

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 / info@winvast.nl

Calculated:

18-10-2013 16:56/2.9.250



SHADOW - Main Result

Calculation: 4xWT

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	591	803	1.174	1.137	761	567	502	8.348

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



New WTG

Scale 1:40.000

Shadow receptor

WTGs

RD1	East	North	Z	Row data/Description	WTG type			Shadow data			
					Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]
1	145.638	444.118	0,0	NORDEX N117 2400 117,0 !O! hub: 120,0 ... No	NORDEX	N117-2.400	2.400	117,0	120,0	1.487	11,8
2	146.164	443.855	0,0	NORDEX N117 2400 117,0 !O! hub: 120,0 ... No	NORDEX	N117-2.400	2.400	117,0	120,0	1.487	11,8
3	146.631	443.622	0,0	NORDEX N117 2400 117,0 !O! hub: 120,0 ... No	NORDEX	N117-2.400	2.400	117,0	120,0	1.487	11,8
4	145.059	444.406	0,0	NORDEX N117 2400 117,0 !O! hub: 120,0 ... No	NORDEX	N117-2.400	2.400	117,0	120,0	1.487	11,8

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	Kappelleweg 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	Kappelleweg 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	Kappelleweg 6, 3945 LA Cothen	145.856	444.551	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
L	Kappelleweg 11, 3945 LA Cothen	146.154	444.546	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
M	Kappelleweg 9, 3945 LA Cothen	146.229	444.571	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
N	Kappelleweg 7, 3945 LA Cothen	146.419	444.536	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
O	Kappelleweg 5, 3945 LA Cothen	146.657	444.541	0,0	10,0	5,0	1,0	-180,0	90,0	"Green house mode"
P	Kappelleweg 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"

To be continued on next page...

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**SHADOW - Main Result**

Calculation: 4xWT

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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]				
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"	
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	7:46	
B	Hoeksedijk 3, 3998 NM Schalkwijk	0:54	
C	Beusichemseweg 146, 3998 NL Schalkwijk	6:53	
D	Beusichemseweg 71, 3998 NL Schalkwijk	16:57	
E	Beusichemseweg 69, 3998 NL Schalkwijk	21:43	
F	Zuwedijk 6, 3998 NA Schalkwijk	13:02	
G	Nachtdijk 25, 3997 MR 't Goy	41:13	
H	Kappelleweg 25, 3997 MP 't Goy	26:57	
I	Nachtdijk 19, 3997 MR 't Goy	6:14	
J	Kappelleweg 20, 3997 MP 't Goy	21:48	
K	Kappelleweg 6, 3945 LA Cothen	20:50	
L	Kappelleweg 11, 3945 LA Cothen	8:28	
M	Kappelleweg 9, 3945 LA Cothen	6:59	
N	Kappelleweg 7, 3945 LA Cothen	7:06	
O	Kappelleweg 5, 3945 LA Cothen	6:51	
P	Kappelleweg 3, 3945 LA Cothen	5:16	
Q	Wijkersloot 33, 3961 MN Wijk bij Duurstede	2:02	
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	18:39	
V	Zuwedijk 2, 3998 NA Schalkwijk	7:07	

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

No.	Name	Worst case	Expected
		[h/year]	[h/year]
1	NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.1)	581:52	91:15
2	NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.2)	379:20	64:55
3	NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.3)	100:03	15:45
4	NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (6)	245:32	46:22

