

SHADOW - Main Result

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi 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

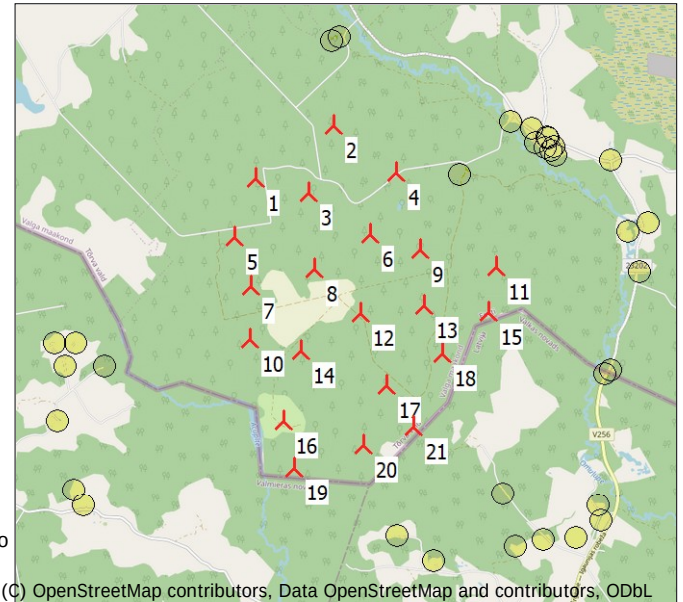
Minimum sun height over horizon for influence 3 °
Day step for calculation 1 days
Time step for calculation 1 minutes

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)



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

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	599 374	6 423 251	97,6	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
2	600 375	6 423 982	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
3	600 077	6 423 076	93,8	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
4	601 226	6 423 379	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
5	599 108	6 422 477	90,8	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
6	600 903	6 422 551	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
7	599 334	6 421 821	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
8	600 172	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	6 422 362	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
10	599 346	6 421 133	88,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
11	602 579	6 422 166	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
12	600 796	6 421 505	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
13	601 640	6 421 636	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
14	600 016	6 420 989	88,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
15	602 495	6 421 568	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
16	599 818	6 420 055	80,9	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
17	601 163	6 420 566	89,9	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
18	601 897	6 421 003	90,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
19	599 965	6 419 437	80,0	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
20	600 884	6 419 773	85,5	Teoreetiline 300 tipukõrgus...	Yes	Teoreetiline	300 tipukõrgus-7 000	7 000	200,0	200,0	1 932	-
21	601 535	6 420 032	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]	a.g.l. [m]	window [°]		(ZVI) a.g.l. [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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Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi 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	6 420 797	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	31:00	66	0:32	2:25	
Elli	25:21	60	0:29	1:57	
Holdre kordon	21:21	59	0:28	5:18	
Holdre mõis	36:20	90	0:31	4:17	
Jaanimäe	33:18	72	0:31	2:39	
Lindmäe	30:57	70	0:30	2:27	
Luhe	53:39	80	0:45	4:21	
LV_Aizupes	0:00	0	0:00	0:00	
LV_Andreni	0:00	0	0:00	0:00	
LV_Apsinas	18:48	47	0:31	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	33:12	70	0:33	8:33	
LV_Lejasumpuli	0:00	0	0:00	0:00	
LV_Medni	0:00	0	0:00	0:00	
LV_Omuli RPP	31:23	91	0:30	7:53	
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	11:03	33	0:26	2:33	
Männiku	24:11	58	0:29	1:51	
Pargi	35:00	80	0:31	2:50	
Pelgu	236:00	241	1:46	34:17	
Sepakõrtsi	0:00	0	0:00	0:00	
Silla	25:14	74	0:26	3:08	
Vanaveski	0:00	0	0:00	0:00	
Vastseveski	20:56	63	0:30	2:53	

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SHADOW - Main Result

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi 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	11:46	34	0:27	2:25	
Viitaku	59:52	84	0:48	4:51	

