

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean

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
 1,00 2,82 4,23 6,60 8,77 9,10 8,87 6,81 4,67 2,52 1,17 0,58

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

Meteo MIDDLE

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 569 428 341 332 536 819 844 1 304 1 282 825 621 645 8 546

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: DEM 2m and 10m combined, 3km WTG buffer

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
01	373 367	7 076 738	110,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
02	373 697	7 075 584	107,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
03	374 469	7 074 357	115,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
04	374 770	7 074 027	120,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
05	375 473	7 073 753	116,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
06	375 912	7 073 642	116,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
07	374 906	7 073 488	118,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
08	375 414	7 073 121	122,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
09	376 074	7 073 057	120,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
10	375 580	7 072 615	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
11	376 274	7 072 576	124,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
12	376 435	7 072 079	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
13	375 788	7 072 031	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
14	375 205	7 072 027	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
15	376 582	7 071 654	127,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
16	376 000	7 071 526	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
17	375 019	7 071 345	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
18	376 169	7 071 006	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
19	375 136	7 070 732	129,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
20	375 218	7 070 244	127,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
21	374 833	7 069 783	126,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
22	374 077	7 069 104	122,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
23	374 370	7 068 668	125,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
24	373 964	7 068 043	122,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
25	375 646	7 067 770	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
26	374 664	7 067 622	125,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
27	374 145	7 067 529	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
28	375 966	7 067 331	127,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
29	374 335	7 067 008	129,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
30	374 819	7 066 904	127,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

To be continued on next page...

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
31	376 155	7 066 896	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
32	374 542	7 066 292	129,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
33	374 710	7 065 802	134,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
34	374 881	7 065 305	138,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
35	375 674	7 065 211	132,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
36	375 016	7 064 939	140,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
37	376 055	7 064 862	132,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
38	375 345	7 064 536	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
39	376 410	7 064 475	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
40	375 741	7 064 204	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
41	376 740	7 064 084	143,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
42	374 795	7 064 083	137,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
43	374 069	7 063 828	139,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
44	377 131	7 063 794	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
45	373 609	7 063 358	143,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
46	377 390	7 063 326	133,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
47	374 157	7 063 277	140,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
48	377 619	7 062 838	139,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
49	373 681	7 062 818	138,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
50	377 073	7 062 695	140,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
51	377 933	7 062 433	140,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
52	373 684	7 062 209	140,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
53	377 376	7 062 173	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
54	378 243	7 062 018	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
55	377 732	7 061 631	139,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
56	378 625	7 061 499	140,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
57	378 971	7 061 009	140,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
58	379 278	7 060 609	140,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
59	379 575	7 060 209	139,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
60	379 886	7 059 789	138,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
61	380 194	7 059 386	137,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
62	379 576	7 059 193	136,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
63	380 448	7 059 035	137,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
64	380 241	7 057 057	137,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
65	379 995	7 056 273	145,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
66	380 774	7 055 822	143,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
67	380 652	7 055 184	144,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
68	379 308	7 054 980	144,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
69	380 245	7 054 621	147,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
70	379 337	7 054 426	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
71	380 475	7 054 159	147,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
72	379 953	7 053 813	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
73	379 791	7 053 110	147,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
74	379 467	7 052 420	151,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

Shadow receptor-Input

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]	[°]	[°]	
HH 01	374 069	7 077 887	125,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	373 882	7 077 755	117,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	376 900	7 075 109	132,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	376 899	7 074 798	135,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	377 095	7 074 764	134,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	376 880	7 074 646	133,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	373 257	7 074 409	117,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	372 871	7 073 829	116,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	373 520	7 072 436	134,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 11	372 438	7 069 086	112,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 12	372 627	7 069 022	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 13	372 570	7 068 991	113,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 14	375 778	7 068 878	126,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 15	375 910	7 068 771	125,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"

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SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean

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No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
HH 16	376 200	7 068 709	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 17	377 846	7 065 354	129,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 18	378 993	7 064 740	130,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 19	379 078	7 064 730	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 20	379 286	7 063 477	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 21	379 291	7 063 465	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 22	379 745	7 063 233	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 23	375 558	7 062 617	136,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 24	375 256	7 062 130	136,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 25	375 559	7 061 749	136,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 26	373 007	7 060 703	128,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 27	374 178	7 060 399	133,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 30	378 823	7 059 797	135,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 31	378 182	7 057 540	139,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 32	379 304	7 064 226	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 33	378 154	7 066 356	127,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	372 544	7 077 498	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	371 966	7 076 389	113,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	372 207	7 074 831	109,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	372 752	7 069 059	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	371 432	7 068 470	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	371 884	7 061 455	118,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	371 852	7 061 382	114,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	372 074	7 061 332	115,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	371 756	7 060 969	112,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	371 786	7 060 961	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	371 798	7 060 874	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	373 020	7 060 570	124,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	373 017	7 060 532	124,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	370 705	7 062 000	103,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	370 704	7 061 994	103,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	370 803	7 061 826	100,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	370 957	7 061 724	99,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	370 886	7 061 635	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	370 891	7 061 560	99,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	370 902	7 061 248	99,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	370 911	7 061 183	99,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	371 777	7 060 732	112,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	371 641	7 060 416	108,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	371 386	7 060 287	102,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	371 521	7 060 262	113,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	371 446	7 060 228	105,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 27	371 508	7 060 214	107,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 28	373 328	7 059 399	125,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 29	373 356	7 059 368	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 30	376 662	7 058 377	135,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, expected values

No.	Shadow hours per year [h/year]
HH 01	1:51
HH 02	2:37
HH 03	0:57
HH 04	2:28
HH 05	1:13
HH 06	3:52
HH 07	4:05
HH 08	1:53
HH 09	4:46
HH 11	1:29

To be continued on next page...

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

Shadow, expected values

No.	Shadow hours per year [h/year]
HH 12	4:14
HH 13	3:00
HH 14	14:38
HH 15	13:39
HH 16	7:59
HH 17	3:29
HH 18	0:00
HH 19	0:00
HH 20	3:11
HH 21	3:12
HH 22	0:00
HH 23	4:18
HH 24	7:53
HH 25	2:51
HH 26	0:00
HH 27	0:00
HH 30	21:58
HH 31	0:00
HH 32	0:00
HH 33	0:00
RH 01	2:25
RH 02	2:27
RH 03	2:34
RH 04	4:53
RH 05	0:00
RH 06	0:00
RH 07	0:00
RH 08	0:00
RH 09	0:00
RH 10	0:00
RH 11	0:00
RH 12	0:00
RH 13	0:00
RH 14	0:00
RH 15	0:00
RH 16	0:00
RH 17	0:00
RH 18	0:00
RH 19	0:00
RH 20	0:00
RH 21	0:00
RH 22	0:00
RH 23	0:00
RH 24	0:00
RH 25	0:00
RH 26	0:00
RH 27	0:00
RH 28	0:00
RH 29	0:00
RH 30	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
01	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (244)	51:33	9:02
02	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (262)	9:06	2:34
03	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (243)	18:48	4:37
04	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (245)	6:38	1:21
05	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (265)	11:00	2:00
06	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (266)	28:07	4:30
07	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (264)	12:48	3:42
08	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (267)	0:00	0:00

To be continued on next page...