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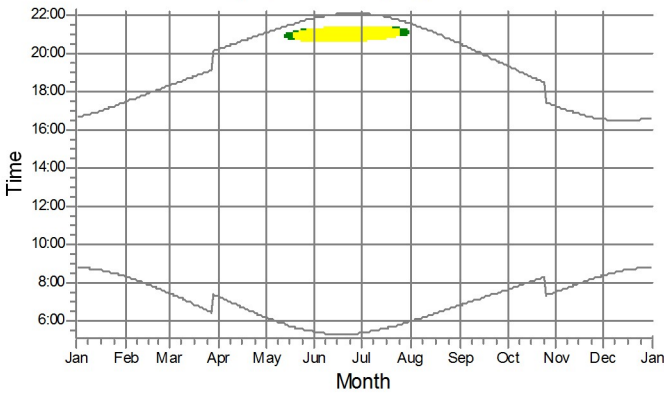
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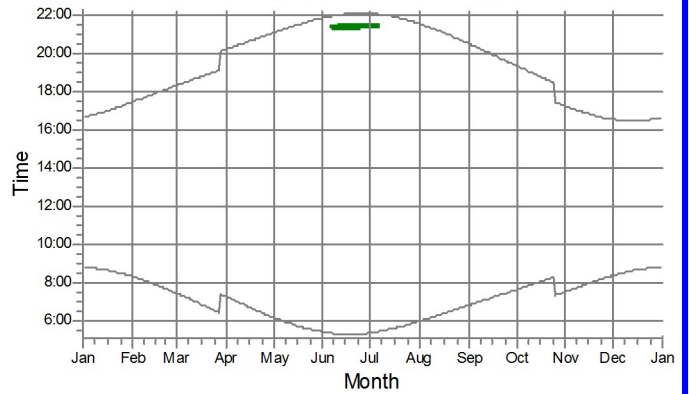
SHADOW - Calendar, graphical

Calculation: 4xWT

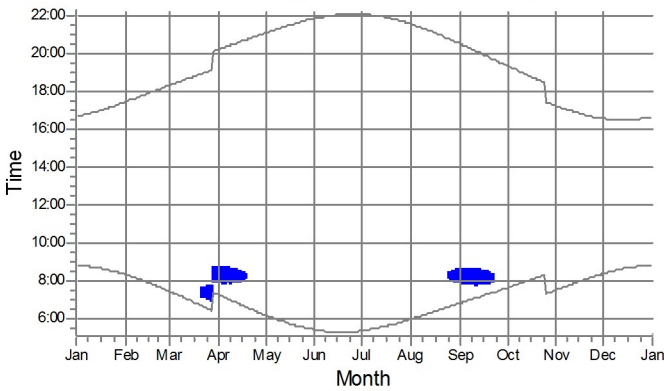
A: Hoeksedijk 2, 3961 ME Wijk bij Duurstede



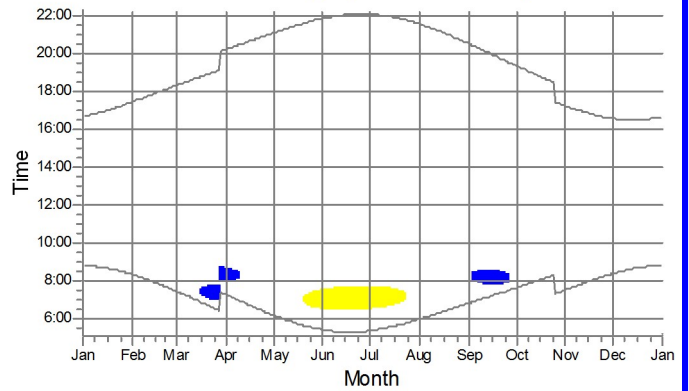
B: Hoeksedijk 3, 3998 NM Schalkw ijk



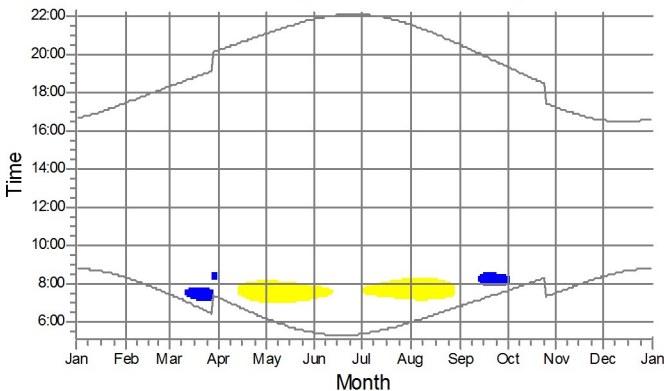
C: Beusichemsew eg 146, 3998 NL Schalkw ijk



