128 496	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CM	388 448	7 128 631	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CN	387 733	7 129 071	60,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CO	387 801	7 128 738	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CP	387 896	7 128 681	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CQ	388 207	7 128 699	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CR	388 172	7 128 711	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CS	388 228	7 128 343	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CT	387 641	7 128 826	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CU	387 465	7 128 507	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CV	387 410	7 128 414	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CW	387 341	7 128 352	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CX	387 377	7 128 329	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CY	387 293	7 128 298	56,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CZ	387 584	7 128 203	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DA	389 291	7 128 181	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DB	389 322	7 128 181	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DC	389 255	7 128 166	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DD	389 029	7 128 223	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DE	389 618	7 128 241	61,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DF	389 433	7 128 085	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DG	389 583	7 127 921	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DH	389 340	7 128 122	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DI	388 967	7 128 212	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DJ	390 143	7 128 263	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DK	390 060	7 128 245	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DL	390 061	7 128 092	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DM	390 174	7 128 126	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DN	390 128	7 128 132	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DO	389 772	7 128 079	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DP	388 130	7 134 643	67,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DQ	388 492	7 134 826	66,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DR	388 611	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DS	388 666	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DT	388 669	7 134 714	67,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DU	388 787	7 134 583	67,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DV	388 520	7 134 052	69,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DW	388 578	7 134 042	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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Calculated:

16.4.2014 15:06/2.9.269

SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask**Calculation Results**

Shadow receptor

No.	Shadow, worst case		Max shadow hours per day [h/day]	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	0:00	0	0:00	0:00
D	0:00	0	0:00	0:00
E	13:26	38	0:28	3:31
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00
I	13:47	38	0:28	3:40
J	0:00	0	0:00	0:00
K	0:00	0	0:00	0:00
L	0:00	0	0:00	0:00
M	0:00	0	0:00	0:00
N	0:00	0	0:00	0:00
O	0:00	0	0:00	0:00
P	0:00	0	0:00	0:00
Q	0:00	0	0:00	0:00
R	0:00	0	0:00	0:00
S	0:00	0	0:00	0:00
T	0:00	0	0:00	0:00
U	0:00	0	0:00	0:00
V	0:00	0	0:00	0:00
W	41:53	100	0:47	5:55
X	54:18	151	0:35	10:01
Y	0:00	0	0:00	0:00
Z	0:00	0	0:00	0:00
AA	0:00	0	0:00	0:00
AB	0:00	0	0:00	0:00
AC	0:00	0	0:00	0:00
AD	0:00	0	0:00	0:00
AE	0:00	0	0:00	0:00
AF	0:00	0	0:00	0:00
AG	0:00	0	0:00	0:00
AH	0:00	0	0:00	0:00
AI	0:00	0	0:00	0:00
AJ	0:00	0	0:00	0:00
AK	0:00	0	0:00	0:00
AL	0:00	0	0:00	0:00
AM	0:00	0	0:00	0:00
AN	0:00	0	0:00	0:00
AO	0:00	0	0:00	0:00
AP	0:00	0	0:00	0:00
AQ	0:00	0	0:00	0:00
AR	0:00	0	0:00	0:00
AS	0:00	0	0:00	0:00
AT	0:00	0	0:00	0:00
AU	0:00	0	0:00	0:00
AV	0:00	0	0:00	0:00
AW	0:00	0	0:00	0:00
AX	0:00	0	0:00	0:00
AY	0:00	0	0:00	0:00
AZ	0:00	0	0:00	0:00
BA	0:00	0	0:00	0:00
BB	0:00	0	0:00	0:00
BC	0:00	0	0:00	0:00
BD	0:00	0	0:00	0:00
BE	0:00	0	0:00	0:00
BF	0:00	0	0:00	0:00

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask

...continued from previous page

No.	Shadow, worst case		Max shadow hours per day	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
BG	0:00	0	0:00	0:00
BH	0:00	0	0:00	0:00
BI	0:00	0	0:00	0:00
BJ	0:00	0	0:00	0:00
BK	0:00	0	0:00	0:00
BL	0:00	0	0:00	0:00
BM	0:00	0	0:00	0:00
BN	0:00	0	0:00	0:00
BO	0:00	0	0:00	0:00
BP	0:00	0	0:00	0:00
BQ	0:00	0	0:00	0:00
BR	0:00	0	0:00	0:00
BS	0:00	0	0:00	0:00
BT	0:00	0	0:00	0:00
BU	0:00	0	0:00	0:00
BV	0:00	0	0:00	0:00
BW	0:00	0	0:00	0:00
BX	0:00	0	0:00	0:00
BY	0:00	0	0:00	0:00
BZ	0:00	0	0:00	0:00
CA	0:00	0	0:00	0:00
CB	0:00	0	0:00	0:00
CC	0:00	0	0:00	0:00
CD	0:00	0	0:00	0:00
CE	0:00	0	0:00	0:00
CF	0:00	0	0:00	0:00
CG	0:00	0	0:00	0:00
CH	0:00	0	0:00	0:00
CI	0:00	0	0:00	0:00
CJ	0:00	0	0:00	0:00
CK	0:00	0	0:00	0:00
CL	0:00	0	0:00	0:00
CM	0:00	0	0:00	0:00
CN	0:00	0	0:00	0:00
CO	0:00	0	0:00	0:00
CP	0:00	0	0:00	0:00
CQ	0:00	0	0:00	0:00
CR	0:00	0	0:00	0:00
CS	0:00	0	0:00	0:00
CT	0:00	0	0:00	0:00
CU	0:00	0	0:00	0:00
CV	0:00	0	0:00	0:00
CW	0:00	0	0:00	0:00
CX	0:00	0	0:00	0:00
CY	0:00	0	0:00	0:00
CZ	0:00	0	0:00	0:00
DA	0:00	0	0:00	0:00
DB	0:00	0	0:00	0:00
DC	0:00	0	0:00	0:00
DD	0:00	0	0:00	0:00
DE	0:00	0	0:00	0:00
DF	0:00	0	0:00	0:00
DG	0:00	0	0:00	0:00
DH	0:00	0	0:00	0:00
DI	0:00	0	0:00	0:00
DJ	0:00	0	0:00	0:00
DK	0:00	0	0:00	0:00
DL	0:00	0	0:00	0:00
DM	0:00	0	0:00	0:00

