

SHADOW - Main Result

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

Assumptions for shadow calculations

Maximum distance for influence

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

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,09	2,33	4,53	6,36	8,50	8,58	8,67	7,34	5,07	2,56	1,00	0,78

Operational time

N	NE	E	SE	S	SW	W	NW	Sum
670	1 025	670	828	1 143	1 577	1 262	710	7 885

Monthly aggregation of real case reduction

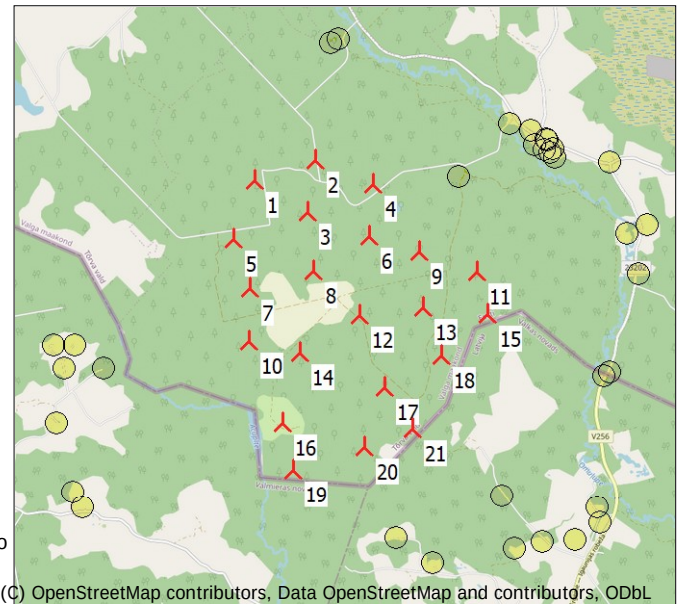
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_ONLINEDATA_4.wpo

Receptor grid resolution: 1,0 m

All coordinates are in

Estonian Lambert L-EST97-EST97 (EE)



Scale 1:100 000
New WTG
Shadow receptor

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]									[RPM]
1	599 372	6 423 253	97,6	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
2	600 152	6 423 536	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
3	600 067	6 422 858	91,8	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
4	600 940	6 423 242	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
5	599 107	6 422 478	90,8	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
6	600 901	6 422 552	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
7	599 334	6 421 822	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
8	600 171	6 422 074	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
9	601 572	6 422 363	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
10	599 345	6 421 134	88,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
11	602 341	6 422 121	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
12	600 795	6 421 507	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
13	601 638	6 421 639	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
14	600 016	6 420 991	88,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
15	602 494	6 421 569	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
16	599 816	6 420 056	80,8	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
17	601 160	6 420 567	89,9	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
18	601 897	6 421 006	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
19	599 963	6 419 439	80,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
20	600 900	6 419 774	85,6	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
21	601 534	6 420 033	89,9	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-

Shadow receptor-Input

No.	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
			[m]	[m]	[m]	[m]	[°]		[m]
Ellemäe	603 191	6 423 757	81,2	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Elli	603 231	6 423 888	83,1	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Holdre kordon	604 147	6 420 836	85,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Holdre mõis	603 065	6 423 826	80,8	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Jaanimäe	603 272	6 423 722	81,2	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Lindmäe	603 314	6 423 782	82,3	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Luhe	600 416	6 425 156	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Aizupes	597 186	6 418 869	80,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5

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SHADOW - Main Result

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

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No.	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
LV_Andreni	604 017	6 419 050	84,7	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Apsinas	602 756	6 419 153	87,5	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Attekas	604 065	6 418 836	84,1	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Cesnieki	597 051	6 419 070	81,5	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Dzintari	597 036	6 421 015	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Gundegas	601 358	6 418 575	80,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Lejasumpuli	596 820	6 419 987	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Medni	602 931	6 418 461	82,7	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Omuli RPP	604 066	6 420 716	80,4	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Rozas	603 733	6 418 606	85,6	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Strazdini	603 309	6 418 557	84,5	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Vecunguri	601 858	6 418 244	82,7	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Vilci	596 903	6 423 716	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Zeltkalni	597 432	6 420 734	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
LV_Zimelnieki	596 750	6 421 013	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Mekro	604 485	6 422 161	82,6	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Männiku	603 206	6 423 903	83,2	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Pargi	603 339	6 423 662	81,3	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Pelgu	602 076	6 423 374	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Sepakõrtsi	604 072	6 423 618	87,3	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Silla	603 006	6 424 018	82,7	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Vanaveski	604 582	6 422 810	84,7	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Vastseveski	602 721	6 424 090	80,4	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Veski	604 315	6 422 679	80,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5
Viitaku	600 317	6 425 095	90,0	15,0	15,0	1,5	0,0	"Green house mode"	1,5