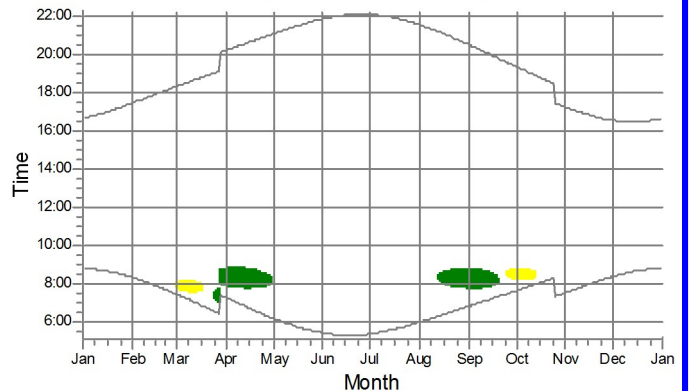
D: Beusichemsew eg 71, 3998 NL Schalkw ijk



E: Beusichemsew eg 69, 3998 NL Schalkw ijk



F: Zuwedijk 6, 3998 NA Schalkw ijk



WTGs

- 1: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.1)
- 2: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.2)
- 3: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.3)

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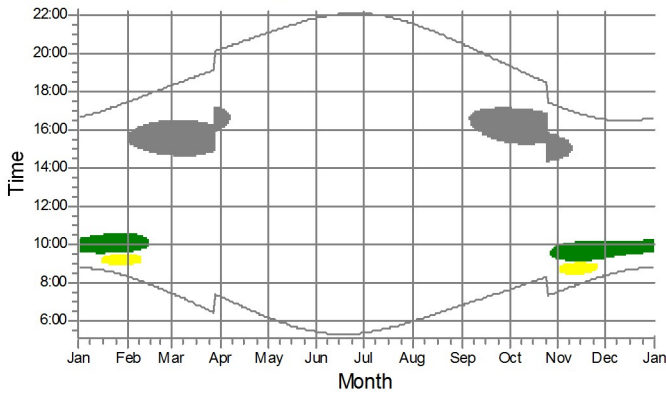
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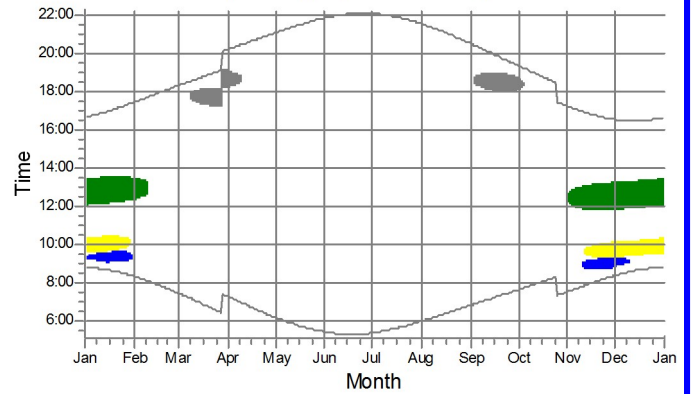
SHADOW - Calendar, graphical

