

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 1

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**ENVO**

ul.Sikorskiego 25/20

PL-62 030 Lubon

0048 662 643 300

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Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Main Result

**Calculation:** Analiza migotania cienia - wariant proponowany

### 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:

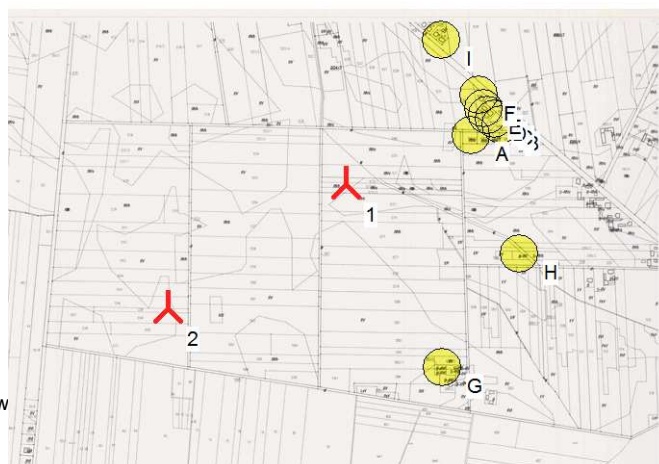
Height contours used: Height Contours: CONTOURLINE\_ONLINEDATA\_0.w

Obstacles used in calculation

Eye height: 1,5 m

Grid resolution: 10,0 m

Topographic shadow included in calculation



Scale 1:20 000

Y New WTG

● Shadow receptor

### WTGs

Geo [deg,min,sec]-WGS84	Longitude	Latitude	Z	Row	WTG type	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
												Calculation distance [m]	RPM [RPM]
1	18°15'49,48" East	51°20'08,14" North	162,0	E1	No	ENERCON	E-58/10.58-1 000	1 000	58,0	80,0	1 347	24,0	
2	18°15'25,27" East	51°19'57,30" North	164,6	E2	No	ENERCON	E-58/10.58-1 000	1 000	58,0	80,0	1 347	24,0	

### Shadow receptor-Input

No.	Name	Geo [deg,min,sec]-WGS84		Z	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
		Longitude	Latitude							
A	SH1	18°16'06,63" East	51°20'12,37" North	163,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
B	SH2	18°16'10,73" East	51°20'13,37" North	163,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
C	SH3	18°16'09,72" East	51°20'13,85" North	163,1	1,0	1,0	1,0	0,0	90,0	"Green house mode"
D	SH4	18°16'08,88" East	51°20'14,17" North	163,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
E	SH5	18°16'08,29" East	51°20'14,73" North	163,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
F	SH6	18°16'07,64" East	51°20'15,84" North	164,4	1,0	1,0	1,0	0,0	90,0	"Green house mode"
G	Sh7	18°16'02,95" East	51°19'52,55" North	163,7	1,0	1,0	1,0	0,0	90,0	"Green house mode"
H	SH8	18°16'13,43" East	51°20'02,27" North	162,0	1,0	1,0	1,0	0,0	90,0	"Green house mode"
I	SH9	18°16'02,48" East	51°20'20,54" North	166,5	1,0	1,0	1,0	0,0	90,0	"Green house mode"

### 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	SH1	27:21	71	0:37
B	SH2	19:02	60	0:31
C	SH3	20:19	63	0:31
D	SH4	21:29	64	0:32
E	SH5	22:26	66	0:33
F	SH6	23:15	67	0:32
G	Sh7	6:33	27	0:19
H	SH8	34:15	107	0:29
I	SH9	40:39	65	0:46

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**SHADOW - Main Result****Calculation:** Analiza migotania cienia - wariant proponowany

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	E1	121:03	
2	E2	32:26	

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**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** A - SH1

**Assumptions for shadow calculations**

Reference year for calendar

2015

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

	January	February	March	April	May	June	July	August	September	October	November	December								
1	07:51	07:26	06:34	16:18 (1)	06:25	05:21	04:36	04:32	05:07	05:56	06:43	16:40 (1)	06:36	15:33 (2)	07:26					
2	15:47	16:33	17:23	7	16:25 (1)	19:16	20:06	20:51	21:05	20:36	19:35	18:27	37	17:17 (1)	16:22	15	15:48 (2)	15:42		
3	07:51	07:24	06:32	16:13 (1)	06:23	05:19	04:35	04:33	05:09	05:57	06:45	16:39 (1)	06:37	15:33 (2)	07:27					
4	15:48	16:35	17:25	17	16:30 (1)	19:18	20:07	20:52	21:05	20:34	19:33	18:25	37	17:16 (1)	16:20	15	15:48 (2)	15:41		
5	07:50	07:23	06:30	16:11 (1)	06:20	05:17	04:35	04:34	05:10	05:59	06:47	16:39 (1)	06:39	15:34 (2)	07:29					
6	15:49	16:36	17:27	21	16:32 (1)	19:19	20:09	20:53	21:05	20:32	19:31	18:23	37	17:16 (1)	16:18	14	15:48 (2)	15:41		
7	07:50	07:21	06:28	16:08 (1)	06:18	05:16	04:34	04:34	05:12	06:00	06:48	16:39 (1)	06:41	15:35 (2)	07:30					
8	15:50	16:38	17:28	25	16:33 (1)	19:21	20:11	20:54	21:04	20:31	19:29	18:20	37	17:16 (1)	16:17	13	15:48 (2)	15:40		
9	07:50	07:20	06:26	16:07 (1)	06:16	05:14	04:33	04:35	05:13	06:02	06:50	16:39 (1)	06:43	15:36 (2)	07:31					
10	15:51	16:40	17:30	28	16:35 (1)	19:23	20:12	20:55	21:04	20:29	19:26	18:18	36	17:15 (1)	16:15	11	15:47 (2)	15:39		
11	07:50	07:18	16:07 (2)	06:23	16:05 (1)	06:14	05:12	04:33	04:36	05:15	06:04	06:52	36	16:39 (1)	06:44					
12	15:52	16:42	7	16:14 (2)	17:32	31	16:36 (1)	19:24	20:14	20:56	21:04	20:27	19:24	18:16	35	17:14 (1)	16:13	8	15:44 (2)	15:39
13	07:49	07:16	16:05 (2)	06:21	16:04 (1)	06:11	05:10	04:32	04:37	05:16	06:05	06:53	34	16:40 (1)	06:46					
14	15:53	16:44	11	16:16 (2)	17:34	33	16:37 (1)	19:26	20:15	20:57	21:03	20:26	19:22	18:14	34	17:14 (1)	16:11	1	15:41 (2)	15:39
15	07:49	07:15	16:05 (2)	06:19	16:03 (1)	06:09	05:08	04:31	04:38	05:18	06:07	06:55	33	16:40 (1)	06:48					
16	15:54	16:45	13	16:18 (2)	17:35	34	16:37 (1)	19:28	20:17	20:58	21:03	20:24	19:20	18:11	33	17:13 (1)	16:10		07:35	
17	07:49	07:13	16:05 (2)	06:17	16:02 (1)	06:07	05:07	04:31	04:39	05:19	06:08	06:56	31	16:40 (1)	06:50					
18	15:56	16:47	13	16:18 (2)	17:37	35	16:37 (1)	19:29	20:19	20:59	21:02	20:22	19:17	18:09	31	17:11 (1)	16:08		15:38	
19	07:48	07:11	16:04 (2)	06:15	16:02 (1)	06:05	05:05	04:30	04:40	05:21	06:10	06:58	28	16:42 (1)	06:51					
20	15:57	16:49	15	16:19 (2)	17:39	36	16:38 (1)	19:31	20:20	20:59	21:01	20:20	19:15	18:07	28	17:10 (1)	16:07		15:38	
21	07:48	07:09	16:04 (2)	06:12	16:01 (1)	06:03	05:03	04:30	04:41	05:23	06:12	07:00	25	16:43 (1)	06:53					
22	15:58	16:51	15	16:19 (2)	17:41	37	16:38 (1)	19:33	20:22	21:00	21:01	20:18	19:13	18:05	25	17:08 (1)	16:05		15:38	
23	07:47	07:08	16:04 (2)	06:10	16:00 (1)	06:00	05:02	04:30	04:42	05:24	06:13	07:01	21	16:44 (1)	06:55					
24	16:00	16:53	15	16:19 (2)	17:42	37	16:37 (1)	19:34	20:23	21:01	21:00	20:16	19:11	18:03	21	17:05 (1)	16:03		15:37	
25	07:47	07:06	16:04 (2)	06:08	16:00 (1)	05:58	05:00	04:29	04:43	05:26	06:15	07:03	17	16:46 (1)	06:57					
26	16:01	16:54	14	16:18 (2)	17:44	37	16:37 (1)	19:36	20:25	21:01	20:59	20:15	19:08	18:00	17	17:03 (1)	16:02		15:37	
27	07:46	07:04	16:05 (2)	06:06	16:01 (1)	05:56	04:58	04:29	04:44	05:27	06:16	07:05	8	16:51 (1)	06:58					
28	16:03	16:56	13	16:18 (2)	17:46	36	16:37 (1)	19:38	20:26	21:02	20:58	20:13	19:06	17:58	8	16:59 (1)	16:01		15:37	
29	07:45	07:02	16:06 (2)	06:03	16:01 (1)	05:54	04:57	04:29	04:45	05:29	06:18	07:06	16	16:49 (1)	07:00					
30	16:04	16:58	10	16:16 (2)	17:47	36	16:37 (1)	19:39	20:28	21:03	20:57	20:11	19:04	17:56	15	15:59				
31	07:44	07:00	16:08 (2)	06:01	16:00 (1)	05:52	04:55	04:29	04:46	05:30	06:19	07:08	15	16:49 (1)	07:02					
1	16:06	17:00	6	16:14 (2)	17:49	36	16:36 (1)	19:41	20:29	21:03	20:56	20:09	19:01	17:54	15	15:58				
2	07:43	06:58	05:59	16:01 (1)	05:50	04:54	04:29	04:47	05:32	06:21	07:10	08:00	17	16:49 (1)	07:04					
3	16:07	17:02	17:51	34	16:35 (1)	19:43	20:31	21:04	20:55	20:07	18:59	17:52	15	15:56						
4	07:43	06:56	05:57	16:02 (1)	05:47	04:53	04:29	04:48	05:34	06:23	07:12	08:02	16	16:49 (1)	07:05					
5	16:09	17:04	17:53	32	16:34 (1)	19:44	20:32	21:04	20:54	20:05	18:57	17:50	15	15:55						
6	07:42	06:55	05:54	16:02 (1)	05:45	04:51	04:29	04:50	05:35	06:24	07:13	08:03	16	16:49 (1)	07:07					
7	16:10	17:05	17:54	31	16:33 (1)	19:46	20:34	21:05	20:53	20:03	18:55	17:48	15	15:54						
8	07:41	06:53	05:52	16:03 (1)	05:43	04:50	04:29	04:51	05:37	06:26	07:15	08:05	16	16:49 (1)	07:09					
9	16:12	17:07	17:56	28	16:31 (1)	19:48	20:35	21:05	20:52	20:01	18:52	17:46	15	15:53						
10	07:40	06:51	05:50	16:05 (1)	05:41	04:48	04:29	04:52	05:38	06:27	07:16	08:06	17	16:49 (1)	07:10					
11	16:14	17:09	17:58	25	16:30 (1)	19:49	20:37	21:05	20:51	19:59	18:50	17:43	15	15:51						
12	07:39	06:49	05:48	16:07 (1)	05:39	04:47	04:29	04:53	05:40	06:29	07:18	08:08	16	16:49 (1)	07:12					
13	16:15	17:11	17:59	21	16:28 (1)	19:51	20:38	21:06	20:50	19:57	18:48	17:41	15	15:50						
14	07:38	06:47	05:45	16:08 (1)	05:37	04:46	04:29	04:55	05:41	06:31	07:20	08:10	16	16:49 (1)	07:14					
15	16:17	17:13	18:01	17	16:25 (1)	19:53	20:39	21:06	20:48	19:55	18:45	17:39	15	15:49						
16	07:36	06:45	05:43	16:13 (1)	05:35	04:45	04:29	04:56	05:43	06:32	07:21	08:10	16	16:49 (1)	07:15					
17	16:19	17:14	18:03	7	16:20 (1)	19:54	20:41	21:06	20:47	19:53	18:43	17:37	15	15:48						
18	07:35	06:42	05:41	16:04 (1)	05:33	04:43	04:30	04:57	05:45	06:34	07:23	08:12	16	16:46 (1)	07:17					
19	16:20	17:16	18:04	16:04 (1)	05:31	04:42	04:30	04:57	05:46	06:35	07:24	08:13	16	16:46 (1)	07:17					
20	07:34	06:40	05:39	16:03 (1)	05:31	04:42	04:30	04:59	05:48	06:37	07:26	08:15	16	16:46 (1)	07:18					
21	16:22	17:18	18:06	16:02 (1)	05:29	04:40	04:30	04:59	05:48	06:37	07:26	08:15	16	16:46 (1)	07:18					
22	07:33	06:38	05:36	16:01 (1)	05:29	04:41	04:30	05:00	05:49	06:38	07:27	08:16	16	16:46 (1)	07:18					
23	16:24	17:20	18:08	16:01 (1)	05:29	04:41	04:30	05:00	05:49	06:38	07:27	08:16	16	16:46 (1)	07:18					
24	07:31	06:36	05:34	16:00 (1)	05:27	04:40	04:31	05:02	05:49	06:39	07:28	08:17	16	16:46 (1)	07:18					
25	16:26	17:21	18:09	16:00 (1)	05:27	04:40	04:31	05:02	05:49	06:39	07:28	08:17	16	16:46 (1)	07:18					
26	07:30	06:35	05:32	16:00 (1)	05:25	04:40	04:31	05:03	05:51	06:40	07:29	08:18	16	16:46 (1)	07:18					
27	16:27	17:22	18																	