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

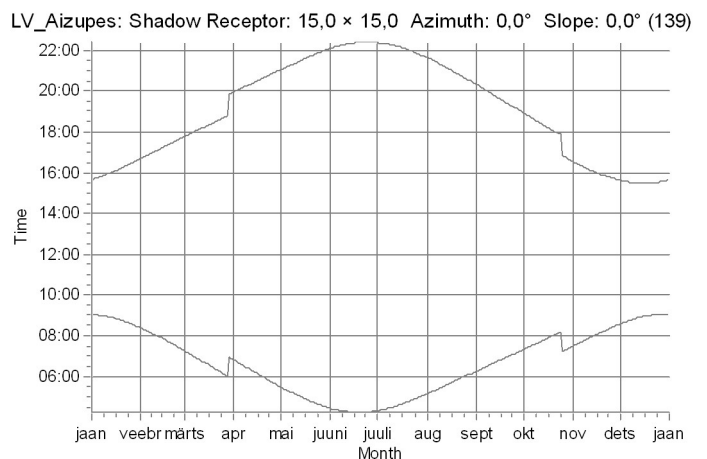
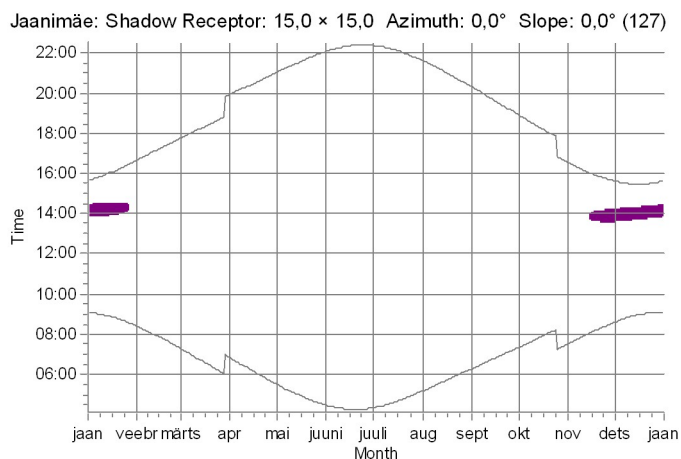
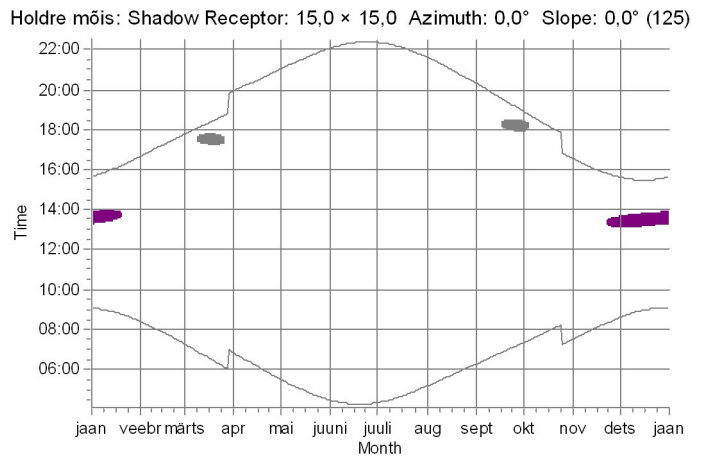
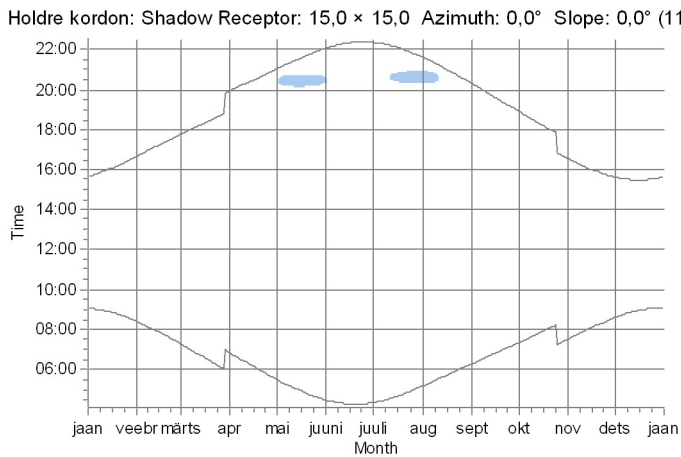
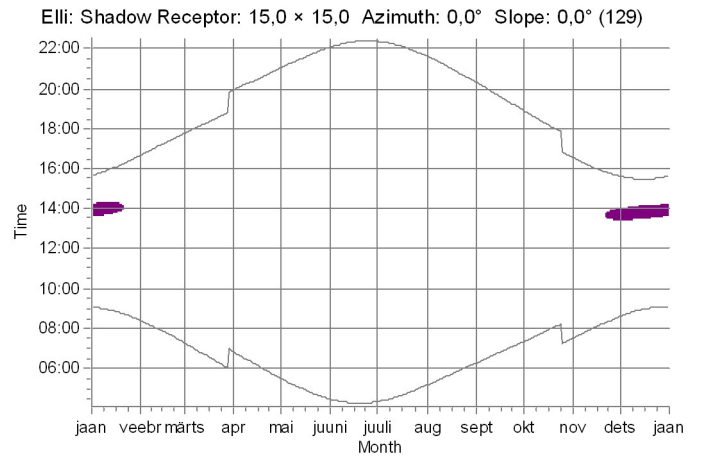
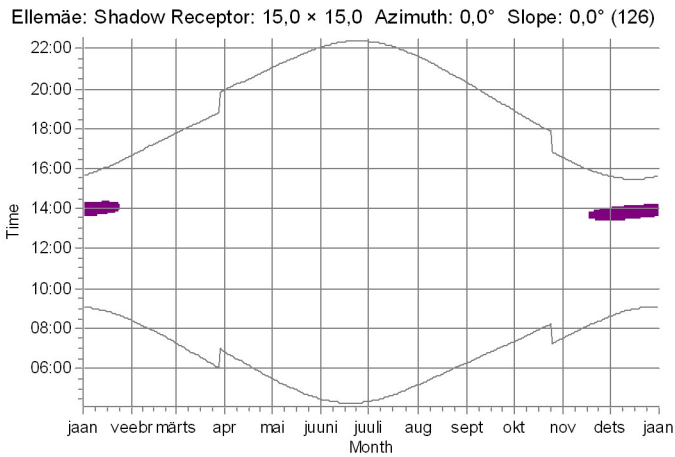
No.	Name		Worst case [h/year]	Expected [h/year]
1	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (111)		0:00	0:00
2	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (129)		102:50	11:01
3	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (131)		0:00	0:00
4	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (130)		96:38	22:25
5	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (128)		0:00	0:00
6	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (112)		20:28	3:09
7	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (114)		0:00	0:00
8	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (113)		0:00	0:00
9	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (127)		55:53	5:09
10	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (122)		0:00	0:00
11	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (119)		165:21	15:59
12	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (126)		0:00	0:00
13	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (121)		18:30	1:25
14	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (123)		0:00	0:00
15	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (118)		50:22	10:33
16	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (124)		0:00	0:00
17	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (125)		0:00	0:00
18	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (117)		0:00	0:00
19	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (115)		33:12	8:33
20	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (116)		0:00	0:00
21	Teoreetiline 300 tipukõrgus 7000 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (120)		18:48	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_eksiisi paigutus