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case without forest mask

...continued from previous page

No.	Shadow, worst case		Max shadow hours per day	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
DN	0:00	0	0:00	0:00
DO	0:00	0	0:00	0:00
DP	0:00	0	0:00	0:00
DQ	0:00	0	0:00	0:00
DR	0:00	0	0:00	0:00
DS	0:00	0	0:00	0:00
DT	0:00	0	0:00	0:00
DU	0:00	0	0:00	0:00
DV	0:00	0	0:00	0:00
DW	0:00	0	0:00	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
01	WTG 01	0:00	0:00
02	WTG 02	0:00	0:00
03	WTG 03	0:00	0:00
04	WTG 04	12:53	3:40
05	WTG 05	0:00	0:00
06	WTG 06	18:52	3:40
07	WTG 07	30:43	4:43
08	WTG 08	55:31	9:36

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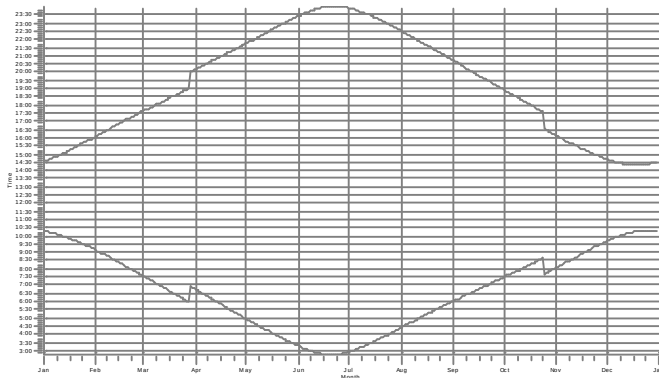
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Calculated:

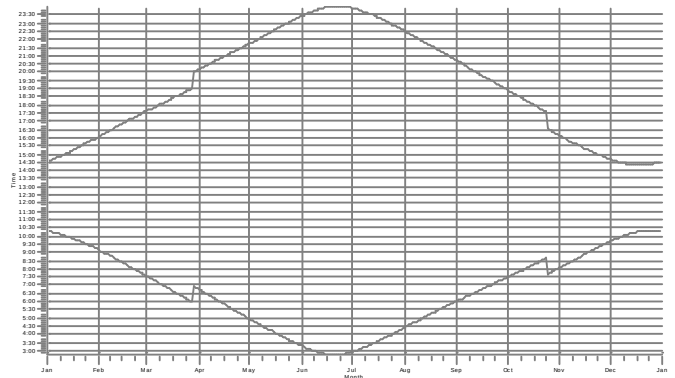
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SHADOW - Calendar per WTG, graphical**Calculation: 8x V126 - Real Case without forest mask**

