



Project:

Goyerbrug

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Winvast B.V.

Meerkoetwaard 6

NL-3984 MK Odijk

+31 6 27 876 441

R.L.M. de Coo / ronald@winvast.nl

Calculated:

9-1-2015 19:21/2.9.285

### SHADOW - Main Result

Calculation: 3 x V112-3.3MW-119m

#### 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) [DE BILT]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 1,48 2,65 3,60 5,24 6,59 6,28 6,20 6,12 4,48 3,32 1,87 1,32

Operational hours are calculated from WTGs in calculation and wind distribution:

Site data 12 sectors; Radius: 20.000 m (1)

Operational time  
 N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 605 611 553 568 476 592 803 1.174 1.139 761 568 503 8.350  
 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: CONTOURLINE\_ONLINEDATA\_0.wp  
 Obstacles not used in calculation  
 Eye height: 1,5 m  
 Grid resolution: 10,0 m



Scale 1:40.000

New WTG

Shadow receptor

#### WTGs

RD1	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
1	145.638	444.118	0,0	VESTAS V112-3.3 Gridstrea...	Yes	VESTAS	V112-3.3 Gridstrea...	3.300	112,0	119,0	1.713	0,0
2	146.164	443.855	0,0	VESTAS V112-3.3 Gridstrea...	Yes	VESTAS	V112-3.3 Gridstrea...	3.300	112,0	119,0	1.713	0,0
3	146.631	443.622	0,0	VESTAS V112-3.3 Gridstrea...	Yes	VESTAS	V112-3.3 Gridstrea...	3.300	112,0	119,0	1.713	0,0

#### Shadow receptor-Input

No.	Name	RD1			Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
		East	North	Z						
A	Hoeksedijk 2, 3961 ME Wijk bij Duurstede	146.911	443.426	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
B	Hoeksedijk 3, 3998 NM Schalkwijk	146.766	443.302	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
C	Beusichemseweg 146, 3998 NL Schalkwijk	145.986	443.670	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
D	Beusichemseweg 71, 3998 NL Schalkwijk	145.844	443.703	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
E	Beusichemseweg 69, 3998 NL Schalkwijk	145.660	443.765	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
F	Zuwedijk 6, 3998 NA Schalkwijk	145.109	444.143	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
G	Nachtdijk 25, 3997 MR 't Goy	145.249	444.593	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
H	Kapelleweg 25, 3997 MP 't Goy	145.645	444.526	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
I	Nachtdijk 19, 3997 MR 't Goy	145.560	444.857	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
J	Kapelleweg 20, 3997 MP 't Goy	145.781	444.556	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
K	Kapelleweg 6, 3945 LA Cothen	145.856	444.551	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
L	Kapelleweg 11, 3945 LA Cothen	146.154	444.546	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
M	Kapelleweg 9, 3945 LA Cothen	146.229	444.571	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
N	Kapelleweg 7, 3945 LA Cothen	146.419	444.536	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
O	Kapelleweg 5, 3945 LA Cothen	146.657	444.541	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
P	Kapelleweg 3, 3945 LA Cothen	146.853	444.531	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
Q	Wijkersloot 33, 3961 MN Wijk bij Duurstede	147.706	443.946	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
R	Hoeksedijk 1, 3998 NM Schalkwijk	146.680	443.096	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
S	Lekdijk West 53, 3961 MD Wijk bij Duurstede	146.628	442.998	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
T	Lekdijk West 52, 3961 MD Wijk bij Duurstede	146.736	442.905	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"

To be continued on next page...

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**SHADOW - Main Result****Calculation:** 3 x V112-3.3MW-119m

...continued from previous page

No.	Name	RD1							Degrees from south cw [°]	Slope of window [°]	Direction mode
		East	North	Z	Width	Height	Height a.g.l.				
				[m]	[m]	[m]	[m]				
	U Lekdijk 4, 3998 NH Schalkwijk	145.064	443.876	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"	
	V Zuwedijk 2, 3998 NA Schalkwijk	144.837	444.001	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"	