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### SHADOW - Calendar

Calculation: Analiza migotania cienia - wariant proponowany Shadow receptor: B - SH2

#### Assumptions for shadow calculations

Reference year for calendar

2015

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

	January	February	March	April	May	June	July	August	September	October	November	December						
1	07:51	07:26	06:34	16:17 (1)	06:25	05:21	04:36	04:32	05:07	05:56	06:43	16:53 (1)	06:36	15:38 (2)	07:26			
2	15:47	16:33	17:23	21	16:38 (1)	19:16	20:06	20:51	21:05	20:36	19:35	18:27	23	17:16 (1)	16:22	13	15:51 (2)	15:42
3	07:50	07:24	06:32	16:15 (1)	06:23	05:19	04:35	04:33	05:09	05:57	06:45	16:51 (1)	06:37	15:38 (2)	07:27			
4	15:48	16:35	17:25	25	16:40 (1)	19:18	20:07	20:52	21:05	20:34	19:33	18:25	25	17:16 (1)	16:20	13	15:51 (2)	15:41
5	07:50	07:23	06:30	16:14 (1)	06:20	05:17	04:35	04:34	05:10	05:59	06:47	16:50 (1)	06:39	15:38 (2)	07:29			
6	15:49	16:36	17:27	27	16:41 (1)	19:19	20:09	20:53	21:05	20:32	19:31	18:23	27	17:17 (1)	16:18	13	15:51 (2)	15:41
7	07:50	07:21	06:28	16:13 (1)	06:18	05:16	04:34	04:34	05:12	06:00	06:48	16:49 (1)	06:41	15:39 (2)	07:30			
8	15:50	16:38	17:28	27	16:40 (1)	19:21	20:11	20:54	21:04	20:31	19:29	18:20	29	17:18 (1)	16:17	10	15:49 (2)	15:40
9	07:50	07:20	06:26	16:12 (1)	06:16	05:14	04:33	04:35	05:13	06:02	06:50	16:48 (1)	06:43	15:40 (2)	07:31			
10	15:51	16:40	17:30	29	16:41 (1)	19:23	20:12	20:55	21:04	20:29	19:26	18:18	29	17:17 (1)	16:15	8	15:48 (2)	15:39
11	07:50	07:18	06:23	16:12 (1)	06:14	05:12	04:33	04:36	05:15	06:04	06:52	16:47 (1)	06:44	15:42 (2)	07:33			
12	15:52	16:42	17:32	29	16:41 (1)	19:24	20:14	20:56	21:04	20:27	19:24	18:16	31	17:18 (1)	16:13	3	15:45 (2)	15:39
13	07:49	07:16	06:21	16:11 (1)	06:11	05:10	04:32	04:37	05:16	06:05	06:53	16:47 (1)	06:46	15:40 (2)	07:34			
14	15:53	16:44	17:34	31	16:42 (1)	19:26	20:15	20:57	21:03	20:26	19:22	18:14	31	17:18 (1)	16:11			15:39
15	07:49	07:15	06:19	16:10 (1)	06:09	05:08	04:31	04:38	05:18	06:07	06:55	16:47 (1)	06:48	15:40 (2)	07:35			
16	15:54	16:45	17:35	31	16:41 (1)	19:28	20:17	20:58	21:03	20:24	19:20	18:11	31	17:18 (1)	16:10			15:38
17	07:49	07:13	06:19	16:11 (1)	06:07	05:07	04:31	04:39	05:19	06:08	06:56	16:47 (1)	06:50	15:40 (2)	07:36			
18	15:56	16:47	17:37	30	16:41 (1)	19:29	20:19	20:59	21:02	20:22	19:17	18:09	29	17:16 (1)	16:08			15:38
19	07:48	07:11	06:15	16:11 (1)	06:05	05:05	04:30	04:40	05:21	06:10	06:58	16:47 (1)	06:51	15:40 (2)	07:37			
20	15:57	16:49	17:39	29	16:40 (1)	19:31	20:20	20:59	21:01	20:20	19:15	18:07	29	17:16 (1)	16:07			15:38
21	07:48	07:09	06:12	16:11 (1)	06:03	05:03	04:30	04:41	05:23	06:12	07:00	16:48 (1)	06:53	15:40 (2)	07:38			
22	15:58	16:51	17:41	29	16:40 (1)	19:33	20:22	21:00	21:01	20:18	19:13	18:05	27	17:15 (1)	16:05			15:37
23	07:47	07:08	06:10	16:11 (1)	06:00	05:02	04:30	04:42	05:24	06:13	07:01	16:47 (1)	06:55	15:40 (2)	07:40			
24	16:00	16:53	17:42	27	16:38 (1)	19:34	20:23	21:01	21:00	20:16	19:11	18:03	27	17:14 (1)	16:03			15:37
25	07:46	07:06	06:08	16:12 (1)	05:58	05:00	04:29	04:43	05:26	06:15	07:03	16:48 (1)	06:57	15:40 (2)	07:41			
26	16:01	16:54	17:44	25	16:37 (1)	19:36	20:25	21:01	20:59	20:15	19:08	18:00	25	17:13 (1)	16:02			15:37
27	07:46	07:04	06:06	16:13 (1)	05:56	04:58	04:29	04:44	05:27	06:16	07:05	16:50 (1)	06:58	15:40 (2)	07:42			
28	16:03	16:56	17:46	23	16:36 (1)	19:38	20:26	21:02	20:58	20:13	19:06	17:58	21	17:11 (1)	16:01			15:37
29	07:45	07:02	06:03	16:15 (1)	05:54	04:57	04:29	04:45	05:29	06:18	07:06	16:51 (1)	07:00	15:40 (2)	07:43			
30	16:04	16:58	17:47	20	16:35 (1)	19:39	20:28	21:03	20:57	20:11	19:04	17:56	19	17:10 (1)	16:00			15:37
31	07:44	07:00	06:01	16:16 (1)	05:52	04:55	04:29	04:46	05:30	06:19	07:08	16:53 (1)	07:02	15:40 (2)	07:43			
1	16:06	17:00	17:49	16	16:32 (1)	19:41	20:29	21:03	20:56	20:09	19:01	17:54	13	17:06 (1)	16:00			15:37
2	07:43	06:58	05:59	16	16:20 (1)	05:50	04:54	04:29	04:47	05:32	06:21	07:10	13	16:58 (1)	07:04			15:37
3	16:07	17:02	17:51	8	16:28 (1)	19:43	20:31	21:04	20:55	20:07	18:59	17:52	3	17:01 (1)	16:00			15:38
4	07:43	06:56	05:57	05:47	04:53	04:29	04:48	04:48	05:34	06:23	07:12	07:02		07:05	15:38			15:38
5	16:09	17:04	17:53	19:44	20:32	21:04	20:54	20:55	20:05	18:57	17:50	16:55		15:55	15:38			15:38
6	07:42	06:55	05:54	05:45	04:51	04:29	04:50	04:50	05:35	06:24	07:13	07:07		07:07	15:38			15:38
7	16:10	17:05	17:54	19:46	20:34	21:05	20:53	20:03	18:55	17:48	16:48	15:54		15:54	15:38			15:38
8	07:41	06:53	05:52	05:43	04:50	04:29	04:51	05:37	06:26	07:15	07:06	07:09		07:09	15:38			15:38
9	16:12	17:07	17:56	19:48	20:35	21:05	20:52	20:01	18:52	17:46	16:46	15:53		15:53	15:38			15:38
10	07:40	06:51	05:50	05:41	04:48	04:29	04:52	05:38	06:27	07:17	07:07	07:10		07:10	15:38			15:38
11	16:14	17:09	17:58	19:49	20:37	21:05	20:51	19:59	18:50	17:43	16:43	15:51		15:51	15:39			15:39
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13	16:15	17:11	17:59	19:51	20:38	21:06	20:50	19:57	18:48	17:41	16:41	15:50		15:50	15:39			15:39
14	07:38	06:47	05:45	05:37	04:46	04:29	04:55	05:41	06:31	07:20	07:10	07:14		07:14	15:40			15:40
15	16:17	17:13	18:01	19:53	20:39	21:06	20:48	19:55	18:45	17:39	16:39	15:49		15:49	15:40			15:40
16	07:36	06:45	05:43	05:35	04:45	04:29	04:56	05:43	06:32	07:22	07:12	07:15		07:15	15:40			15:40
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18	07:35	06:42	05:41	05:33	04:43	04:30	04:57	05:45	06:34	07:24	07:14	07:17		07:17	15:40			15:40
19	16:20	17:16	18:04	19:56	20:42	21:06	20:46	19:50	18:41	17:35	16:35	15:47		15:47	15:40			15:41
20	07:34	06:40	05:39	05:31	04:42	04:30	04:59	05:46	06:35	07:25	07:18	07:21		07:21	15:40			15:41
21	16:22	17:18	18:06	19:57	20:43	21:06	20:44	19:48	18:39	17:33	16:33	15:46		15:46	15:40			15:41
22	07:33	06:38	05:36	05:29	04:41	04:30	05:00	05:48	06:37	07:27	07:19	07:22		07:22	15:40			15:41
23	16:24	17:20	18:08	19:59	20:45	21:06	20:43	19:46	18:36	17:31	16:31	15:43	3	15:43 (2)	07:20			15:42
24	07:31	06:36	05:34	05:27	04:40	04:31	05:02	05:49	06:39	07:29	07:21	07:24		07:24	15:40			15:42
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26	07:30	06:32	05:30	05:25	04:39	04:31	05:03	05:51	06:40	07:30	07:22	07:25		07:25	15:40			15:43
27	16:27	17:22	18:10	19:59	20:47	21:06	20:40	19:42										

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 5

Licensed user:

**ENVO**  
 ul.Sikorskiego 25/20  
 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envoo-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** C - SH3