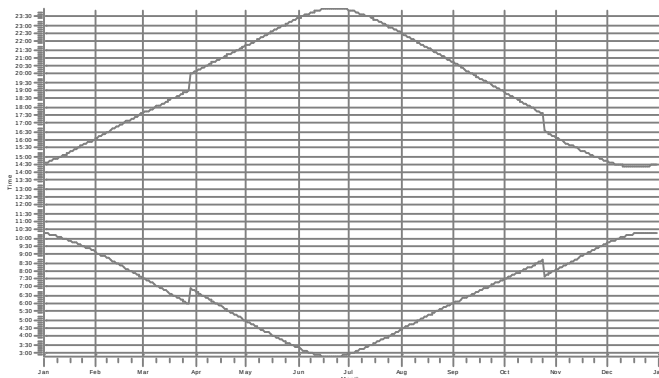
01: WTG 01



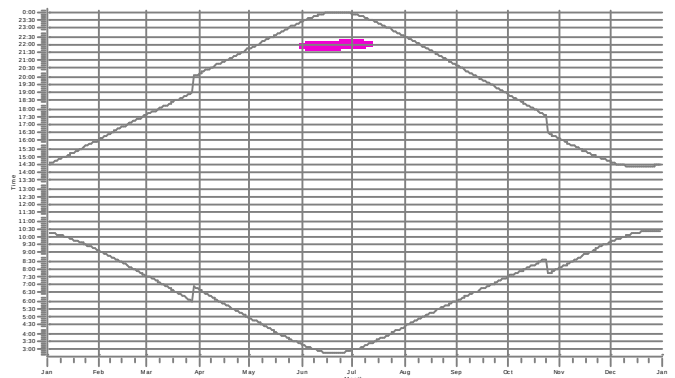
02: WTG 02



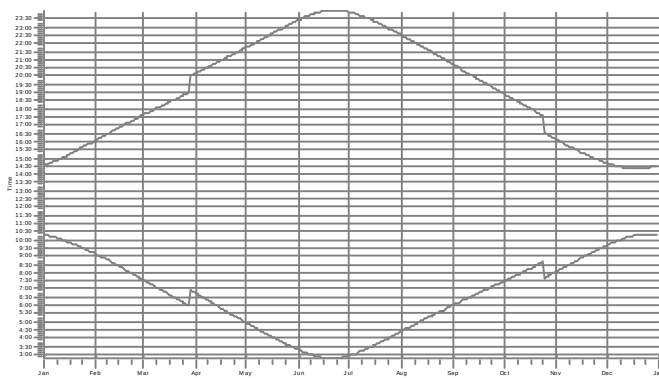
03: WTG 03



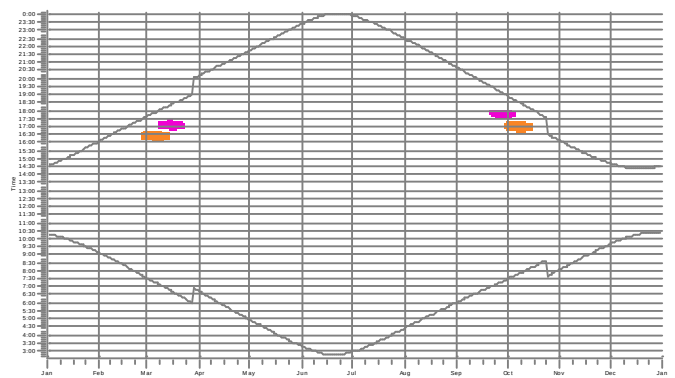
04: WTG 04



05: WTG 05



06: WTG 06



Shadow receptors

■ W: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (23)
 ■ X: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (24)

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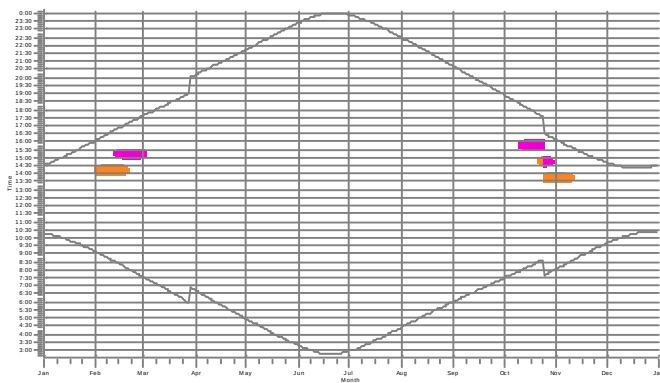
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Calculated:

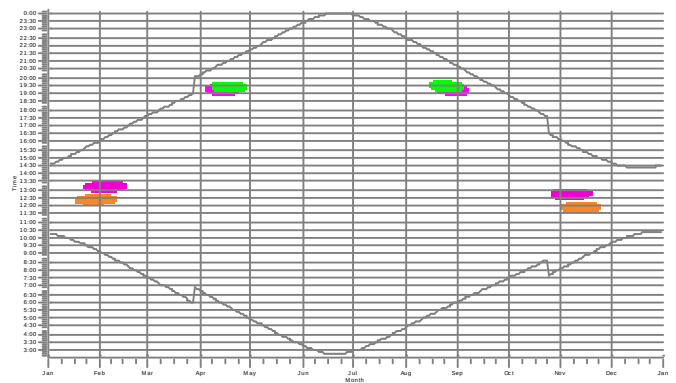
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SHADOW - Calendar per WTG, graphical**Calculation: 8x V126 - Real Case without forest mask**

07: WTG 07



08: WTG 08



Shadow receptors

E: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (E)

I: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (I)

W: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (W)

X: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 90.0° (X)