Calculation: 4xWT

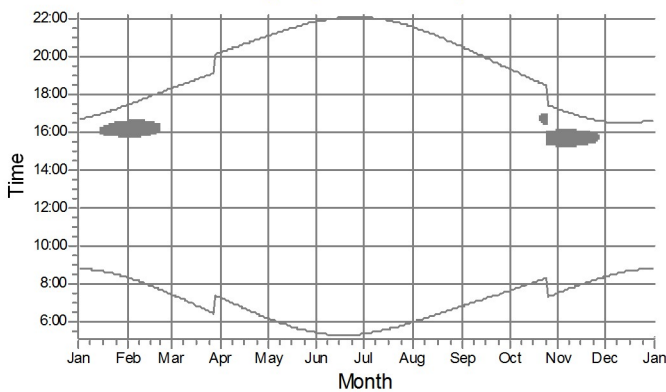
G: Nachtdijk 25, 3997 MR 't Goy



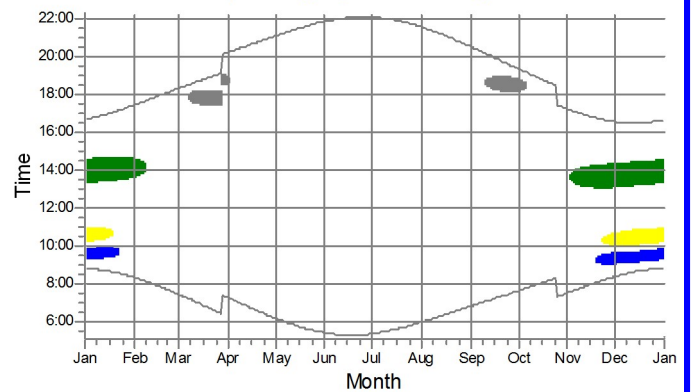
H: Kapelleweg 25, 3997 MP 't Goy



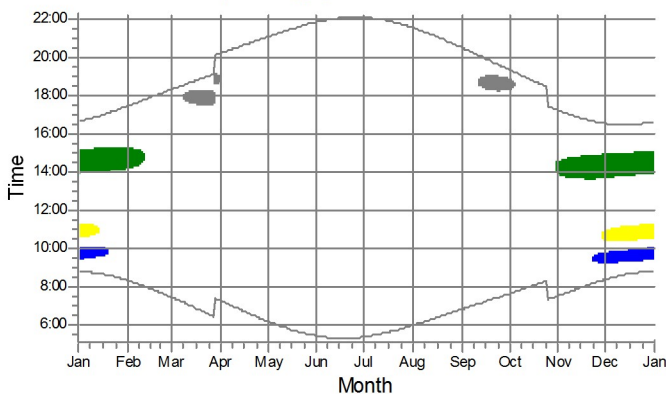
I: Nachtdijk 19, 3997 MR 't Goy



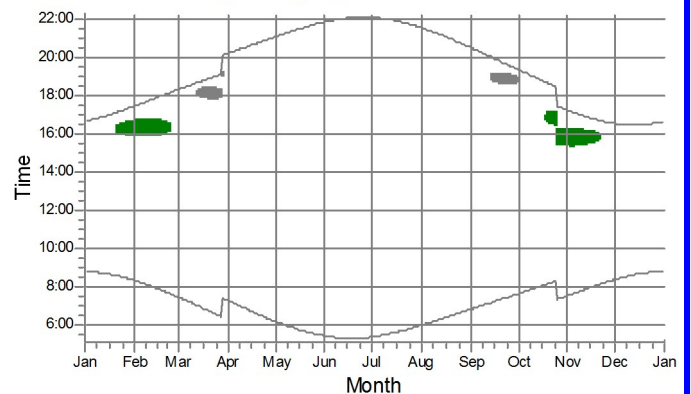
J: Kapelleweg 20, 3997 MP 't Goy



K: Kapelleweg 6, 3945 LA Cothen



L: Kapelleweg 11, 3945 LA Cothen



WTGs

- 1: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.1)
- 2: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.2)
- 3: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.3)
- 4: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (6)

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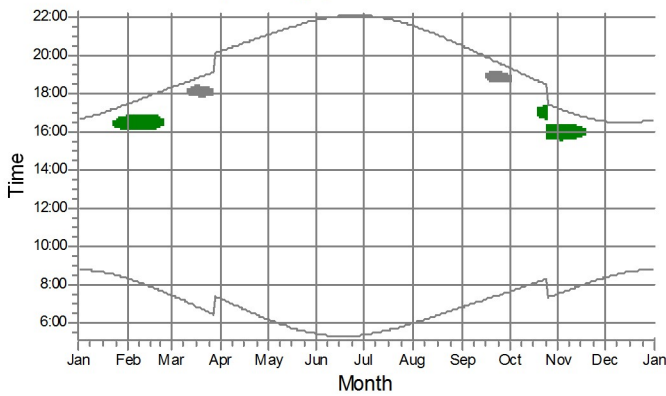
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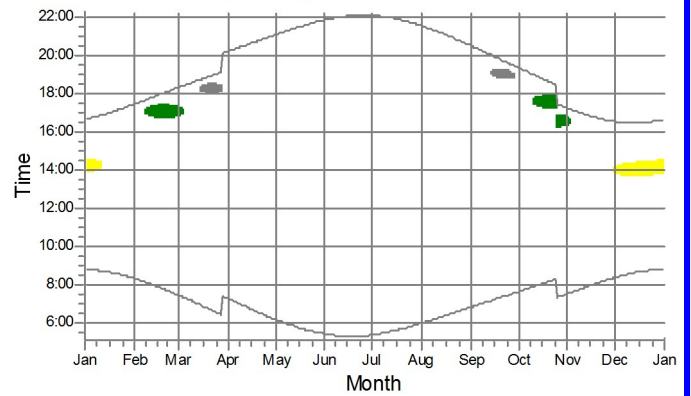
SHADOW - Calendar, graphical

