

Project:

flickering\_Vestas\_V162\_Stelpe1\_kumulativa\_ietekme

Licensed user:

SIA Estonian, Latvian &amp; Lithuanian environment

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Calculated:

07.04.2025 14:12/4.1.254

## SHADOW - Main Result

Calculation: Flickering\_Vestas\_V162\_kumulativa\_ietekme

### Assumptions for shadow calculations

Maximum distance for influence

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

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,80	1,82	4,75	6,63	9,63	10,06	8,16	7,72	5,94	2,93	0,63	0,52

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

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:

DHM: Elevation Grid Data Object: flickering\_Nordex\_N175\_Stelpe1\_EMDGrid\_

Receptor grid resolution: 1,0 m

All coordinates are in

Latvian TM LKS92-LKS92 (LV)

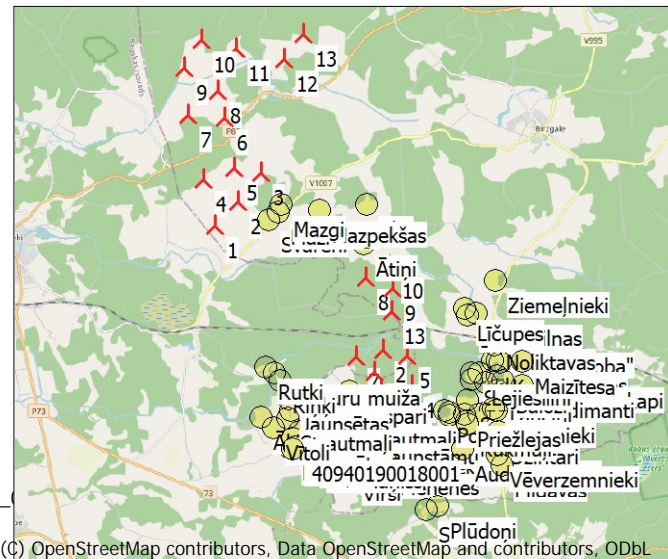
### WTGs

	Y	X	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	541 983	270 194	42,3	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
1	537 716	274 030	36,3	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
2	542 202	270 786	43,2	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
2	538 332	274 680	39,8	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
3	538 924	275 434	40,4	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
3	542 890	269 274	41,6	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
4	537 386	275 240	41,8	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
4	542 961	269 853	41,8	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
5	538 213	275 555	40,4	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
5	542 827	270 623	43,0	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
6	537 929	276 882	35,8	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
6	542 166	269 672	43,2	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
7	541 485	270 587	42,8	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
7	536 978	276 953	33,6	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
8	541 708	272 679	44,5	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
8	537 742	277 596	34,4	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
9	542 443	272 413	43,3	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
9	536 863	278 187	33,5	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
10	537 299	278 931	34,5	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
10	542 342	273 010	44,5	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
11	538 232	278 709	35,4	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
12	539 516	278 452	44,8	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8
13	542 412	271 815	43,4	VESTAS V162-6.2 6200 162....Yes	Yes	VESTAS	V162-6.2-6 200	6 200	162,0	166,0	2 041	-
13	540 006	279 093	48,5	Siemens Gamesa SG 6.6-17....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	165,0	2 037	8,8

### Shadow receptor-Input

No.	Y	X	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
40940190018001	539 852	268 142	39,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Alpi	541 730	274 626	48,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Apseni	541 365	268 848	41,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Atputas	539 880	268 184	40,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Audzespieduri	544 355	268 178	48,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Balož	545 388	270 010	59,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Beikapi	543 969	269 139	50,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0