Calculation Results

Shadow receptor

No.	Shadow, worst case			Shadow, expected values	
	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]	
Ellemäe	30:21	74	0:29	2:27	
Elli	0:00	0	0:00	0:00	
Holdre kordon	21:21	59	0:28	5:18	
Holdre mõis	27:26	64	0:29	2:09	
Jaanimäe	29:22	80	0:29	2:25	
Lindmäe	27:55	77	0:27	2:17	
Luhe	21:31	50	0:31	1:41	
LV_Aizupes	0:00	0	0:00	0:00	
LV_Andreni	0:00	0	0:00	0:00	
LV_Apsinas	18:47	47	0:30	4:52	
LV_Attekas	0:00	0	0:00	0:00	
LV_Cesnieki	0:00	0	0:00	0:00	
LV_Dzintari	0:00	0	0:00	0:00	
LV_Gundegas	33:04	70	0:33	8:31	
LV_Lejasumpuli	0:00	0	0:00	0:00	
LV_Medni	0:00	0	0:00	0:00	
LV_Omuli RPP	31:19	91	0:30	7:52	
LV_Rozas	0:00	0	0:00	0:00	
LV_Strazdini	0:00	0	0:00	0:00	
LV_Vecunguri	0:00	0	0:00	0:00	
LV_Vilci	0:00	0	0:00	0:00	
LV_Zeltkalni	0:00	0	0:00	0:00	
LV_Zimelnieki	0:00	0	0:00	0:00	
Mekro	0:00	0	0:00	0:00	
Männiku	0:00	0	0:00	0:00	
Pargi	23:32	66	0:29	2:01	
Pelgu	182:03	206	1:35	23:00	
Sepakõrtsi	0:00	0	0:00	0:00	
Silla	0:00	0	0:00	0:00	
Vanaveski	0:00	0	0:00	0:00	
Vastseveski	0:00	0	0:00	0:00	

To be continued on next page...

SHADOW - Main Result

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

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No.	Shadow, worst case			Shadow, expected values	
	Shadow hours	Shadow days	Max shadow	Shadow hours	
	per year [h/year]	per year [days/year]	hours per day [h/day]	per year [h/year]	
Veski	0:00	0	0:00	0:00	
Viitaku	23:40	52	0:33	1:52	

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

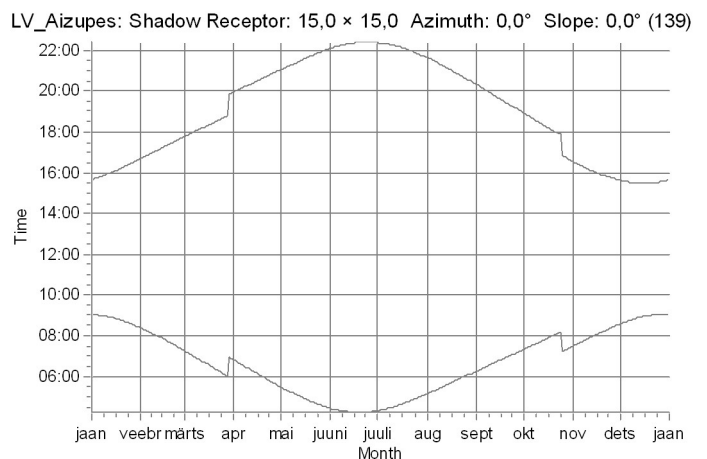
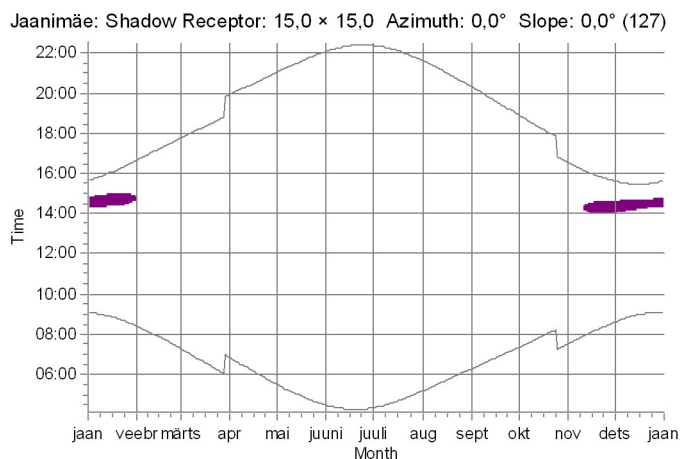
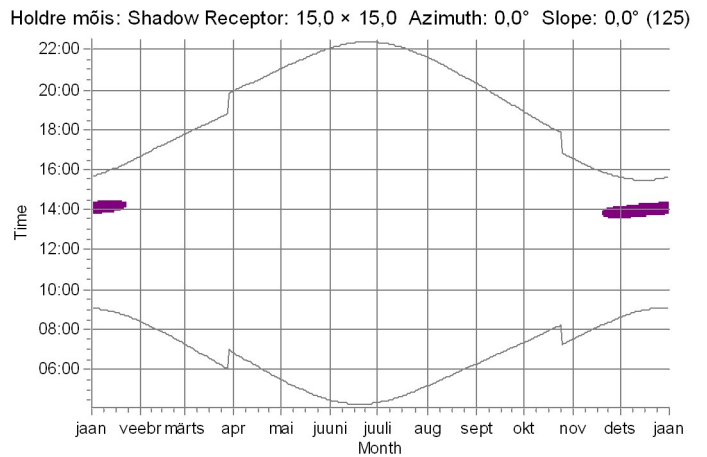
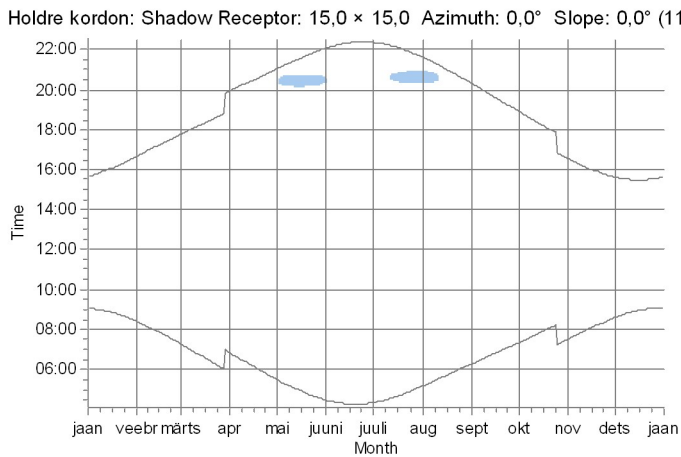
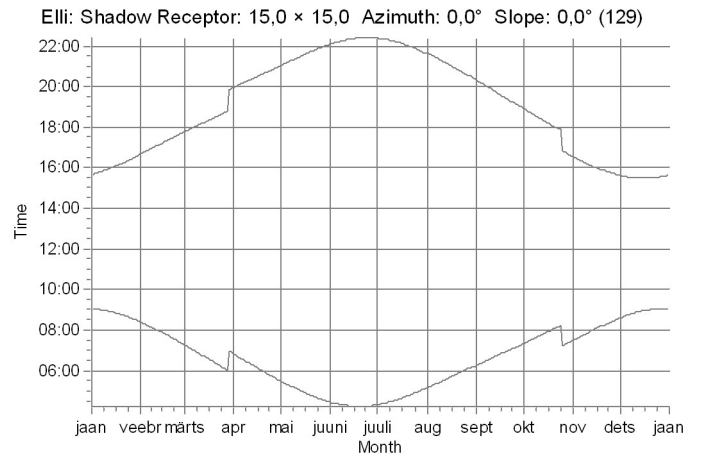
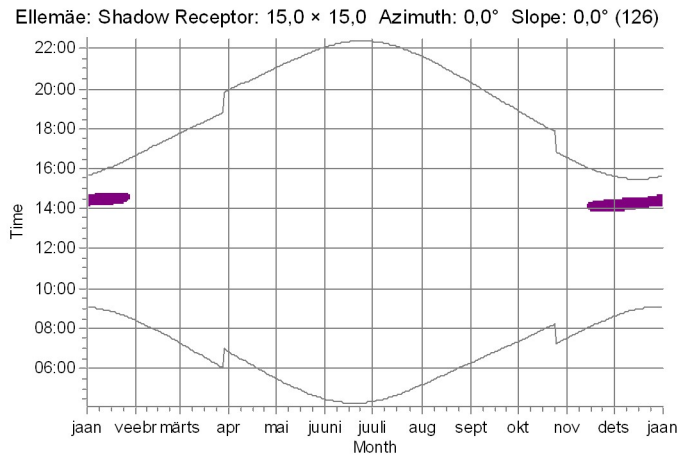
No.	Name		Worst case [h/year]	Expected [h/year]
1	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (140)		0:00	0:00
2	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (137)		45:25	5:21
3	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (139)		0:00	0:00
4	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (138)		29:56	7:01
5	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (141)		0:00	0:00
6	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (144)		20:25	3:09
7	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (142)		0:00	0:00
8	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (143)		0:00	0:00
9	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (145)		55:47	5:09
10	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (152)		0:00	0:00
11	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (146)		120:48	9:44
12	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (150)		0:00	0:00
13	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (149)		18:51	1:27
14	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (151)		0:00	0:00
15	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (147)		50:25	10:33
16	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (156)		0:00	0:00
17	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (153)		0:00	0:00
18	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (148)		0:00	0:00
19	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (157)		33:04	8:31
20	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (155)		0:00	0:00
21	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (154)		18:47	4:52