SHADOW - Main Result

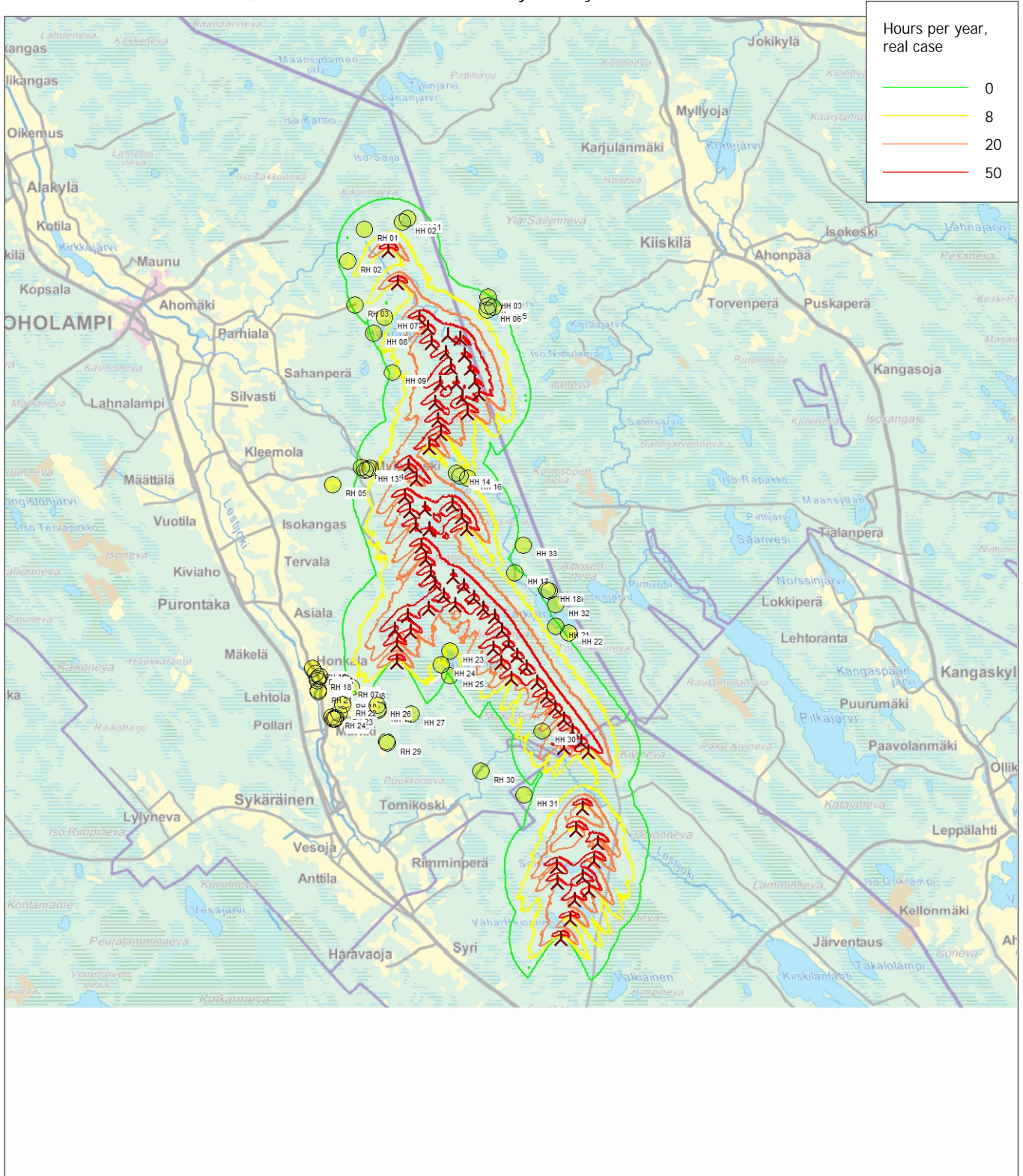
Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
09	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (252)	8:18	0:58
10	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (268)	0:00	0:00
11	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (249)	0:00	0:00
12	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (247)	0:00	0:00
13	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (253)	0:00	0:00
14	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (255)	5:18	1:04
15	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (246)	0:00	0:00
16	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (248)	0:00	0:00
17	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (269)	0:00	0:00
18	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (251)	0:00	0:00
19	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (250)	0:00	0:00
20	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (257)	0:00	0:00
21	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (258)	35:01	9:27
22	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (259)	21:35	5:15
23	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (260)	23:12	4:55
24	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (254)	15:45	2:45
25	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (242)	60:00	8:44
26	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (261)	14:20	2:29
27	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (270)	0:00	0:00
28	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (271)	43:31	4:59
29	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (272)	0:00	0:00
30	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (273)	0:00	0:00
31	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (274)	0:00	0:00
32	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (275)	0:00	0:00
33	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (276)	0:00	0:00
34	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (277)	0:00	0:00
35	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (278)	0:00	0:00
36	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (279)	0:00	0:00
37	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (280)	0:00	0:00
38	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (281)	0:00	0:00
39	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (282)	6:10	1:08
40	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (283)	0:00	0:00
41	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (284)	7:23	1:13
42	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (285)	0:00	0:00
43	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (287)	0:00	0:00
44	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (288)	9:19	1:06
45	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (291)	0:00	0:00
46	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (292)	0:00	0:00
47	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (293)	26:06	6:54
48	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (296)	5:51	1:06
49	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (297)	7:10	1:49
50	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (298)	17:20	4:42
51	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (299)	7:00	1:16
52	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (300)	6:54	1:36
53	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (301)	0:00	0:00
54	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (302)	7:52	1:10
55	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (304)	0:00	0:00
56	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (305)	0:00	0:00
57	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (306)	0:00	0:00
58	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (307)	0:00	0:00
59	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (309)	43:54	12:29
60	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (310)	15:24	3:48
61	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (311)	7:52	1:36
62	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (312)	17:41	3:11
63	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (313)	5:15	0:57
64	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (308)	0:00	0:00
65	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (314)	0:00	0:00
66	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (315)	0:00	0:00
67	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (316)	0:00	0:00
68	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (317)	0:00	0:00
69	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (318)	0:00	0:00
70	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (319)	0:00	0:00
71	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (320)	0:00	0:00
72	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (321)	0:00	0:00
73	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (322)	0:00	0:00
74	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (323)	0:00	0:00

SHADOW - Map

Calculation: OPT1 74 x V136_162mHH_WTG Real Case Seinäjoki daily mean



Map: BM160 , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 377 720 North: 7 064 500