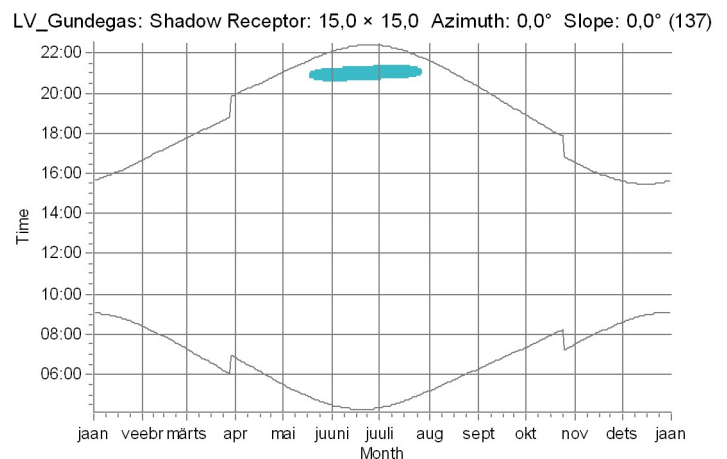
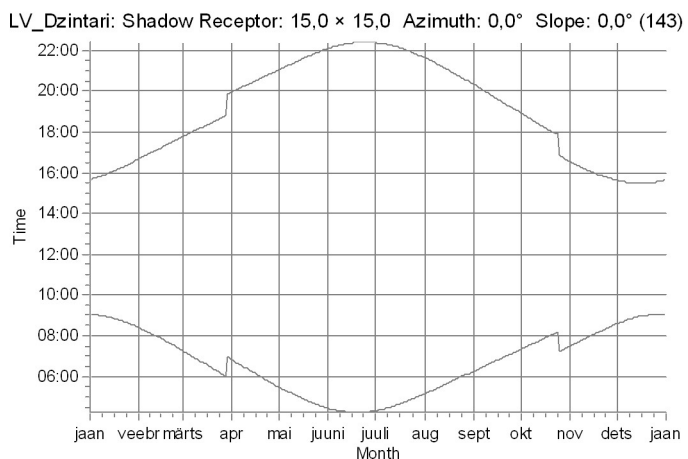
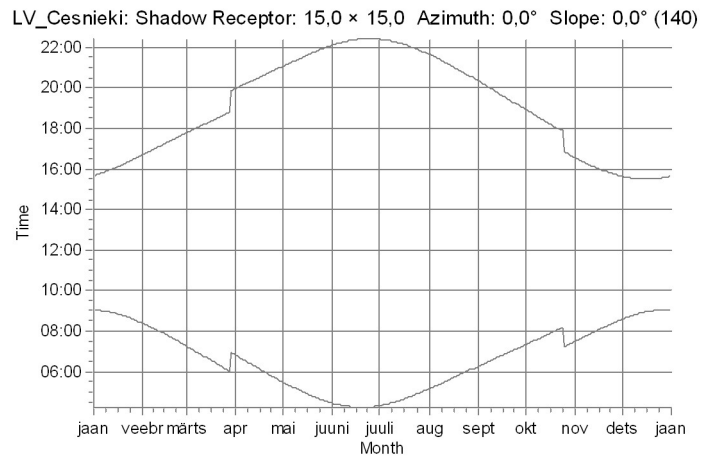
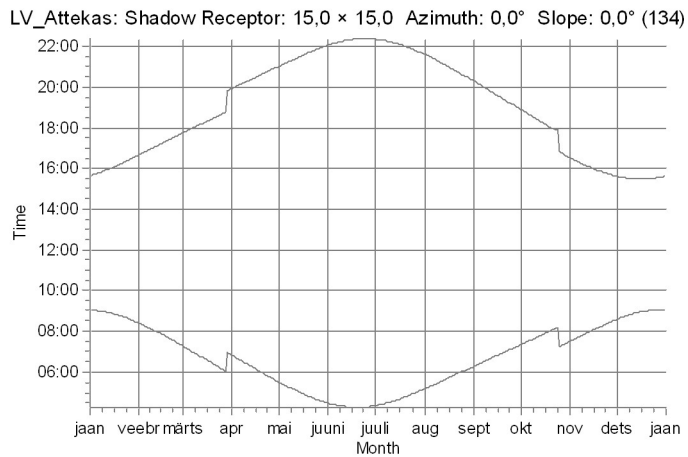
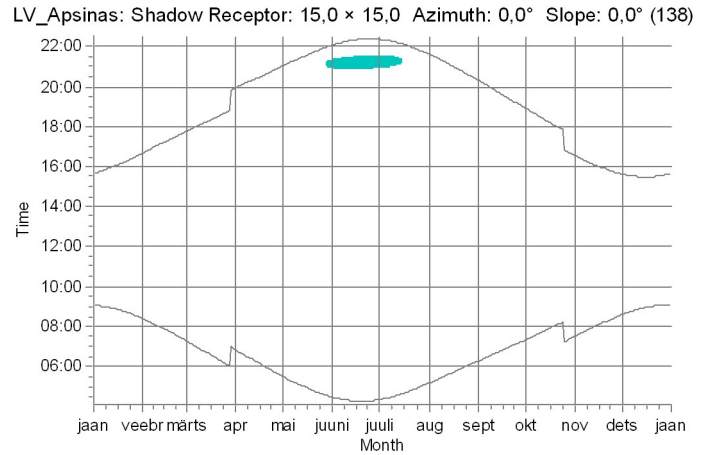
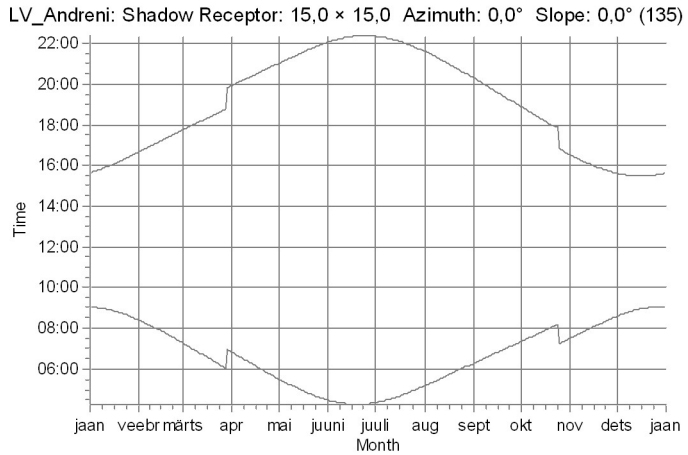
WTGs