**Calculation Results**

Shadow receptor

No.	Name	Shadow, expected values	
		Shadow hours per year [h/year]	
A	Hoeksedijk 2, 3961 ME Wijk bij Duurstede	7:26	
B	Hoeksedijk 3, 3998 NM Schalkwijk	0:49	
C	Beusichemseweg 146, 3998 NL Schalkwijk	6:21	
D	Beusichemseweg 71, 3998 NL Schalkwijk	15:20	
E	Beusichemseweg 69, 3998 NL Schalkwijk	19:40	
F	Zuwedijk 6, 3998 NA Schalkwijk	12:32	
G	Nachtdijk 25, 3997 MR 't Goy	9:30	
H	Kappelleweg 25, 3997 MP 't Goy	18:10	
I	Nachtdijk 19, 3997 MR 't Goy	0:54	
J	Kappelleweg 20, 3997 MP 't Goy	15:38	
K	Kappelleweg 6, 3945 LA Cothen	15:29	
L	Kappelleweg 11, 3945 LA Cothen	5:46	
M	Kappelleweg 9, 3945 LA Cothen	4:43	
N	Kappelleweg 7, 3945 LA Cothen	5:08	
O	Kappelleweg 5, 3945 LA Cothen	6:23	
P	Kappelleweg 3, 3945 LA Cothen	4:51	
Q	Wijkersloot 33, 3961 MN Wijk bij Duurstede	2:45	
R	Hoeksedijk 1, 3998 NM Schalkwijk	0:00	
S	Lekdijk West 53, 3961 MD Wijk bij Duurstede	0:00	
T	Lekdijk West 52, 3961 MD Wijk bij Duurstede	0:00	
U	Lekdijk 4, 3998 NH Schalkwijk	18:23	
V	Zuwedijk 2, 3998 NA Schalkwijk	6:32	

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

No.	Name	Worst case	Expected
		[h/year]	[h/year]
1	VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.1)	546:21	85:12
2	VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.2)	354:52	60:52
3	VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.3)	104:19	16:09

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Calculated:

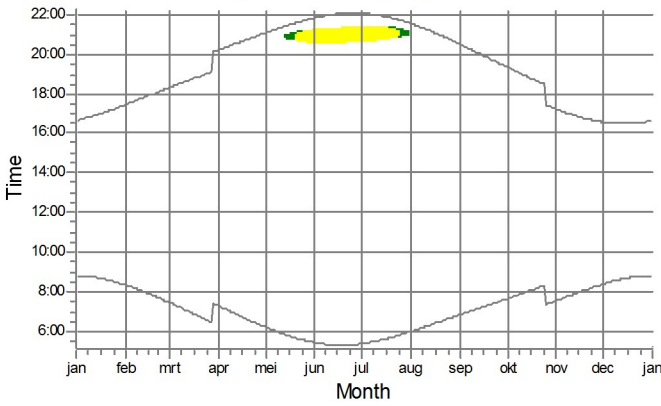
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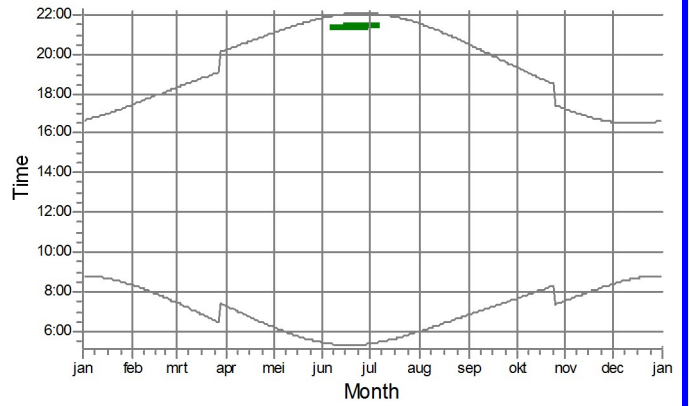
## SHADOW - Calendar, graphical