Calculation: 4xWT

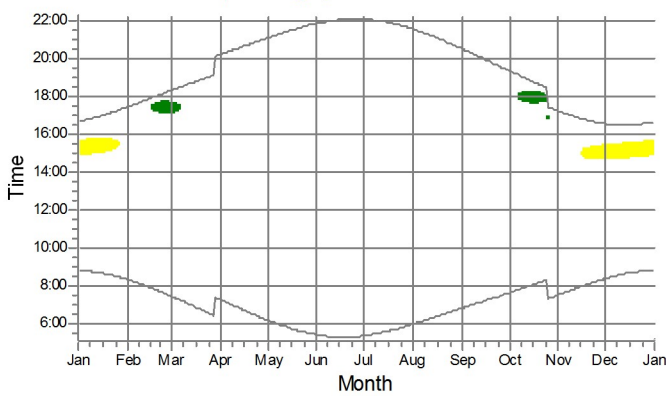
M: Kapelleweg 9, 3945 LA Cothen



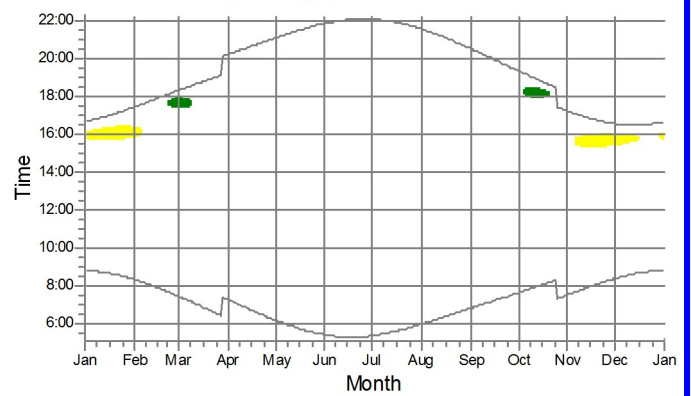
N: Kapelleweg 7, 3945 LA Cothen



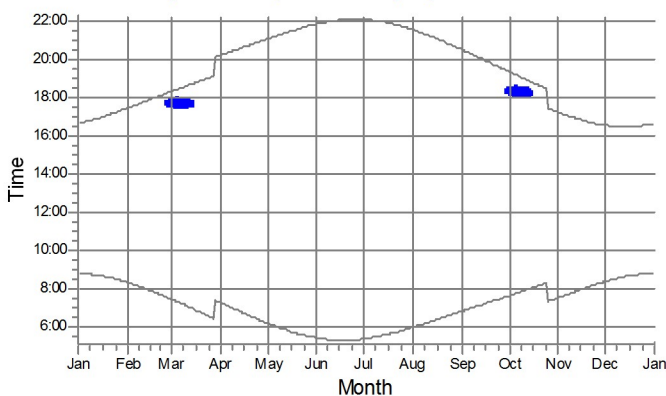
O: Kapelleweg 5, 3945 LA Cothen



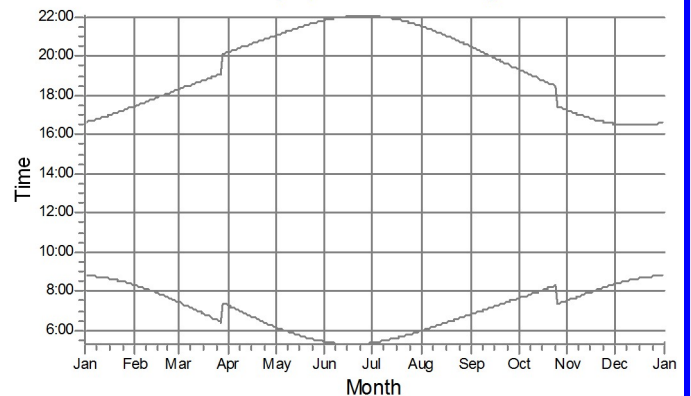
P: Kapelleweg 3, 3945 LA Cothen



Q: Wijkersloot 33, 3961 MN Wijk bij Duurstede



R: Hoeksedijk 1, 3998 NM Schalkwijk



WTGs

- 1: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.1)
- 2: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.2)
- 3: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.3)
- 4: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (6)