4: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (130)
11: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (119)

15: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (118)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi paigutus



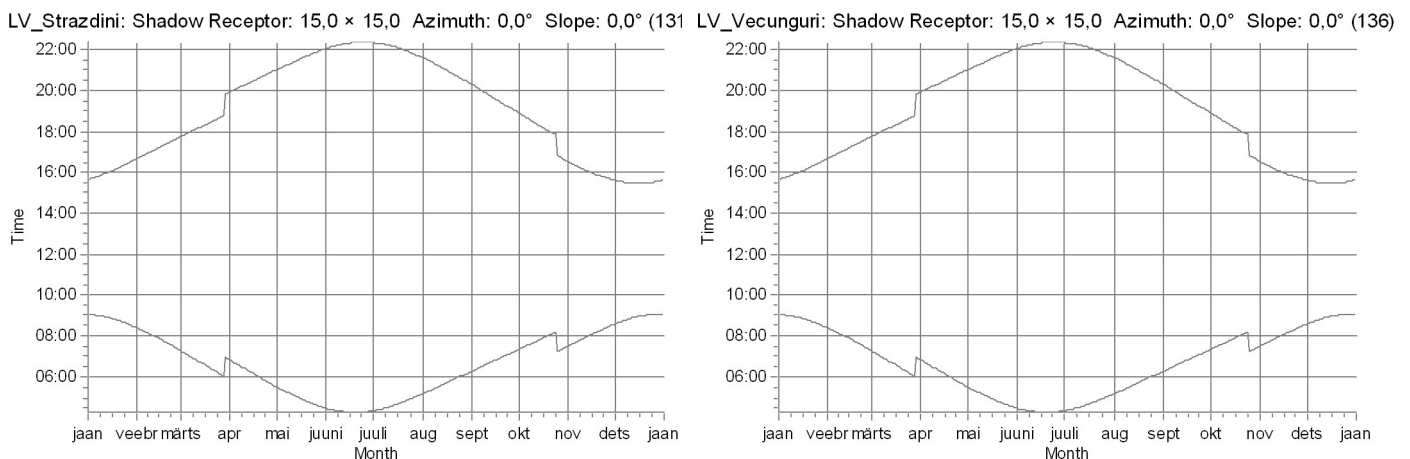
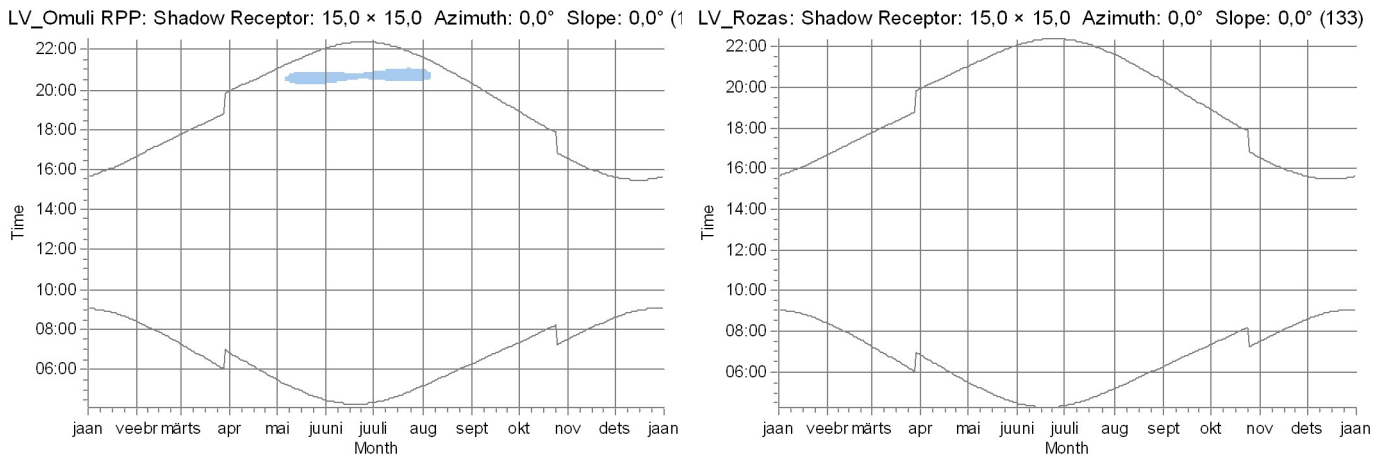
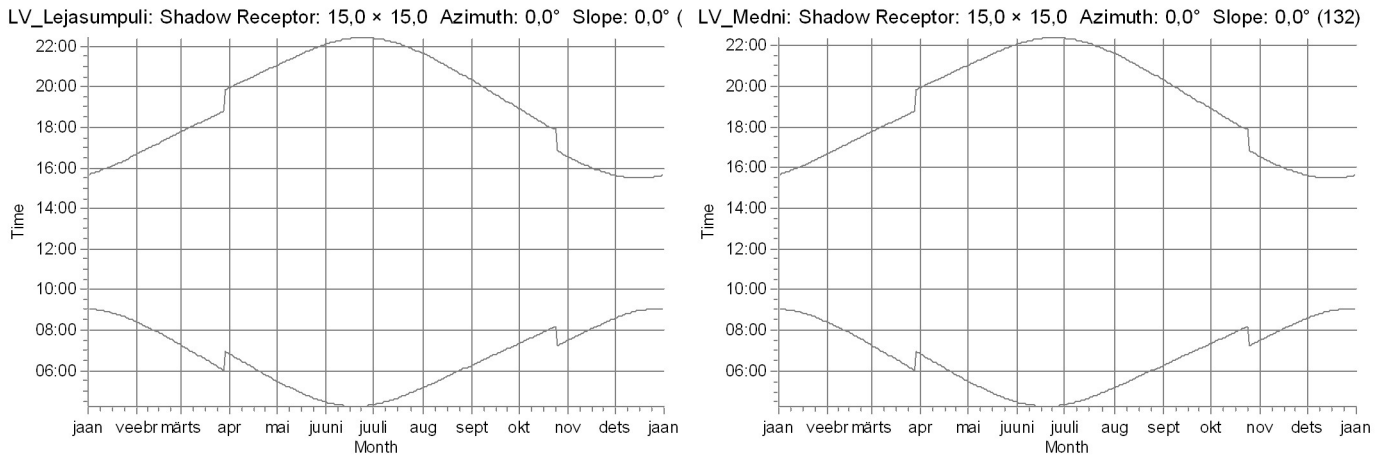
WTGs