Calculation: 3 x V112-3.3MW-119m

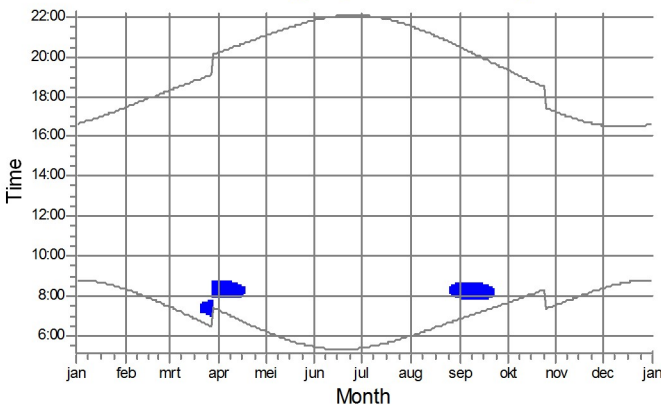
A: Hoeksedijk 2, 3961 ME Wijk bij Duurstede



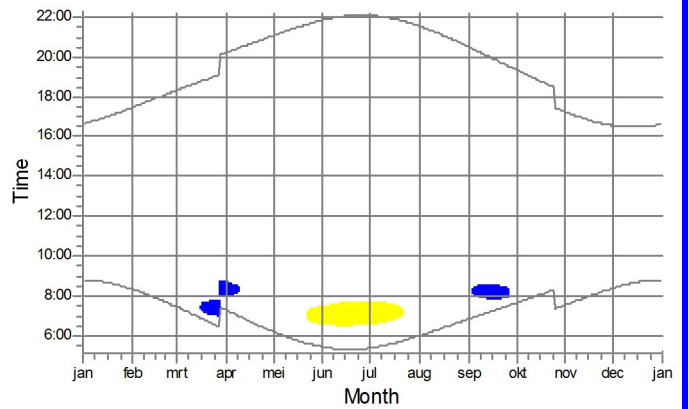
B: Hoeksedijk 3, 3998 NM Schalkw ijk



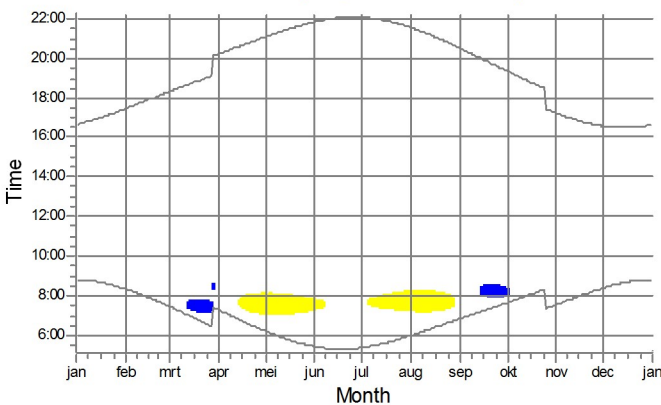
C: Beusichemseweg 146, 3998 NL Schalkw ijk



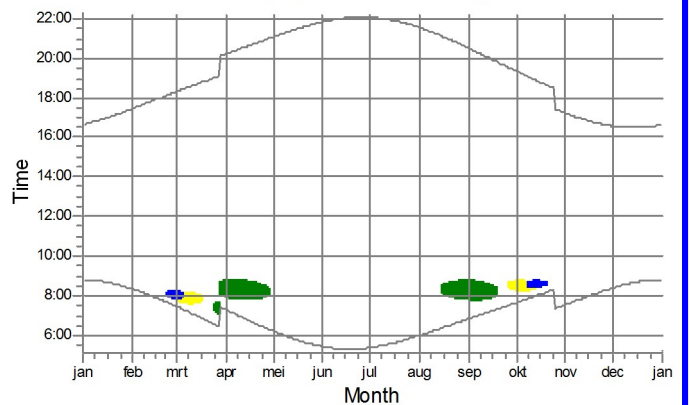
D: Beusichemseweg 71, 3998 NL Schalkw ijk



E: Beusichemseweg 69, 3998 NL Schalkw ijk



F: Zuwedijk 6, 3998 NA Schalkw ijk



### WTGs

- 1: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.1)
- 2: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.2)
- 3: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.3)

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Calculated:

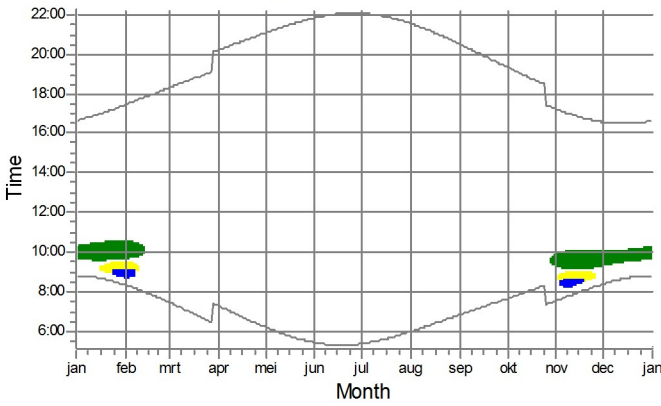
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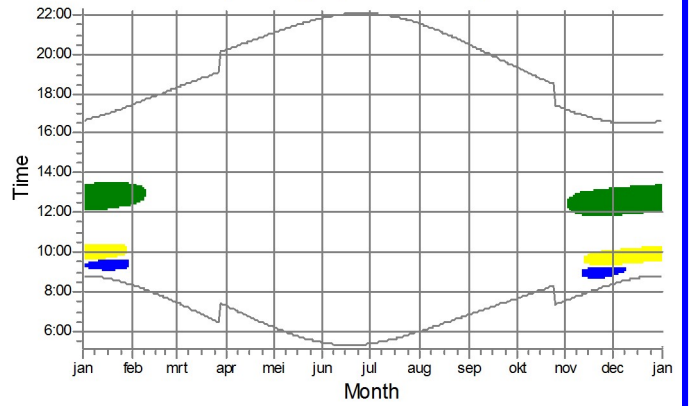
**SHADOW - Calendar, graphical**

