Licensed user:
Lagerwey Wind BV
Anthonie Fokkerstraat 2
NL-3772 MR Barneveld
+31(0)342 751935
Oziel Garcia James / ogj@lagerwey.com
Calculated:
24/11/2015 14:45/3.0.629

SHADOW - Main Result

Calculation: 3xL100-2.5MW 135mHH - Isolines 8, 10 hours

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.02	2.84	3.78	6.14	8.62	9.94	7.42	5.13	4.32	3.43	1.58	0.96

Operational hours are calculated from WTGs in calculation and wind distribution:
EmdConwx_N62.480_E022.160

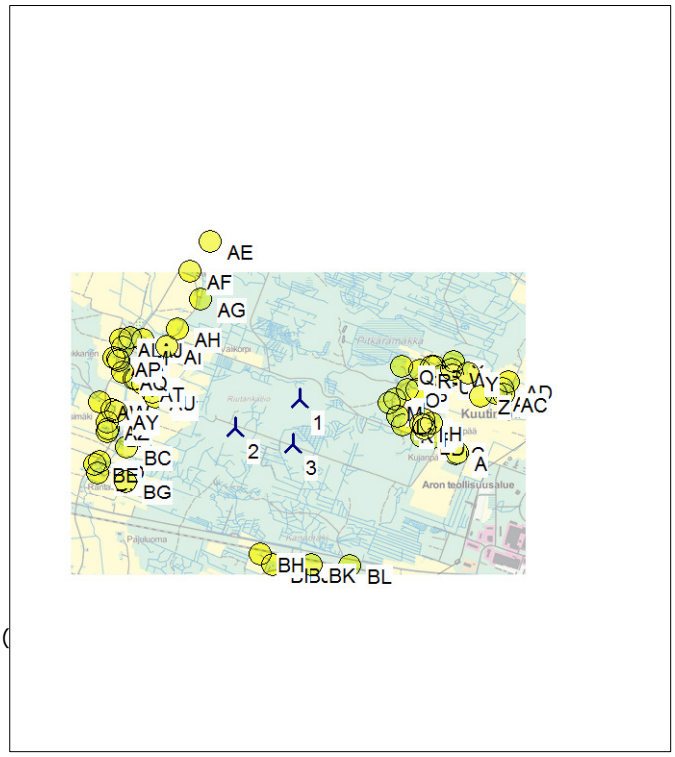
Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
596	581	473	441	527	751	927	1,300	1,010	778	665	554	8,604

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: Elevation Grid Data Object: Aronkyla_EMDGrid_0.wpg (
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89



Scale 1:75,000
New WTG
Shadow receptor

WTGs

	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	250,484	6,936,046	120.6	LAGERWEY L100-2.5MW 2520 1...	Yes	LAGERWEY	L100-2.5MW-2,520	2,520	100.0	135.0	1,527	15.2
2	249,840	6,935,757	120.0	LAGERWEY L100-2.5MW 2520 1...	Yes	LAGERWEY	L100-2.5MW-2,520	2,520	100.0	135.0	1,527	15.2
3	250,410	6,935,600	114.6	LAGERWEY L100-2.5MW 2520 1...	Yes	LAGERWEY	L100-2.5MW-2,520	2,520	100.0	135.0	1,527	15.2

Shadow receptor-Input

No.	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	252,060	6,935,509	99.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	252,042	6,935,497	99.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	252,015	6,935,607	100.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
D	251,821	6,935,657	102.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
E	251,698	6,935,676	105.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
F	251,728	6,935,749	105.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
G	251,723	6,935,786	105.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
H	251,794	6,935,809	104.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
I	251,689	6,935,797	106.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
J	251,724	6,935,846	105.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
K	251,507	6,935,783	110.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
L	251,461	6,935,878	111.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
M	251,378	6,936,006	114.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
N	251,427	6,936,046	113.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
O	251,560	6,936,141	111.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
P	251,649	6,936,143	109.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Q	251,496	6,936,372	113.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
R	251,679	6,936,330	110.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
S	251,799	6,936,374	107.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
T	251,828	6,936,376	107.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
U	251,889	6,936,280	105.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"

To be continued on next page...