19: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (115)

21: Teoreetiline 300 tipukõrgus 7000 200,0 !OI! hub: 200,0 m (TOT: 300,0 m) (120)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi paigutus

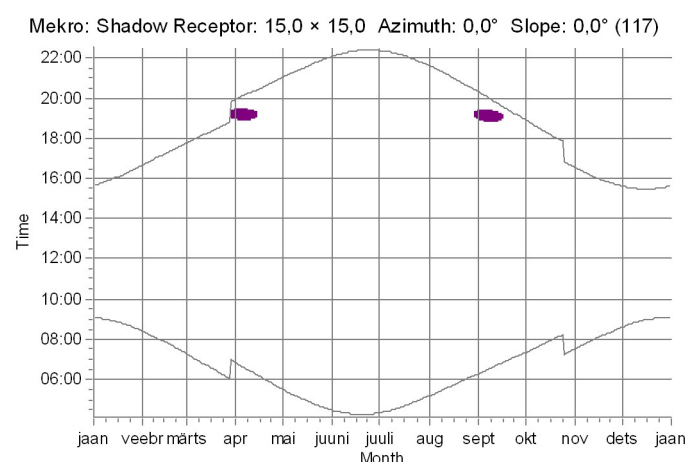
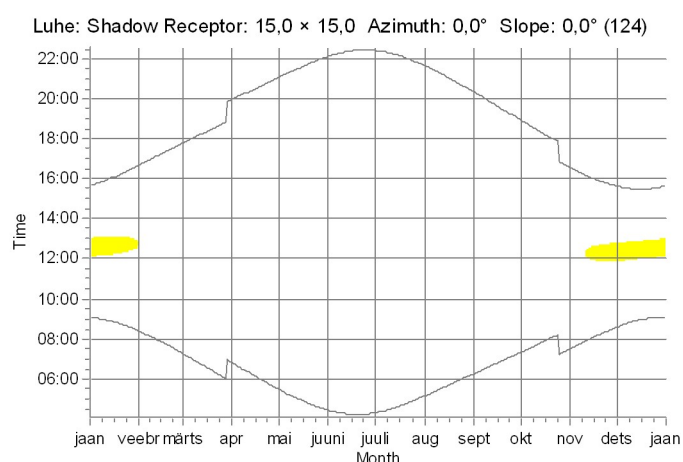
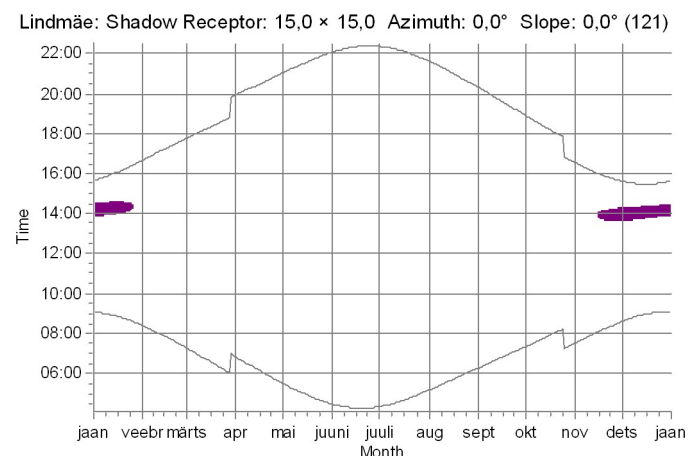
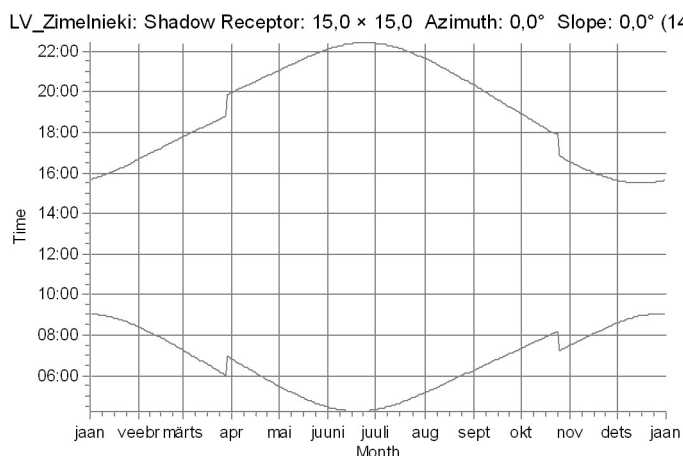
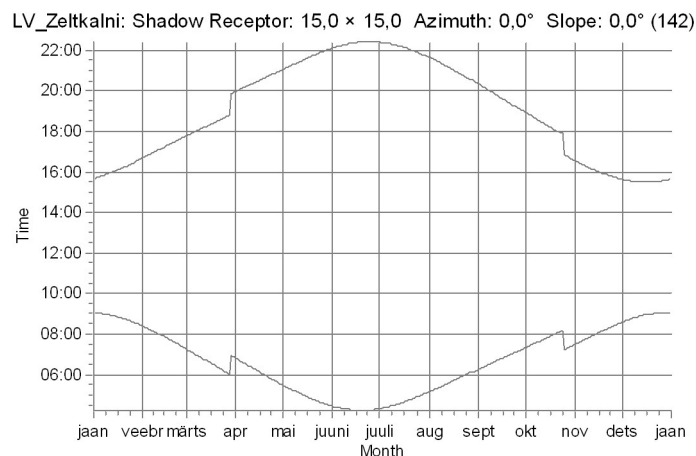
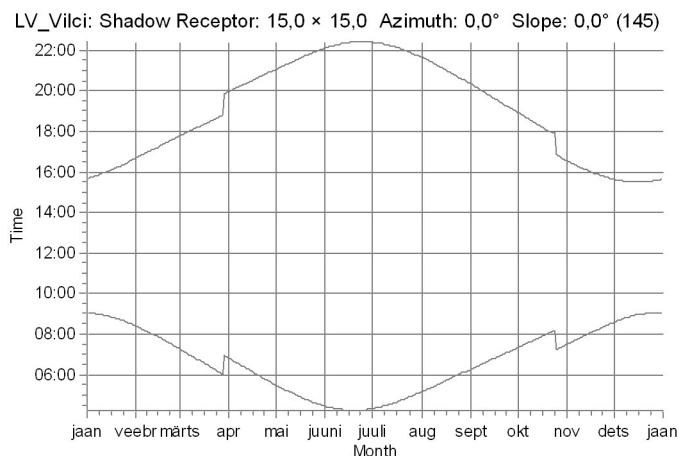


