

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 1

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Main Result**Calculation:** Shadow Max layout worstcase EIAR KJ**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

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

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_1.w

Obstacles not used in calculation

Eye height: 1.5 m

Grid resolution: 10 m



New WTG

Shadow receptor

WTGs

KKJ Zone: 2				WTG type				Shadow data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
KKJ Zone: 2											
		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	2 499 769	7 135 235	25.0 WTG 2	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
2	2 499 556	7 134 876	25.0 WTG 13	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
3	2 500 045	7 134 897	27.9 WTG 5	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
4	2 499 605	7 134 537	28.1 WTG 14	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
5	2 498 347	7 135 055	21.0 WTG 12	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
6	2 498 713	7 133 794	22.3 WTG 9	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
7	2 498 445	7 134 120	21.5 WTG 10	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
8	2 499 158	7 134 174	25.6 WTG 6	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
9	2 499 276	7 135 077	29.2 WTG 1	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
10	2 498 187	7 134 434	20.0 WTG 7	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
11	2 498 058	7 134 708	18.2 WTG 8	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
12	2 498 116	7 135 281	19.5 WTG 11	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
13	2 498 747	7 134 879	23.8 WTG 4	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0
14	2 498 698	7 134 486	23.1 WTG 3	Yes	ENERCON	E-82 E2-2 300	2 300	82.0	138.4	1 599	18.0

Shadow receptor-Input

KKJ Zone: 2										
No.	Name	East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	Juolanpää_1	2 497 423	7 137 222	3.1	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
B	Juolanpää_2	2 497 612	7 137 250	3.8	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
C	Juolanpää_3	2 498 155	7 137 385	5.0	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
D	Kiviranta_1	2 496 232	7 134 459	1.5	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
E	Kiviranta_2	2 496 275	7 135 267	1.8	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
F	Virpelä_1	2 496 449	7 136 419	1.8	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
G	Aapraminsääri	2 496 323	7 135 719	1.1	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
H	Leirikeskus	2 496 437	7 133 987	1.9	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
I	Satulaperä	2 496 357	7 133 764	1.3	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
J	Konnunsuo	2 497 458	7 133 144	10.0	1.0	1.0	2.0	-180.0	0.0	"Green house mode"
K	Kivisuo	2 498 066	7 132 684	15.0	1.0	1.0	2.0	-180.0	0.0	"Green house mode"

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 2

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Main Result**Calculation:** Shadow Max layout worstcase EIAR KJ**Calculation Results**

Shadow receptor

Shadow, worst case

No.	Name	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	Juolanpää_1	0:00	0	0:00
B	Juolanpää_2	0:00	0	0:00
C	Juolanpää_3	0:00	0	0:00
D	Kiviranta_1	0:00	0	0:00
E	Kiviranta_2	0:00	0	0:00
F	Virpelä_1	0:00	0	0:00
G	Aapraminsääri	0:00	0	0:00
H	Leirikeskus	0:00	0	0:00
I	Satulaperä	0:00	0	0:00
J	Konnunsuo	13:51	68	0:15
K	Kivisuo	0:00	0	0:00

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	WTG 2	0:00	
2	WTG 13	0:00	
3	WTG 5	0:00	
4	WTG 14	0:00	
5	WTG 12	0:00	
6	WTG 9	4:27	
7	WTG 10	9:24	
8	WTG 6	0:00	
9	WTG 1	0:00	
10	WTG 7	0:00	
11	WTG 8	0:00	
12	WTG 11	0:00	
13	WTG 4	0:00	
14	WTG 3	0:00	