**Assumptions for shadow calculations**

Reference year for calendar 2015  
 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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:51 15:47	07:26 16:33	06:34 17:23	16:03 (1) 19:16	05:21 20:06	04:36 20:51	04:32 21:05	05:07 20:36	05:56 19:35	06:43 18:27	16:50 (1) 16:22	15:33 (2) 15:42
2	07:51 15:48	07:24 16:35	06:32 17:25	16:03 (1) 19:18	05:19 20:07	04:35 20:52	04:33 21:05	05:09 20:34	05:57 19:33	06:45 18:25	17:00 (1) 16:20	15:33 (2) 15:41
3	07:50 15:49	07:23 16:36	06:30 17:27	16:02 (1) 19:19	05:17 20:09	04:35 20:53	04:34 21:05	05:10 20:32	05:59 19:31	06:47 18:23	16:44 (1) 16:18	15:33 (2) 15:41
4	07:50 15:50	07:21 16:38	16:08 (2) 17:28	16:01 (1) 19:21	05:16 20:11	04:34 20:54	04:34 21:04	05:12 20:31	06:00 19:29	06:48 18:20	16:42 (1) 16:17	15:33 (2) 15:40
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19	07:42 16:10	06:55 17:05	05:54 17:54	05:45 19:46	04:51 20:34	04:29 21:05	04:50 20:53	05:35 20:03	06:24 18:55	07:13 17:48	16:41 (1) 16:07	15:37 (2) 15:38
20	07:41 16:12	06:53 17:07	05:52 17:56	05:43 19:48	04:50 20:35	04:29 21:05	04:51 20:52	05:37 20:01	06:26 18:52	07:15 17:46	16:43 (1) 16:04	15:37 (2) 15:38
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23	07:38 16:17	06:47 17:13	16:12 (1) 18:01	05:37 19:53	04:46 20:39	04:29 21:06	04:55 20:48	05:41 19:55	06:31 18:45	07:20 17:39	16:49 (1) 16:05	15:37 (2) 15:40
24	07:36 16:19	06:45 17:14	16:10 (1) 18:03	05:35 19:54	04:45 20:41	04:29 21:06	04:56 20:47	05:43 19:53	06:32 18:43	07:22 17:37	16:48 (1) 16:04	15:37 (2) 15:40
25	07:35 16:20	06:42 17:16	16:08 (1) 18:04	05:33 19:56	04:43 20:42	04:30 21:06	04:57 20:46	05:45 19:50	06:34 18:41	07:24 17:35	16:49 (1) 16:04	15:37 (2) 15:41
26	07:34 16:22	06:40 17:18	16:06 (1) 18:06	05:31 19:57	04:42 20:43	04:30 21:06	04:59 20:44	05:46 19:48	06:35 18:39	07:25 17:33	16:49 (1) 16:04	15:37 (2) 15:41
27	07:33 16:24	06:38 17:20	16:04 (1) 18:08	05:29 19:59	04:41 20:45	04:30 21:06	05:00 20:43	05:48 19:46	06:37 18:36	07:27 17:31	16:49 (1) 16:04	15:37 (2) 15:42
28	07:31 16:26	06:36 17:21	16:04 (1) 18:09	05:27 20:01	04:40 20:46	04:31 21:06	05:02 20:42	05:49 19:44	06:39 18:34	07:29 17:29	16:49 (1) 16:04	15:37 (2) 15:43
29	07:30 16:27	06:32 17:22	06:32 18:09	05:25 20:02	04:39 20:47	04:31 21:06	05:03 20:40	05:51 19:42	06:40 18:32	06:30 17:28	15:38 (2) 15:43	15:43 (2) 15:44
30	07:29 16:29	06:29 17:23	06:29 18:06	05:23 20:04	04:38 20:48	04:32 21:06	05:04 20:39	05:53 19:40	06:42 18:29	06:32 17:26	15:35 (2) 15:44	15:43 (2) 15:44
31	07:27 16:31	06:27 17:25	06:27 18:09	05:21 20:04	04:37 20:50	04:31 21:06	05:06 20:37	05:54 19:37	06:34 18:24	06:34 17:24	15:34 (2) 15:45	15:44 (2) 15:45
Potential sun hours	261	278	366	413	482	495	500	453	382	334	270	247
Total, worst case		244	361							522	92	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 6

Licensed user:

**ENVO**  
 ul.Sikorskiego 25/20  
 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envoo-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** D - SH4

**Assumptions for shadow calculations**

Reference year for calendar 2015  
 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

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:51 15:47	07:26 16:33	06:34 17:23	15:54 (1) 19:16	06:25 20:06	05:21 20:51	04:36 21:05	04:32 21:06	05:07 20:36	05:56 19:35	06:43 18:27	06:36 16:22	15:31 (2) 15:42 (2)
2	07:51 15:48	07:24 16:35	06:32 17:25	15:54 (1) 19:18	06:23 20:07	05:19 20:52	04:35 21:05	04:33 21:06	05:09 20:34	05:57 19:33	06:45 18:25	06:37 16:20	15:30 (2) 15:43 (2)
3	07:50 15:49	07:23 16:36	06:30 17:27	15:54 (1) 19:19	06:20 20:09	05:17 20:53	04:34 21:05	04:34 21:06	05:10 20:32	05:59 19:31	06:47 18:23	16:44 (1) 16:18	06:39 15:30 (2)
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6	07:50 15:52	07:18 16:42	06:23 17:32	15:55 (1) 19:24	06:14 20:14	05:12 20:56	04:33 21:04	04:36 21:05	05:15 20:27	06:04 19:24	06:52 18:16	16:34 (1) 16:13	06:44 15:30 (2)
7	07:49 15:53	07:16 16:44	06:21 17:34	15:56 (1) 19:26	06:11 20:15	05:10 20:57	04:32 21:03	04:37 21:04	05:16 20:26	06:05 19:22	06:53 18:14	16:33 (1) 16:11	06:46 15:30 (2)
8	07:49 15:54	07:15 16:45	06:19 17:35	15:56 (1) 19:28	06:09 20:17	05:08 20:58	04:31 21:03	04:38 21:04	05:18 20:24	06:07 19:20	06:55 18:11	16:31 (1) 16:10	06:48 15:31 (2)
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11	07:48 15:57	07:09 16:51	06:12 17:41	16:02 (1) 19:33	06:03 20:22	05:03 21:00	04:30 21:01	04:41 21:02	05:23 20:18	06:12 19:13	07:00 18:05	16:29 (1) 16:05	06:53 15:37
12	07:47 16:00	07:08 16:53	06:10 17:42	16:07 (1) 19:34	06:00 20:23	05:02 21:01	04:30 21:02	04:42 21:03	05:24 20:16	06:13 19:11	07:01 18:03	16:27 (1) 16:03	06:55 15:40
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17	07:43 16:07	06:58 17:02	05:59 17:51	16:13 (1) 19:43	06:00 20:31	05:00 21:04	04:29 21:05	04:47 21:06	05:32 20:07	06:21 18:59	07:10 17:52	16:27 (1) 16:00	07:04 15:58
18	07:43 16:09	06:56 17:04	05:57 17:53	16:14 (1) 19:44	06:00 20:32	05:00 21:04	04:29 21:05	04:48 21:06	05:33 20:05	06:23 18:57	07:12 17:50	16:28 (1) 16:00	07:05 15:58
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20	07:41 16:12	06:53 17:07	05:52 17:56	16:16 (1) 19:48	06:00 20:35	05:00 21:05	04:29 21:06	04:51 21:07	05:37 20:01	06:26 18:52	07:15 17:46	16:30 (1) 16:00	07:09 15:58
21	07:40 16:14	06:51 17:09	05:50 17:58	16:17 (1) 19:49	06:00 20:37	05:00 21:05	04:29 21:06	04:52 21:07	05:38 20:01	06:27 18:50	07:17 17:43	16:30 (1) 16:00	07:10 15:59
22	07:39 16:15	06:49 17:11	05:48 17:59	16:18 (1) 19:51	06:00 20:38	05:00 21:06	04:29 21:07	04:53 21:08	05:40 20:50	06:29 18:48	07:18 17:41	16:32 (1) 16:00	07:12 15:59
23	07:38 16:17	06:47 17:13	05:47 18:01	16:19 (1) 19:53	06:00 20:39	05:00 21:06	04:29 21:07	04:54 21:08	05:41 20:50	06:31 18:48	07:20 17:41	16:33 (1) 16:00	07:13 15:40
24	07:36 16:19	06:45 17:14	05:43 18:03	16:20 (1) 19:54	06:00 20:41	05:00 21:06	04:29 21:08	04:55 21:09	05:43 20:53	06:32 18:43	07:22 17:37	16:40 (1) 16:43 (1)	07:15 15:48
25	07:35 16:20	06:42 17:16	05:41 18:04	16:21 (1) 19:56	06:00 20:42	05:00 21:06	04:29 21:09	04:56 21:10	05:45 20:46	06:34 18:41	07:24 18:35	16:41 (1) 16:41 (1)	07:17 15:41
26	07:34 16:22	06:40 17:18	05:39 18:06	16:22 (1) 19:57	06:00 20:43	05:00 21:06	04:29 21:10	04:57 21:11	05:46 20:44	06:35 18:39	07:25 18:33	16:42 (1) 16:42 (1)	07:18 15:46
27	07:33 16:24	06:38 17:20	05:36 18:08	16:23 (1) 19:59	06:00 20:44	05:00 21:06	04:29 21:11	04:58 21:12	05:48 20:43	06:37 18:46	07:27 18:36	16:43 (1) 16:43 (1)	07:20 15:45
28	07:31 16:26	06:36 17:21	05:34 18:09	16:24 (1) 20:01	06:00 20:46	05:00 21:06	04:29 21:12	04:59 21:13	05:49 20:42	06:39 18:34	07:29 18:29	16:44 (1) 16:44 (1)	07:21 15:44
29	07:30 16:27	06:34 17:22	05:32 18:10	16:25 (1) 20:02	06:00 20:47	05:00 21:06	04:29 21:13	04:59 21:14	05:51 20:42	06:40 18:32	07:30 18:28	16:45 (1) 16:45 (1)	07:23 15:44
30	07:29 16:29	06:32 17:23	05:30 18:11	16:26 (1) 20:03	06:00 20:48	05:00 21:06	04:29 21:14	04:59 21:15	05:52 20:43	06:41 18:31	07:31 18:27	16:46 (1) 16:46 (1)	07:24 15:44
31	07:27 16:31	06:29 17:24	05:29 18:12	16:27 (1) 20:04	06:00 20:49	05:00 21:06	04:29 21:15	04:59 21:16	05:53 20:44	06:42 18:30	07:32 18:26	16:47 (1) 16:47 (1)	07:25 15:45
Potential sun hours	261	278	339	396	453	495	500	453	382	334	270	115	247
Total, worst case	261	278	339	396	453	495	500	453	382	334	270	115	247

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**Elektrownie wiatrowe Galewice**

Printed/Page

2015-03-07 10:41 / 7

Licensed user:

**ENVO**  
 ul.Sikorskiego 25/20  
 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envio-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** E - SH5

