Project:
Velinga RK20130618

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Calculated:
2013-09-24 13:42/2.8.579

SHADOW - Main Result

Calculation: alt 16 skuggberäkning

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) [GOTEBORG]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,32	2,16	3,42	6,08	9,24	8,56	7,23	5,77	4,73	3,30	1,75	1,23

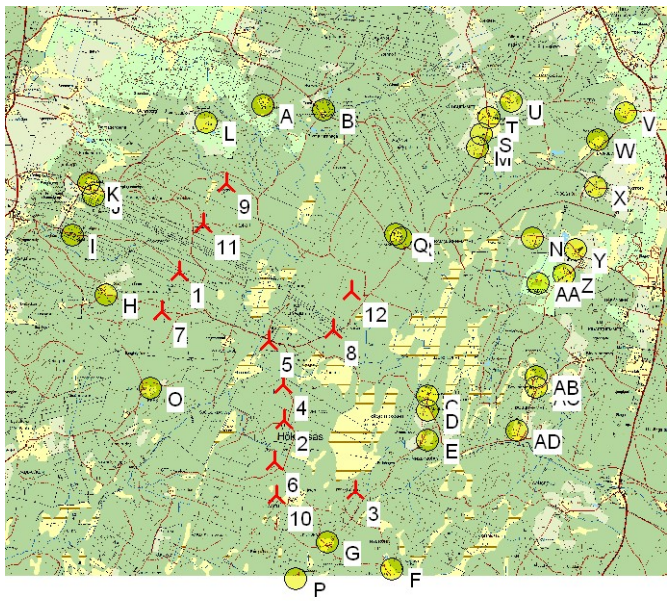
Operational hours are calculated from WTGs in calculation and wind distribution:
Site data f.u.i. Wasp - vat03-pos2 - 8.44 at 125 m

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
405	374	474	533	530	471	711	909	1 522	1 349	735	542	8 553

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: velinga height contours.map (8)
Obstacles used in calculation
Eye height: 1,5 m
Grid resolution: 10,0 m



Scale 1:75 000

New WTG Shadow receptor

WTGs

RN	East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	1 393 209	6 443 015	289,8	16C	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
2	1 394 246	6 441 546	308,8	16I	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
3	1 394 945	6 440 846	329,3	16K	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
4	1 394 235	6 441 904	300,2	16H	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
5	1 394 088	6 442 326	290,0	16G	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
6	1 394 149	6 441 135	309,2	16J	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
7	1 393 034	6 442 621	305,4	16E	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
8	1 394 731	6 442 445	305,0	16F	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
9	1 393 673	6 443 892	257,4	16A	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
10	1 394 169	6 440 795	323,0	16L	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
11	1 393 443	6 443 491	270,0	16B	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0
12	1 394 911	6 442 823	305,0	16D	Yes	Siemens	SWT-3.0 113m-3 000	3 000	113,0	122,5	1 357	0,0

Shadow receptor-Input

No.	RN East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	1 394 030	6 444 667	238,1	1,0	1,0	1,5	0,0	90,0	"Green house mode"
B	1 394 635	6 444 619	245,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
C	1 395 663	6 441 783	310,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
D	1 395 661	6 441 643	310,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
E	1 395 663	6 441 349	301,5	1,0	1,0	1,5	0,0	90,0	"Green house mode"
F	1 395 311	6 440 058	332,4	1,0	1,0	1,5	0,0	90,0	"Green house mode"
G	1 394 673	6 440 325	324,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
H	1 392 480	6 442 787	284,5	1,0	1,0	1,5	0,0	90,0	"Green house mode"
I	1 392 150	6 443 378	244,4	1,0	1,0	1,5	0,0	90,0	"Green house mode"
J	1 392 357	6 443 765	237,8	1,0	1,0	1,5	0,0	90,0	"Green house mode"

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SHADOW - Main Result

Calculation: alt 16 skuggberäkning

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RN No.	East	North	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
K	1 392 306	6 443 893	233,4	1,0	1,0	1,5	0,0	90,0	"Green house mode"
L	1 393 472	6 444 491	235,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
M	1 396 154	6 444 239	320,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
N	1 396 704	6 443 349	323,6	1,0	1,0	1,5	0,0	90,0	"Green house mode"
O	1 392 924	6 441 859	302,3	1,0	1,0	1,5	0,0	90,0	"Green house mode"
P	1 394 354	6 439 964	310,5	1,0	1,0	1,5	0,0	90,0	"Green house mode"
Q	1 395 345	6 443 391	325,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
R	1 395 407	6 443 351	325,0	1,0	1,0	1,5	0,0	90,0	"Green house mode"
S	1 396 195	6 444 379	310,8	1,0	1,0	1,0	0,0	90,0	"Green house mode"
T	1 396 275	6 444 539	300,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
U	1 396 495	6 444 699	289,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
V	1 397 626	6 444 589	292,2	1,0	1,0	1,0	0,0	90,0	"Green house mode"
W	1 397 346	6 444 319	320,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
X	1 397 326	6 443 849	321,6	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Y	1 397 126	6 443 229	319,9	1,0	1,0	1,0	0,0	90,0	"Green house mode"
Z	1 397 016	6 442 989	314,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AA	1 396 755	6 442 899	311,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AB	1 396 735	6 441 979	296,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AC	1 396 735	6 441 869	295,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
AD	1 396 545	6 441 439	290,1	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	43:40	88	0:36	5:35
B	9:26	33	0:23	1:40
C	39:31	117	0:25	9:01
D	26:49	87	0:26	5:31
E	15:34	40	0:30	3:02
F	0:00	0	0:00	0:00
G	0:00	0	0:00	0:00
H	83:11	168	0:44	23:07
I	25:28	89	0:23	5:02
J	36:48	132	0:24	6:18
K	16:17	58	0:22	2:39
L	67:26	113	0:51	7:53
M	0:00	0	0:00	0:00
N	0:00	0	0:00	0:00
O	16:37	64	0:22	4:53
P	0:00	0	0:00	0:00
Q	54:52	108	0:40	7:32
R	48:05	108	0:45	7:01
S	0:00	0	0:00	0:00
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
AD	0:00	0	0:00	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	16C	56:18	14:12
2	16I	0:00	0:00
3	16K	42:00	6:47
4	16H	6:46	1:46
5	16G	9:50	3:07
6	16J	0:00	0:00
7	16E	52:30	9:42
8	16F	75:31	14:56
9	16A	94:07	13:10
10	16L	0:00	0:00
11	16B	87:23	16:26
12	16D	57:47	8:34