Calculation: 3 x V112-3.3MW-119m

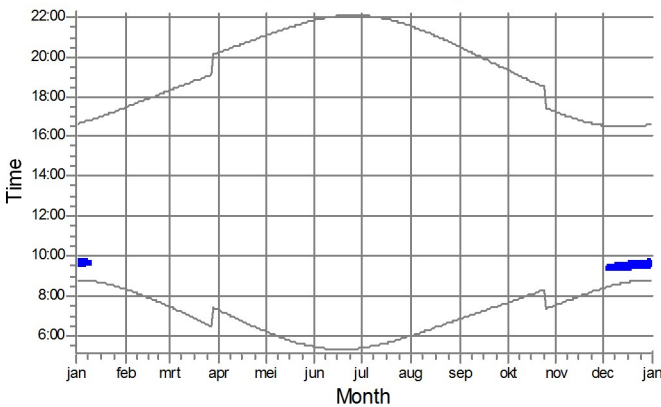
G: Nachtdijk 25, 3997 MR 't Goy



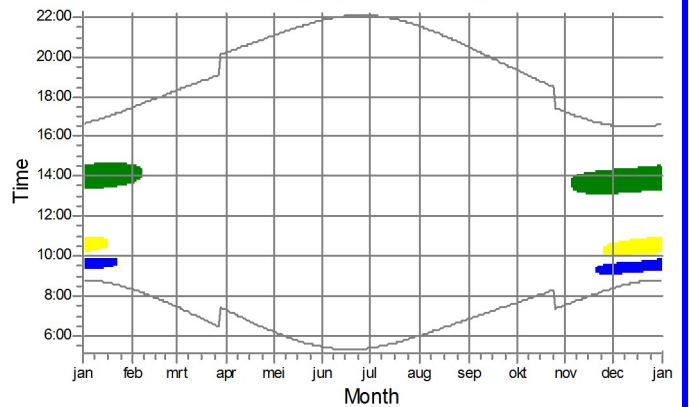
H: Kapelleweg 25, 3997 MP 't Goy



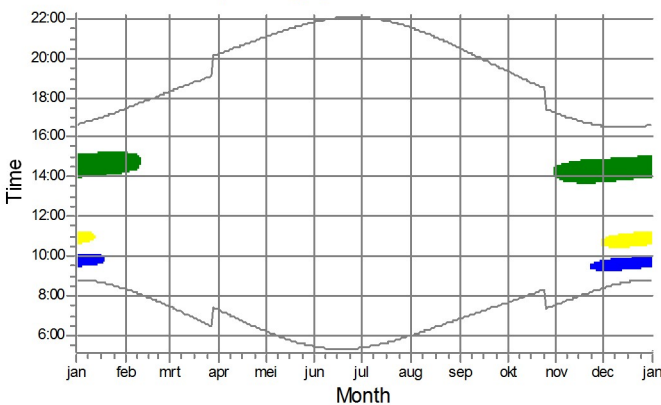
I: Nachtdijk 19, 3997 MR 't Goy



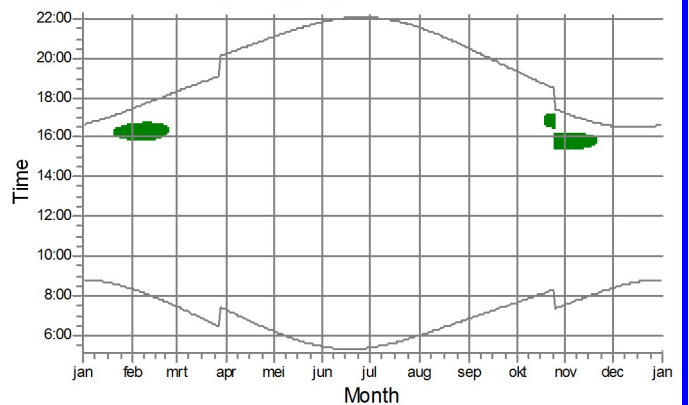
J: Kapelleweg 20, 3997 MP 't Goy



K: Kapelleweg 6, 3945 LA Cothen



L: Kapelleweg 11, 3945 LA Cothen



WTGs

- 1: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.1)
- 2: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.2)
- 3: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.3)



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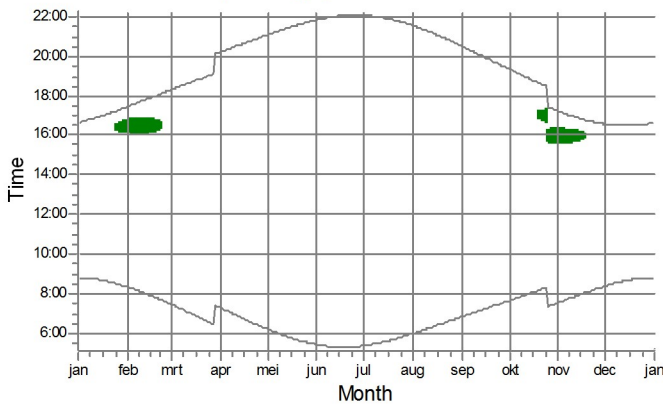
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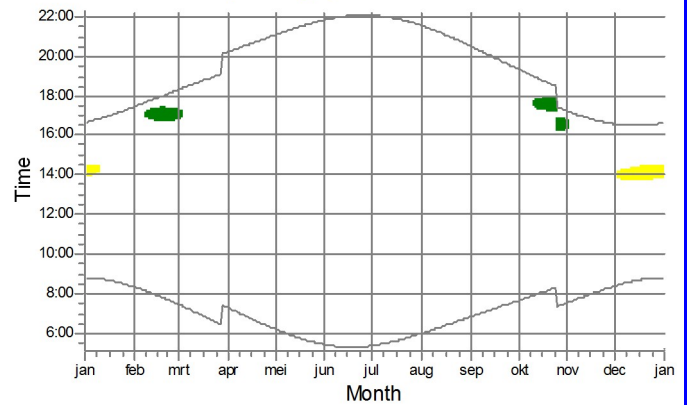
**SHADOW - Calendar, graphical**