**Assumptions for shadow calculations**

Reference year for calendar

2015

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:51	07:26	15:58 (2)   06:34	15:45 (1)   06:25	05:21   04:36	04:32	05:07	05:56	06:43	06:36	07:26	07:26
2	15:47	16:33	7   16:05 (2)   17:23	31   16:16 (1)   19:16	20:06	20:51	21:05	20:36	19:35	18:27	16:22	15:42
3	07:50	07:23	15:58 (2)   06:32	15:46 (1)   06:23	05:19	04:35	04:33	05:09	05:57	06:45	06:37	15:29 (2)   07:27
4	15:48	16:35	11   16:07 (2)   17:25	30   16:16 (1)   19:18	20:07	20:52	21:05	20:34	19:33	18:25	16:20	15:36 (2)   07:29
5	07:50	07:23	15:55 (2)   06:30	15:47 (1)   06:20	05:17	04:35	04:34	05:10	05:59	06:47	06:39	15:27 (2)   07:29
6	15:49	16:36	13   16:08 (2)   17:27	28   16:15 (1)   19:19	20:09	20:53	21:05	20:32	19:31	18:23	16:18	11   15:38 (2)   07:30
7	07:50	07:21	15:56 (2)   06:28	15:47 (1)   06:18	05:16	04:34	04:34	05:12	06:00	06:48	06:41	15:26 (2)   07:30
8	15:50	16:38	13   16:09 (2)   17:28	26   16:13 (1)   19:21	20:11	20:54	21:04	20:31	19:29	18:20	16:17	13   15:39 (2)   07:31
9	07:50	07:20	15:55 (2)   06:26	15:48 (1)   06:16	05:14	04:33	04:35	05:13	06:02	06:50	06:43	15:26 (2)   07:31
10	15:51	16:40	14   16:09 (2)   17:30	24   16:12 (1)   19:23	20:12	20:55	21:04	20:29	19:26	18:18	16:15	13   15:39 (2)   07:32
11	07:50	07:18	15:55 (2)   06:23	15:50 (1)   06:14	05:12	04:33	04:36	05:15	06:04	06:52	06:44	15:25 (2)   07:33
12	15:52	16:42	14   16:09 (2)   17:32	20   16:10 (1)   19:24	20:14	20:56	21:04	20:27	19:24	18:16	16:13	14   15:39 (2)   07:34
13	07:49	07:16	15:55 (2)   06:21	15:53 (1)   06:11	05:10	04:32	04:37	05:16	06:05	06:53	7   16:33 (1)   06:46	15:25 (2)   07:34
14	15:53	16:44	14   16:09 (2)   17:34	15   16:08 (1)   19:26	20:15	20:57	21:03	20:26	19:22	18:14	16:14	14   15:39 (2)   07:35
15	07:49	07:15	15:57 (2)   06:19	15:57 (1)   06:09	05:08	04:31	04:38	05:18	06:07	06:55	16:29 (1)   06:48	15:25 (2)   07:35
16	15:54	16:45	12   16:09 (2)   17:35	5   16:02 (1)   19:28	20:17	20:58	21:03	20:24	19:20	18:11	15   16:44 (1)   06:10	14   15:38 (2)   07:36
17	07:49	07:13	15:57 (2)   06:17	06:07	05:07	04:31	04:39	05:19	06:08	06:56	16:25 (1)   06:50	15:26 (2)   07:36
18	15:56	16:47	11   16:08 (2)   17:37	19:29	20:19	20:59	21:02	20:22	19:17	18:09	20   16:45 (1)   06:08	13   15:39 (2)   07:37
19	07:48	07:11	15:59 (2)   06:15	06:05	05:05	04:30	04:40	05:21	06:10	06:58	16:23 (1)   06:51	15:27 (2)   07:37
20	15:57	16:49	8   16:07 (2)   17:39	19:31	20:20	20:59	21:01	20:20	19:15	18:07	24   16:47 (1)   06:07	11   15:37 (2)   07:38
21	07:48	07:09	06:12	06:03	05:03	04:30	04:41	05:23	06:12	07:00	16:22 (1)   06:53	15:28 (2)   07:38
22	15:58	16:51	17:41	19:33	20:22	21:00	21:01	20:18	19:13	18:05	26   16:48 (1)   06:05	9   15:37 (2)   07:39
23	07:47	07:08	06:10	06:00	05:02	04:30	04:42	05:24	06:13	07:01	16:20 (1)   06:55	15:30 (2)   07:40
24	16:00	16:53	17:42	19:34	20:23	21:01	21:00	20:16	19:11	18:03	28   16:48 (1)   06:03	5   15:35 (2)   07:41
25	07:47	07:06	06:08	05:58	05:00	04:29	04:43	05:26	06:15	07:03	16:19 (1)   06:57	07:41
26	16:01	16:54	17:44	19:36	20:25	21:02	20:59	20:15	19:08	18:00	30   16:49 (1)   06:02	15:37
27	07:46	07:04	06:06	05:56	04:58	04:29	04:44	05:27	06:16	07:05	16:18 (1)   06:58	07:42
28	16:03	16:56	17:46	19:38	20:26	21:02	20:58	20:13	19:06	17:58	31   16:49 (1)   06:01	15:37
29	07:45	07:02	06:03	05:54	04:57	04:29	04:45	05:29	06:18	07:06	16:18 (1)   07:00	07:42
30	16:04	16:58	7   17:47	19:39	20:28	21:03	20:57	20:11	19:04	17:56	32   16:50 (1)   06:59	15:37
31	07:44	07:00	06:01	05:52	04:55	04:29	04:46	05:30	06:19	07:08	16:17 (1)   07:02	07:43
1	16:06	17:00	15   17:49	19:41	20:29	21:03	20:56	20:09	19:01	17:54	32   16:49 (1)   06:58	15:37
2	07:43	06:58	15:52 (1)   05:59	05:50	04:54	04:29	04:47	05:32	06:21	07:10	16:17 (1)   07:04	07:44
3	16:07	17:02	19   17:51	19:43	20:31	21:04	20:55	20:07	18:59	17:52	32   16:49 (1)   06:56	15:38
4	07:43	06:56	15:50 (1)   05:57	05:47	04:53	04:29	04:48	05:34	06:23	07:12	16:17 (1)   07:05	07:45
5	16:09	17:04	23   17:53	19:44	20:32	21:04	20:54	20:05	18:57	17:50	32   16:49 (1)   06:55	15:38
6	07:42	06:55	15:49 (1)   05:54	05:45	04:51	04:29	04:50	05:35	06:24	07:13	16:17 (1)   07:07	07:46
7	16:10	17:05	25   17:54	19:46	20:34	21:05	20:53	20:03	18:55	17:48	32   16:49 (1)   06:54	15:38
8	07:41	06:53	15:48 (1)   05:52	05:43	04:50	04:29	04:51	05:37	06:26	07:15	16:17 (1)   07:09	07:46
9	16:12	17:07	27   17:56	19:48	20:35	21:05	20:52	20:01	18:52	17:46	31   16:48 (1)   06:53	15:38
10	07:40	06:51	15:47 (1)   05:50	05:41	04:48	04:29	04:52	05:38	06:27	07:17	16:17 (1)   07:10	07:47
11	16:14	17:09	29   17:58	19:49	20:37	21:05	20:51	19:59	18:50	17:43	30   16:47 (1)   06:51	15:39
12	07:39	06:49	15:46 (1)   05:48	05:39	04:47	04:29	04:53	05:40	06:29	07:18	16:17 (1)   07:12	07:48
13	16:15	17:11	31   17:59	19:51	20:38	21:06	20:50	19:57	18:48	17:41	29   16:46 (1)   06:50	15:39
14	07:38	06:47	15:46 (1)   05:45	05:37	04:46	04:29	04:55	05:41	06:31	07:20	16:18 (1)   07:14	07:48
15	16:17	17:13	31   17:01	19:53	20:39	21:06	20:48	19:55	18:45	17:39	28   16:46 (1)   06:49	15:40
16	07:36	06:45	15:46 (1)   05:43	05:35	04:45	04:29	04:56	05:43	06:32	07:22	16:19 (1)   07:15	07:49
17	16:19	17:14	32   18:01	19:54	20:41	21:06	20:47	19:53	18:43	17:37	26   16:45 (1)   06:48	15:40
18	07:35	06:42	15:45 (1)   05:41	05:33	04:43	04:30	04:57	05:45	06:34	07:24	15:20 (1)   07:17	07:49
19	16:20	17:16	33   18:04	19:56	20:42	21:06	20:46	19:50	18:41	17:35	23   15:43 (1)   06:47	15:41
20	07:34	06:40	15:44 (1)   05:39	05:31	04:42	04:30	04:59	05:46	06:35	07:25	15:22 (1)   07:18	07:49
21	16:22	17:18	33   18:06	19:57	20:43	21:06	20:44	19:48	18:39	17:33	20   15:42 (1)   06:46	15:41
22	07:33	06:38	15:45 (1)   05:36	05:29	04:41	04:30	05:00	05:48	06:37	07:27	15:23 (1)   07:20	07:50
23	16:24	17:20	32   18:08	19:59	20:45	21:06	20:43	19:46	18:36	17:31	16   15:39 (1)   06:45	15:42
24	07:31	06:36	15:45 (1)   05:34	05:27	04:40	04:31	05:02	05:49	06:39	07:29	15:26 (1)   07:21	07:50
25	16:26	17:21	31   18:09	20:01	20:46	21:06	20:42	19:44	18:34	17:29	10   15:36 (1)   06:44	15:43
26	07:30	06:32	19:11	05:25	04:39	04:31	05:03	05:51	06:40	07:30	07:23	07:50
27	16:27	17:22	19:11	20:02	20:47	21:06	20:40	19:42	18:32	17:28	15:43	15:44
28	07:29	06:29	19:13	05:23	04:38	04:32	05:04	05:53	06:42	07:32	07:24	07:50
29	16:29	17:24	19:13	20:04	20:48	21:06	20:39	19:40	18:29	17:26	15:43	15:44
30	07:27	06:27	19:14	05:21	04:37	04:30	05:06	05:54	06:43	07:34	07:26	07:50
31	16:31	17:26	16:03 (2)	20:50	20:50	21:07	20:37	19:37	18:24	17:24	15:45	15:45
Potential sun hours	261	278	366	413	482	495	500	453	382	334	270	247
Total, worst case	4	485	179						554	124		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

**Elektrownie wiatrowe Galewice**

Printed/Page

2015-03-07 10:41 / 8

Licensed user:

**ENVO**

ul.Sikorskiego 25/20  
PL-62 030 Lubon  
0048 662 643 300

ENVO / envo-i.nowicki@wp.pl

Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Calendar

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** F - SH6

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:51 15:47	07:26 16:33	15:48 (2) 16:02 (2)	06:34 17:23	06:25 19:16	05:21 20:06	04:36 20:51	04:32 21:05	05:07 20:36	05:56 19:35	06:43 18:27	06:36 16:22	15:03 (1) 15:29 (1)
2	07:51 15:48	07:24 16:35	15:48 (2) 16:02 (2)	06:32 17:25	06:23 19:18	05:19 20:07	04:35 20:52	04:33 21:05	05:09 20:34	05:57 19:33	06:45 18:25	06:37 16:20	15:04 (1) 15:28 (1)
3	07:50 15:49	07:23 16:36	15:48 (2) 16:02 (2)	06:30 17:27	06:20 19:19	05:17 20:09	04:35 20:53	04:34 21:05	05:10 20:32	05:59 19:31	06:47 18:23	06:39 16:18	15:05 (1) 15:27 (1)
4	07:50 15:50	07:21 16:38	15:49 (2) 16:02 (2)	06:28 17:28	06:18 19:21	05:16 20:11	04:34 20:54	04:34 21:04	05:12 20:31	06:00 19:29	06:48 18:20	06:41 16:17	15:07 (1) 15:25 (1)
5	07:50 15:51	07:20 16:40	15:50 (2) 16:01 (2)	06:26 17:30	06:16 19:23	05:14 20:12	04:33 20:55	04:35 21:04	05:13 20:29	06:02 19:26	06:50 18:18	06:43 16:15	15:09 (1) 15:23 (1)
6	07:50 15:52	07:18 16:42	15:44 (1) 16:00 (2)	06:23 17:32	06:14 19:24	05:12 20:14	04:33 20:56	04:36 21:04	05:15 20:27	06:04 19:24	06:52 18:16	06:44 16:13	15:11 (1) 15:29 (2)
7	07:49 15:53	07:16 16:44	15:39 (1) 15:57 (2)	06:21 17:34	06:11 19:26	05:10 20:15	04:32 20:57	04:37 21:03	05:16 20:26	06:05 19:22	06:53 18:14	06:46 16:11	15:09 (1) 15:30 (2)
8	07:49 15:54	07:15 16:45	15:38 (1) 15:55 (1)	06:19 17:35	06:09 19:28	05:08 20:17	04:31 20:58	04:38 21:03	05:18 20:24	06:07 19:20	06:55 18:11	06:48 16:10	15:19 (2) 15:31 (2)
9	07:49 15:56	07:13 16:47	15:36 (1) 15:57 (1)	06:17 17:37	06:07 19:29	05:07 20:19	04:31 20:59	04:39 21:02	05:19 20:22	06:08 19:17	06:56 18:09	06:50 16:08	15:19 (2) 15:32 (2)
10	07:48 15:57	07:11 16:49	15:34 (1) 15:58 (1)	06:15 17:39	06:05 19:31	05:05 20:20	04:30 20:59	04:40 21:01	05:21 20:20	06:10 19:15	06:58 18:07	06:51 16:07	15:19 (2) 15:33 (2)
11	07:48 15:58	07:09 16:51	15:33 (1) 15:59 (1)	06:12 17:41	06:03 19:33	05:03 20:22	04:30 21:00	04:41 21:01	05:23 20:18	06:12 19:13	07:00 18:05	06:53 16:05	15:19 (2) 15:33 (2)
12	07:47 16:00	07:08 16:53	15:32 (1) 16:00 (1)	06:10 17:42	06:00 19:34	05:02 20:23	04:30 21:01	04:42 21:00	05:24 20:16	06:13 19:11	07:01 18:03	06:55 16:03	15:19 (2) 15:33 (2)
13	07:47 16:01	07:06 16:54	15:32 (1) 16:01 (1)	06:08 17:44	05:58 19:36	05:00 20:25	04:29 21:02	04:43 20:59	05:26 20:15	06:15 19:08	07:03 18:00	06:57 16:02	15:20 (2) 15:33 (2)
14	07:46 16:03	07:04 16:56	15:31 (1) 16:01 (1)	06:06 17:46	05:56 19:38	04:58 20:26	04:29 21:02	04:44 20:58	05:27 20:13	06:16 19:06	07:05 17:58	06:58 16:01	15:21 (2) 15:32 (2)
15	07:45 16:04	07:02 16:58	15:30 (1) 16:02 (1)	06:03 17:47	05:54 19:39	04:57 20:28	04:29 21:03	04:45 20:57	05:29 20:11	06:18 19:04	07:06 17:56	16:14 (1) 16:23 (1)	15:22 (2) 15:31 (2)
16	07:44 16:06	07:00 17:00	15:30 (1) 16:02 (1)	06:01 17:49	05:52 19:41	04:55 20:29	04:29 21:03	04:46 20:56	05:30 20:09	06:19 19:01	07:08 17:54	16:10 (1) 16:25 (1)	15:22 (2) 15:33 (2)
17	07:43 16:07	06:58 17:02	15:30 (1) 16:02 (1)	05:59 17:51	05:50 19:43	04:54 20:31	04:29 21:04	04:47 20:55	05:32 20:07	06:21 17:52	07:10 18:59	16:07 (1) 16:28 (1)	15:24 (2) 15:36 (2)
18	07:43 16:09	06:56 17:04	15:30 (1) 16:02 (1)	05:57 17:53	05:47 19:44	04:53 20:32	04:29 21:04	04:48 20:54	05:34 20:05	06:23 18:57	07:12 17:50	16:06 (1) 16:29 (1)	15:27 (2) 15:38 (2)
19	07:42 16:10	06:55 17:05	15:30 (1) 16:02 (1)	05:54 17:54	05:45 19:46	04:51 20:34	04:29 21:05	04:50 20:53	05:35 20:03	06:24 18:55	07:13 17:48	16:04 (1) 16:30 (1)	15:28 (2) 15:39 (2)
20	07:41 16:12	06:53 17:07	15:30 (1) 16:02 (1)	05:52 17:56	05:43 19:48	04:50 20:35	04:29 21:05	04:51 20:52	05:37 20:01	06:26 18:52	07:15 17:46	16:03 (1) 16:31 (1)	15:29 (2) 15:40 (2)
21	07:40 16:14	06:51 17:09	15:31 (1) 16:01 (1)	05:50 17:58	05:41 19:49	04:48 20:37	04:29 21:05	04:52 20:51	05:38 19:59	06:27 18:50	07:17 17:43	16:02 (1) 16:31 (1)	15:30 (2) 15:41 (2)
22	07:39 16:15	06:49 17:11	15:31 (1) 16:01 (1)	05:48 17:59	05:39 19:51	04:47 20:38	04:29 21:06	04:53 20:50	05:39 19:57	06:29 18:48	07:18 17:41	16:01 (1) 16:32 (1)	15:31 (2) 15:42 (2)
23	07:38 16:17	06:47 17:13	15:32 (1) 16:00 (1)	05:45 18:01	05:37 19:53	04:46 20:39	04:29 21:06	04:55 20:48	05:41 19:55	06:31 18:45	07:19 17:39	16:01 (1) 16:32 (1)	15:32 (2) 15:43 (2)
24	07:36 16:19	06:45 17:14	15:33 (1) 15:59 (1)	05:43 18:03	05:35 19:54	04:45 20:41	04:29 21:06	04:56 20:47	05:43 19:53	06:32 18:43	07:22 17:37	16:00 (1) 16:32 (1)	15:33 (2) 15:44 (2)
25	07:35 16:20	06:42 17:16	15:34 (1) 15:58 (1)	05:41 18:04	05:33 19:56	04:43 20:42	04:30 21:06	04:57 20:46	05:45 19:50	06:34 18:41	07:24 16:35	15:00 (1) 15:32 (1)	15:34 (2) 15:45 (2)
26	07:34 16:22	06:40 17:18	15:36 (1) 15:57 (1)	05:39 18:06	05:31 19:57	04:42 20:43	04:30 21:06	04:59 20:44	05:46 19:48	06:35 18:39	07:25 16:33	15:00 (1) 15:32 (1)	15:35 (2) 15:46 (2)
27	07:33 16:24	15:50 (2) 06:38	15:37 (1) 15:54 (1)	05:36 18:08	05:29 19:59	04:41 20:45	04:30 21:06	05:00 20:43	05:48 19:46	06:37 18:36	07:27 16:31	15:00 (1) 15:31 (1)	15:36 (2) 15:47 (2)
28	07:31 16:26	15:49 (2) 06:36	15:41 (1) 15:50 (1)	05:34 18:09	05:27 20:01	04:40 20:46	04:31 21:06	05:02 20:42	05:49 19:44	06:39 18:34	07:29 16:29	15:00 (1) 15:31 (1)	15:37 (2) 15:48 (2)
29	07:30 16:27	15:48 (2) 15:59 (2)	15:40 (1) 15:49 (1)	05:32 18:11	05:25 20:02	04:39 20:47	04:31 21:06	05:03 20:40	05:51 19:42	06:40 18:32	07:30 16:28	15:00 (1) 15:31 (1)	15:39 (2) 15:50 (2)
30	07:29 16:29	15:48 (2) 16:01 (2)	15:39 (1) 15:48 (1)	05:29 18:13	05:23 20:04	04:38 20:48	04:32 21:06	05:04 20:39	05:53 19:40	06:42 18:29	07:31 16:26	15:01 (1) 15:30 (1)	15:41 (2) 15:52 (2)
31	07:27 16:31	15:48 (2) 16:01 (2)	15:37 (1) 15:46 (1)	05:27 18:14	05:21 20:50	04:37 20:50	05:06 20:37	05:54 19:37	06:34 18:24	07:32 16:24	07:32 15:30 (1)	15:02 (1) 15:30 (1)	15:43 (2) 15:54 (2)
Potential sun hours	261	278	366	413	482	495	500	453	382	334	270	239	247
Total, worst case	50	647	366	413	482	495	500	453	382	334	270	239	247

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)



Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 9

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**ENVO**  
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Calculated:  
2015-03-07 10:39/2.9.285

## SHADOW - Calendar

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** G - Sh7

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:51 15:47	07:26 16:33	06:34 17:23	06:25 19:16	05:21 20:06	04:36 20:51	04:33 21:05	05:07 20:36	05:56 19:35	06:43 18:27	06:36 16:22	07:26 15:42	
2	07:50 15:48	07:24 16:35	06:32 17:25	06:23 19:18	05:19 20:07	04:35 20:52	04:33 21:05	05:09 20:34	05:57 19:33	06:45 18:25	06:37 16:20	07:27 15:41	
3	07:50 15:49	07:23 16:36	06:30 17:27	06:20 19:19	05:17 20:09	04:35 20:53	04:34 21:05	05:10 20:32	05:59 19:31	06:47 18:23	06:39 16:18	07:29 15:41	
4	07:50 15:50	07:21 16:38	06:28 17:29	06:18 19:21	05:16 20:11	04:34 20:54	04:35 21:04	05:12 20:31	06:00 19:29	06:48 18:20	06:41 16:17	07:30 15:40	
5	07:50 15:51	07:20 16:40	06:26 17:30	06:16 19:23	05:14 20:12	04:33 20:55	04:35 21:04	05:13 20:29	06:02 19:26	06:50 18:18	06:43 16:15	07:31 15:40	
6	07:50 15:52	07:18 16:42	06:23 17:32	06:14 19:24	05:12 20:14	04:33 20:56	04:36 21:04	05:15 20:27	06:04 19:24	06:52 18:16	06:44 16:13	07:33 15:39	
7	07:49 15:53	07:16 16:44	06:21 17:34	06:11 19:26	05:10 20:15	04:32 20:57	04:37 21:03	05:16 20:26	06:05 19:22	06:53 18:14	06:46 16:11	07:34 15:39	
8	07:49 15:55	07:15 16:45	06:19 17:35	06:09 19:28	05:08 20:17	04:31 20:58	04:38 21:02	05:18 20:24	06:07 19:20	06:55 18:11	06:48 16:10	07:35 15:38	
9	07:49 15:56	07:13 16:47	06:17 17:37	06:07 19:29	05:07 20:19	04:31 20:58	04:39 21:02	05:19 20:22	06:08 19:17	06:56 18:09	06:50 16:08	07:36 15:38	
10	07:48 15:57	07:11 16:49	06:15 17:39	06:05 19:31	05:05 20:20	04:30 20:59	04:40 21:01	05:21 20:20	06:10 19:15	06:58 18:07	06:51 16:07	07:37 15:38	
11	07:48 15:58	07:09 16:51	06:12 17:41	06:03 19:33	05:03 20:22	04:30 21:00	04:41 21:00	05:23 20:18	06:12 19:13	07:00 18:05	06:53 16:05	07:38 15:38	
12	07:47 16:00	07:08 16:53	06:10 17:42	06:00 19:34	05:02 20:23	04:30 21:01	04:42 21:00	05:24 20:16	06:13 19:11	07:01 18:03	06:55 16:03	07:40 15:37	
13	07:46 16:01	07:06 16:55	06:08 17:44	05:58 19:36	05:00 20:25	04:29 21:01	04:43 20:59	05:26 20:15	06:15 19:08	07:03 18:00	06:57 16:02	07:41 15:37	
14	07:46 16:03	07:04 16:56	06:06 17:46	05:56 19:38	04:59 20:26	04:29 21:02	04:44 20:58	05:27 20:13	06:16 19:06	07:05 17:58	06:58 16:01	07:42 15:37	
15	07:45 16:04	07:02 16:58	06:03 17:47	05:54 19:39	04:57 20:28	04:29 21:03	04:45 20:57	05:29 20:11	06:18 19:04	07:06 17:56	07:00 15:59	07:42 15:37	
16	07:44 16:06	07:00 17:00	06:01 17:49	05:52 19:41	19:02 (2) 19:11 (2)	04:55 20:29	04:46 21:03	05:30 20:09	19:08 (2) 19:15 (2)	06:19 19:01	07:08 17:54	07:02 15:58	07:43 15:37
17	07:43 16:07	06:58 17:02	05:59 17:51	05:50 19:43	19:00 (2) 19:13 (2)	04:54 20:31	04:47 21:04	05:32 20:55	19:06 (2) 19:17 (2)	06:21 18:59	07:10 17:52	07:44 15:56	07:44 15:38
18	07:43 16:09	06:56 17:04	05:57 17:53	05:47 19:44	18:59 (2) 19:14 (2)	04:53 20:32	04:29 21:04	05:34 20:05	19:04 (2) 19:18 (2)	06:23 18:57	07:12 17:50	07:45 15:55	07:45 15:38
19	07:42 16:11	06:55 17:05	05:54 17:54	05:45 19:46	18:58 (2) 19:15 (2)	04:51 20:34	04:29 21:05	05:35 20:03	19:03 (2) 19:19 (2)	06:24 18:55	07:13 17:48	07:46 15:54	07:46 15:38
20	07:41 16:12	06:53 17:07	05:52 17:56	05:43 19:48	18:57 (2) 19:15 (2)	04:50 20:35	04:29 21:05	05:37 20:01	19:02 (2) 19:19 (2)	06:26 18:52	07:15 17:46	07:46 15:53	07:46 15:38
21	07:40 16:14	06:51 17:09	05:50 17:58	05:41 19:49	18:57 (2) 19:15 (2)	04:48 20:37	04:29 21:05	05:38 19:59	19:02 (2) 19:20 (2)	06:27 18:50	07:17 17:43	07:47 15:51	07:47 15:39
22	07:39 16:15	06:49 17:11	05:48 17:59	05:39 19:51	18:56 (2) 19:15 (2)	04:47 20:38	04:29 21:05	05:40 20:50	19:01 (2) 19:19 (2)	06:29 18:48	07:18 17:41	07:48 15:50	07:48 15:39
23	07:38 16:17	06:47 17:13	05:45 18:01	05:37 19:52	18:56 (2) 19:14 (2)	04:46 20:39	04:29 21:06	05:41 20:48	19:01 (2) 19:20 (2)	06:31 18:45	07:20 17:39	07:48 15:49	07:48 15:40
24	07:36 16:19	06:45 17:14	05:43 18:03	05:35 19:54	18:56 (2) 19:14 (2)	04:45 20:41	04:29 21:06	05:43 19:53	19:01 (2) 19:19 (2)	06:32 18:43	07:22 17:37	07:49 15:48	07:49 15:40
25	07:35 16:20	06:42 17:16	05:41 18:04	05:33 19:56	18:57 (2) 19:13 (2)	04:43 20:42	04:30 21:06	05:45 19:50	19:01 (2) 19:18 (2)	06:34 18:41	06:24 16:35	07:17 15:47	07:49 15:41
26	07:34 16:22	06:40 17:18	05:39 18:06	05:31 19:57	18:57 (2) 19:12 (2)	04:42 20:43	04:30 21:06	05:46 19:48	19:01 (2) 19:17 (2)	06:35 18:39	06:25 16:33	07:18 15:46	07:49 15:41
27	07:33 16:24	06:38 17:20	05:36 18:08	05:29 19:59	18:59 (2) 19:10 (2)	04:41 20:45	04:30 21:06	05:48 19:46	19:02 (2) 19:16 (2)	06:37 18:36	06:27 16:31	07:20 15:45	07:50 15:42
28	07:31 16:26	06:36 17:21	05:34 18:09	05:27 20:01	19:00 (2) 19:08 (2)	04:40 20:46	04:31 21:06	05:49 19:44	19:03 (2) 19:13 (2)	06:39 18:34	06:29 16:30	07:21 15:44	07:50 15:43
29	07:30 16:27		06:32 19:11	05:25 20:02		04:39 20:47	04:31 21:06	05:03 19:42	19:07 (2) 19:10 (2)	06:40 18:32	06:30 16:28	07:23 15:43	07:50 15:44
30	07:29 16:29		06:29 19:13	05:23 20:04		04:38 20:48	04:32 21:06	05:04 19:40	18:32 18:29	06:42 16:26	06:32 15:43	07:24 15:44	07:50 15:44
31	07:27 16:31		06:27 19:14			04:37 20:50	05:06 20:37	05:54 19:37		06:34 16:24		07:50 15:45	07:50 15:45
Potential sun hours	261	278	366	413	481	495	500	453	382	334	270	247	
Total, worst case				195				198					