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, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus



WTGs

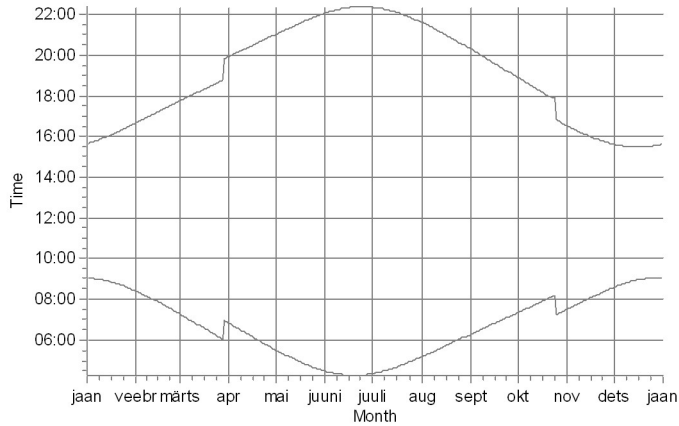
11: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (146)

15: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (147)

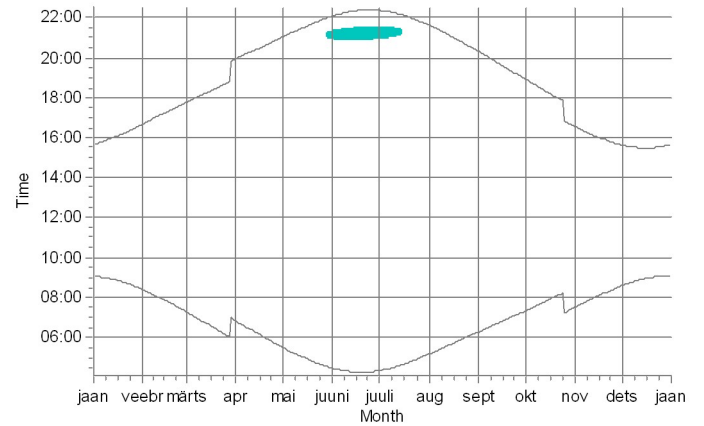
SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