Calculation: 3 x V112-3.3MW-119m

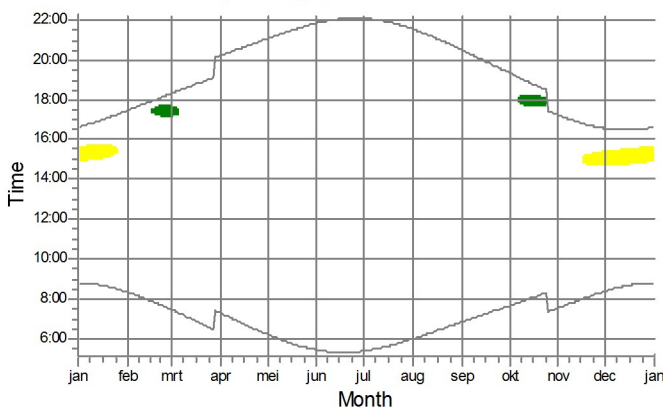
M: Kapelleweg eg 9, 3945 LA Cothen



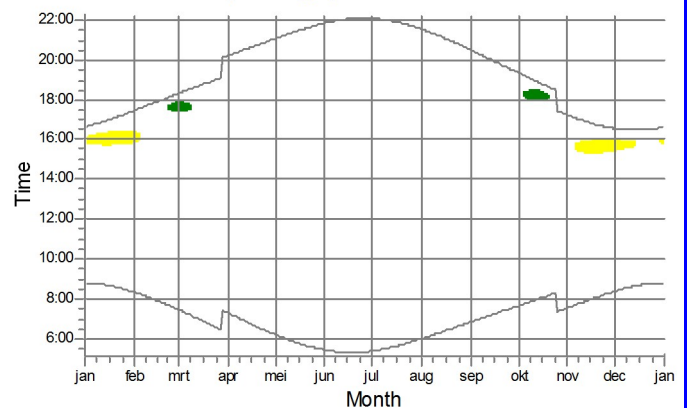
N: Kapelleweg eg 7, 3945 LA Cothen



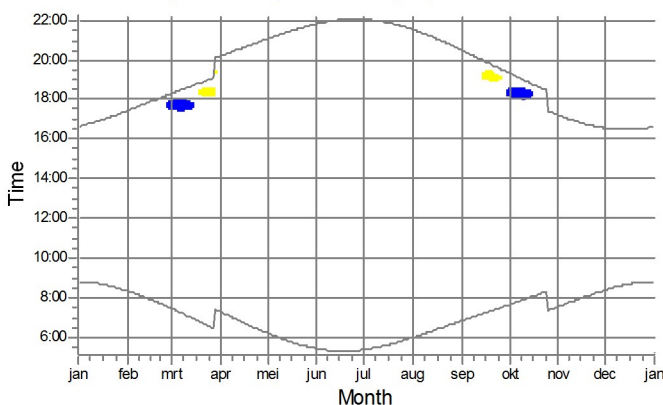
O: Kapelleweg eg 5, 3945 LA Cothen



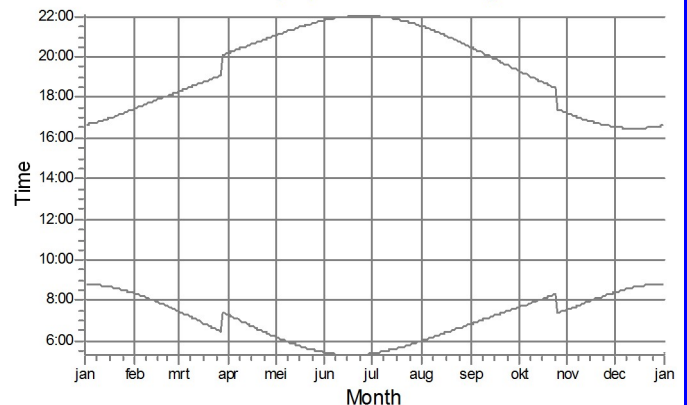
P: Kapelleweg eg 3, 3945 LA Cothen



Q: Wijkersloot 33, 3961 MN Wijk bij Duurstede



R: Hoeksedijk 1, 3998 NM Schalkwijk



WTGs

- 1: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.1)
- 2: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.2)
- 3: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.3)