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Scale 1:200 000

New WTG

Shadow receptor

## SHADOW - Main Result

Calculation: Flickering\_Vestas\_V162\_kumulativa\_ietekme

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No.	Y	X	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]		[°]		[m]
Bikernieki	545 224	269 210	53,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Buži	539 976	268 189	39,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Berzes	545 143	270 944	54,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Duburi	544 427	271 727	51,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Dzeni	545 420	269 756	56,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Dzilnas	545 182	268 884	51,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Dzintari	545 288	268 667	55,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Dzirnavnieki	539 758	268 149	39,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Glizdi	545 087	269 223	53,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Grašiņi	543 980	269 056	52,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Gaguli	545 145	269 257	53,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Indras	545 578	268 097	57,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Jaunbirznieki	541 384	268 658	41,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Jaunpenki	540 008	268 609	37,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Jaunstamuri	541 854	268 628	40,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Jaunsetas	539 728	269 454	40,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Jaunvilni	540 984	268 658	40,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Kalna Druvas	545 245	270 525	59,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Kalna Skola	545 316	270 498	56,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Kalnamiuži as kapi	545 237	270 136	62,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Kaspāri	541 323	269 669	43,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Krogsetas	539 827	268 420	37,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Klavas	540 907	268 233	42,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Laivenieki	545 108	270 523	58,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Laucini	545 250	269 754	57,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Lejies	544 756	270 219	63,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Licupes	544 364	271 909	49,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Maizītes	545 891	270 518	56,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Mazgi	539 464	274 594	48,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Mazmazgi	539 392	274 394	43,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Mazpekši as	540 483	274 458	47,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Mazpukes	540 647	267 964	42,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Noliktavas	545 120	271 132	48,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Oši	544 550	270 020	62,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pāpādes	539 773	269 151	39,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pieduri	544 463	268 527	46,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pienenes	542 345	267 813	41,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pildavas	545 405	267 770	57,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Platmani	540 408	267 946	41,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pludoni	543 693	266 665	46,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Porini	543 843	269 194	51,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Prieži lejās	544 395	269 089	52,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Pukes	540 253	268 102	41,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Plavinas	541 032	268 129	43,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Rinki	539 486	269 956	40,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Rogas	544 769	269 099	53,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Rukmuli	544 448	268 840	55,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Rutki	539 086	270 298	37,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Salaskalni	544 552	270 206	55,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Saulieši	543 385	266 523	46,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Senci	544 470	269 499	59,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Silini	544 952	269 967	58,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Skambas	544 875	268 253	56,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Stacija "Goba"	545 127	271 035	49,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Straumes	541 765	268 620	40,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Strautmalī	541 413	269 067	42,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Strautmalī	539 692	268 953	36,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Svareni	539 134	274 186	45,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Vecbirznieki	541 400	268 496	43,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Vecdimanti	545 908	269 880	53,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Vecdzilnas	544 681	271 797	50,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Viesturu muiža a	539 321	270 156	36,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Virši	541 369	267 596	42,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Veverzemnieki	545 272	268 039	58,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0

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## SHADOW - Main Result

Calculation: Flickering\_Vestas\_V162\_kumulativa\_ietekme

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No.	Y	X	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
Vitoli	539 311	268 701	36,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Zarini	544 426	268 920	55,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Zeltini	545 460	269 648	54,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Ziemelnieki	545 161	272 627	48,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Zustreni	541 851	267 904	41,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Zviedri	540 967	268 146	42,7	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Atini	541 663	273 569	46,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Aki	538 973	268 966	35,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0