WTGs

15: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (118)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi paigutus



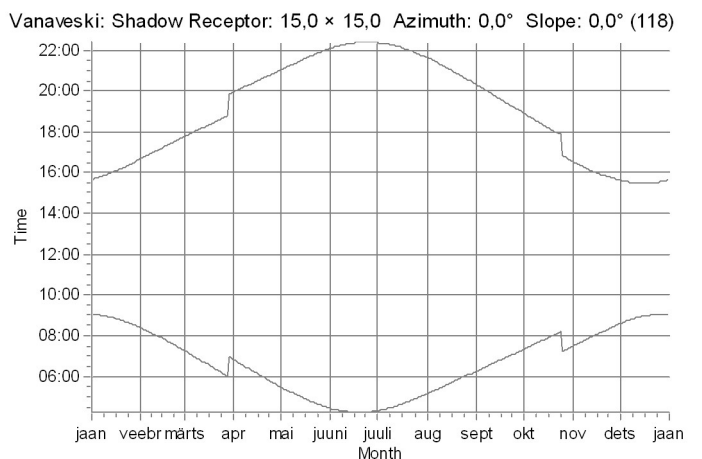
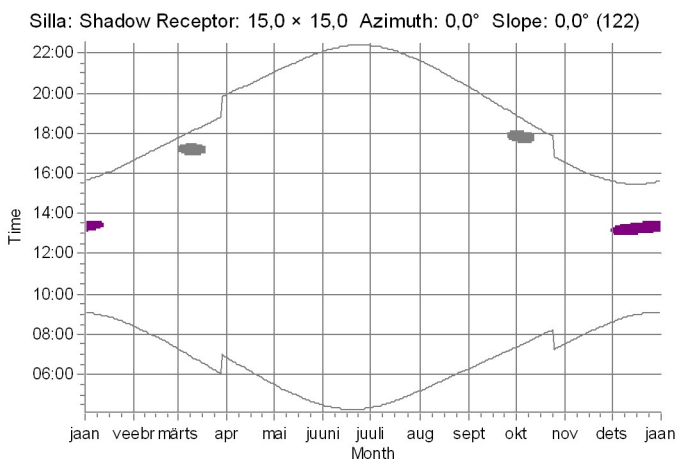
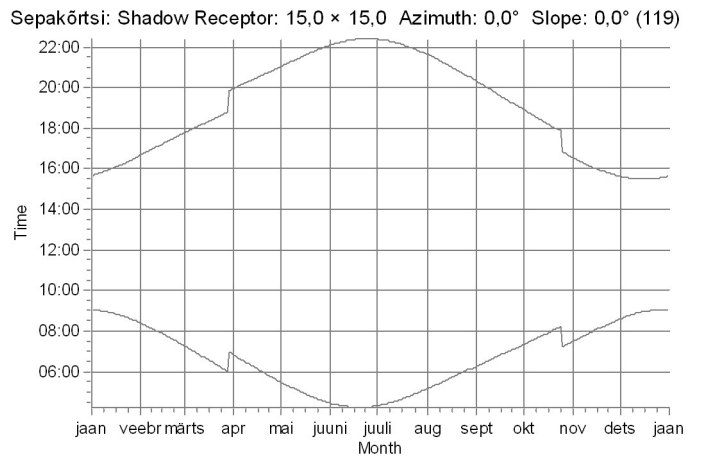
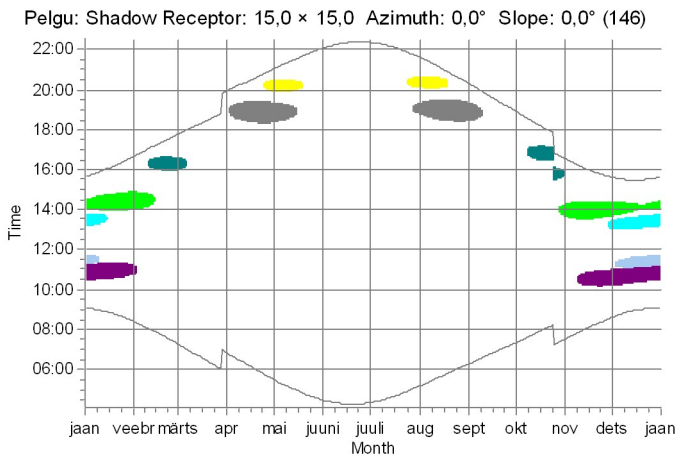
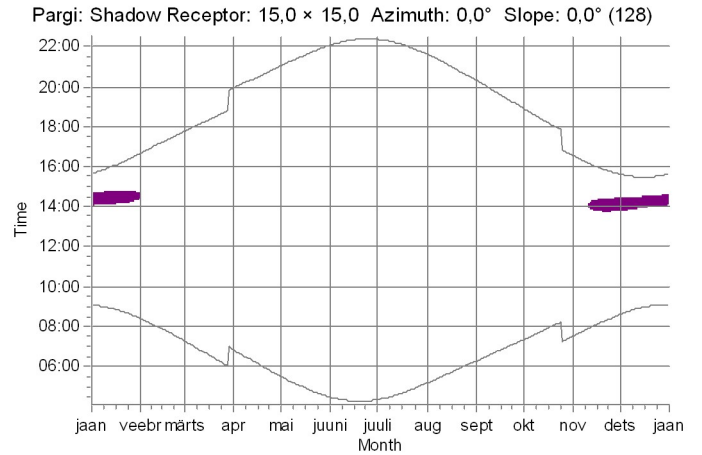