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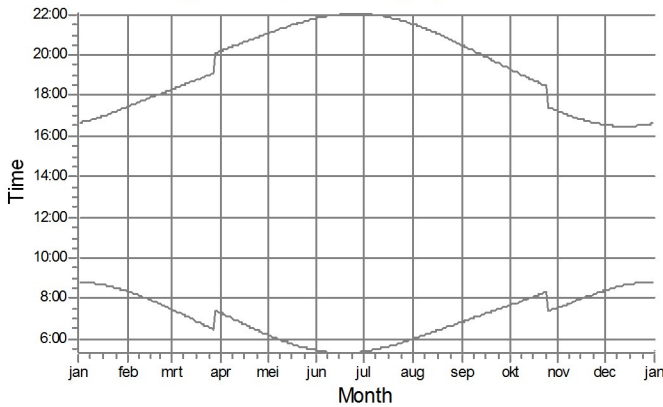
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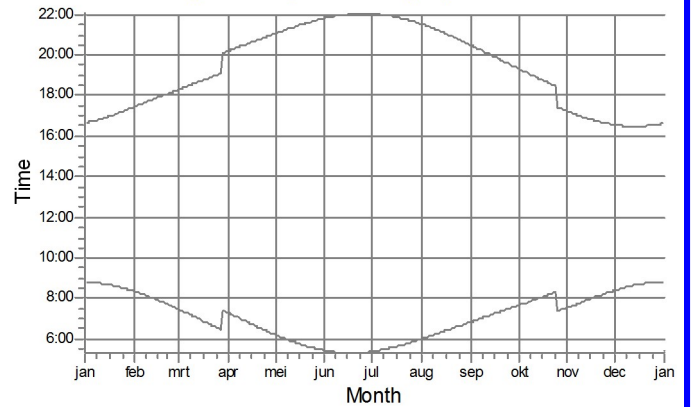
## SHADOW - Calendar, graphical

Calculation: 3 x V112-3.3MW-119m

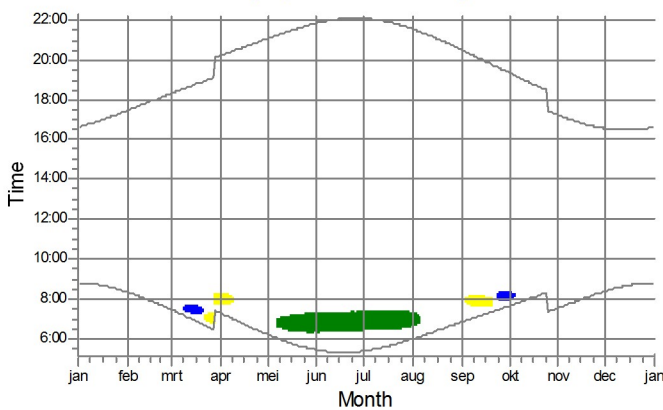
S: Lekdijk West 53, 3961 MD Wijk bij Duurstede



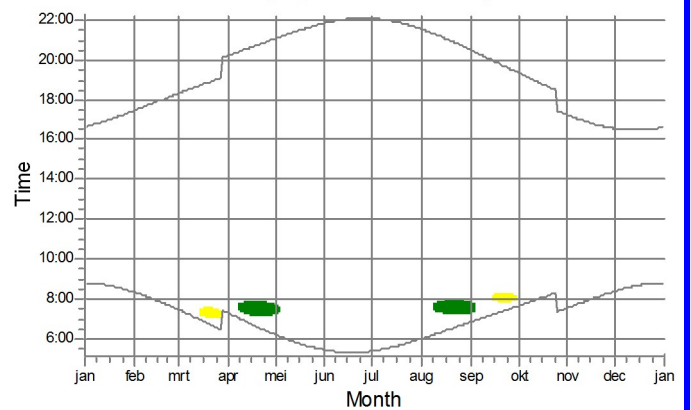
T: Lekdijk West 52, 3961 MD Wijk bij Duurstede





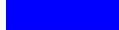
U: Lekdijk 4, 3998 NH Schalkwijk



V: Zuwendijk 2, 3998 NA Schalkwijk



### WTGs

-  1: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.1)
-  2: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.2)
-  3: VESTAS V112-3.3 Gridstreame 3300 112.0 !O! hub: 119,0 m (TOT: 175,0 m) (1.3)

