

Project:

141120\_PotentialUpdate\_Tjäder

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VATTENFALL AB IT  
Företagsenhet 1002  
SE-962 80 Jokkmokk

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Calculated:

2014-11-27 17:53/2.9.269

## SHADOW - Main Result

Calculation: 141125 MM114 tjäderupd 93mHH

### 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
509	268	355	487	426	555	644	710	1 448	1 381	1 067	706	8 556

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

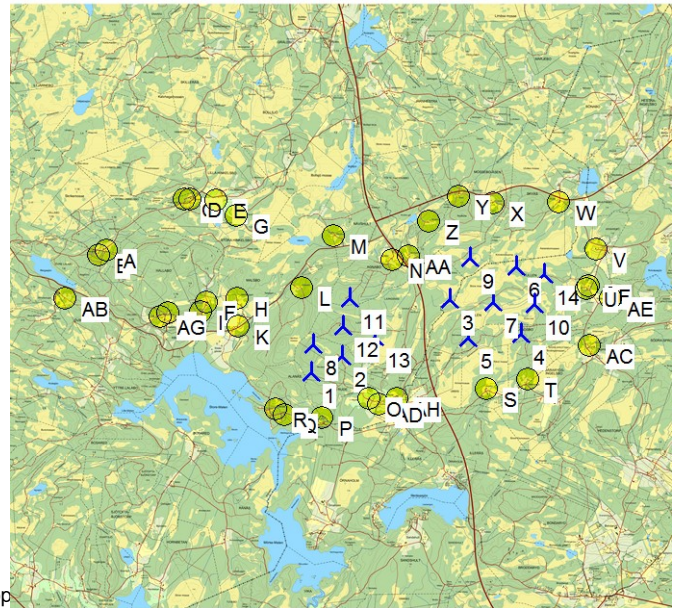
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

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)				Row data/Description	WTG type				Shadow data		
	East	North	Z			Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	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	93,0	1 718	12,6

### Shadow receptor-Input

No.	Name	Swedish RT90 2.5gonV 0:-15-RT90 (SE)				Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
		East	North	Z	Width [m]				
A 1	1 354 439	6 365 935	231,9	5,0	5,0	2,0	0,0	0,0	"Green house mode"
B 2	1 354 303	6 365 863	228,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"
C 3	1 355 719	6 366 777	230,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"
D 4	1 355 823	6 366 785	228,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"
E 5	1 356 247	6 366 773	220,8	5,0	5,0	2,0	0,0	0,0	"Green house mode"
F 6	1 356 082	6 365 087	238,0	5,0	5,0	2,0	0,0	0,0	"Green house mode"
G 7	1 356 579	6 366 515	237,5	5,0	5,0	2,0	0,0	0,0	"Green house mode"
H 8	1 356 602	6 365 151	223,5	5,0	5,0	2,0	0,0	0,0	"Green house mode"

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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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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		6:03	25	0:19	0:47
I 9		0:00	0	0:00	0:00
J 10		0:00	0	0:00	0:00
K 11		13:48	53	0:21	2:07
L 12		83:08	150	0:52	9:35
M 13		23:32	58	0:28	1:55
N 14		47:16	129	0:50	6:21
O 18		17:15	49	0:27	4:57
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		19:42	76	0:24	5:17
U 26		46:36	127	0:38	10:19
V 27		22:30	86	0:29	3:10
W 28		19:09	56	0:24	1:49
X 29		32:29	66	0:48	2:49
Y 30		7:24	39	0:20	0:44

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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		26:55	93	0:31	2:58
AA 32		56:25	144	0:44	7:21
AB 33		0:00	0	0:00	0:00
AC 35		32:11	100	0:26	8:19
AD 38		14:50	63	0:23	4:05
AE 37		14:35	72	0:23	3:10
AF 36		37:53	118	0:37	7:56
AG 17		0:00	0	0:00	0:00
AH 15		34:45	106	0:29	9:08

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: 93,0 m (TOT: 150,0 m) (462)	29:46	7:21
2	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (463)	41:21	7:03
3	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (464)	24:36	2:46
4	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (465)	18:11	3:24
5	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (466)	27:27	6:06
6	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (467)	52:59	6:54
7	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (468)	11:40	1:30
8	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (469)	54:52	8:00
9	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (470)	45:43	6:21
10	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (471)	49:17	10:01
11	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (472)	69:14	8:50
12	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (473)	37:48	4:17
13	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (474)	0:00	0:00
14	REpower 3.2M114 3200 114.0 !O! hub: 93,0 m (TOT: 150,0 m) (475)	61:55	13:21