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SHADOW - Main Result

Calculation: 3xL100-2.5MW 135mHH - Isolines 8, 10 hours

...continued from previous page

No.	East	North	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
V	252,007	6,936,285	104.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
W	252,000	6,936,343	106.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
X	252,021	6,936,423	107.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Y	252,160	6,936,307	103.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
Z	252,283	6,936,074	99.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AA	252,438	6,936,106	99.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AB	252,512	6,936,147	99.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AC	252,519	6,936,096	99.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AD	252,568	6,936,223	99.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AE	249,581	6,937,624	109.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AF	249,380	6,937,329	108.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AG	249,490	6,937,050	110.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AH	249,259	6,936,747	107.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AI	249,154	6,936,580	105.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AJ	248,908	6,936,650	103.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AK	248,784	6,936,666	104.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AL	248,688	6,936,642	106.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AM	248,708	6,936,567	105.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AN	248,626	6,936,464	105.8	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AO	248,670	6,936,436	105.3	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AP	248,665	6,936,453	105.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AQ	248,713	6,936,318	103.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AR	248,825	6,936,251	101.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AS	248,843	6,936,248	101.4	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AT	248,914	6,936,205	101.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AU	249,009	6,936,119	101.2	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AV	249,039	6,936,073	100.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AW	248,476	6,936,025	100.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AX	248,606	6,935,941	100.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AY	248,646	6,935,929	99.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
AZ	248,559	6,935,822	99.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BA	248,564	6,935,752	99.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BB	248,560	6,935,720	99.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BC	248,749	6,935,567	99.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BD	248,478	6,935,429	98.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BE	248,437	6,935,397	98.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BF	248,464	6,935,306	97.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BG	248,745	6,935,222	98.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BH	250,085	6,934,491	96.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BI	250,211	6,934,381	95.5	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BJ	250,382	6,934,387	95.7	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BK	250,594	6,934,380	95.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"
BL	250,978	6,934,372	94.0	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
A	0:00	0	0:00	0:00
B	0:00	0	0:00	0:00
C	0:00	0	0:00	0:00
D	9:46	46	0:17	1:58
E	11:48	49	0:19	2:23
F	11:17	49	0:19	2:17
G	11:04	48	0:18	2:15
H	9:54	44	0:18	2:01
I	11:47	50	0:19	2:24
J	11:04	48	0:18	2:16
K	16:18	58	0:23	3:18
L	17:26	60	0:24	3:38
M	19:46	62	0:26	4:15

To be continued on next page...

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SHADOW - Main Result

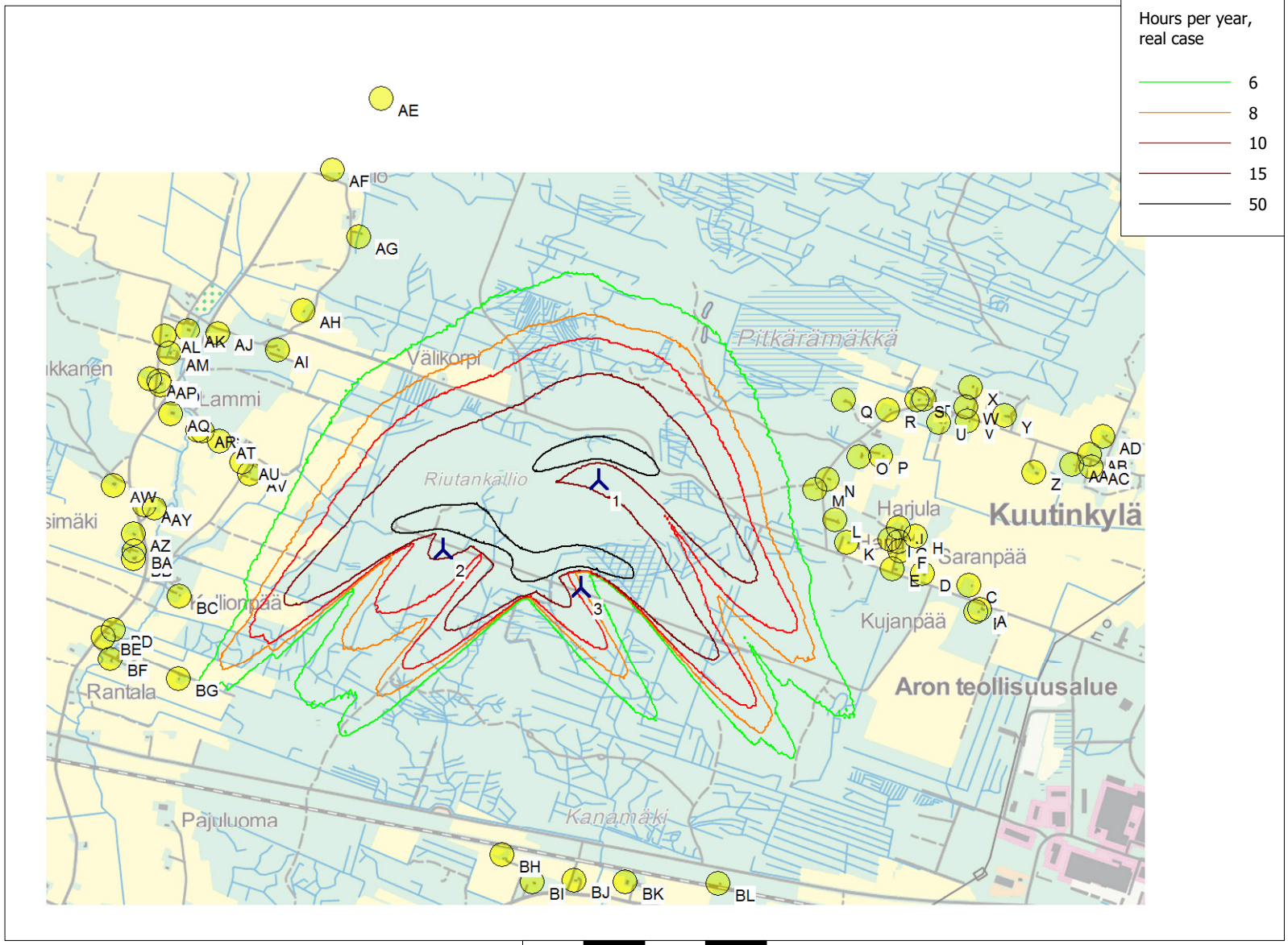
Calculation: 3xL100-2.5MW 135mHH - Isolines 8, 10 hours