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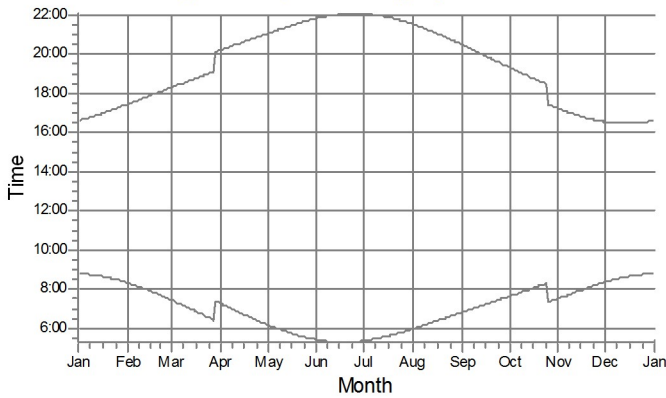
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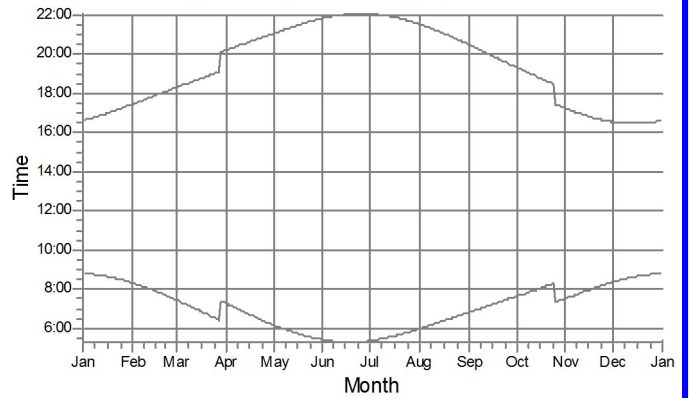
SHADOW - Calendar, graphical

Calculation: 4xWT

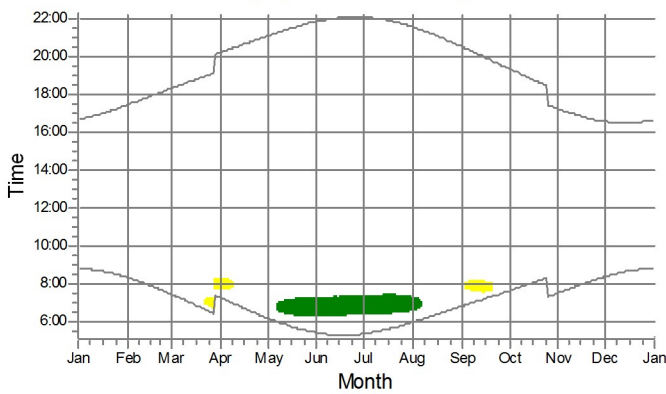
S: Lekdijk West 53, 3961 MD Wijk bij Duurstede



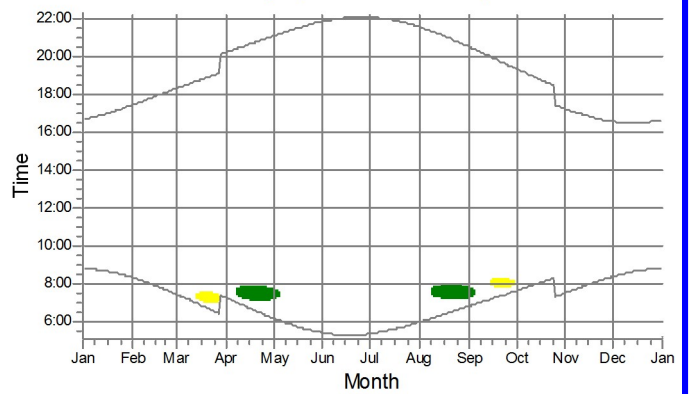
T: Lekdijk West 52, 3961 MD Wijk bij Duurstede