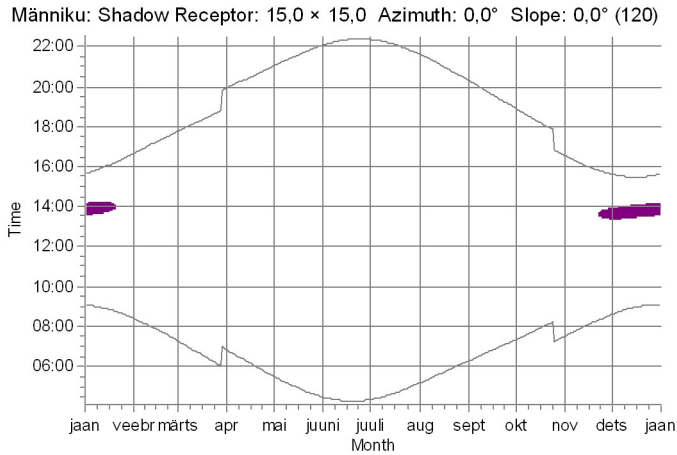
WTGs

2: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (129)

11: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (119)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi paigutus



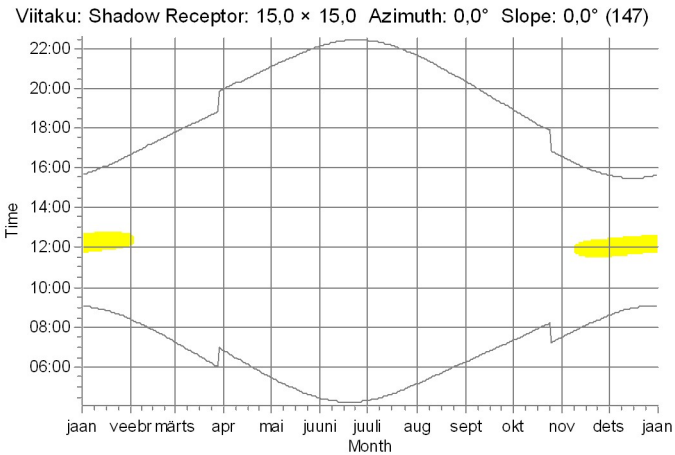
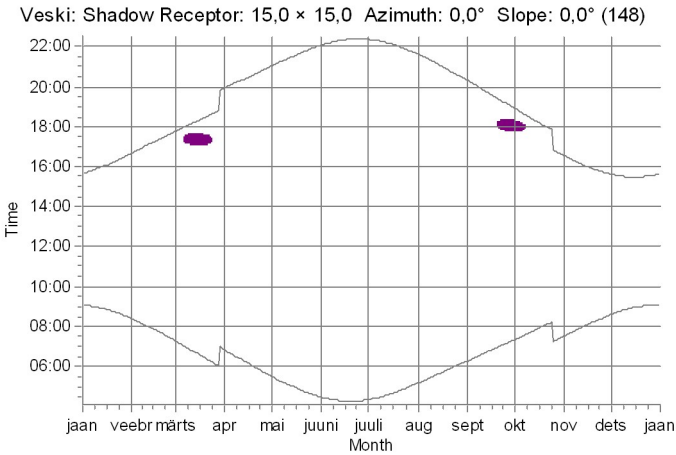
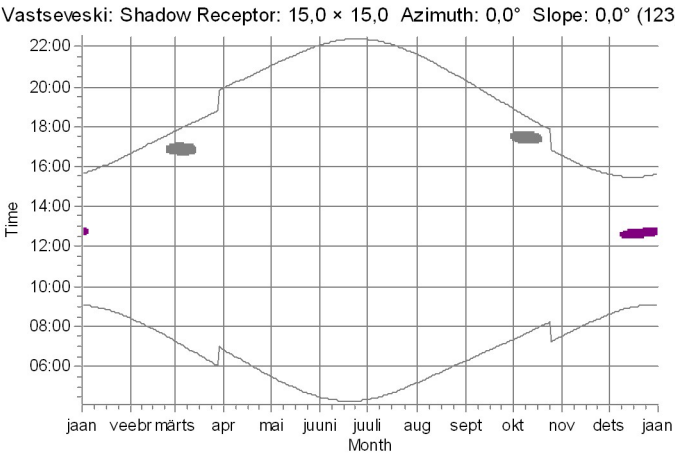
WTGs