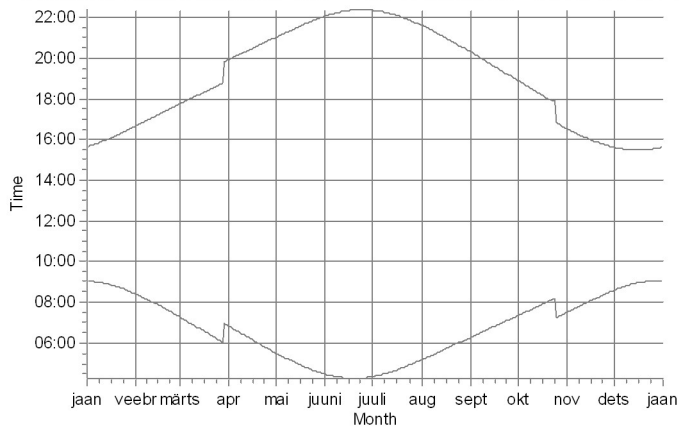
LV_Andreni: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (135)



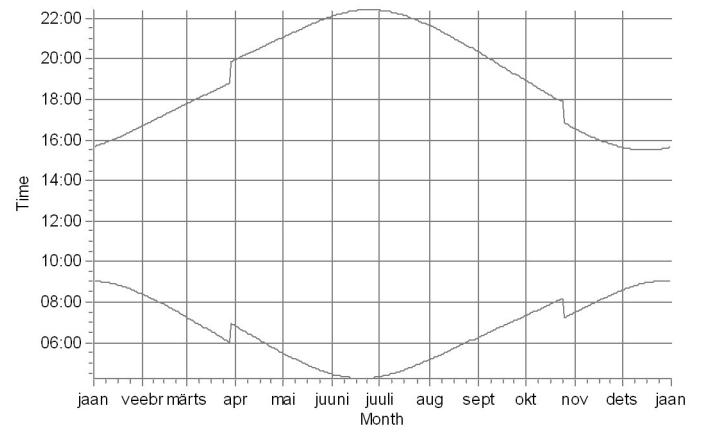
LV_Apsinas: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (138)



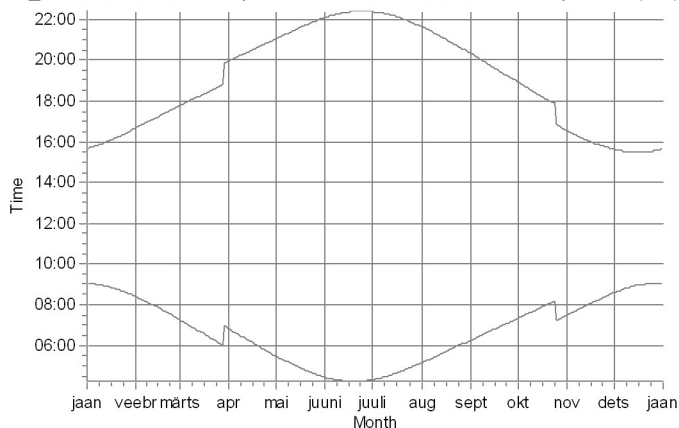
LV_Attekas: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (134)



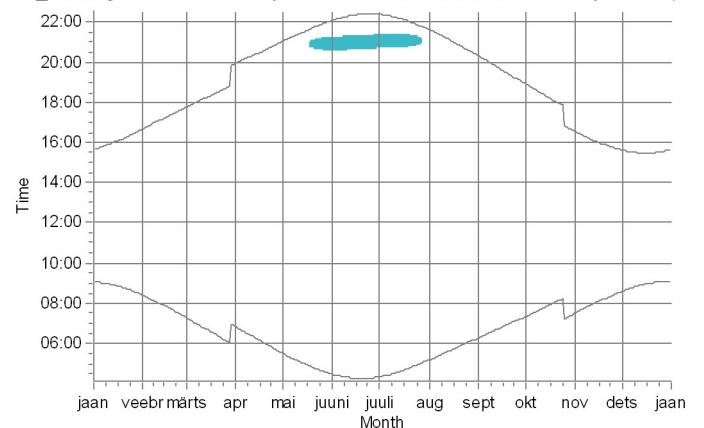
LV_Cesnieki: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (140)



LV_Dzintari: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (143)



LV_Gundegas: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (137)