U: Lekdijk 4, 3998 NH Schalkwijk



V: Zuwendijk 2, 3998 NA Schalkwijk



WTGs

- 1: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.1)
- 2: NORDEX N117 2400 117.0 !O! hub: 120,0 m (TOT: 178,5 m) (1.2)

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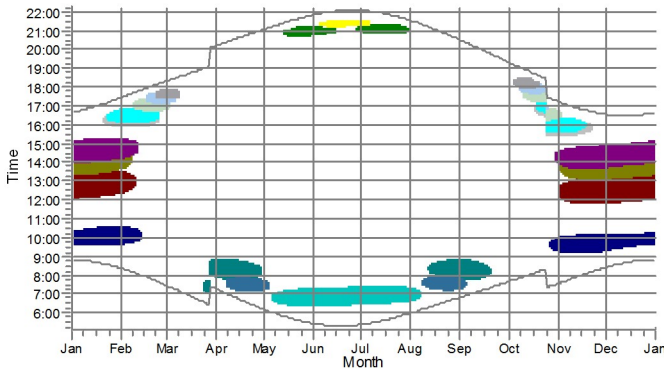
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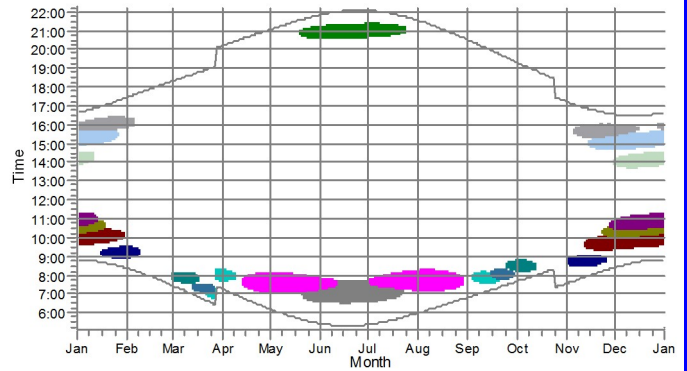
SHADOW - Calendar per WTG, graphical

Calculation: 4xWT

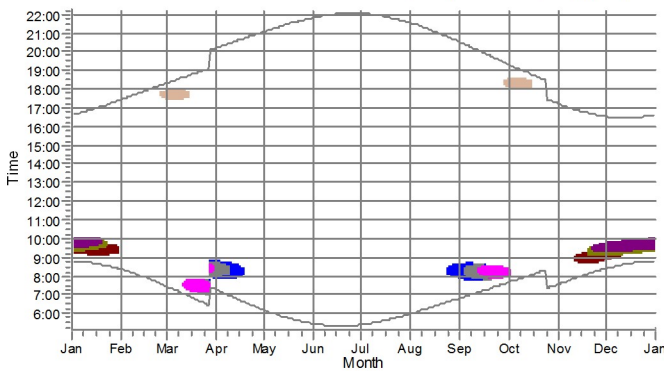
1: NORDEX N117 2400 117.0 IO! hub: 120,0 m (TOT: 178,5 m) (1.1)



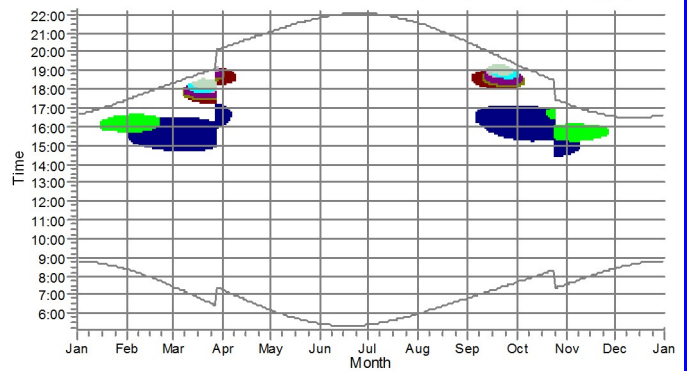
2: NORDEX N117 2400 117.0 IO! hub: 120,0 m (TOT: 178,5 m) (1.2)



3: NORDEX N117 2400 117.0 IO! hub: 120,0 m (TOT: 178,5 m) (1.3)



4: NORDEX N117 2400 117.0 IO! hub: 120,0 m (TOT: 178,5 m) (6)