▲ New WTG

● Shadow receptor

Flicker map level: DEM 2m and 10m combined, 3km WTG buffer

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201

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: DEM 2m and 10m combined, 3km WTG buffer

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
01	373 367	7 076 738	110,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
02	373 697	7 075 584	107,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
03	374 469	7 074 357	115,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
04	374 770	7 074 027	120,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
05	375 473	7 073 753	116,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
06	375 912	7 073 642	116,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
07	374 906	7 073 488	118,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
08	375 414	7 073 121	122,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
09	376 074	7 073 057	120,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
10	375 580	7 072 615	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
11	376 274	7 072 576	124,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
12	376 435	7 072 079	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
13	375 788	7 072 031	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
14	375 205	7 072 027	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
15	376 582	7 071 654	127,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
16	376 000	7 071 526	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
17	375 019	7 071 345	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
18	376 169	7 071 006	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
19	375 136	7 070 732	129,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
20	375 218	7 070 244	127,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
21	374 833	7 069 783	126,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
22	374 077	7 069 104	122,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
23	374 370	7 068 668	125,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
24	373 964	7 068 043	122,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
25	375 646	7 067 770	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
26	374 664	7 067 622	125,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
27	374 145	7 067 529	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
28	375 966	7 067 331	127,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
29	374 335	7 067 008	129,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
30	374 819	7 066 904	127,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
31	376 155	7 066 896	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
32	374 542	7 066 292	129,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
33	374 710	7 065 802	134,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
34	374 881	7 065 305	138,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
35	375 674	7 065 211	132,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
36	375 016	7 064 939	140,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
37	376 055	7 064 862	132,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

To be continued on next page...

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201

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	East	North	Z	Row data/Description	WTG type			Shadow data											
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]							
38	375	345	7 064	536	141,0	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
39	376	410	7 064	475	132,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
40	375	741	7 064	204	141,0	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
41	376	740	7 064	084	133,3	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
42	374	795	7 064	083	137,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
43	374	069	7 063	828	139,2	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
44	377	131	7 063	794	132,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
45	373	609	7 063	358	143,3	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
46	377	390	7 063	326	133,8	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
47	374	157	7 063	277	140,1	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
48	377	619	7 062	838	139,5	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
49	373	681	7 062	818	138,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
50	377	073	7 062	695	140,3	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
51	377	933	7 062	433	140,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
52	373	684	7 062	209	140,2	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
53	377	376	7 062	173	141,1	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
54	378	243	7 062	018	141,1	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
55	377	732	7 061	631	139,9	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
56	378	625	7 061	499	140,8	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
57	378	971	7 061	009	140,0	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
58	379	278	7 060	609	140,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
59	379	575	7 060	209	139,2	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
60	379	886	7 059	789	138,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
61	380	194	7 059	386	137,8	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
62	379	576	7 059	193	136,5	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
63	380	448	7 059	035	137,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
64	380	241	7 057	057	137,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
65	379	995	7 056	273	145,2	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
66	380	774	7 055	822	143,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
67	380	652	7 055	184	144,7	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
68	379	308	7 054	980	144,5	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
69	380	245	7 054	621	147,2	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
70	379	337	7 054	426	144,3	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
71	380	475	7 054	159	147,4	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
72	379	953	7 053	813	144,3	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
73	379	791	7 053	110	147,5	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0
74	379	467	7 052	420	151,6	VESTAS	V136-3.45	3450	136,0	!O!	...Yes	VESTAS	V136-3.45-3	450	3 450	136,0	162,0	1 809	0,0

Shadow receptor-Input

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode	
			[m]	[m]	[m]	[m]	[°]	[°]		
HH 01	374	069	7 077	887	125,7	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	373	882	7 077	755	117,6	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	376	900	7 075	109	132,8	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	376	899	7 074	798	135,1	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	377	095	7 074	764	134,9	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	376	880	7 074	646	133,5	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	373	257	7 074	409	117,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	372	871	7 073	829	116,2	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	373	520	7 072	436	134,1	1,0	1,0	0,0	90,0	"Green house mode"
HH 11	372	438	7 069	086	112,3	1,0	1,0	0,0	90,0	"Green house mode"
HH 12	372	627	7 069	022	115,6	1,0	1,0	0,0	90,0	"Green house mode"
HH 13	372	570	7 068	991	113,1	1,0	1,0	0,0	90,0	"Green house mode"
HH 14	375	778	7 068	878	126,4	1,0	1,0	0,0	90,0	"Green house mode"
HH 15	375	910	7 068	771	125,6	1,0	1,0	0,0	90,0	"Green house mode"
HH 16	376	200	7 068	709	125,1	1,0	1,0	0,0	90,0	"Green house mode"
HH 17	377	846	7 065	354	129,3	1,0	1,0	0,0	90,0	"Green house mode"
HH 18	378	993	7 064	740	130,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 19	379	078	7 064	730	129,9	1,0	1,0	0,0	90,0	"Green house mode"
HH 20	379	286	7 063	477	129,8	1,0	1,0	0,0	90,0	"Green house mode"
HH 21	379	291	7 063	465	129,9	1,0	1,0	0,0	90,0	"Green house mode"
HH 22	379	745	7 063	233	129,8	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201

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No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
HH 23	375 558	7 062 617	136,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 24	375 256	7 062 130	136,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 25	375 559	7 061 749	136,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 26	373 007	7 060 703	128,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 27	374 178	7 060 399	133,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 30	378 823	7 059 797	135,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 31	378 182	7 057 540	139,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 32	379 304	7 064 226	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 33	378 154	7 066 356	127,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	372 544	7 077 498	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	371 966	7 076 389	113,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	372 207	7 074 831	109,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	372 752	7 069 059	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	371 432	7 068 470	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	371 884	7 061 455	118,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	371 852	7 061 382	114,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	372 074	7 061 332	115,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	371 756	7 060 969	112,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	371 786	7 060 961	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	371 798	7 060 874	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	373 020	7 060 570	124,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	373 017	7 060 532	124,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	370 705	7 062 000	103,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	370 704	7 061 994	103,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	370 803	7 061 826	100,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	370 957	7 061 724	99,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	370 886	7 061 635	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	370 891	7 061 560	99,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	370 902	7 061 248	99,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	370 911	7 061 183	99,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	371 777	7 060 732	112,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	371 641	7 060 416	108,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	371 386	7 060 287	102,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	371 521	7 060 262	113,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	371 446	7 060 228	105,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 27	371 508	7 060 214	107,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 28	373 328	7 059 399	125,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 29	373 356	7 059 368	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 30	376 662	7 058 377	135,1	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]
HH 01	12:50	40	0:25
HH 02	17:16	46	0:29
HH 03	7:10	31	0:19
HH 04	14:29	52	0:22
HH 05	7:05	29	0:20
HH 06	24:38	86	0:28
HH 07	18:11	61	0:26
HH 08	7:15	28	0:19
HH 09	18:06	76	0:20
HH 11	6:13	24	0:19
HH 12	19:51	78	0:22
HH 13	13:49	53	0:21
HH 14	77:17	191	0:48
HH 15	72:48	180	0:48
HH 16	43:55	130	0:36
HH 17	22:52	88	0:20
HH 18	0:00	0	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201