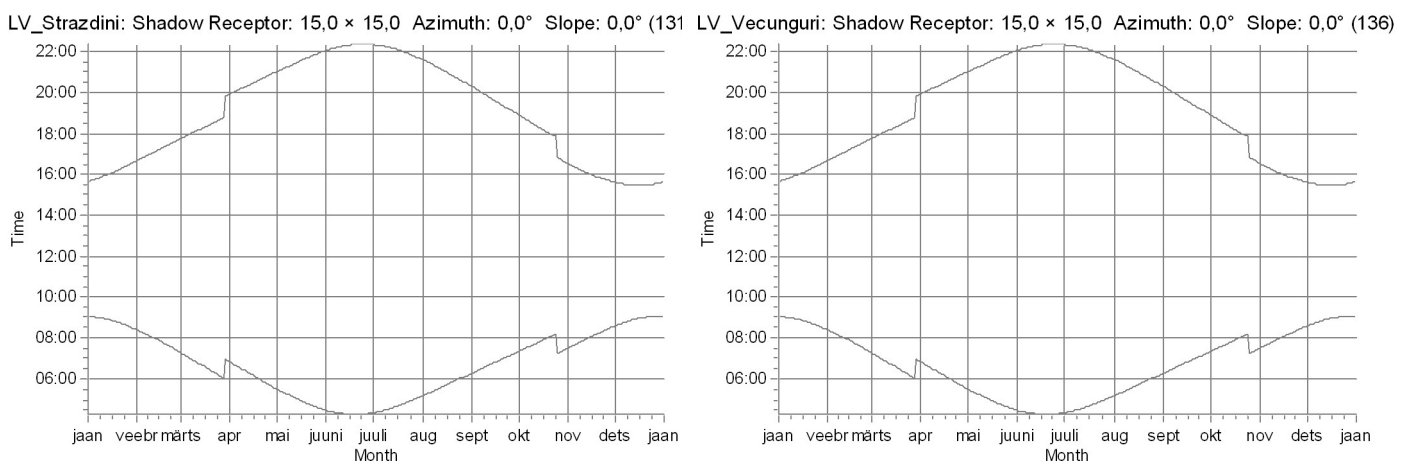
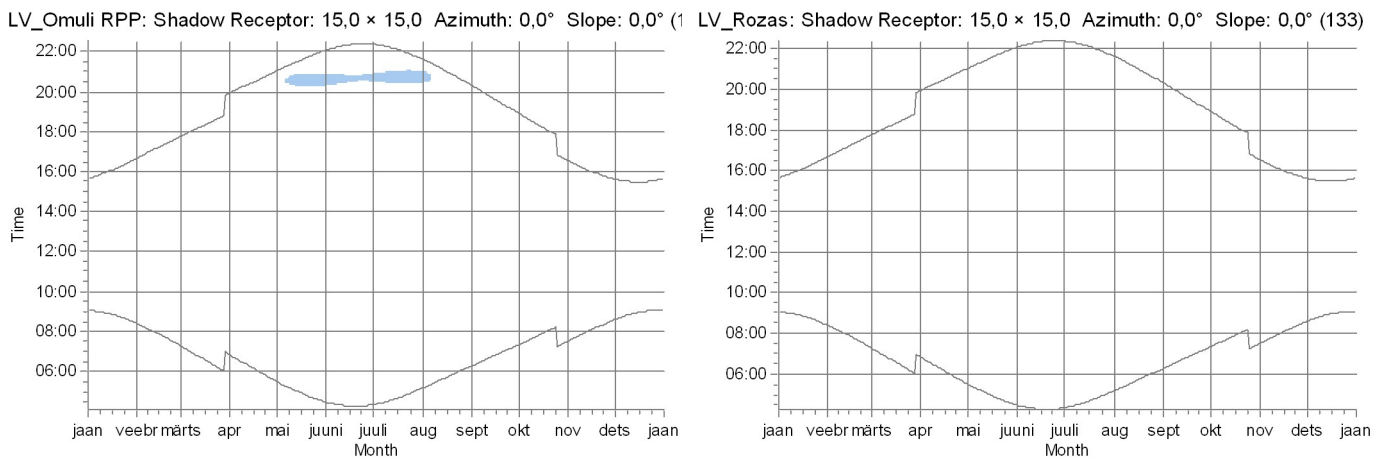
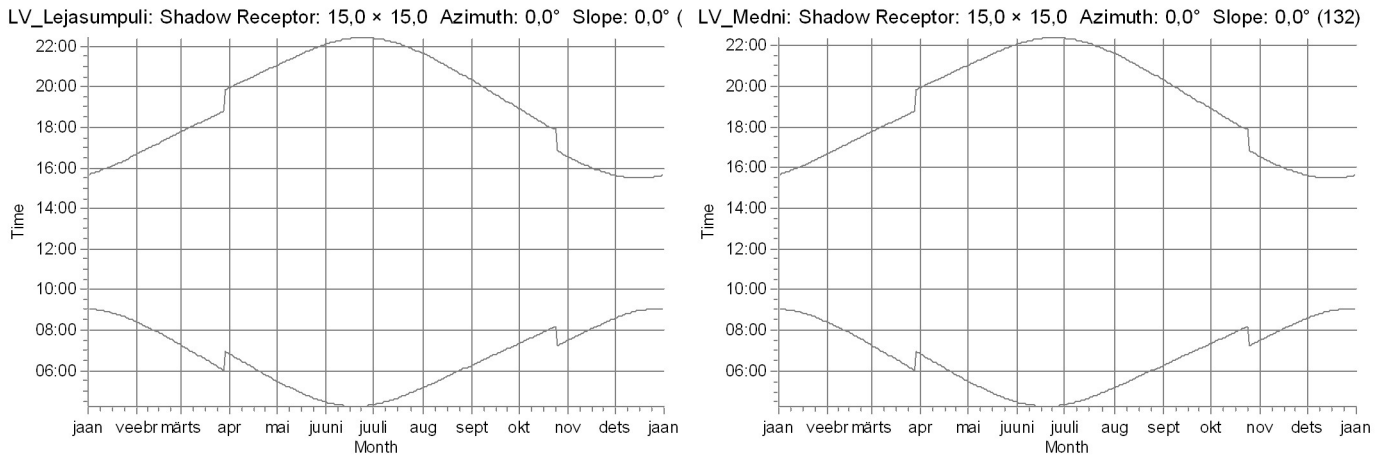
WTGs

19: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (157)

21: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (154)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