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 10

Licensed user:

**ENVO**  
 ul.Sikorskiego 25/20  
 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envo-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** H - SH8

**Assumptions for shadow calculations**

Reference year for calendar 2015  
 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

	January	February	March	April	May	June	
1	07:51	07:26	06:34	06:25	05:21	04:36	19:17 (1)
	15:47	16:33	17:23	19:16	20:06	20:51	24 19:41 (1)
2	07:50	07:24	06:32	06:23	05:19	04:35	19:17 (1)
	15:48	16:35	17:25	19:18	20:07	20:52	24 19:41 (1)
3	07:50	07:23	06:30	06:20	05:17	04:35	19:18 (1)
	15:49	16:36	17:27	19:19	20:09	20:53	23 19:41 (1)
4	07:50	07:21	06:28	06:18	05:16	04:34	19:18 (1)
	15:50	16:38	17:28	19:21	20:11	20:54	23 19:41 (1)
5	07:50	07:20	06:26	06:16	05:14	04:33	19:19 (1)
	15:51	16:40	17:30	19:23	20:12	20:55	22 19:41 (1)
6	07:50	07:18	06:23	06:14	05:12	04:33	19:20 (1)
	15:52	16:42	17:32	19:24	20:14	20:56	20 19:40 (1)
7	07:49	07:16	06:21	06:11	05:10	04:32	19:21 (1)
	15:53	16:44	17:34	19:26	20:15	20:57	20 19:41 (1)
8	07:49	07:15	06:19	06:09	05:08	04:31	19:21 (1)
	15:54	16:45	17:35	19:28	20:17	20:58	19 19:40 (1)
9	07:49	07:13	06:17	06:07	05:07	19:22 (1) 04:31	19:22 (1)
	15:56	16:47	17:37	19:29	20:19	11 19:33 (1) 20:58	18 19:40 (1)
10	07:48	07:11	06:15	06:05	05:05	19:21 (1) 04:30	19:22 (1)
	15:57	16:49	17:39	19:31	20:20	14 19:35 (1) 20:59	17 19:39 (1)
11	07:48	07:09	06:12	06:03	05:03	19:19 (1) 04:30	19:23 (1)
	15:58	16:51	17:41	19:33	20:22	17 19:36 (1) 21:00	16 19:39 (1)
12	07:47	07:08	06:10	17:12 (2) 06:00	05:02	19:18 (1) 04:30	19:24 (1)
	16:00	16:53	17:42	6 17:18 (2) 19:34	20:23	20 19:38 (1) 21:01	15 19:39 (1)
13	07:46	07:06	06:08	17:10 (2) 05:58	05:00	19:16 (1) 04:29	19:25 (1)
	16:01	16:54	17:44	10 17:20 (2) 19:36	20:25	23 19:39 (1) 21:01	14 19:39 (1)
14	07:46	07:04	06:06	17:09 (2) 05:56	04:58	19:16 (1) 04:29	19:26 (1)
	16:03	16:56	17:46	12 17:21 (2) 19:38	20:26	24 19:40 (1) 21:02	13 19:39 (1)
15	07:45	07:02	06:03	17:08 (2) 05:54	04:57	19:15 (1) 04:29	19:25 (1)
	16:04	16:58	17:47	14 17:22 (2) 19:39	20:28	25 19:40 (1) 21:03	13 19:38 (1)
16	07:44	07:00	06:01	17:07 (2) 05:52	04:55	19:15 (1) 04:29	19:26 (1)
	16:06	17:00	17:49	14 17:21 (2) 19:41	20:29	26 19:41 (1) 21:03	12 19:38 (1)
17	07:43	06:58	05:59	17:07 (2) 05:50	04:54	19:15 (1) 04:29	19:27 (1)
	16:07	17:02	17:51	14 17:21 (2) 19:43	20:31	27 19:42 (1) 21:04	11 19:38 (1)
18	07:43	06:56	05:57	17:08 (2) 05:47	04:53	19:14 (1) 04:29	19:27 (1)
	16:09	17:04	17:53	13 17:21 (2) 19:44	20:32	27 19:41 (1) 21:04	11 19:38 (1)
19	07:42	06:55	05:54	17:08 (2) 05:45	04:51	19:14 (1) 04:29	19:27 (1)
	16:10	17:05	17:54	11 17:19 (2) 19:46	20:34	28 19:42 (1) 21:05	11 19:38 (1)
20	07:41	06:53	05:52	17:09 (2) 05:43	04:50	19:14 (1) 04:29	19:28 (1)
	16:12	17:07	17:56	8 17:17 (2) 19:48	20:35	28 19:42 (1) 21:05	9 19:37 (1)
21	07:40	06:51	05:50	05:41	04:48	19:14 (1) 04:29	19:29 (1)
	16:14	17:09	17:58	19:49	20:37	29 19:43 (1) 21:05	9 19:38 (1)
22	07:39	06:49	05:48	05:39	04:47	19:14 (1) 04:29	19:29 (1)
	16:15	17:11	17:59	19:51	20:38	29 19:43 (1) 21:05	9 19:38 (1)
23	07:38	06:47	05:45	05:37	04:46	19:13 (1) 04:29	19:29 (1)
	16:17	17:13	18:01	19:52	20:39	29 19:42 (1) 21:06	9 19:38 (1)
24	07:36	06:45	05:43	05:35	04:45	19:14 (1) 04:29	19:29 (1)
	16:19	17:14	18:03	19:54	20:41	28 19:42 (1) 21:06	9 19:38 (1)
25	07:35	06:42	05:41	05:33	04:43	19:14 (1) 04:30	19:29 (1)
	16:20	17:16	18:04	19:56	20:42	28 19:42 (1) 21:06	11 19:40 (1)
26	07:34	06:40	05:39	05:31	04:42	19:14 (1) 04:30	19:29 (1)
	16:22	17:18	18:06	19:57	20:43	28 19:42 (1) 21:06	11 19:40 (1)
27	07:33	06:38	05:36	05:29	04:41	19:14 (1) 04:30	19:29 (1)
	16:24	17:20	18:08	19:59	20:45	28 19:42 (1) 21:06	12 19:41 (1)
28	07:31	06:36	05:34	05:27	04:40	19:15 (1) 04:31	19:29 (1)
	16:26	17:21	18:09	20:01	20:46	27 19:42 (1) 21:06	12 19:41 (1)
29	07:30		06:32	05:25	04:39	19:16 (1) 04:31	19:28 (1)
	16:27		19:11	20:02	20:47	27 19:43 (1) 21:06	13 19:41 (1)
30	07:29		06:29	05:23	04:38	19:16 (1) 04:32	19:28 (1)
	16:29		19:13	20:04	20:48	26 19:42 (1) 21:06	14 19:42 (1)
31	07:27		06:27		04:37	19:16 (1)	
	16:31		19:14		20:50	26 19:42 (1)	
Potential sun hours	261	278	366	413	482	495	
Total, worst case			102		575	444	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 11

Licensed user:

**ENVO**

ul.Sikorskiego 25/20

PL-62 030 Lubon

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Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Calendar

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** H - SH8

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	July	August	September	October	November	December
1	04:32	19:29 (1)   05:07	19:27 (1)   05:56	06:43	17:49 (2)   06:36	07:26
	21:05	14 19:43 (1)   20:36	23 19:50 (1)   19:35	18:27	12 18:01 (2)   16:22	15:42
2	04:33	19:28 (1)   05:09	19:28 (1)   05:57	06:45	17:49 (2)   06:37	07:27
	21:05	15 19:43 (1)   20:34	20 19:48 (1)   19:33	18:25	10 17:59 (2)   16:20	15:41
3	04:34	19:28 (1)   05:10	19:29 (1)   05:59	06:47	17:52 (2)   06:39	07:29
	21:05	16 19:44 (1)   20:32	18 19:47 (1)   19:31	18:23	4 17:56 (2)   16:18	15:41
4	04:34	19:28 (1)   05:12	19:31 (1)   06:00	06:48	06:41	07:30
	21:04	17 19:45 (1)   20:31	15 19:46 (1)   19:29	18:20	16:17	15:40
5	04:35	19:27 (1)   05:13	19:32 (1)   06:02	06:50	06:43	07:31
	21:04	18 19:45 (1)   20:29	11 19:43 (1)   19:26	18:18	16:15	15:39
6	04:36	19:27 (1)   05:15	06:04	06:52	06:44	07:33
	21:04	19 19:46 (1)   20:27	19:24	18:16	16:13	15:39
7	04:37	19:27 (1)   05:16	06:05	06:53	06:46	07:34
	21:03	20 19:47 (1)   20:26	19:22	18:14	16:11	15:39
8	04:38	19:26 (1)   05:18	06:07	06:55	06:48	07:35
	21:02	21 19:47 (1)   20:24	19:20	18:11	16:10	15:38
9	04:39	19:26 (1)   05:19	06:08	06:56	06:50	07:36
	21:02	22 19:48 (1)   20:22	19:17	18:09	16:08	15:38
10	04:40	19:25 (1)   05:21	06:10	06:58	06:51	07:37
	21:01	23 19:48 (1)   20:20	19:15	18:07	16:07	15:38
11	04:41	19:25 (1)   05:23	06:12	07:00	06:53	07:38
	21:00	23 19:48 (1)   20:18	19:13	18:05	16:05	15:38
12	04:42	19:25 (1)   05:24	06:13	07:01	06:55	07:40
	21:00	24 19:49 (1)   20:16	19:11	18:03	16:03	15:37
13	04:43	19:24 (1)   05:26	06:15	07:03	06:57	07:41
	20:59	25 19:49 (1)   20:15	19:08	18:00	16:02	15:37
14	04:44	19:24 (1)   05:27	06:16	07:05	06:58	07:42
	20:58	26 19:50 (1)   20:13	19:06	17:58	16:01	15:37
15	04:45	19:24 (1)   05:29	06:18	07:06	07:00	07:42
	20:57	26 19:50 (1)   20:11	19:04	17:56	15:59	15:37
16	04:46	19:25 (1)   05:30	06:19	07:08	07:02	07:43
	20:56	26 19:51 (1)   20:09	19:01	17:54	15:58	15:37
17	04:47	19:24 (1)   05:32	06:21	07:10	07:04	07:44
	20:55	28 19:52 (1)   20:07	18:59	17:52	15:56	15:38
18	04:48	19:24 (1)   05:34	06:23	07:12	07:05	07:45
	20:54	28 19:52 (1)   20:05	18:57	17:50	15:55	15:38
19	04:50	19:24 (1)   05:35	06:24	07:13	07:07	07:46
	20:53	28 19:52 (1)   20:03	18:55	17:48	15:54	15:38
20	04:51	19:24 (1)   05:37	06:26	07:15	07:09	07:46
	20:52	28 19:52 (1)   20:01	18:52	17:46	15:53	15:38
21	04:52	19:24 (1)   05:38	06:27	07:17	07:10	07:47
	20:51	28 19:52 (1)   19:59	18:50	17:43	15:51	15:39
22	04:53	19:24 (1)   05:40	06:29	07:18	07:12	07:48
	20:50	29 19:53 (1)   19:57	18:48	17:41	15:50	15:39
23	04:55	19:24 (1)   05:41	06:31	07:20	07:14	07:48
	20:48	29 19:53 (1)   19:55	18:45	17:39	15:49	15:40
24	04:56	19:24 (1)   05:43	06:32	07:22	07:15	07:49
	20:47	28 19:52 (1)   19:53	18:43	17:37	15:48	15:40
25	04:57	19:24 (1)   05:45	06:34	17:52 (2)   06:24	07:17	07:49
	20:46	28 19:52 (1)   19:50	18:41	9 18:01 (2)   16:35	15:47	15:41
26	04:59	19:25 (1)   05:46	06:35	17:51 (2)   06:25	07:18	07:49
	20:44	28 19:53 (1)   19:48	18:39	11 18:02 (2)   16:33	15:46	15:41
27	05:00	19:25 (1)   05:48	06:37	17:49 (2)   06:27	07:20	07:50
	20:43	27 19:52 (1)   19:46	18:36	13 18:02 (2)   16:31	15:45	15:42
28	05:02	19:25 (1)   05:49	06:39	17:49 (2)   06:29	07:21	07:50
	20:42	27 19:52 (1)   19:44	18:34	14 18:03 (2)   16:29	15:44	15:43
29	05:03	19:26 (1)   05:51	06:40	17:49 (2)   06:30	07:23	07:50
	20:40	26 19:52 (1)   19:42	18:32	14 18:03 (2)   16:28	15:43	15:44
30	05:04	19:26 (1)   05:53	06:42	17:48 (2)   06:32	07:24	07:50
	20:39	25 19:51 (1)   19:40	18:29	14 18:02 (2)   16:26	15:43	15:44
31	05:06	19:26 (1)   05:54		06:34		07:50
	20:37	24 19:50 (1)   19:37		16:24		15:45
Potential sun hours	500	453	382	334	270	247
Total, worst case	746	87	75	26		

