

SHADOW - Main Result

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) [ZAKOPANE]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2,18	3,07	3,69	4,28	5,39	5,21	5,74	5,60	4,30	3,94	2,30	1,54

Operational time

N	NE	E	SE	S	SW	W	NW	Sum
525	525	600	750	825	1 125	2 025	1 125	7 500

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

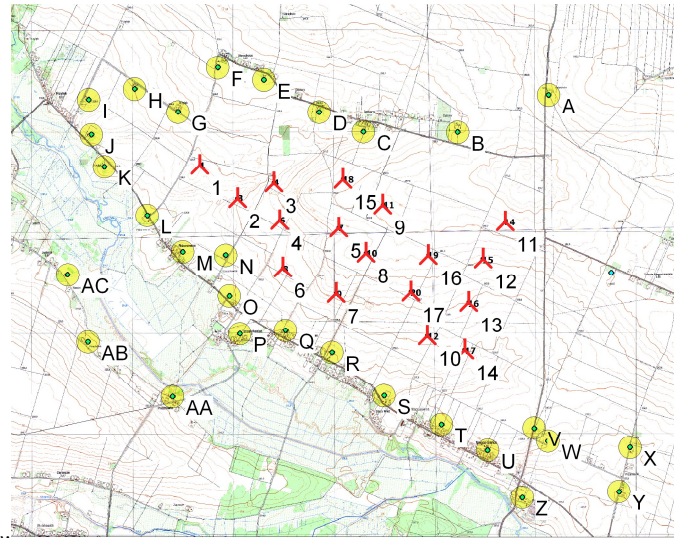
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_ONLINEDATA_36.w

Obstacles used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m



Scale 1:75 000

 New WTG

- Shadow receptor

WTGs

Polish GK 1992/19-ETRS89					WTG type					Shadow data		
East		North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	590 675	298 670	223,3	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
2	591 049	298 340	223,8	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
3	591 411	298 495	223,6	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
4	591 469	298 120	239,7	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
5	592 054	298 044	249,2	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
6	591 499	297 646	231,1	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
7	592 027	297 392	239,3	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
8	592 325	297 793	250,8	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
9	592 491	298 273	257,1	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
10	592 934	296 968	228,6	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
11	593 709	298 102	259,9	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
12	593 489	297 734	247,1	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
13	593 344	297 301	235,2	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
14	593 306	296 825	225,1	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
15	592 996	298 529	252,7	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
16	592 944	297 771	251,1	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9
17	592 772	297 405	240,0	VESTAS V90 2000 120.0 !O! hub: 1...	Yes	VESTAS	V90-2 000	2 000	120,0	125,0	1 504	14,9

Shadow receptor-Input

Polish GK 1992/19-ETRS89										
No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode	
			[m]	[m]	[m]	[m]	[°]	[°]		
A	594 139	299 363	249,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
B	593 236	298 996	256,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
C	592 298	299 001	242,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
D	591 858	299 198	242,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
E	591 310	299 513	250,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
F	590 853	299 636	249,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
G	590 457	299 200	230,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
H	590 027	299 428	227,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"	
I	589 570	299 324	222,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"	

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Project:

FW13

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Calculated:

2013-06-25 15:57/2.8.552

SHADOW - Main Result

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Polish GK 1992/19-ETRS89

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
J	589 597	298 976	217,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
K	589 726	298 658	219,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
L	590 152	298 173	215,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
M	590 504	297 808	219,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
N	590 930	297 773	219,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
O	590 968	297 367	216,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
P	591 072	296 992	213,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Q	591 526	297 025	217,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
R	591 986	296 804	218,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
S	592 504	296 374	211,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
T	593 073	296 086	222,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
U	593 533	295 828	223,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
V	593 993	296 047	231,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
W	594 132	295 918	227,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
X	594 948	295 852	222,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Y	594 836	295 413	217,3	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Z	593 878	295 357	208,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AA	590 402	296 368	213,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AB	589 563	296 914	220,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AC	589 363	297 583	215,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, worst case**Shadow, expected values**

No.	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]
A	0:00	0	0:00	0:00
B	33:17	100	0:28	5:20
C	119:00	130	1:22	15:46
D	77:31	93	1:48	9:22
E	20:01	36	0:43	2:11
F	0:00	0	0:00	0:00
G	75:51	98	1:26	8:06
H	33:05	62	0:40	3:40
I	9:54	34	0:23	1:36
J	10:21	32	0:25	1:57
K	21:28	65	0:29	4:12
L	38:49	98	0:44	7:55
M	30:45	84	0:28	6:19
N	72:25	164	1:01	13:56
O	59:00	118	1:01	11:45
P	37:11	91	0:31	7:33
Q	16:39	61	0:22	3:27
R	32:20	96	0:30	6:46
S	25:41	58	0:32	5:05
T	0:00	0	0:00	0:00
U	0:00	0	0:00	0:00
V	0:00	0	0:00	0:00
W	0:00	0	0:00	0:00
X	0:00	0	0:00	0:00
Y	0:00	0	0:00	0:00
Z	0:00	0	0:00	0:00
AA	0:00	0	0:00	0:00
AB	0:00	0	0:00	0:00
AC	0:00	0	0:00	0:00

Project:

FW13

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Calculated:

2013-06-25 15:57/2.8.552

SHADOW - Main Result

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (1)	124:15	16:35
2	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (2)	71:56	11:00
3	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (3)	60:25	9:16
4	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (4)	62:15	9:30
5	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (5)	23:29	4:48
6	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (6)	77:28	14:46
7	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (7)	48:59	9:47
8	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (8)	24:58	5:00
9	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (9)	32:16	4:24
10	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (10)	22:28	4:39
11	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (11)	0:00	0:00
12	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (12)	0:00	0:00
13	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (13)	8:49	1:54
14	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (14)	33:11	6:34
15	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (15)	121:22	16:00
16	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (16)	0:00	0:00
17	VESTAS V90 2000 120.0 !O! hub: 125,0 m (TOT: 185,0 m) (17)	10:12	2:11