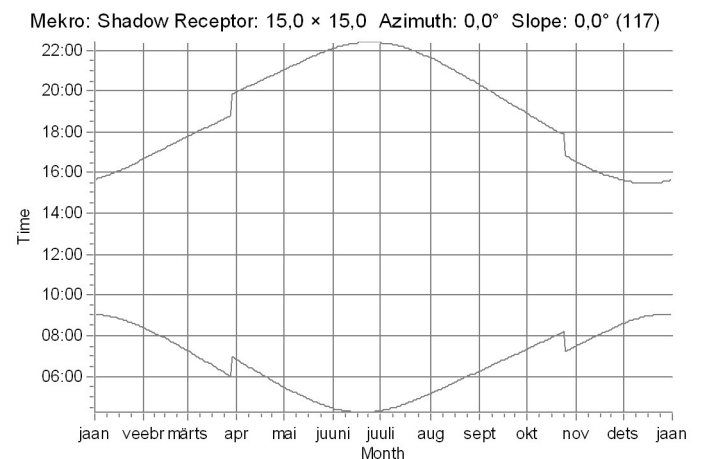
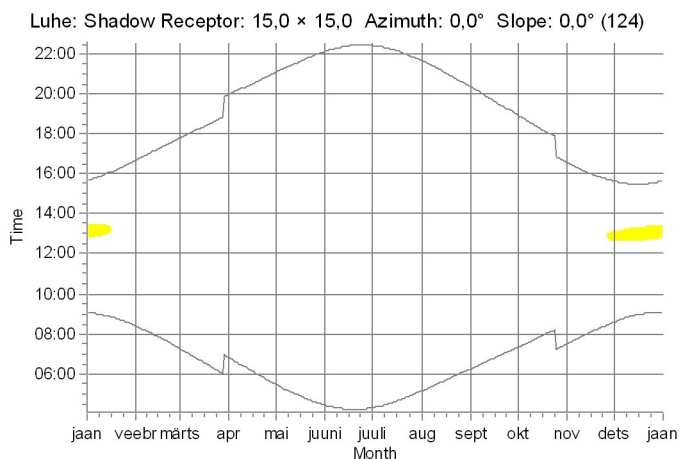
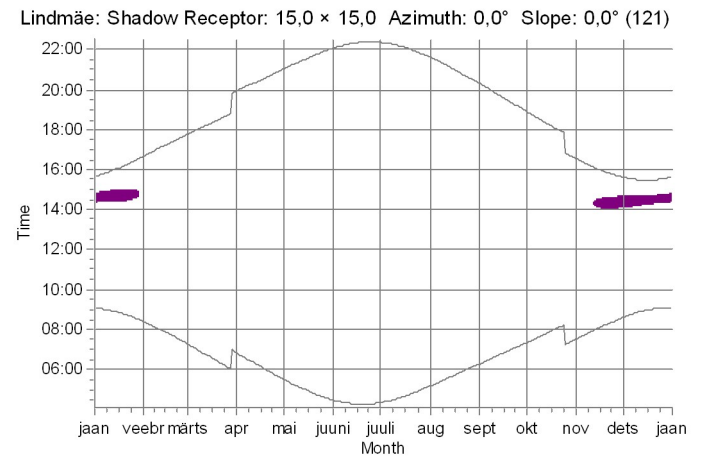
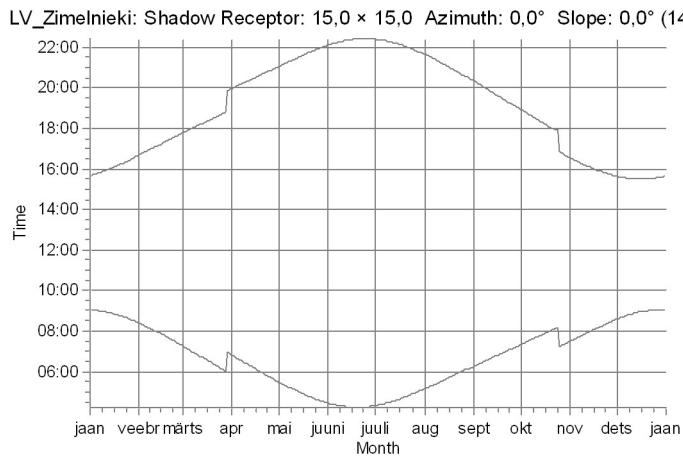
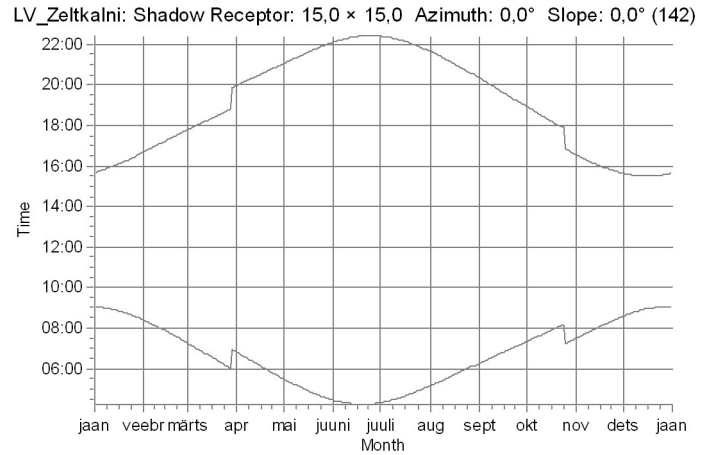
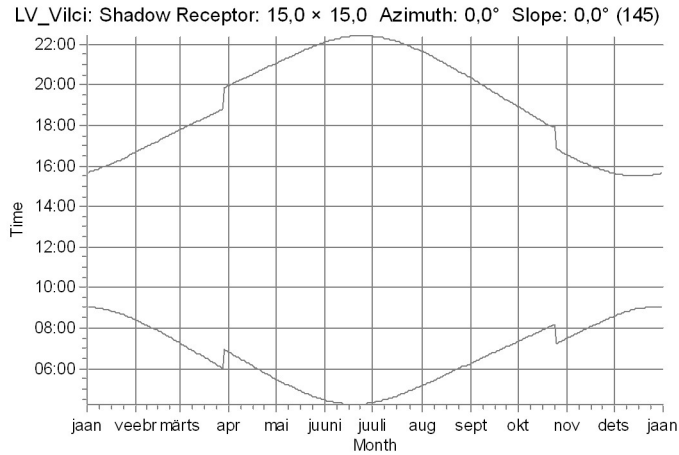


