

Project:

141120_PotentialUpdate_Tjäder

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VATTENFALL AB IT

Företagsenhet 1002

SE-962 80 Jokkmokk

Jenny Longworth / jenny.longworth@vattenfall.com

Calculated:

2014-11-27 11:08/2.9.269

SHADOW - Main Result**Calculation:** 141125 MM114 TjäderUpd**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) [VAXJO /KRONOBER G]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,36	1,52	2,62	6,08	8,82	7,64	6,65	5,42	4,02	2,68	1,38	0,88

Operational hours are calculated from WTGs in calculation and wind

distribution:

Sodar_VAT10

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
516	271	360	494	432	563	653	721	1 469	1 400	1 082	716	8 678

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

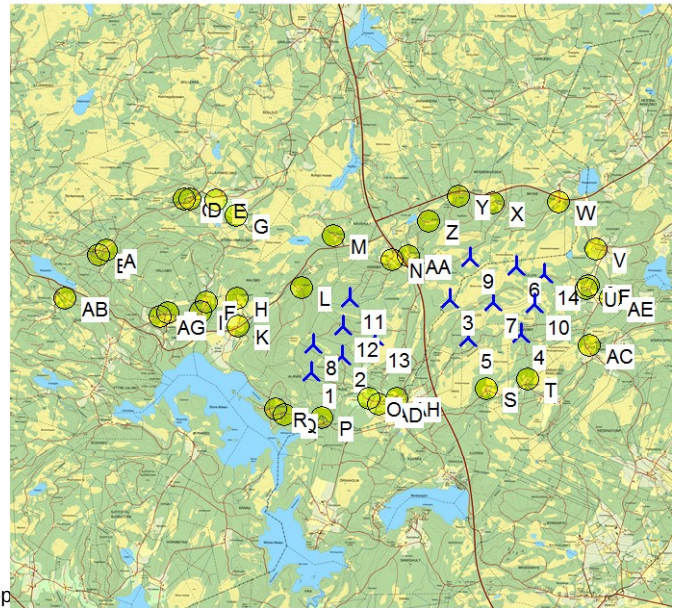
window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: 120531_GH2mCont_2mScan_5mTop

Obstacles not used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m



New WTG

Scale 1:125 000

Shadow receptor

WTGs**Swedish RT90 2.5gonV 0:-15-RT90 (SE)**

	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM
			[m]									[RPM]
1	1 357 815	6 363 927	266,4	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
2	1 358 334	6 364 200	274,9	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
3	1 360 107	6 365 124	257,1	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
4	1 361 285	6 364 553	276,2	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
5	1 360 410	6 364 497	276,2	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
6	1 361 207	6 365 677	270,0	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
7	1 360 816	6 365 085	267,5	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
8	1 357 852	6 364 387	292,7	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
9	1 360 439	6 365 813	266,8	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
10	1 361 495	6 365 050	268,4	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
11	1 358 456	6 365 153	292,7	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
12	1 358 350	6 364 683	313,2	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
13	1 358 867	6 364 513	281,6	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6
14	1 361 656	6 365 548	274,0	REpower 3.2M114 3200 114,0 !...	Yes	REpower	3.2M114-3 200	3 200	114,0	143,0	1 714	12,6

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SHADOW - Main Result

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Swedish RT90 2.5gonV 0:-15-RT90 (SE)

No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
I 9	1 355 989	6 364 921	223,7	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
J 10	1 355 455	6 364 908	260,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
K 11	1 356 610	6 364 688	204,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
L 12	1 357 661	6 365 318	239,4	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
M 13	1 358 186	6 366 173	238,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
N 14	1 359 151	6 365 788	250,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
O 18	1 358 766	6 363 488	243,7	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
P 19	1 358 001	6 363 183	217,1	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
Q 20	1 357 381	6 363 228	204,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
R 21	1 357 226	6 363 318	206,2	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
S 23	1 360 701	6 363 648	259,7	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
T 24	1 361 391	6 363 808	280,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
U 26	1 362 356	6 365 303	284,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
V 27	1 362 521	6 365 953	278,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
W 28	1 361 906	6 366 738	260,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
X 29	1 360 812	6 366 711	272,4	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
Y 30	1 360 247	6 366 836	262,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
Z 31	1 359 762	6 366 416	259,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AA 32	1 359 427	6 365 846	262,2	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AB 33	1 353 748	6 365 145	228,1	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AC 35	1 362 402	6 364 363	270,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AD 38	1 358 924	6 363 405	248,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AE 37	1 362 749	6 365 140	286,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AF 36	1 362 389	6 365 360	289,1	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AG 17	1 355 333	6 364 842	245,5	5,0	5,0	2,0	0,0	0,0	"Green house mode"	
AH 15	1 359 233	6 363 491	249,6	5,0	5,0	2,0	0,0	0,0	"Green house mode"	

Calculation Results

Shadow receptor

No.	Name	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]
A 1		0:00	0	0:00	0:00
B 2		0:00	0	0:00	0:00
C 3		0:00	0	0:00	0:00
D 4		0:00	0	0:00	0:00
E 5		0:00	0	0:00	0:00
F 6		0:00	0	0:00	0:00
G 7		0:00	0	0:00	0:00
H 8		5:48	24	0:19	0:49
I 9		0:00	0	0:00	0:00
J 10		0:00	0	0:00	0:00
K 11		13:23	52	0:21	2:09
L 12		77:50	165	0:52	10:07
M 13		37:48	78	0:37	3:18
N 14		53:29	149	0:51	7:14
O 18		22:28	65	0:28	6:34
P 19		0:00	0	0:00	0:00
Q 20		0:00	0	0:00	0:00
R 21		0:00	0	0:00	0:00
S 23		0:00	0	0:00	0:00
T 24		22:57	63	0:25	6:07
U 26		68:54	158	0:46	16:24
V 27		29:11	88	0:31	4:17
W 28		30:09	74	0:32	2:56
X 29		65:34	80	1:07	6:08
Y 30		29:49	88	0:29	2:38

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No.	Name	Shadow, worst case		Max shadow hours per day	Shadow, expected values
		Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
Z 31		34:32	112	0:40	3:52
AA 32		70:09	177	0:44	9:23
AB 33		0:00	0	0:00	0:00
AC 35		28:01	84	0:25	7:18
AD 38		14:03	47	0:24	4:09
AE 37		25:54	95	0:24	5:53
AF 36		57:30	134	0:40	12:44
AG 17		0:00	0	0:00	0:00
AH 15		25:54	95	0:22	6:56

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (462)	41:14	10:14
2	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (463)	17:02	2:21
3	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (464)	31:06	3:26
4	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (465)	26:25	4:55
5	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (466)	31:42	7:02
6	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (467)	82:06	11:38
7	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (468)	19:25	2:41
8	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (469)	58:14	9:05
9	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (470)	84:05	10:46
10	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (471)	54:50	10:27
11	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (472)	70:03	9:59
12	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (473)	41:59	4:34
13	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (474)	21:55	1:52
14	REpower 3.2M114 3200 114.0 !O! hub: 143,0 m (TOT: 200,0 m) (475)	92:58	20:41