## 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]	
40940190018001	0:00	0	0:00	0:00	
Alpi	1:37	14	0:09	0:07	
Apseni	30:28	112	0:24	15:52	
Atputas	0:00	0	0:00	0:00	
Audzespieduri	13:29	49	0:22	7:22	
Balož i	0:00	0	0:00	0:00	
Beikapi	49:26	103	0:52	25:16	
Bikernieki	0:00	0	0:00	0:00	
Buž i	0:00	0	0:00	0:00	
Berzes	0:00	0	0:00	0:00	
Duburi	11:37	52	0:20	3:38	
Dzeni	0:00	0	0:00	0:00	
Dzilnas	0:00	0	0:00	0:00	
Dzintari	0:00	0	0:00	0:00	
Dzirnavnieki	0:00	0	0:00	0:00	
Glizdi	0:00	0	0:00	0:00	
Graš ini	39:40	85	0:53	20:31	
Gaguli	0:00	0	0:00	0:00	
Indras	0:00	0	0:00	0:00	
Jaunbirznieki	22:11	77	0:23	11:53	
Jaunpenki	0:00	0	0:00	0:00	
Jaunstamuri	32:51	68	0:33	17:45	
Jaunsetas	0:00	0	0:00	0:00	
Jaunvilni	8:47	44	0:19	4:31	
Kalna Druvas	0:00	0	0:00	0:00	
Kalna Skola	0:00	0	0:00	0:00	
Kalnamuiž as kapi	0:00	0	0:00	0:00	
Kaspari	74:51	164	1:06	36:12	
Krogsetas	0:00	0	0:00	0:00	
Klavas	0:00	0	0:00	0:00	
Laivenieki	0:00	0	0:00	0:00	
Laucini	0:00	0	0:00	0:00	
Lejieš i	11:13	51	0:21	5:02	
Licupes	18:40	83	0:20	6:20	
Maizites	0:00	0	0:00	0:00	
Mazgi	41:44	119	0:35	20:01	
Mazmazgi	37:18	91	0:37	18:36	
Mazpekš as	22:01	74	0:23	11:50	
Mazpukes	0:00	0	0:00	0:00	
Noliktavas	0:00	0	0:00	0:00	
OŠ i	22:29	88	0:24	9:23	
Papardes	0:00	0	0:00	0:00	
Pieduri	12:44	46	0:23	6:50	
Pienenes	0:00	0	0:00	0:00	
Pildavas	0:00	0	0:00	0:00	
Platmani	0:00	0	0:00	0:00	
Pludoni	0:00	0	0:00	0:00	
Porini	49:07	96	0:57	24:42	

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## SHADOW - Main Result

Calculation: Flickering\_Vestas\_V162\_kumulativa\_ietekme

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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]	
Priež lejas	29:04	95	0:25	14:53	
Pukes	0:00	0	0:00	0:00	
Plavinas	0:00	0	0:00	0:00	
Rinki	0:00	0	0:00	0:00	
Rogas	13:41	58	0:20	6:59	
Rukmuli	30:16	99	0:24	15:56	
Rutki	0:00	0	0:00	0:00	
Salaskalni	22:24	87	0:23	8:44	
Saulieš i	0:00	0	0:00	0:00	
Senci	36:12	129	0:25	18:06	
Silini	4:41	22	0:19	2:01	
Skambas	0:00	0	0:00	0:00	
Stacija "Goba"	0:00	0	0:00	0:00	
Straumes	35:19	78	0:31	19:01	
Strautmali	25:03	81	0:25	12:48	
Strautmali	0:00	0	0:00	0:00	
Svareni	49:01	99	0:42	25:15	
Vecbirznieki	15:23	52	0:24	8:14	
Vecdimanti	0:00	0	0:00	0:00	
Vecdzilnas	0:00	0	0:00	0:00	
Viesturu muiža	0:00	0	0:00	0:00	
Virši	0:00	0	0:00	0:00	
Vevezemnieki	0:00	0	0:00	0:00	
Vitoli	0:00	0	0:00	0:00	
Zarini	33:10	105	0:25	17:19	
Zeltini	0:00	0	0:00	0:00	
Ziemeļnieki	0:00	0	0:00	0:00	
Zustreni	0:00	0	0:00	0:00	
Zviedri	0:00	0	0:00	0:00	
Atini	114:40	138	1:12	14:33	
Aki	0:00	0	0:00	0:00	

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (18)	0:00	0:00
1	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (37)	27:02	10:58
2	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (16)	0:00	0:00
2	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (33)	87:21	45:25
3	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (34)	22:01	11:50
3	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (20)	191:21	93:26
4	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (32)	0:00	0:00
4	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (19)	128:35	65:49
5	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (31)	13:35	7:27
5	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (17)	70:39	32:20
6	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (29)	0:00	0:00
6	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (14)	50:13	24:33
7	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (15)	0:00	0:00
7	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (27)	0:00	0:00
8	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (21)	50:22	4:20
8	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (28)	0:00	0:00
9	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (22)	37:26	5:46
9	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (25)	0:00	0:00
10	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (30)	0:00	0:00
10	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (23)	34:38	7:36
11	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (26)	0:00	0:00
12	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (35)	0:00	0:00
13	VESTAS V162-6.2 6200 162.0 !O! hub: 166,0 m (TOT: 247,0 m) (24)	10:36	4:42
13	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 165,0 m (TOT: 250,0 m) (36)	0:00	0:00

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.