WTGs

15: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (147)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus



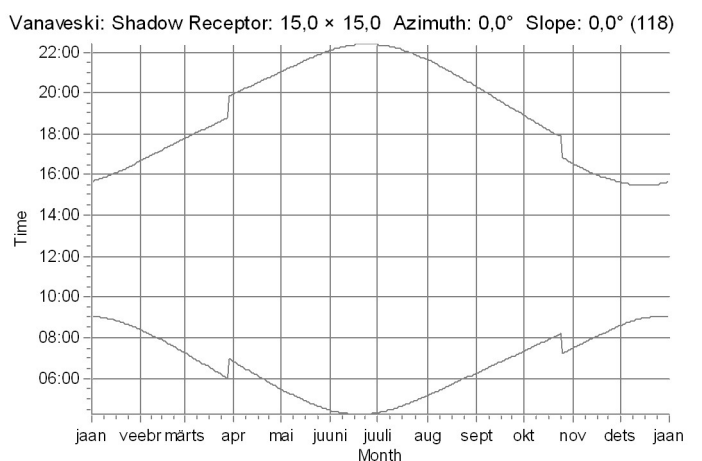
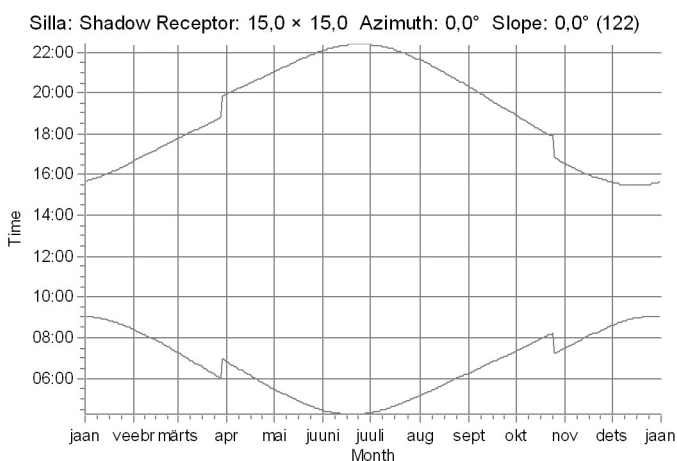
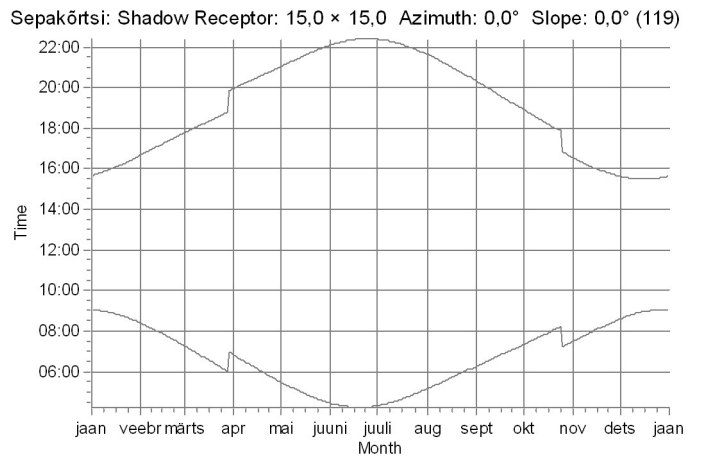
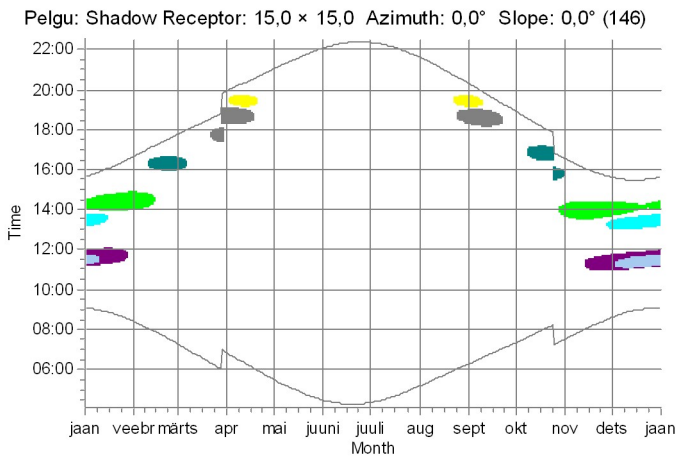
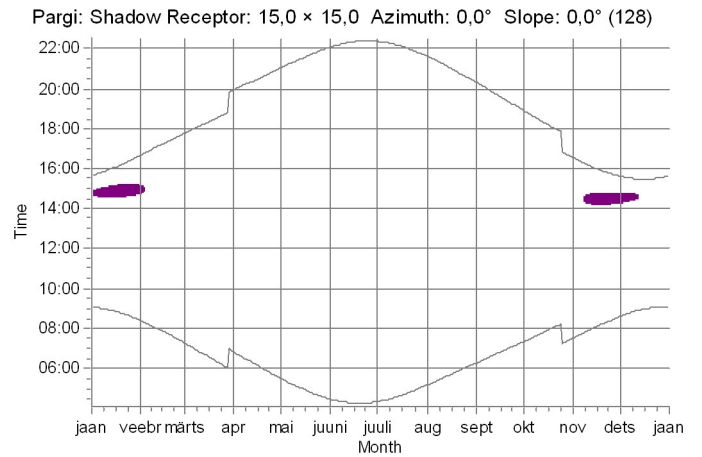
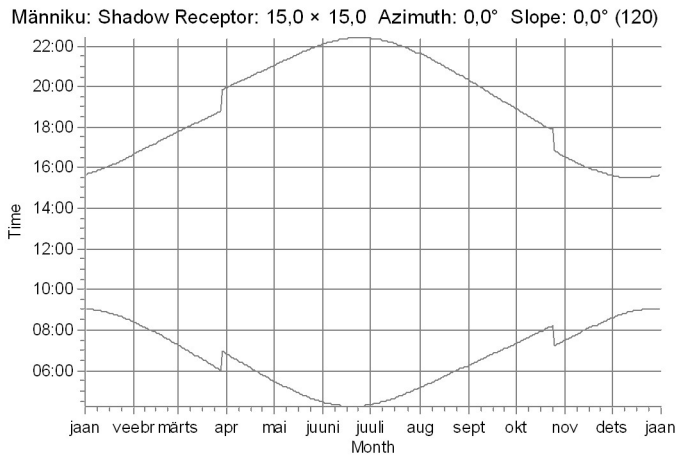
WTGs