...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]
HH 19	0:00	0	0:00
HH 20	18:35	79	0:19
HH 21	18:39	79	0:19
HH 22	0:00	0	0:00
HH 23	16:57	62	0:21
HH 24	30:47	109	0:22
HH 25	9:46	40	0:19
HH 26	0:00	0	0:00
HH 27	0:00	0	0:00
HH 30	90:06	183	0:49
HH 31	0:00	0	0:00
HH 32	0:00	0	0:00
HH 33	0:00	0	0:00
RH 01	13:52	37	0:28
RH 02	9:40	34	0:23
RH 03	9:06	36	0:20
RH 04	22:58	83	0:24
RH 05	0:00	0	0:00
RH 06	0:00	0	0:00
RH 07	0:00	0	0:00
RH 08	0:00	0	0:00
RH 09	0:00	0	0:00
RH 10	0:00	0	0:00
RH 11	0:00	0	0:00
RH 12	0:00	0	0:00
RH 13	0:00	0	0:00
RH 14	0:00	0	0:00
RH 15	0:00	0	0:00
RH 16	0:00	0	0:00
RH 17	0:00	0	0:00
RH 18	0:00	0	0:00
RH 19	0:00	0	0:00
RH 20	0:00	0	0:00
RH 21	0:00	0	0:00
RH 22	0:00	0	0:00
RH 23	0:00	0	0:00
RH 24	0:00	0	0:00
RH 25	0:00	0	0:00
RH 26	0:00	0	0:00
RH 27	0:00	0	0:00
RH 28	0:00	0	0:00
RH 29	0:00	0	0:00
RH 30	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	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (244)	51:33	
02	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (262)	9:06	
03	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (243)	18:48	
04	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (245)	6:38	
05	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (265)	11:00	
06	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (266)	28:07	
07	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (264)	12:48	
08	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (267)	0:00	
09	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (252)	8:18	
10	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (268)	0:00	
11	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (249)	0:00	
12	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (247)	0:00	
13	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (253)	0:00	
14	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (255)	5:18	
15	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (246)	0:00	

To be continued on next page...

SHADOW - Main Result

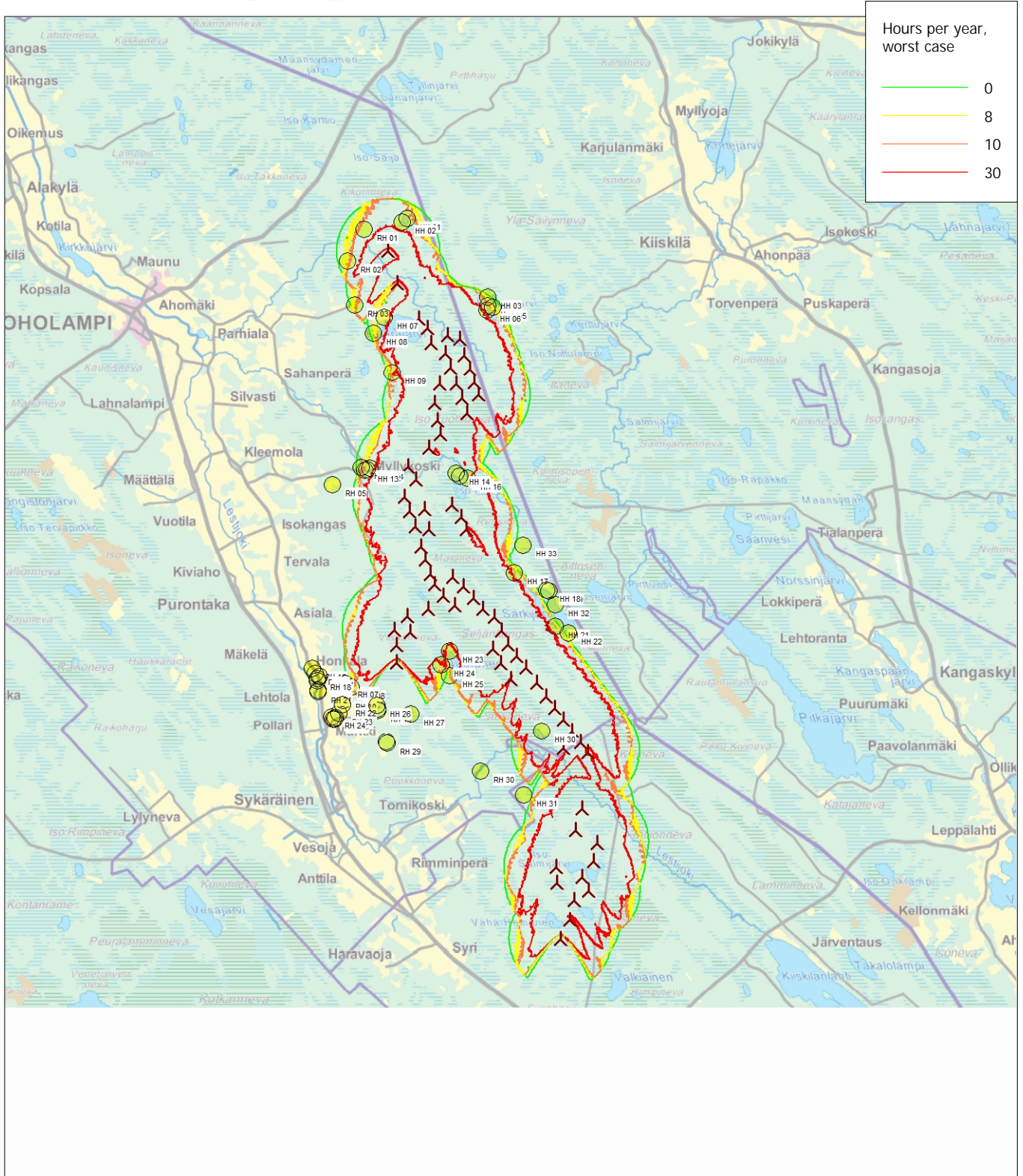
Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201