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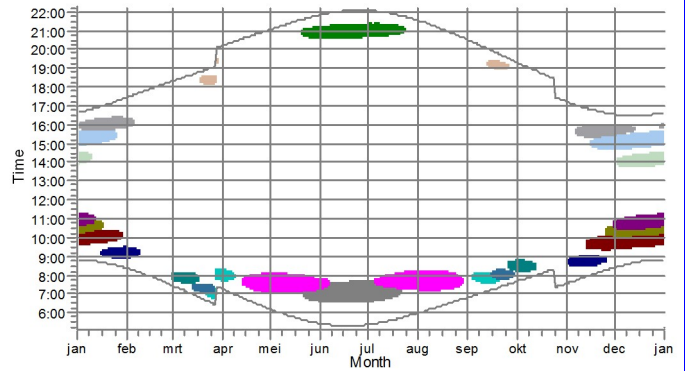
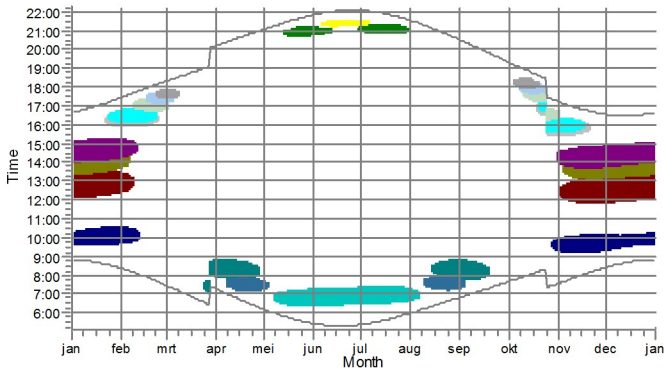
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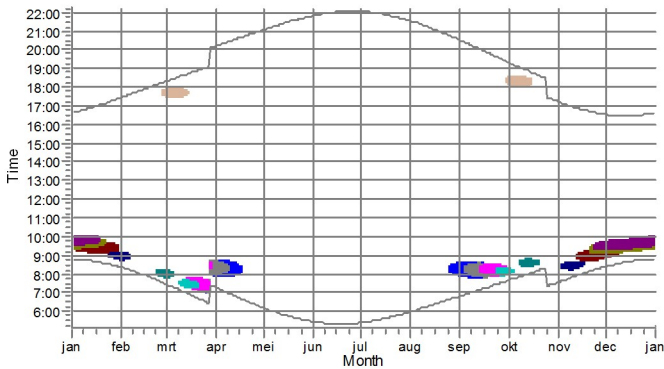
## SHADOW - Calendar per WTG, graphical

Calculation: 3 x V112-3.3MW-119m

ESTAS V112-3.3 Gridstreame 3300 112.0 IO!hub: 119,0 m (TOT: 175,0 m) (ESTAS V112-3.3 Gridstreame 3300 112.0 IO!hub: 119,0 m (TOT: 175,0 m) (



ESTAS V112-3.3 Gridstreame 3300 112.0 IO!hub: 119,0 m (TOT: 175,0 m) (



### Shadow receptors

 A: Hoeksedijk 2, 3961 ME Wijk bij Duurstede	 H: Kapelleweg 25, 3997 MP 't Goy	 O: Kapelleweg 5, 3945 LA Cothen
 B: Hoeksedijk 3, 3998 NM Schalkwijk	 I: Nachtdijk 19, 3997 MR 't Goy	 P: Kapelleweg 3, 3945 LA Cothen
 C: Beusichemseweg 146, 3998 NL Schalkwijk	 J: Kapelleweg 20, 3997 MP 't Goy	 Q: Wijkersloot 33, 3961 MN Wijk bij Duurstede
 D: Beusichemseweg 71, 3998 NL Schalkwijk	 K: Kapelleweg 6, 3945 LA Cothen	 U: Lekdijk 4, 3998 NH Schalkwijk
 E: Beusichemseweg 69, 3998 NL Schalkwijk	 L: Kapelleweg 11, 3945 LA Cothen	 V: Zuwedijk 2, 3998 NA Schalkwijk
 F: Zuwedijk 6, 3998 NA Schalkwijk	 M: Kapelleweg 9, 3945 LA Cothen	
 G: Nachtdijk 25, 3997 MR 't Goy	 N: Kapelleweg 7, 3945 LA Cothen	



Hours per year, real case

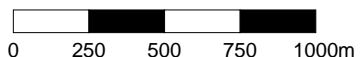
- 0 Hours
- 6 Hours
- 20 Hours
- 50 Hours

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**SHADOW -  
Map**  
Calculation:  
3 x V112-3.3MW-119m

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Calculated:  
9-1-2015 19:21/2.9.285



Map: Google pro Goyerbrug , Print scale 1:25.000, Map center RD1 East: 145.897 North: 444.274

New WTG

Shadow receptor

Flicker map level: Height Contours: CONTOURLINE\_ONLINEDATA\_0.wpo (1)