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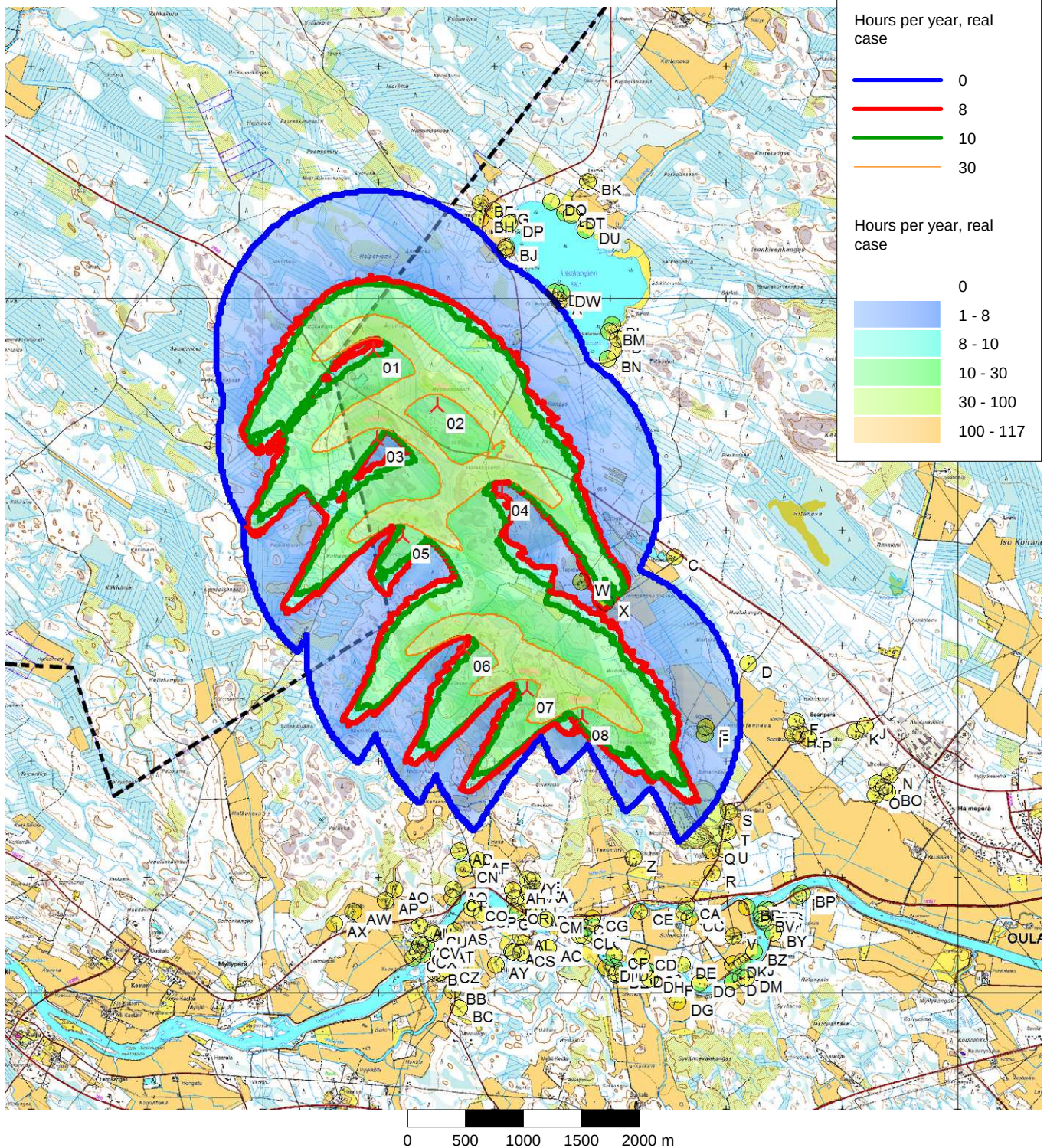
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SHADOW - Map

Calculation: 8x V126 - Real Case without forest mask



New WTG

Shadow receptor

Flicker map level: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpg (11)

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Calculated:

16.4.2014 14:28/2.9.269

SHADOW - Main Result**Calculation:** 8x V126 - Real Case**Assumptions for shadow calculations**

Maximum distance for influence

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

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,42	6,93	8,81	9,87	9,13	6,84	4,29	2,30	0,90	0,27

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

Wind Atlas

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
638	627	627	661	750	784	784	784	773	728	627	672	8 457

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

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
 Height contours used: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpg

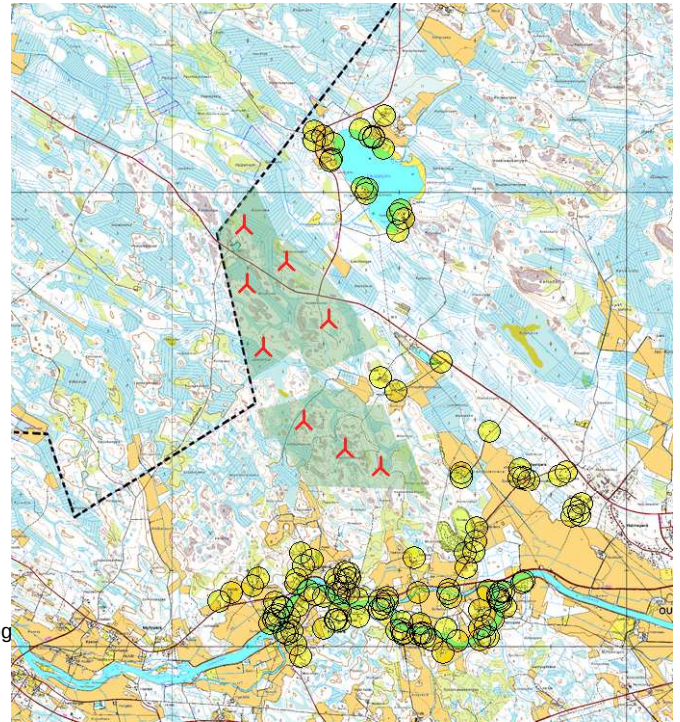
Area object(s) used in calculation:

Logica Forest Mask

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 20,0 m



New WTG

Scale 1:100 000

Shadow receptor

WTGs

ETRS 89 Zone: 35				WTG type					Shadow data			
East	North	Z	Row	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation	RPM	
			data/Description								distance	
			[m]								[m]	[RPM]
01	386 956	7 133 556	65,7 WTG 01	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
02	387 504	7 133 073	67,9 WTG 02	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
03	386 985	7 132 785	65,5 WTG 03	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
04	388 067	7 132 322	69,8 WTG 04	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
05	387 208	7 131 952	63,2 WTG 05	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
06	387 735	7 130 978	65,2 WTG 06	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
07	388 283	7 130 621	71,9 WTG 07	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	
08	388 758	7 130 378	70,3 WTG 08	Yes	VESTAS	V126-3 000	3 000	126,0	167,0	1 352	16,5	

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SHADOW - Main Result**Calculation: 8x V126 - Real Case**