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No.	Name	Worst case [h/year]	Expected [h/year]
16	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (248)	0:00	
17	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (269)	0:00	
18	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (251)	0:00	
19	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (250)	0:00	
20	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (257)	0:00	
21	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (258)	35:01	
22	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (259)	21:35	
23	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (260)	23:12	
24	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (254)	15:45	
25	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (242)	60:00	
26	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (261)	14:20	
27	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (270)	0:00	
28	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (271)	43:31	
29	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (272)	0:00	
30	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (273)	0:00	
31	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (274)	0:00	
32	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (275)	0:00	
33	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (276)	0:00	
34	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (277)	0:00	
35	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (278)	0:00	
36	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (279)	0:00	
37	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (280)	0:00	
38	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (281)	0:00	
39	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (282)	6:10	
40	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (283)	0:00	
41	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (284)	7:23	
42	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (285)	0:00	
43	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (287)	0:00	
44	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (288)	9:19	
45	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (291)	0:00	
46	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (292)	0:00	
47	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (293)	26:06	
48	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (296)	5:51	
49	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (297)	7:10	
50	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (298)	17:20	
51	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (299)	7:00	
52	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (300)	6:54	
53	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (301)	0:00	
54	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (302)	7:52	
55	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (304)	0:00	
56	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (305)	0:00	
57	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (306)	0:00	
58	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (307)	0:00	
59	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (309)	43:54	
60	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (310)	15:24	
61	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (311)	7:52	
62	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (312)	17:41	
63	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (313)	5:15	
64	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (308)	0:00	
65	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (314)	0:00	
66	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (315)	0:00	
67	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (316)	0:00	
68	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (317)	0:00	
69	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (318)	0:00	
70	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (319)	0:00	
71	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (320)	0:00	
72	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (321)	0:00	
73	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (322)	0:00	
74	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (323)	0:00	

SHADOW - Map

Calculation: OPT1 74 x V136_162mHH_WTG Worst Case KB 20151201



Hours per year, worst case	
—	0
—	8
—	10
—	30

0 2,5 5 7,5 10km

Map: BM160 , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 377 720 North: 7 064 500

New WTG Shadow receptor

Flicker map level: DEM 2m and 10m combined, 3km WTG buffer

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean

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
 1,00 2,82 4,23 6,60 8,77 9,10 8,87 6,81 4,67 2,52 1,17 0,58

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

Meteo MIDDLE

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 569 428 341 332 536 819 844 1 304 1 282 825 621 645 8 546

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: DEM 2m and 10m combined, 3km WTG buffer

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
01	374 470	7 074 357	115,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
02	374 771	7 074 027	120,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
03	375 473	7 073 753	116,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
04	375 913	7 073 643	116,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
05	374 906	7 073 489	118,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
06	375 414	7 073 121	122,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
07	376 074	7 073 057	120,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
08	375 580	7 072 615	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
09	376 274	7 072 576	124,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
10	376 435	7 072 079	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
11	375 788	7 072 031	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
12	375 205	7 072 027	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
13	376 582	7 071 655	127,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
14	376 000	7 071 526	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
15	375 020	7 071 345	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
16	376 169	7 071 006	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
17	375 136	7 070 732	129,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
18	375 219	7 070 245	127,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
19	374 834	7 069 783	126,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
20	374 078	7 069 104	122,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
21	374 370	7 068 668	125,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
22	373 964	7 068 043	122,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
23	375 647	7 067 771	126,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
24	374 664	7 067 622	125,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
25	374 145	7 067 529	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
26	375 966	7 067 331	127,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
27	374 335	7 067 008	129,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
28	374 819	7 066 904	127,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
29	376 155	7 066 896	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
30	374 542	7 066 292	129,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
31	374 710	7 065 802	134,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
32	374 881	7 065 305	138,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
33	375 674	7 065 211	132,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
34	375 016	7 064 939	140,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
35	376 055	7 064 862	132,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
36	375 345	7 064 536	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
37	376 410	7 064 475	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
38	375 741	7 064 204	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
39	376 740	7 064 084	133,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
40	374 795	7 064 083	137,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
41	377 131	7 063 794	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
42	377 390	7 063 326	133,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
43	377 619	7 062 838	139,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
44	377 073	7 062 695	140,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
45	377 933	7 062 433	145,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
46	377 376	7 062 173	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
47	378 243	7 062 018	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
48	377 732	7 061 631	139,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
49	379 995	7 056 273	145,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
50	380 774	7 055 822	143,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
51	380 652	7 055 184	144,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
52	379 308	7 054 980	144,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
53	380 245	7 054 621	147,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
54	379 337	7 054 426	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
55	380 475	7 054 159	147,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
56	379 953	7 053 813	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
57	379 791	7 053 110	147,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

Shadow receptor-Input

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
HH 01	374 069	7 077 887	125,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	373 882	7 077 755	117,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	376 900	7 075 109	132,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	376 899	7 074 798	135,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	377 095	7 074 764	134,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	376 880	7 074 646	133,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	373 257	7 074 409	117,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	372 871	7 073 829	116,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	373 520	7 072 436	134,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 11	372 438	7 069 086	112,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 12	372 627	7 069 022	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 13	372 570	7 068 991	113,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 14	375 778	7 068 878	126,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 15	375 910	7 068 771	125,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 16	376 200	7 068 709	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 17	377 846	7 065 354	129,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 18	378 993	7 064 740	130,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 19	379 078	7 064 730	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 20	379 286	7 063 477	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 21	379 291	7 063 465	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 22	379 745	7 063 233	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 23	375 558	7 062 617	136,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 24	375 256	7 062 130	136,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 25	375 559	7 061 749	136,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 26	373 007	7 060 703	128,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 27	374 178	7 060 399	133,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 30	378 823	7 059 797	135,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 31	378 182	7 057 540	139,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 32	379 304	7 064 226	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 33	378 154	7 066 356	127,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

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]	[°]	[°]	
RH 01	372 544	7 077 498	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	371 966	7 076 389	113,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	372 207	7 074 831	109,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	372 752	7 069 059	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	371 432	7 068 470	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	371 884	7 061 455	118,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	371 852	7 061 382	114,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 08	372 074	7 061 332	115,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	371 756	7 060 969	112,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	371 786	7 060 961	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	371 798	7 060 874	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	373 020	7 060 570	124,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	373 017	7 060 532	124,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	370 705	7 062 000	103,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	370 704	7 061 994	103,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	370 803	7 061 826	100,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	370 957	7 061 724	99,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	370 886	7 061 635	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	370 891	7 061 560	99,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	370 902	7 061 248	99,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	370 911	7 061 183	99,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	371 777	7 060 732	112,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	371 641	7 060 416	108,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	371 386	7 060 287	102,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	371 521	7 060 262	113,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	371 446	7 060 228	105,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 27	371 508	7 060 214	107,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 28	373 328	7 059 399	125,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 29	373 356	7 059 368	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 30	376 662	7 058 377	135,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, expected values

No. Shadow hours
per year
[h/year]

HH 01	0:00
HH 02	0:00
HH 03	0:58
HH 04	2:29
HH 05	1:13
HH 06	3:52
HH 07	4:05
HH 08	1:53
HH 09	4:47
HH 11	1:29
HH 12	4:14
HH 13	3:00
HH 14	14:39
HH 15	13:39
HH 16	8:01
HH 17	3:29
HH 18	0:00
HH 19	0:00
HH 20	3:11
HH 21	3:12
HH 22	0:00
HH 23	1:51
HH 24	0:00
HH 25	2:51
HH 26	0:00
HH 27	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