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 14

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

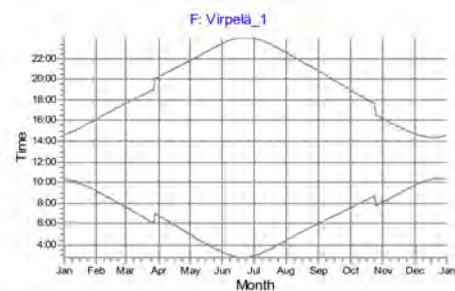
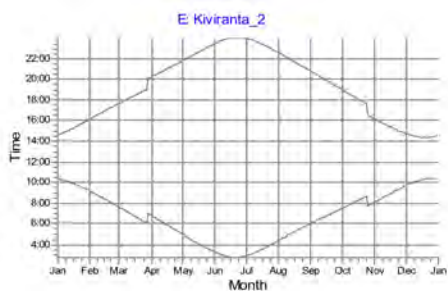
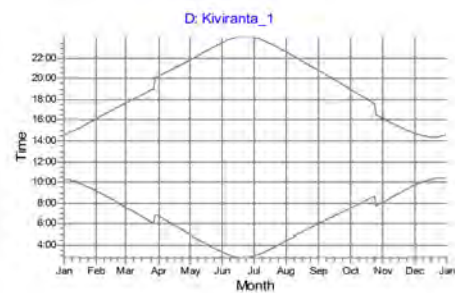
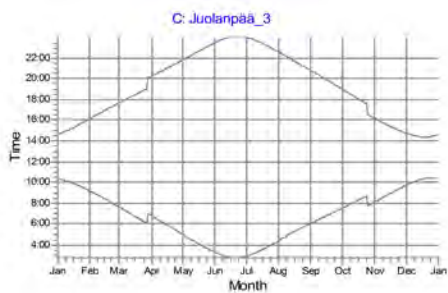
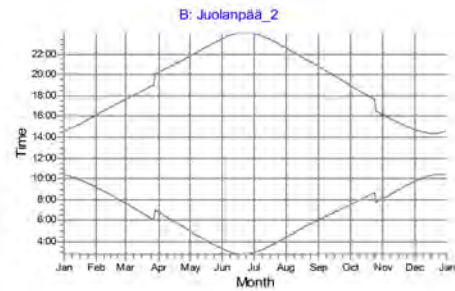
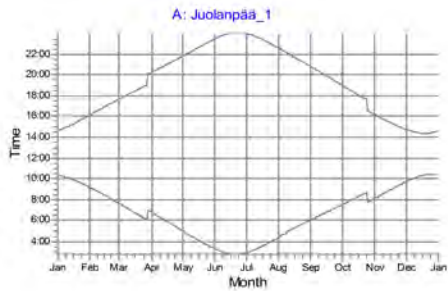
SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Calendar, graphical**Calculation:** Shadow Max layout worstcase EIAR KJ

WTGs

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 15

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

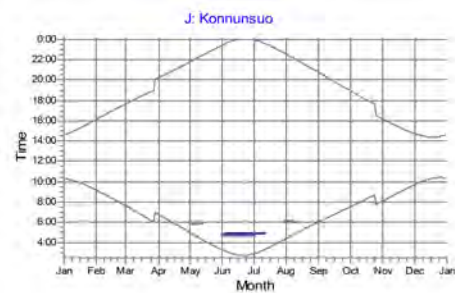
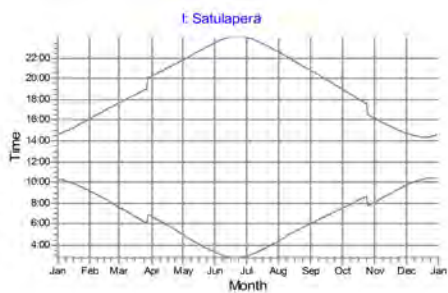
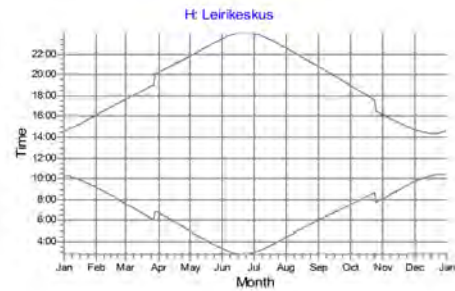
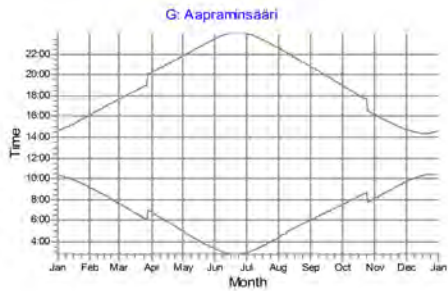
SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Calendar, graphical**Calculation:** Shadow Max layout worstcase EIAR KJ