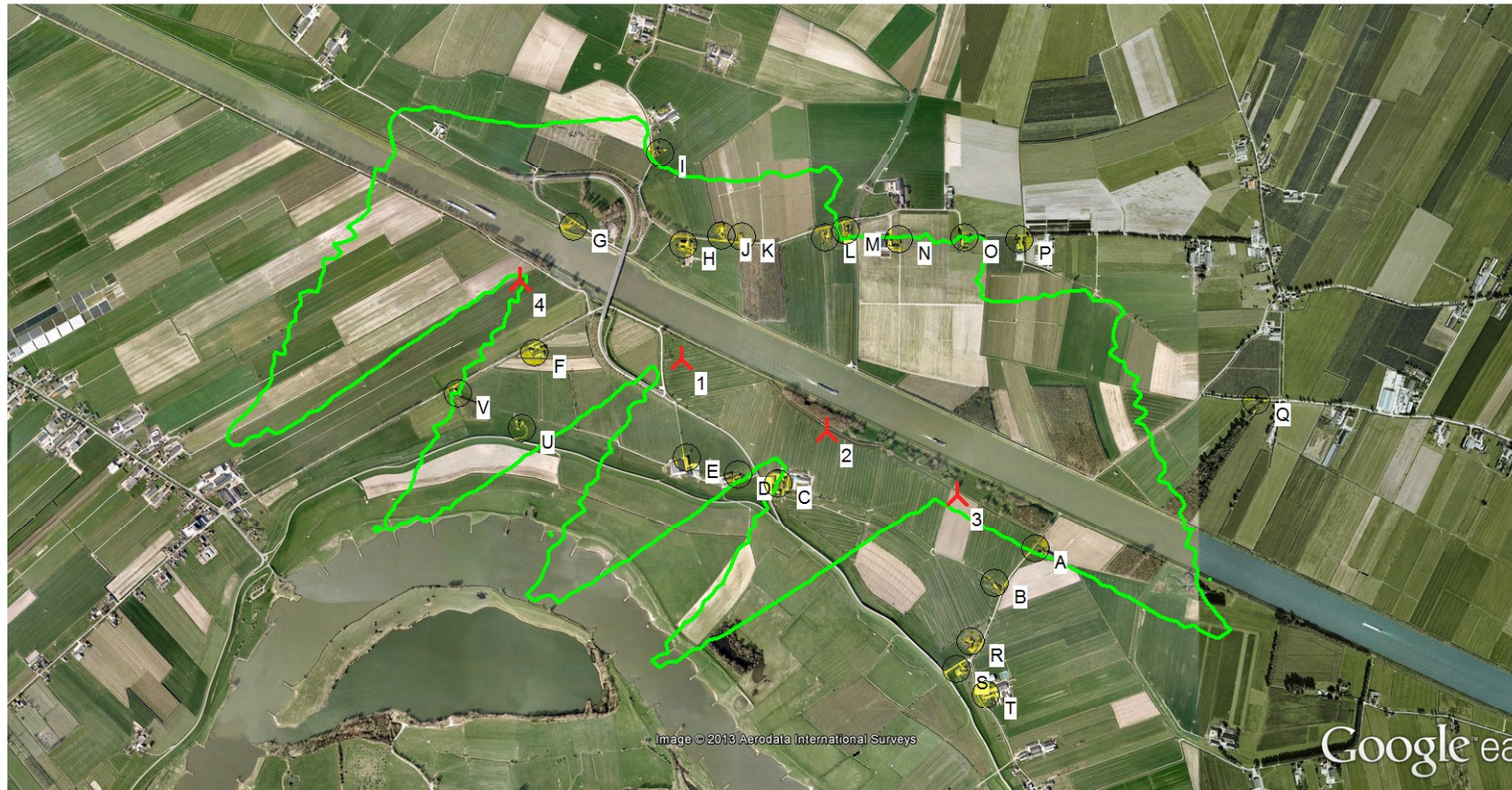


Shadow receptors

 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
 ——— 6 Hours

Project:
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**SHADOW -
 Map**
 Calculation:
 4xWT

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 New WTG
  Shadow receptor
 Map: Google pro Goyerbrug , Print scale 1:25.000, Map center RD1 East: 145.897 North: 444.274
 Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_0.wpo (1)