2: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (137)

11: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (146)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus



WTGs

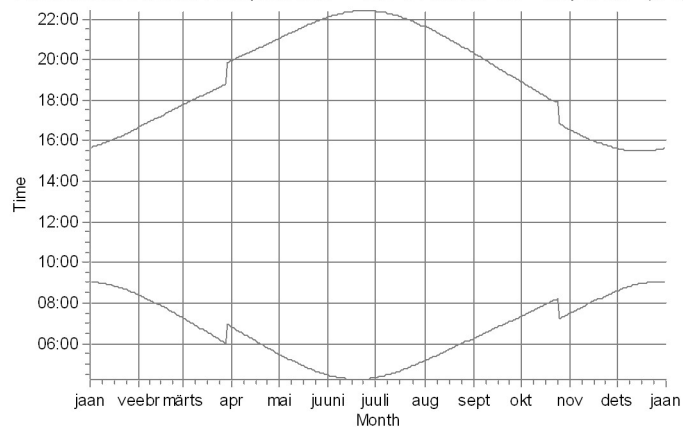
- 2: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (137)
- 4: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (138)
- 6: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (144)
- 9: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (145)

- 11: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (146)
- 13: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (149)
- 15: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (147)

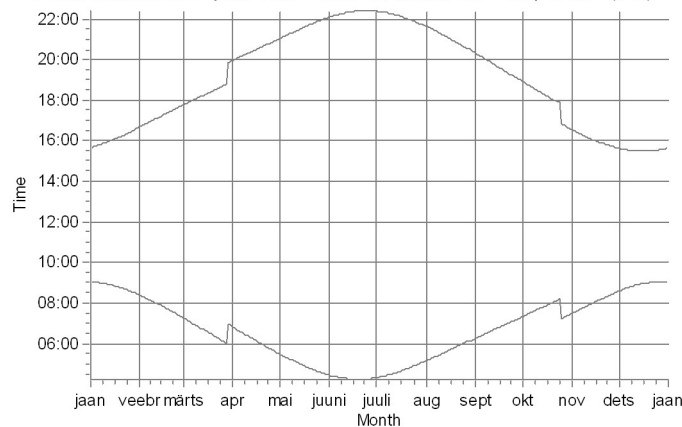
SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus

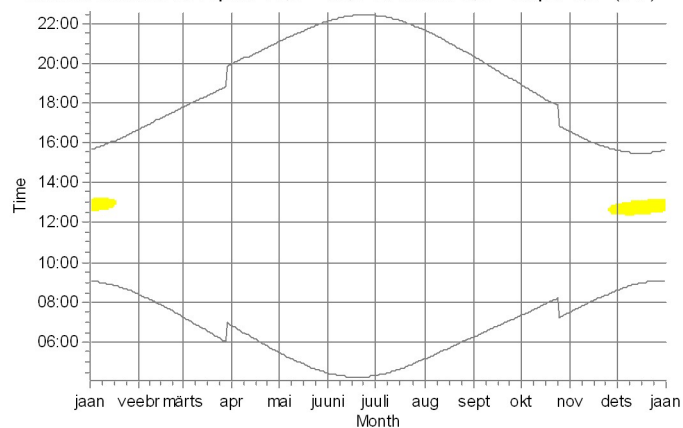
Vastseveski: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (123)



Veski: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (148)



Viitaku: Shadow Receptor: 15,0 × 15,0 Azimuth: 0,0° Slope: 0,0° (147)



WTGs

2: Teoreetiline 300 tipukõrgus 7000 200,0 !0! hub: 200,0 m (TOT: 300,0 m) (137)

SHADOW - Map

Calculation: Varjutus_d200_h200_300m_real case_21052025_muudetud paigutus



Map: EMD OpenStreetMap , Print scale 1:45 000, Map center Estonian Lambert L-EST97-EST97 (EE) East: 600 970 North: 6 421 980

New WTG Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_4.wpo (11)

Time step: 2 minutes, Day step: 3 days, Map resolution: 10 m, Visibility resolution: 5 m, Eye height: 1,5 m