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 12

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**ENVO**  
 ul.Sikorskiego 25/20  
 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envio-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

**SHADOW - Calendar**

**Calculation:** Analiza migotania cienia - wariant proponowany **Shadow receptor:** I - SH9

**Assumptions for shadow calculations**

Reference year for calendar 2015  
 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

	January	February	March	April	May	June	July	August	September	October	November	December								
1   07:51	13:58 (1)   07:26	06:34	06:25	05:21	04:36	04:32	05:07	05:56	06:43	06:36		07:26	13:45 (1)							
15:47	45 15:15 (2)   16:33	17:23	19:16	20:06	20:51	21:05	20:36	19:35	18:27	16:22		15:42	42 15:01 (2)							
2   07:51	13:58 (1)   07:24	06:32	06:23	05:19	04:35	04:33	05:09	05:57	06:45	06:37		07:27	13:45 (1)							
15:48	45 15:15 (2)   16:35	17:25	19:18	20:07	20:52	21:05	20:34	19:33	18:25	16:20		15:41	43 15:02 (2)							
3   07:50	13:59 (1)   07:23	06:30	06:20	05:17	04:35	04:34	05:10	05:59	06:47	06:39		07:29	13:45 (1)							
15:49	45 15:16 (2)   16:36	17:27	19:19	20:09	20:53	21:05	20:32	19:31	18:23	16:18		15:41	44 15:02 (2)							
4   07:50	13:59 (1)   07:21	06:28	06:18	05:16	04:34	04:34	05:12	06:00	06:48	06:41		07:30	13:46 (1)							
15:50	46 15:17 (2)   16:38	17:28	19:21	20:11	20:54	21:05	20:31	19:29	18:20	16:17		15:40	44 15:03 (2)							
5   07:50	13:59 (1)   07:20	06:26	06:16	05:14	04:33	04:35	05:13	06:02	06:50	06:43		07:31	13:46 (1)							
15:51	46 15:17 (2)   16:40	17:30	19:23	20:12	20:55	21:04	20:29	19:26	18:18	16:15		15:39	45 15:03 (2)							
6   07:50	14:00 (1)   07:18	06:23	06:14	05:12	04:33	04:36	05:15	06:04	06:52	06:44		07:33	13:47 (1)							
15:52	46 15:18 (2)   16:42	17:32	19:24	20:14	20:56	21:04	20:27	19:24	18:16	16:13		15:39	45 15:04 (2)							
7   07:50	14:01 (1)   07:16	06:21	06:11	05:10	04:32	04:37	05:16	06:05	06:53	06:46		07:34	13:47 (1)							
15:53	46 15:19 (2)   16:44	17:34	19:26	20:15	20:57	21:03	20:26	19:22	18:14	16:11		15:39	45 15:04 (2)							
8   07:49	14:01 (1)   07:15	06:19	06:09	05:08	04:31	04:38	05:18	06:07	06:55	06:48		07:35	13:47 (1)							
15:54	46 15:19 (2)   16:45	17:35	19:28	20:17	20:58	21:03	20:24	19:20	18:11	16:10		15:38	46 15:05 (2)							
9   07:49	14:01 (1)   07:13	06:17	06:07	05:07	04:31	04:39	05:19	06:08	06:56	06:50		07:36	13:47 (1)							
15:56	46 15:19 (2)   16:47	17:37	19:29	20:19	20:59	21:02	20:22	19:17	18:09	16:08		15:38	46 15:05 (2)							
10   07:48	14:02 (1)   07:11	06:15	06:05	05:05	04:30	04:40	05:21	06:10	06:58	06:52		07:37	13:48 (1)							
15:57	45 15:20 (2)   16:49	17:39	19:31	20:20	20:59	21:01	20:20	19:15	18:07	16:07		15:38	46 15:06 (2)							
11   07:48	14:03 (1)   07:09	06:12	06:03	05:03	04:30	04:41	05:23	06:12	07:00	06:53		07:39	13:48 (1)							
15:58	44 15:20 (2)   16:51	17:41	19:33	20:22	21:00	21:01	20:18	19:13	18:05	16:05		15:37	46 15:06 (2)							
12   07:47	14:03 (1)   07:08	06:10	06:00	05:02	04:30	04:42	05:24	06:13	07:01	06:55		07:40	13:49 (1)							
16:00	43 15:19 (2)   16:53	17:42	19:34	20:23	21:01	21:00	20:16	19:11	18:03	16:03		15:37	44 15:06 (2)							
13   07:47	14:05 (1)   07:06	06:08	05:58	05:00	04:29	04:43	05:26	06:15	07:03	06:57		07:41	13:49 (1)							
16:01	41 15:20 (2)   16:54	17:44	19:36	20:25	21:02	20:59	20:15	19:08	18:00	16:02		15:37	45 15:06 (2)							
14   07:46	14:05 (1)   07:04	06:06	05:56	04:58	04:29	04:44	05:27	06:16	07:05	06:58		07:42	13:49 (1)							
16:03	40 15:20 (2)   16:56	17:46	19:38	20:26	21:02	20:58	20:13	19:06	17:58	16:01		15:37	44 15:06 (2)							
15   07:45	14:06 (1)   07:02	06:03	05:54	04:57	04:29	04:45	05:29	06:18	07:06	07:00		07:43	13:50 (1)							
16:04	38 15:20 (2)   16:58	17:47	19:39	20:28	21:03	20:57	20:11	19:04	17:56	15:59		15:37	43 15:06 (2)							
16   07:44	14:07 (1)   07:00	06:01	05:52	04:55	04:29	04:46	05:30	06:19	07:08	07:02		07:43	13:51 (1)							
16:06	34 15:19 (2)   17:00	17:49	19:41	20:29	21:03	20:56	20:09	19:01	17:54	15:58		15:37	42 15:06 (2)							
17   07:43	14:08 (1)   06:58	05:59	05:50	04:54	04:29	04:47	05:32	06:21	07:10	07:04		07:44	13:51 (1)							
16:07	31 15:18 (2)   17:02	17:51	19:43	20:31	21:04	20:55	20:07	18:59	17:52	15:56		15:38	42 15:06 (2)							
18   07:43	14:09 (1)   06:56	05:57	05:47	04:53	04:29	04:48	05:34	06:23	07:12	07:05		07:45	13:51 (1)							
16:09	24 14:33 (1)   17:04	17:53	19:44	20:32	21:04	20:54	20:05	18:57	17:50	15:55		15:38	41 15:05 (2)							
19   07:42	14:10 (1)   06:55	05:54	05:45	04:51	04:29	04:50	05:35	06:24	07:13	07:07		07:46	13:52 (1)							
16:10	22 14:32 (1)   17:05	17:54	19:46	20:34	21:05	20:53	20:03	18:55	17:48	15:54		15:38	40 15:06 (2)							
20   07:41	14:12 (1)   06:53	05:52	05:43	04:50	04:29	04:51	05:37	06:26	07:15	07:09		13:54 (1)   07:46	13:53 (1)							
16:12	20 14:32 (1)   17:07	17:56	19:48	20:35	21:05	20:52	20:01	18:52	17:46	15:53	7	14:01 (1)   15:38	40 15:07 (2)							
21   07:40	14:12 (1)   06:51	05:50	05:41	04:48	04:29	04:52	05:38	06:27	07:17	07:10		13:51 (1)   07:47	13:52 (1)							
16:14	18 14:30 (1)   17:09	17:58	19:49	20:37	21:05	20:51	19:59	18:50	17:43	15:51	13	14:04 (1)   15:39	40 15:06 (2)							
22   07:39	14:15 (1)   06:49	05:48	05:39	04:47	04:29	04:53	05:40	06:29	07:18	07:12		13:49 (1)   07:48	13:53 (1)							
16:15	14 14:29 (1)   17:11	17:59	19:51	20:38	21:06	20:50	19:57	18:48	17:41	15:50	16	14:05 (1)   15:39	41 15:07 (2)							
23   07:38	14:18 (1)   06:47	05:45	05:37	04:46	04:29	04:55	05:41	06:31	07:20	07:14		13:48 (1)   07:48	13:53 (1)							
16:17	9 14:27 (1)   17:13	18:01	19:53	20:39	21:06	20:48	19:55	18:45	17:39	15:49	19	14:07 (1)   15:40	41 15:07 (2)							
24   07:36		06:45	05:43	05:35	04:45	04:29	04:56	05:43	06:32	07:22		13:47 (1)   07:49	13:54 (1)							
16:19		17:14	18:03	19:54	20:41	21:06	20:47	19:53	18:43	17:37	15:48	22	14:09 (1)   15:40	40 15:08 (2)						
25   07:35		06:42	05:41	05:33	04:43	04:30	04:57	05:45	06:34	06:24		13:47 (1)   07:49	13:55 (1)							
16:20		17:16	18:04	19:56	20:42	21:06	20:46	19:50	18:41	16:35	15:47	23	14:10 (1)   15:41	40 15:09 (2)						
26   07:34		06:40	05:39	05:31	04:42	04:30	04:59	05:46	06:35	06:25		13:46 (1)   07:49	13:55 (1)							
16:22		17:18	18:06	19:57	20:43	21:06	20:44	19:48	18:39	16:33	15:46	28	14:55 (2)   15:41	40 15:09 (2)						
27   07:33		06:38	05:36	05:29	04:41	04:30	05:00	05:48	06:37	06:27		13:46 (1)   07:50	13:55 (1)							
16:24		17:20	18:08	19:59	20:45	21:06	20:43	19:46	18:36	16:31	15:45	33	14:57 (2)   15:42	42 15:10 (2)						
28   07:31		06:36	05:34	05:27	04:40	04:31	05:02	05:49	06:39	06:29		13:46 (1)   07:50	13:56 (1)							
16:26		17:21	18:09	20:01	20:46	21:06	20:42	19:44	18:34	16:29	15:44	37	14:59 (2)   15:43	42 15:11 (2)						
29   07:30			06:32	05:25	04:39	04:31	05:03	05:51	06:40	06:30		13:45 (1)   07:50	13:57 (1)							
16:27			19:11	20:02	20:47	21:06	20:40	19:42	18:32	16:28	15:43	39	14:59 (2)   15:44	42 15:12 (2)						
30   07:29			06:29	05:23	04:38	04:32	05:04	05:53	06:42	06:32		13:45 (1)   07:50	13:57 (1)							
16:29			19:13	20:04	20:48	21:06	20:39	19:40	18:29	16:26	15:43	41	15:01 (2)   15:44	43 15:13 (2)						
31   07:27			06:27		04:37		05:06	05:54	06:43				07:50	13:58 (1)						
16:31			19:14		20:50		20:37	19:38		16:24			15:45	43 15:14 (2)						
Potential sun hours	261		278		482		495	500		453		382		334		270		278		1327
Total, worst case	834																			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)		Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 13