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ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
M	391 369	7 129 774	65,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
N	391 411	7 129 881	68,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
O	391 289	7 129 707	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
P	390 714	7 130 195	65,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Q	389 869	7 129 233	65,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
R	389 883	7 129 035	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
S	390 025	7 129 558	63,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
T	390 015	7 129 387	64,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
U	389 986	7 129 237	62,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
V	390 062	7 128 487	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
W	388 749	7 131 550	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
X	388 962	7 131 373	67,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Y	388 332	7 128 968	64,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Z	389 204	7 129 165	62,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AA	388 354	7 128 898	64,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AB	388 342	7 128 693	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AC	388 462	7 128 387	59,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AD	387 696	7 129 226	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AE	388 284	7 128 980	63,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AF	387 852	7 129 146	58,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AG	388 006	7 128 661	58,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AH	388 161	7 128 889	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AI	388 294	7 128 871	62,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AJ	388 275	7 128 784	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AK	388 178	7 128 815	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AL	388 228	7 128 483	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AM	388 166	7 128 350	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AN	388 153	7 128 356	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AO	387 140	7 128 896	60,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AP	387 063	7 128 796	58,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AQ	387 645	7 128 893	58,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AR	387 458	7 128 518	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AS	387 661	7 128 530	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AT	387 550	7 128 379	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AU	387 354	7 128 579	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AV	387 357	7 128 409	57,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AW	386 782	7 128 705	56,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AX	386 617	7 128 596	56,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AY	388 012	7 128 241	58,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AZ	387 526	7 128 168	57,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BA	387 482	7 128 185	57,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BB	387 637	7 128 018	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BC	387 699	7 127 865	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BD	389 060	7 128 171	59,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BE	389 046	7 128 158	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BF	387 883	7 134 812	72,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BG	387 993	7 134 748	69,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BH	387 879	7 134 678	70,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BI	388 094	7 134 417	69,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BJ	388 101	7 134 436	68,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BK	388 810	7 135 005	70,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BL	389 018	7 133 770	68,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BM	388 989	7 133 714	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BN	388 978	7 133 482	67,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BO	391 390	7 129 731	65,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BP	390 653	7 128 863	60,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BQ	390 624	7 128 834	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BR	390 177	7 128 741	60,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BS	390 379	7 128 718	60,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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Project:

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SHADOW - Main Result**Calculation: 8x V126 - Real Case**

...continued from previous page

ETRS 89 Zone: 35

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
BT	390 343	7 128 724	60,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BU	390 307	7 128 684	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BV	390 305	7 128 640	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BW	390 317	7 128 619	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BX	390 347	7 128 599	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BY	390 410	7 128 514	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
BZ	390 240	7 128 352	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CA	389 656	7 128 752	59,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CB	389 641	7 128 698	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CC	389 684	7 128 649	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CD	389 271	7 128 308	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CE	389 251	7 128 706	59,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CF	389 034	7 128 324	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CG	388 843	7 128 648	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CH	388 740	7 128 606	59,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CI	388 838	7 128 597	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CJ	388 790	7 128 559	58,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CK	388 778	7 128 490	59,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CL	388 740	7 128 496	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CM	388 448	7 128 631	58,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CN	387 733	7 129 071	60,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CO	387 801	7 128 738	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CP	387 896	7 128 681	57,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CQ	388 207	7 128 699	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CR	388 172	7 128 711	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CS	388 228	7 128 343	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CT	387 641	7 128 826	57,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CU	387 465	7 128 507	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CV	387 410	7 128 414	57,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CW	387 341	7 128 352	57,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CX	387 377	7 128 329	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CY	387 293	7 128 298	56,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
CZ	387 584	7 128 203	56,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DA	389 291	7 128 181	58,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DB	389 322	7 128 181	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DC	389 255	7 128 166	58,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DD	389 029	7 128 223	59,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DE	389 618	7 128 241	61,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DF	389 433	7 128 085	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DG	389 583	7 127 921	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DH	389 340	7 128 122	59,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DI	388 967	7 128 212	58,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DJ	390 143	7 128 263	59,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DK	390 060	7 128 245	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DL	390 061	7 128 092	59,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DM	390 174	7 128 126	60,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DN	390 128	7 128 132	60,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DO	389 772	7 128 079	60,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DP	388 130	7 134 643	67,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DQ	388 492	7 134 826	66,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DR	388 611	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DS	388 666	7 134 732	67,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DT	388 669	7 134 714	67,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DU	388 787	7 134 583	67,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DV	388 520	7 134 052	69,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
DW	388 578	7 134 042	69,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case**Calculation Results**