- 2: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (129)
- 4: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (130)
- 6: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (112)
- 9: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (127)

- 11: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (119)
- 13: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (121)
- 15: Teoreetiline 300 tipukõrgus 7000 200,0 lOI hub: 200,0 m (TOT: 300,0 m) (118)

SHADOW - Calendar, graphical

Calculation: Varjutus_d200_h200_300m_real case_21052025_eksiisi paigutus



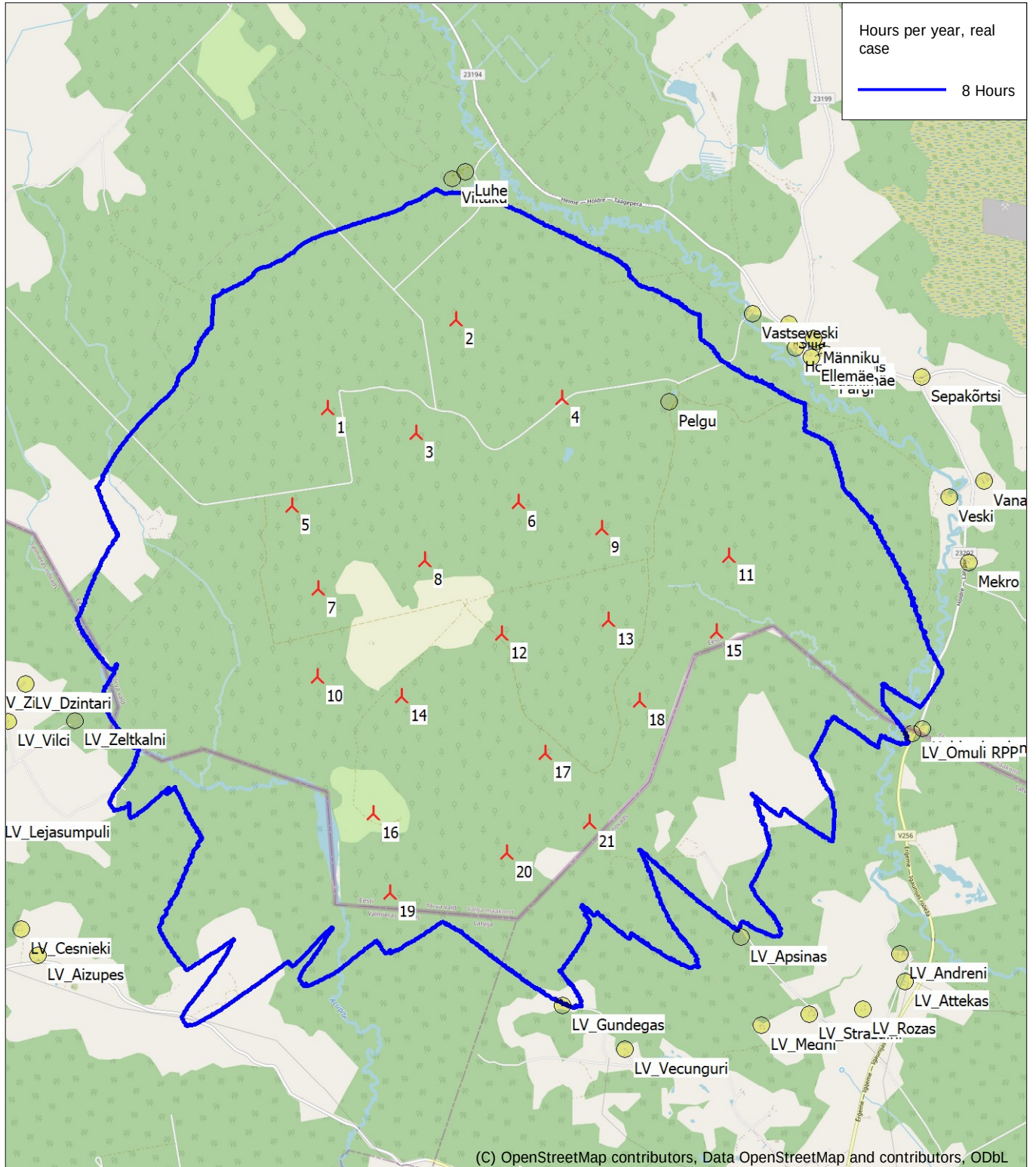
WTGs

2: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (129)
4: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (130)

11: Teoreetiline 300 tipukõrgus 7000 200,0 !OI hub: 200,0 m (TOT: 300,0 m) (119)

SHADOW - Map

Calculation: Varjutus_d200_h200_300m_real case_21052025_eskiisi 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