Shadow, expected values

No.	Shadow hours per year [h/year]
HH 30	0:00
HH 31	0:00
HH 32	0:00
HH 33	0:00
RH 01	0:00
RH 02	0:00
RH 03	0:00
RH 04	4:53
RH 05	0:00
RH 06	0:00
RH 07	0:00
RH 08	0:00
RH 09	0:00
RH 10	0:00
RH 11	0:00
RH 12	0:00
RH 13	0:00
RH 14	0:00
RH 15	0:00
RH 16	0:00
RH 17	0:00
RH 18	0:00
RH 19	0:00
RH 20	0:00
RH 21	0:00
RH 22	0:00
RH 23	0:00
RH 24	0:00
RH 25	0:00
RH 26	0:00
RH 27	0:00
RH 28	0:00
RH 29	0:00
RH 30	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
01	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (326)	18:49	4:37
02	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (327)	6:38	1:21
03	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (328)	11:00	2:00
04	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (329)	28:13	4:31
05	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (330)	12:53	3:44
06	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (331)	0:00	0:00
07	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (332)	8:18	0:58
08	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (333)	0:00	0:00
09	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (334)	0:00	0:00
10	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (335)	0:00	0:00
11	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (336)	0:00	0:00
12	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (337)	5:18	1:04
13	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (338)	0:00	0:00
14	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (339)	0:00	0:00
15	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (340)	0:00	0:00
16	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (341)	0:00	0:00
17	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (342)	0:00	0:00
18	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (343)	0:00	0:00
19	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (344)	35:03	9:28
20	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (345)	21:35	5:15
21	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (346)	23:13	4:55
22	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (349)	15:46	2:46
23	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (350)	60:06	8:45
24	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (351)	14:22	2:29

To be continued on next page...

SHADOW - Main Result

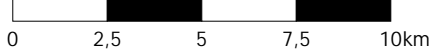
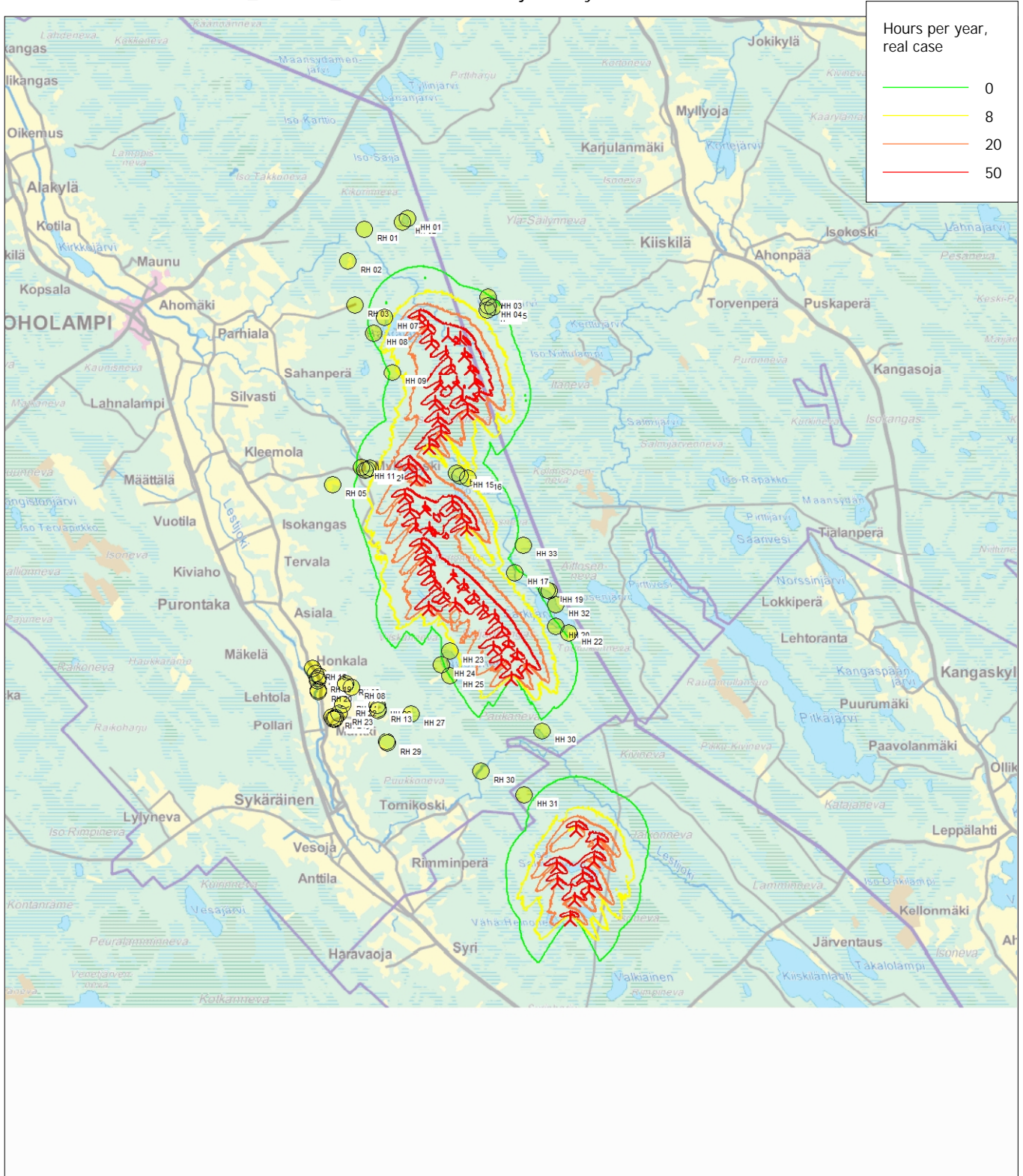
Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
25	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (352)	0:00	0:00
26	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (353)	43:31	4:59
27	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (354)	0:00	0:00
28	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (355)	0:00	0:00
29	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (356)	0:00	0:00
30	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (357)	0:00	0:00
31	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (358)	0:00	0:00
32	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (359)	0:00	0:00
33	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (360)	0:00	0:00
34	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (361)	0:00	0:00
35	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (362)	0:00	0:00
36	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (363)	0:00	0:00
37	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (364)	6:10	1:08
38	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (365)	0:00	0:00
39	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (366)	7:23	1:13
40	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (367)	0:00	0:00
41	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (370)	9:19	1:06
42	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (374)	0:00	0:00
43	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (378)	5:51	1:06
44	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (379)	17:20	4:42
45	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (380)	7:00	1:16
46	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (381)	0:00	0:00
47	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (382)	7:52	1:10
48	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (384)	0:00	0:00
49	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (389)	0:00	0:00
50	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (390)	0:00	0:00
51	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (391)	0:00	0:00
52	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (392)	0:00	0:00
53	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (393)	0:00	0:00
54	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (394)	0:00	0:00
55	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (395)	0:00	0:00
56	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (396)	0:00	0:00
57	VESTAS V136-3.45 3450 136.0 !O! hub: 162.0 m (TOT: 230.0 m) (397)	0:00	0:00