WTGs



6: WTG 9



7: WTG 10

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 30

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

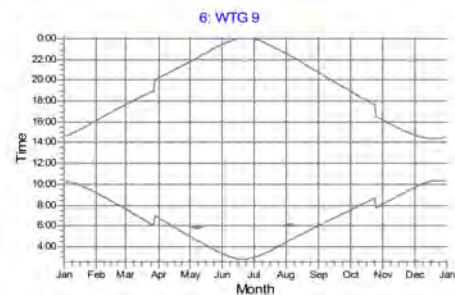
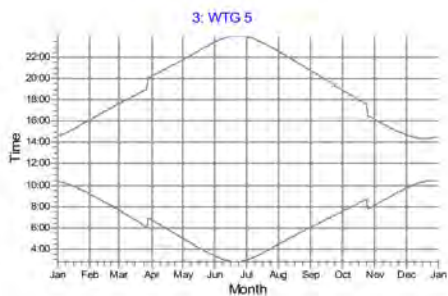
SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Calendar per WTG, graphical**Calculation:** Shadow Max layout worstcase EIAR KJ

Shadow receptor



J: Konnunsuo

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 31

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

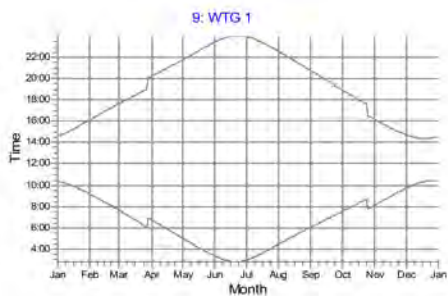
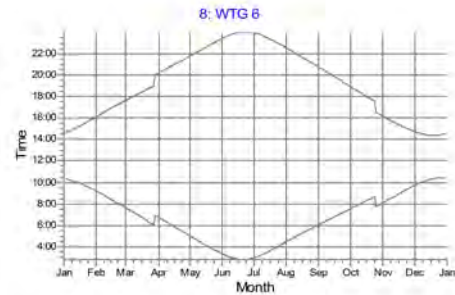
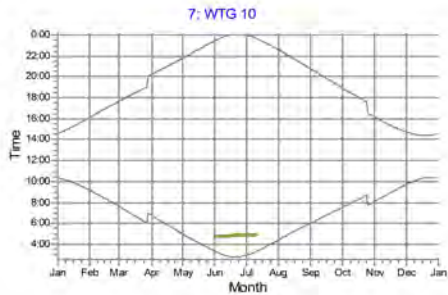
SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Calendar per WTG, graphical**Calculation:** Shadow Max layout worstcase EIAR KJ

Shadow receptor



J: Konnunsuo

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 32

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

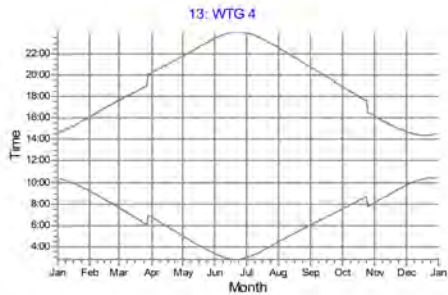
SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Calendar per WTG, graphical**Calculation:** Shadow Max layout worstcase EIAR KJ

Shadow receptor

Project:

Jokela_MASTER

Printed/Page

27.7.2011 14:13 / 33

Licensed user:

wpd Scandinavia AB

Ferkens Gränd 3

SE-111 30 Stockholm

+46 733 99 00 40

Karoliina Joensuu / karoliina.joensuu@wpd.fi

Calculated:

27.7.2011 13:55/2.7.486

SHADOW - Map**Calculation:** Shadow Max layout worstcase EIAR KJ