Shadow receptor

No.	Shadow, worst case		Max shadow hours per day	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	0:00	0	0:00	0:00
D	0:00	0	0:00	0:00
E	0:00	0	0:00	0:00
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	0:00	0	0:00	0:00
I	0:00	0	0:00	0:00
J	0:00	0	0:00	0:00
K	0:00	0	0:00	0:00
L	0:00	0	0:00	0:00
M	0:00	0	0:00	0:00
N	0:00	0	0:00	0:00
O	0:00	0	0:00	0:00
P	0:00	0	0:00	0:00
Q	0:00	0	0:00	0:00
R	0:00	0	0:00	0:00
S	0:00	0	0:00	0:00
T	0:00	0	0:00	0:00
U	0:00	0	0:00	0:00
V	0:00	0	0:00	0:00
W	0:00	0	0:00	0:00
X	0:00	0	0:00	0:00
Y	0:00	0	0:00	0:00
Z	0:00	0	0:00	0:00
AA	0:00	0	0:00	0:00
AB	0:00	0	0:00	0:00
AC	0:00	0	0:00	0:00
AD	0:00	0	0:00	0:00
AE	0:00	0	0:00	0:00
AF	0:00	0	0:00	0:00
AG	0:00	0	0:00	0:00
AH	0:00	0	0:00	0:00
AI	0:00	0	0:00	0:00
AJ	0:00	0	0:00	0:00
AK	0:00	0	0:00	0:00
AL	0:00	0	0:00	0:00
AM	0:00	0	0:00	0:00
AN	0:00	0	0:00	0:00
AO	0:00	0	0:00	0:00
AP	0:00	0	0:00	0:00
AQ	0:00	0	0:00	0:00
AR	0:00	0	0:00	0:00
AS	0:00	0	0:00	0:00
AT	0:00	0	0:00	0:00
AU	0:00	0	0:00	0:00
AV	0:00	0	0:00	0:00
AW	0:00	0	0:00	0:00
AX	0:00	0	0:00	0:00
AY	0:00	0	0:00	0:00
AZ	0:00	0	0:00	0:00
BA	0:00	0	0:00	0:00
BB	0:00	0	0:00	0:00
BC	0:00	0	0:00	0:00
BD	0:00	0	0:00	0:00
BE	0:00	0	0:00	0:00
BF	0:00	0	0:00	0:00

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Project:

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case

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No.	Shadow, worst case		Max shadow hours per day	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
BG	0:00	0	0:00	0:00
BH	0:00	0	0:00	0:00
BI	0:00	0	0:00	0:00
BJ	0:00	0	0:00	0:00
BK	0:00	0	0:00	0:00
BL	0:00	0	0:00	0:00
BM	0:00	0	0:00	0:00
BN	0:00	0	0:00	0:00
BO	0:00	0	0:00	0:00
BP	0:00	0	0:00	0:00
BQ	0:00	0	0:00	0:00
BR	0:00	0	0:00	0:00
BS	0:00	0	0:00	0:00
BT	0:00	0	0:00	0:00
BU	0:00	0	0:00	0:00
BV	0:00	0	0:00	0:00
BW	0:00	0	0:00	0:00
BX	0:00	0	0:00	0:00
BY	0:00	0	0:00	0:00
BZ	0:00	0	0:00	0:00
CA	0:00	0	0:00	0:00
CB	0:00	0	0:00	0:00
CC	0:00	0	0:00	0:00
CD	0:00	0	0:00	0:00
CE	0:00	0	0:00	0:00
CF	0:00	0	0:00	0:00
CG	0:00	0	0:00	0:00
CH	0:00	0	0:00	0:00
CI	0:00	0	0:00	0:00
CJ	0:00	0	0:00	0:00
CK	0:00	0	0:00	0:00
CL	0:00	0	0:00	0:00
CM	0:00	0	0:00	0:00
CN	0:00	0	0:00	0:00
CO	0:00	0	0:00	0:00
CP	0:00	0	0:00	0:00
CQ	0:00	0	0:00	0:00
CR	0:00	0	0:00	0:00
CS	0:00	0	0:00	0:00
CT	0:00	0	0:00	0:00
CU	0:00	0	0:00	0:00
CV	0:00	0	0:00	0:00
CW	0:00	0	0:00	0:00
CX	0:00	0	0:00	0:00
CY	0:00	0	0:00	0:00
CZ	0:00	0	0:00	0:00
DA	0:00	0	0:00	0:00
DB	0:00	0	0:00	0:00
DC	0:00	0	0:00	0:00
DD	0:00	0	0:00	0:00
DE	0:00	0	0:00	0:00
DF	0:00	0	0:00	0:00
DG	0:00	0	0:00	0:00
DH	0:00	0	0:00	0:00
DI	0:00	0	0:00	0:00
DJ	0:00	0	0:00	0:00
DK	0:00	0	0:00	0:00
DL	0:00	0	0:00	0:00
DM	0:00	0	0:00	0:00

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SHADOW - Main Result**Calculation:** 8x V126 - Real Case

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No.	Shadow, worst case		Max shadow hours per day	Shadow, expected values
	Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
DN	0:00	0	0:00	0:00
DO	0:00	0	0:00	0:00
DP	0:00	0	0:00	0:00
DQ	0:00	0	0:00	0:00
DR	0:00	0	0:00	0:00
DS	0:00	0	0:00	0:00
DT	0:00	0	0:00	0:00
DU	0:00	0	0:00	0:00
DV	0:00	0	0:00	0:00
DW	0:00	0	0:00	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
01	WTG 01	0:00	0:00
02	WTG 02	0:00	0:00
03	WTG 03	0:00	0:00
04	WTG 04	0:00	0:00
05	WTG 05	0:00	0:00
06	WTG 06	0:00	0:00
07	WTG 07	0:00	0:00
08	WTG 08	0:00	0:00

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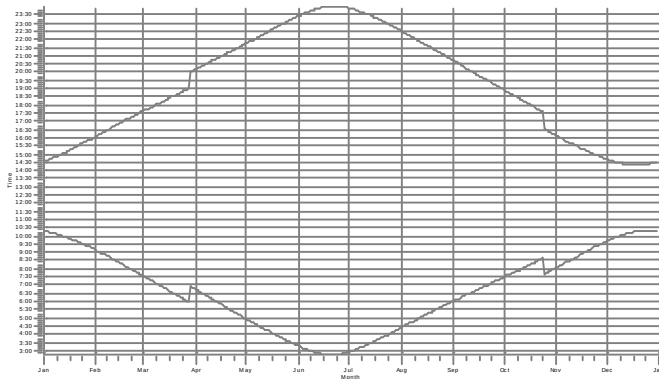
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Calculated:

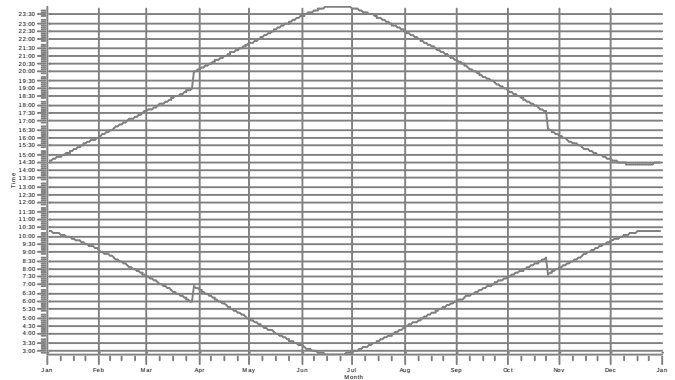
16.4.2014 14:28/2.9.269

SHADOW - Calendar per WTG, graphical**Calculation: 8x V126 - Real Case**

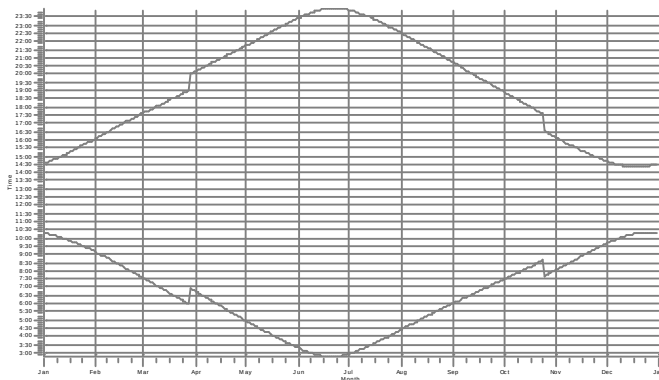
01: WTG 01



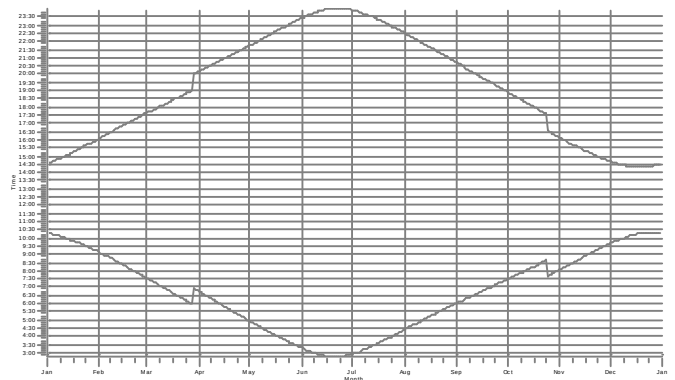
02: WTG 02



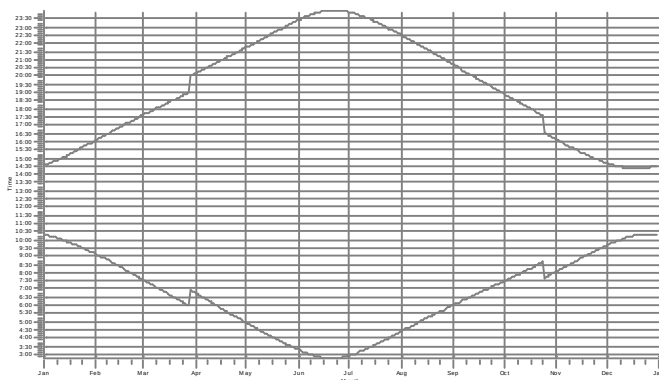
03: WTG 03



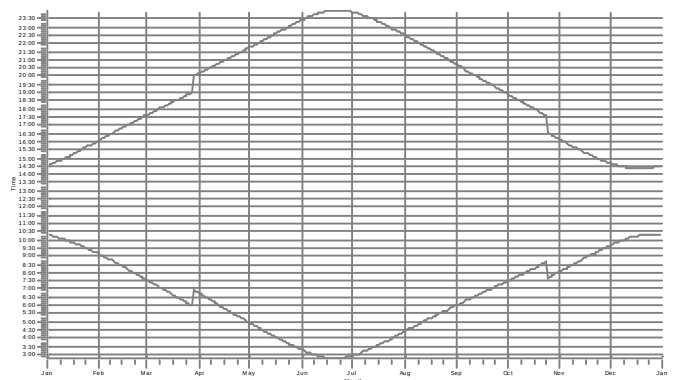
04: WTG 04



05: WTG 05



06: WTG 06



Shadow receptors

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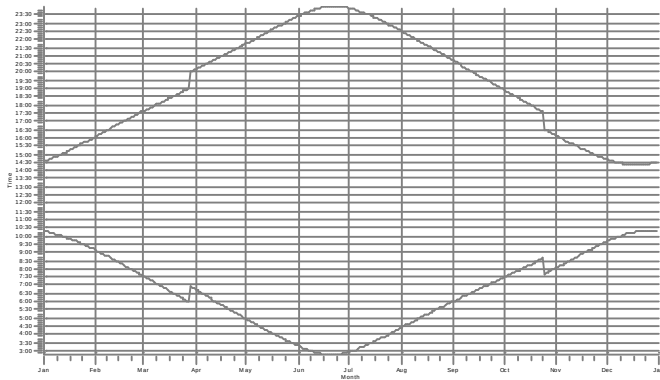
Calculated:

16.4.2014 14:28/2.9.269

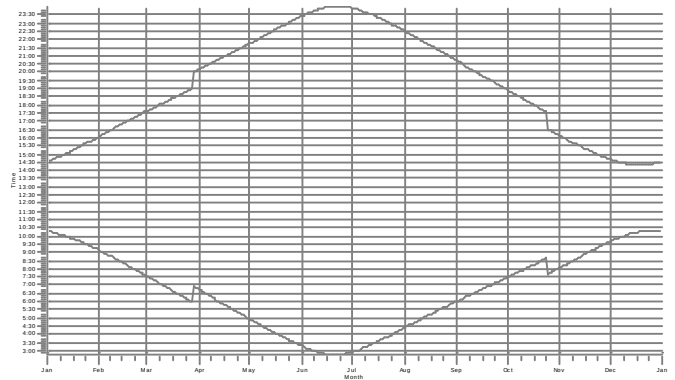
SHADOW - Calendar per WTG, graphical

Calculation: 8x V126 - Real Case

07: WTG 07



08: WTG 08



Shadow reception

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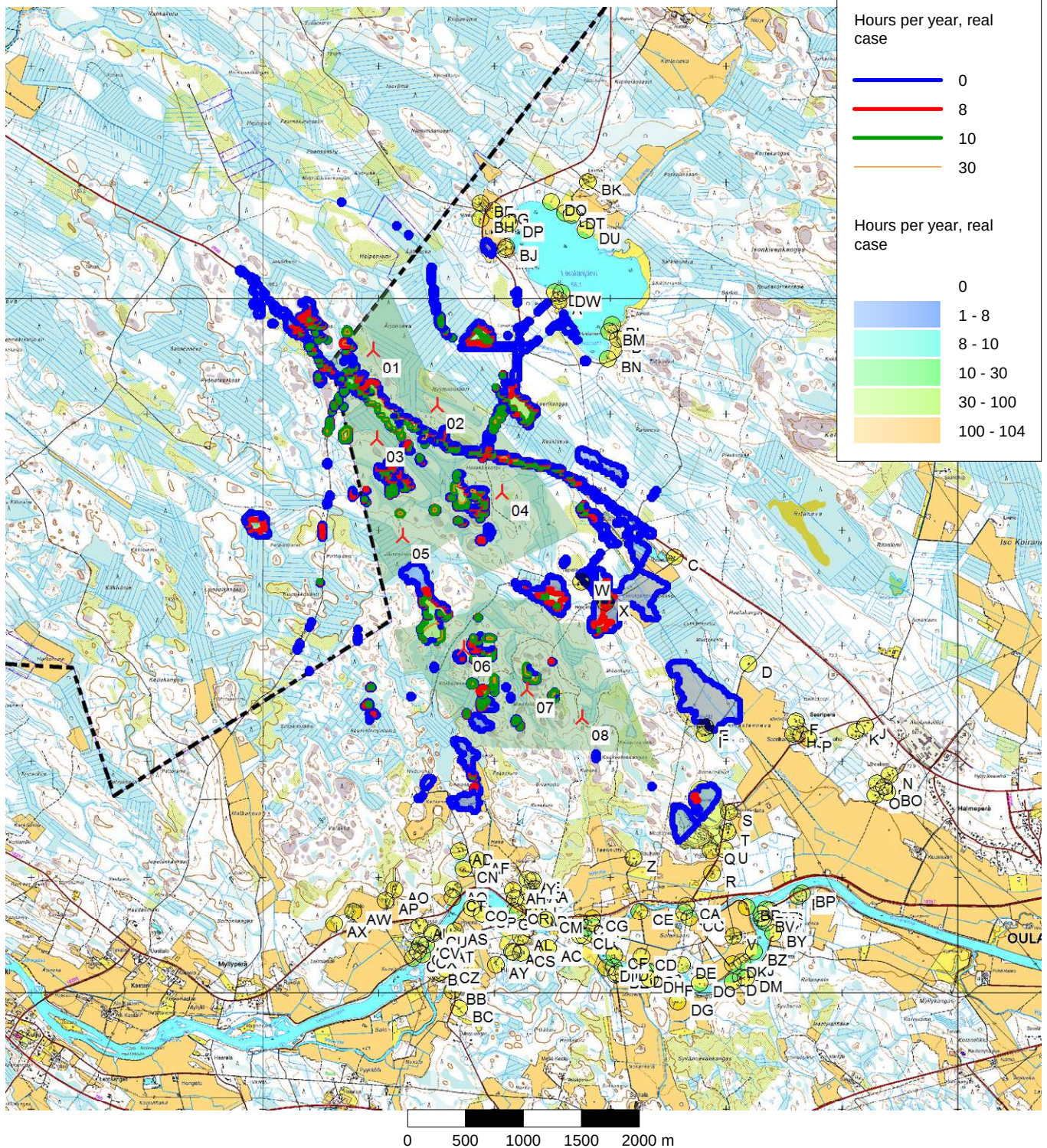
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Calculated:

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SHADOW - Map

Calculation: 8x V126 - Real Case



New WTG

Shadow receptor

Flicker map level: Elevation Grid Data Object: Oulainen_EMDGrid_0.wpg (11)