...continued from previous page

No.	Shadow, worst case: Shadow hours per year [h/year]	Shadow, worst case: Shadow days per year [days/year]	Shadow, worst case: Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
N	17:34	59	0:24	3:44
O	13:23	52	0:22	2:42
P	11:35	48	0:20	2:19
Q	13:31	52	0:22	2:47
R	10:27	46	0:19	2:07
S	4:49	22	0:17	0:57
T	4:39	21	0:17	0:55
U	4:20	21	0:16	0:49
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
AE	0:00	0	0:00	0:00
AF	0:00	0	0:00	0:00
AG	14:36	63	0:19	2:14
AH	13:28	54	0:21	2:27
AI	13:11	51	0:22	2:32
AJ	5:59	26	0:18	1:11
AK	5:05	23	0:17	1:01
AL	4:30	22	0:16	0:53
AM	4:52	22	0:17	0:58
AN	4:40	21	0:17	0:54
AO	5:00	22	0:18	0:58
AP	4:54	22	0:17	0:57
AQ	5:39	24	0:18	1:04
AR	6:54	26	0:20	1:18
AS	7:07	26	0:21	1:21
AT	8:13	28	0:22	1:33
AU	18:43	56	0:37	3:36
AV	20:09	62	0:34	3:52
AW	4:32	21	0:17	0:51
AX	5:52	24	0:19	1:12
AY	6:12	25	0:19	1:17
AZ	5:38	24	0:18	1:14
BA	5:51	25	0:18	1:17
BB	5:57	24	0:19	1:18
BC	9:03	33	0:22	1:58
BD	5:51	26	0:17	1:18
BE	5:31	26	0:17	1:14
BF	5:58	28	0:17	1:26
BG	12:45	50	0:20	3:31
BH	0:00	0	0:00	0:00
BI	0:00	0	0:00	0:00
BJ	0:00	0	0:00	0:00
BK	0:00	0	0:00	0:00
BL	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	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 135.0 m (TOT: 185.0 m) (1)	89:14	18:28
2	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 135.0 m (TOT: 185.0 m) (2)	127:28	26:06
3	LAGERWEY L100-2.5MW 2520 100.0 !O! hub: 135.0 m (TOT: 185.0 m) (3)	53:36	10:43



Map: Aronkyla01 , Print scale 1:25,000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 250,462 North: 6,935,854

New WTG

Shadow receptor

Flicker map level: Elevation Grid Data Object: Aronkyla_EMDGrid_0.wpg (1)

Project:

Aronkyla

SHADOW - Map

Calculation:

3xL100-2.5MW 135mHH - Isolines 8, 10 hours

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