SHADOW - Map

Calculation: OPT2 57 x V136_162mHH_WTG Real Case Seinäjoki daily mean



Map: BM160 , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 377 720 North: 7 064 500

New WTG Shadow receptor

Flicker map level: DEM 2m and 10m combined, 3km WTG buffer

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB

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: DEM 2m and 10m combined, 3km WTG buffer

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
01	374 470	7 074 357	115,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
02	374 771	7 074 027	120,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
03	375 473	7 073 753	116,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
04	375 913	7 073 643	116,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
05	374 906	7 073 489	118,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
06	375 414	7 073 121	122,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
07	376 074	7 073 057	120,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
08	375 580	7 072 615	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
09	376 274	7 072 576	124,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
10	376 435	7 072 079	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
11	375 788	7 072 031	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
12	375 205	7 072 027	127,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
13	376 582	7 071 655	127,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
14	376 000	7 071 526	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
15	375 020	7 071 345	127,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
16	376 169	7 071 006	126,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
17	375 136	7 070 732	129,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
18	375 219	7 070 245	127,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
19	374 834	7 069 783	126,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
20	374 078	7 069 104	122,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
21	374 370	7 068 668	125,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
22	373 964	7 068 043	122,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
23	375 647	7 067 771	126,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
24	374 664	7 067 622	125,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
25	374 145	7 067 529	130,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
26	375 966	7 067 331	127,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
27	374 335	7 067 008	129,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
28	374 819	7 066 904	127,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
29	376 155	7 066 896	128,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
30	374 542	7 066 292	129,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
31	374 710	7 065 802	134,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
32	374 881	7 065 305	138,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
33	375 674	7 065 211	132,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
34	375 016	7 064 939	140,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
35	376 055	7 064 862	132,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
36	375 345	7 064 536	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0
37	376 410	7 064 475	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB

...continued from previous page

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
			[m]									
38	375 741	7 064 204	141,0	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
39	376 740	7 064 084	133,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
40	374 795	7 064 083	137,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
41	377 131	7 063 794	132,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
42	377 390	7 063 326	133,8	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
43	377 619	7 062 838	139,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
44	377 073	7 062 695	140,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
45	377 933	7 062 433	140,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
46	377 376	7 062 173	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
47	378 243	7 062 018	141,1	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
48	377 732	7 061 631	139,9	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
49	379 995	7 056 273	145,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
50	380 774	7 055 822	143,6	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
51	380 652	7 055 184	144,7	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
52	379 308	7 054 980	144,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
53	380 245	7 054 621	147,2	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
54	379 337	7 054 426	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
55	380 475	7 054 159	147,4	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
56	379 953	7 053 813	144,3	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	
57	379 791	7 053 110	147,5	VESTAS V136-3.45 3450 136.0 !O! ...Yes	VESTAS	V136-3.45-3 450	3 450	136,0	162,0	1 809	0,0	

Shadow receptor-Input

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]	[°]	[°]	
HH 01	374 069	7 077 887	125,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 02	373 882	7 077 755	117,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 03	376 900	7 075 109	132,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 04	376 899	7 074 798	135,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 05	377 095	7 074 764	134,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 06	376 880	7 074 646	133,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 07	373 257	7 074 409	117,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 08	372 871	7 073 829	116,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 09	373 520	7 072 436	134,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 11	372 438	7 069 086	112,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 12	372 627	7 069 022	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 13	372 570	7 068 991	113,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 14	375 778	7 068 878	126,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 15	375 910	7 068 771	125,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 16	376 200	7 068 709	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 17	377 846	7 065 354	129,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 18	378 993	7 064 740	130,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 19	379 078	7 064 730	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 20	379 286	7 063 477	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 21	379 291	7 063 465	129,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 22	379 745	7 063 233	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 23	375 558	7 062 617	136,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 24	375 256	7 062 130	136,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 25	375 559	7 061 749	136,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 26	373 007	7 060 703	128,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 27	374 178	7 060 399	133,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 30	378 823	7 059 797	135,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 31	378 182	7 057 540	139,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 32	379 304	7 064 226	129,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
HH 33	378 154	7 066 356	127,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 01	372 544	7 077 498	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 02	371 966	7 076 389	113,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 03	372 207	7 074 831	109,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 04	372 752	7 069 059	115,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 05	371 432	7 068 470	113,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 06	371 884	7 061 455	118,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 07	371 852	7 061 382	114,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB

...continued from previous page

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]	[°]	[°]	
RH 08	372 074	7 061 332	115,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 09	371 756	7 060 969	112,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 10	371 786	7 060 961	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 11	371 798	7 060 874	112,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 12	373 020	7 060 570	124,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 13	373 017	7 060 532	124,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 14	370 705	7 062 000	103,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 15	370 704	7 061 994	103,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 16	370 803	7 061 826	100,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 17	370 957	7 061 724	99,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 18	370 886	7 061 635	99,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 19	370 891	7 061 560	99,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 20	370 902	7 061 248	99,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 21	370 911	7 061 183	99,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 22	371 777	7 060 732	112,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 23	371 641	7 060 416	108,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 24	371 386	7 060 287	102,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 25	371 521	7 060 262	113,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 26	371 446	7 060 228	105,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 27	371 508	7 060 214	107,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 28	373 328	7 059 399	125,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 29	373 356	7 059 368	125,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
RH 30	376 662	7 058 377	135,1	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]
HH 01	0:00	0	0:00
HH 02	0:00	0	0:00
HH 03	7:14	31	0:19
HH 04	14:31	52	0:22
HH 05	7:07	29	0:20
HH 06	24:38	86	0:28
HH 07	18:12	61	0:26
HH 08	7:15	28	0:19
HH 09	18:11	77	0:20
HH 11	6:14	24	0:19
HH 12	19:51	78	0:22
HH 13	13:49	53	0:21
HH 14	77:22	191	0:48
HH 15	72:47	180	0:48
HH 16	44:02	130	0:36
HH 17	22:52	88	0:20
HH 18	0:00	0	0:00
HH 19	0:00	0	0:00
HH 20	18:35	79	0:19
HH 21	18:39	79	0:19
HH 22	0:00	0	0:00
HH 23	7:34	28	0:21
HH 24	0:00	0	0:00
HH 25	9:46	40	0:19
HH 26	0:00	0	0:00
HH 27	0:00	0	0:00
HH 30	0:00	0	0:00
HH 31	0:00	0	0:00
HH 32	0:00	0	0:00
HH 33	0:00	0	0:00
RH 01	0:00	0	0:00
RH 02	0:00	0	0:00
RH 03	0:00	0	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB

...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]
RH 04	22:58	83	0:24
RH 05	0:00	0	0:00
RH 06	0:00	0	0:00
RH 07	0:00	0	0:00
RH 08	0:00	0	0:00
RH 09	0:00	0	0:00
RH 10	0:00	0	0:00
RH 11	0:00	0	0:00
RH 12	0:00	0	0:00
RH 13	0:00	0	0:00
RH 14	0:00	0	0:00
RH 15	0:00	0	0:00
RH 16	0:00	0	0:00
RH 17	0:00	0	0:00
RH 18	0:00	0	0:00
RH 19	0:00	0	0:00
RH 20	0:00	0	0:00
RH 21	0:00	0	0:00
RH 22	0:00	0	0:00
RH 23	0:00	0	0:00
RH 24	0:00	0	0:00
RH 25	0:00	0	0:00
RH 26	0:00	0	0:00
RH 27	0:00	0	0:00
RH 28	0:00	0	0:00
RH 29	0:00	0	0:00
RH 30	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	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (326)	18:49	
02	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (327)	6:38	
03	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (328)	11:00	
04	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (329)	28:13	
05	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (330)	12:53	
06	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (331)	0:00	
07	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (332)	8:18	
08	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (333)	0:00	
09	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (334)	0:00	
10	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (335)	0:00	
11	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (336)	0:00	
12	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (337)	5:18	
13	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (338)	0:00	
14	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (339)	0:00	
15	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (340)	0:00	
16	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (341)	0:00	
17	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (342)	0:00	
18	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (343)	0:00	
19	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (344)	35:03	
20	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (345)	21:35	
21	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (346)	23:13	
22	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (349)	15:46	
23	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (350)	60:06	
24	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (351)	14:22	
25	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (352)	0:00	
26	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (353)	43:31	
27	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (354)	0:00	
28	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (355)	0:00	
29	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (356)	0:00	
30	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (357)	0:00	
31	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (358)	0:00	

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SHADOW - Main Result

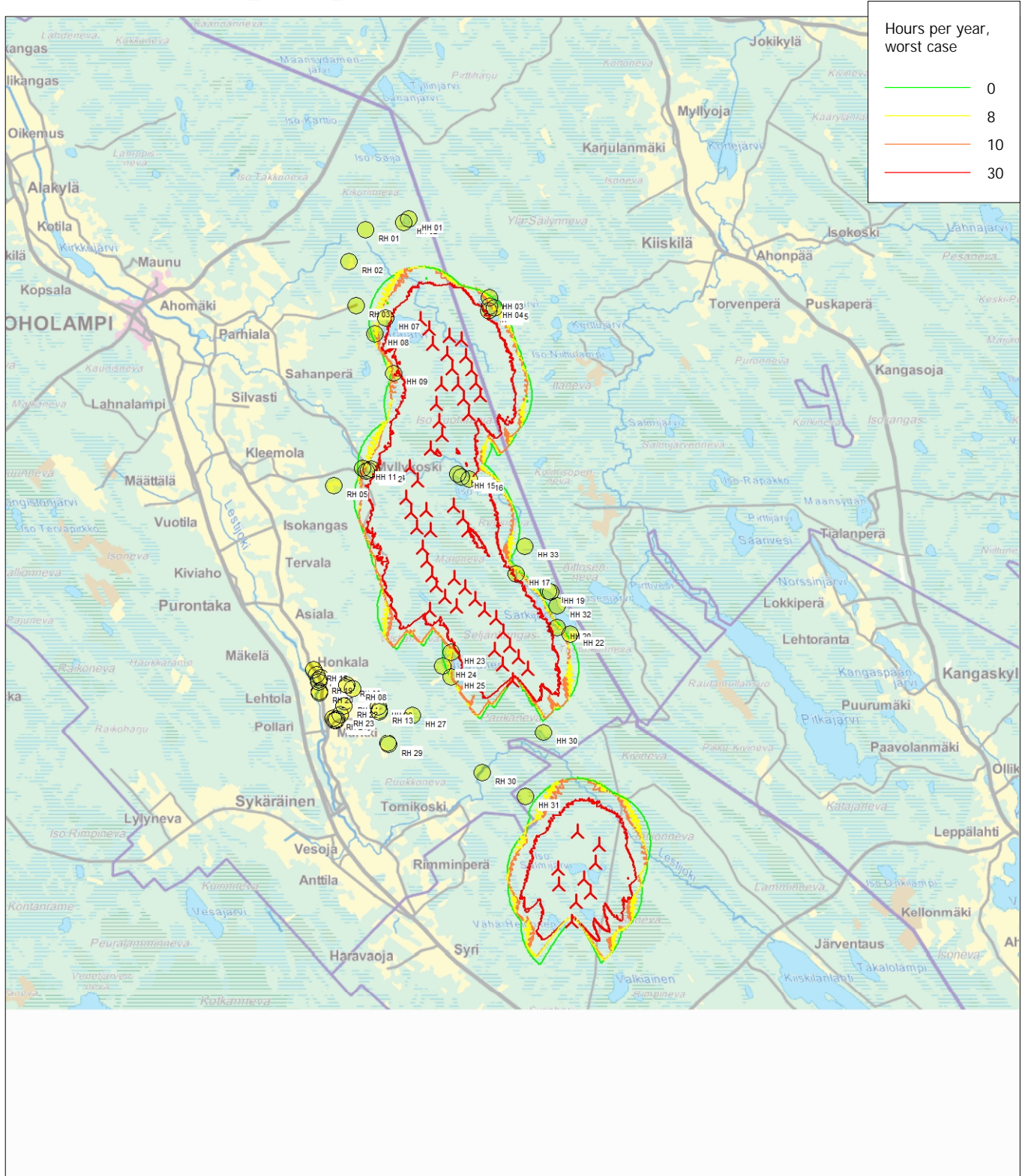
Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB

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No.	Name	Worst case [h/year]	Expected [h/year]
32	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (359)	0:00	
33	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (360)	0:00	
34	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (361)	0:00	
35	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (362)	0:00	
36	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (363)	0:00	
37	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (364)	6:10	
38	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (365)	0:00	
39	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (366)	7:23	
40	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (367)	0:00	
41	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (370)	9:19	
42	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (374)	0:00	
43	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (378)	5:51	
44	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (379)	17:20	
45	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (380)	7:00	
46	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (381)	0:00	
47	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (382)	7:52	
48	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (384)	0:00	
49	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (389)	0:00	
50	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (390)	0:00	
51	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (391)	0:00	
52	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (392)	0:00	
53	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (393)	0:00	
54	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (394)	0:00	
55	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (395)	0:00	
56	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (396)	0:00	
57	VESTAS V136-3.45 3450 136.0 !O! hub: 162,0 m (TOT: 230,0 m) (397)	0:00	

SHADOW - Map

Calculation: OPT2 57 x V136_162mHH_WTG Worst Case KB



Map: BM160 , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 377 720 North: 7 064 500

New WTG

Shadow receptor

Flicker map level: DEM 2m and 10m combined, 3km WTG buffer