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**ENVO**

ul.Sikorskiego 25/20

PL-62 030 Lubon

0048 662 643 300

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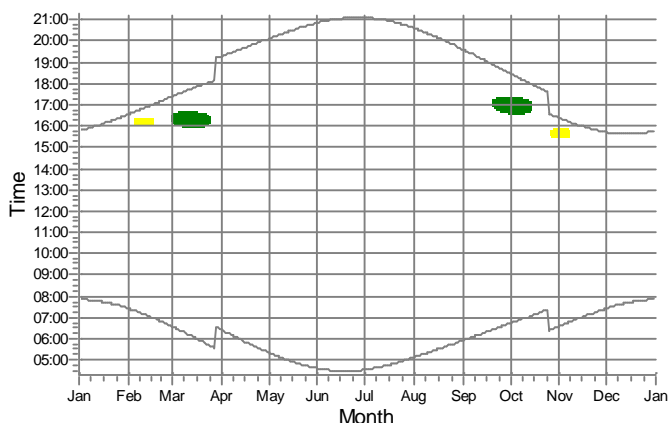
Calculated:

2015-03-07 10:39/2.9.285

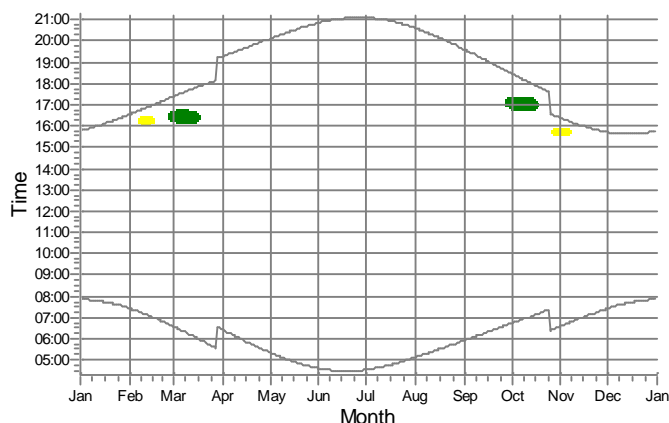
### SHADOW - Calendar, graphical

Calculation: Analiza migotania cienia - wariant proponowany

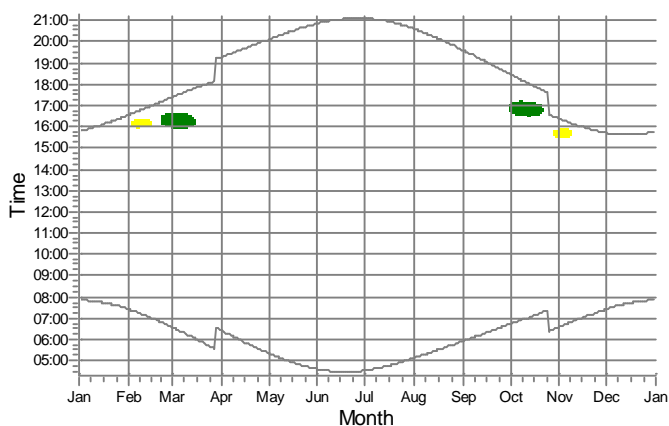
A: SH1



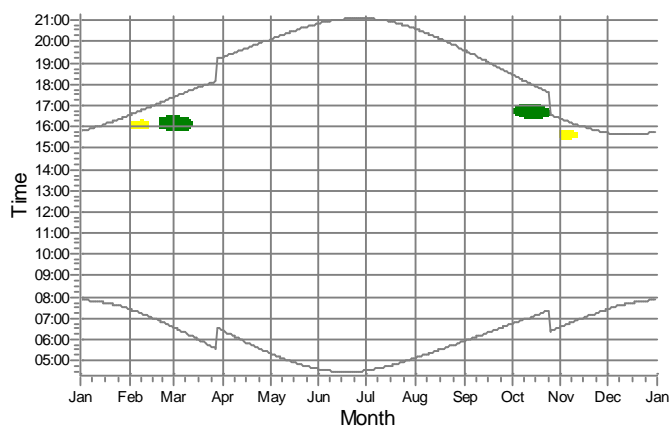
B: SH2



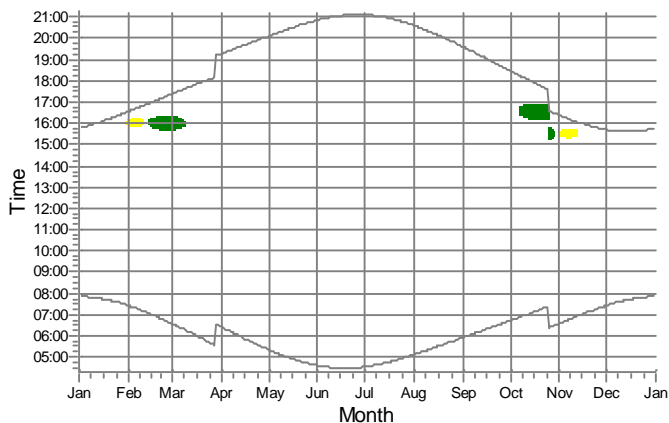
C: SH3



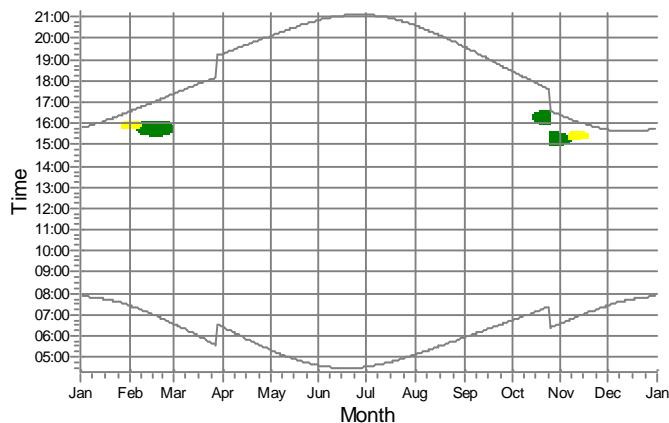
D: SH4



E: SH5



F: SH6



WTGs

1: E1

2: E2

Project:

**Elektrownie wiatrowe Galewice**

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2015-03-07 10:41 / 14

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ul.Sikorskiego 25/20

PL-62 030 Lubon

0048 662 643 300

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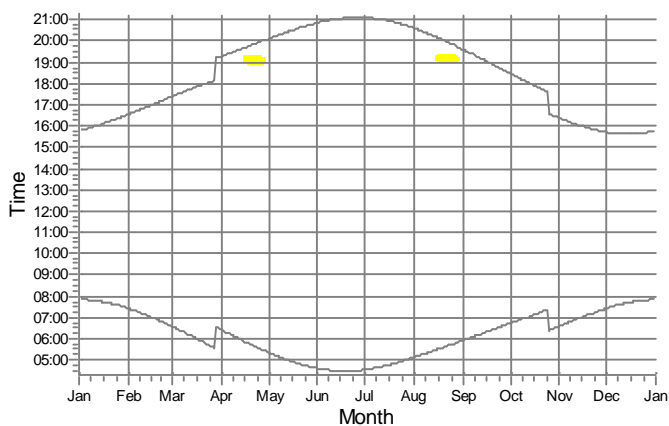
Calculated:

2015-03-07 10:39/2.9.285

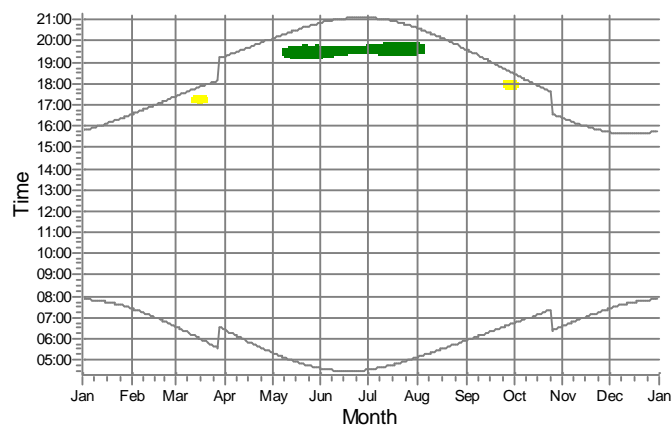
### SHADOW - Calendar, graphical

Calculation: Analiza migotania cienia - wariant proponowany

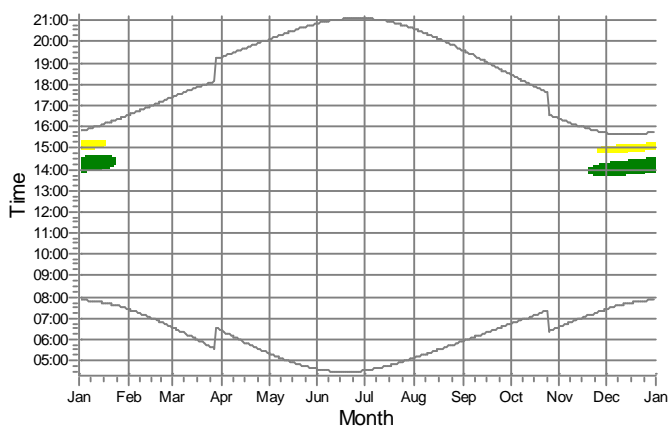
G: Sh7



H: SH8



I: SH9



WTGs

1: E1

2: E2

Project:

**Elektrownie wiatrowe Galewice**

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Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Calendar per WTG

Calculation: Analiza migotania cienia - wariant proponowany WTG: 1 - E1

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	January	February	March	April	May	June
1	07:51 13:58-14:30/32 15:47	07:26 16:33	06:34 15:45-16:20/35 17:23 16:17-16:38/21	06:25 19:16	05:21 20:06	04:36 19:17-19:41/24 20:51
2	07:51 13:58-14:30/32 15:48	07:24 16:35	06:32 15:46-16:20/34 17:25 16:17-16:40/23	06:23 19:18	05:19 20:07	04:35 19:17-19:41/24 20:52
3	07:50 13:59-14:30/31 15:49	07:23 16:36	06:30 15:47-16:19/32 17:27 16:16-16:41/25	06:20 19:19	05:17 20:09	04:35 19:18-19:41/23 20:53
4	07:50 13:59-14:31/32 15:50	07:21 16:38	06:28 15:47-16:17/30 17:29 16:14-16:40/26	06:18 19:21	05:16 20:11	04:34 19:18-19:41/23 20:54
5	07:50 13:59-14:31/32 15:51	07:20 16:40	06:26 15:48-16:16/28 17:30 16:13-16:41/28	06:16 19:23	05:14 20:12	04:33 19:19-19:41/22 20:55
6	07:50 14:00-14:32/32 15:52	07:18 15:44-15:48/4 16:42	06:23 15:50-16:14/24 17:32 16:11-16:41/30	06:14 19:24	05:12 20:14	04:33 19:20-19:40/20 20:56
7	07:50 14:01-14:32/31 15:53	07:16 15:39-15:52/13 16:44	06:21 15:53-16:11/18 17:34 16:09-16:42/33	06:11 19:26	05:10 20:15	04:32 19:21-19:41/20 20:57
8	07:49 14:01-14:32/31 15:55	07:15 15:38-15:55/17 16:45	06:19 15:56-16:05/9 17:35 16:03-16:41/38	06:09 19:28	05:08 20:17	04:31 19:21-19:40/19 20:58
9	07:49 14:01-14:32/31 15:56	07:13 15:36-15:57/21 16:47	06:17 15:57-16:23/26 17:37 16:21-16:41/20	06:07 19:29	05:07 19:22-19:33/11 20:19	04:31 19:22-19:40/18 20:59
10	07:48 14:02-14:33/31 15:57	07:11 15:34-15:58/24 16:49	06:15 15:59-16:21/22 17:39 16:19-16:40/21	06:05 19:31	05:05 19:21-19:35/14 20:20	04:30 19:22-19:39/17 20:59
11	07:48 14:03-14:33/30 15:58	07:09 15:33-15:59/26 16:51	06:12 16:01-16:19/18 17:41 16:17-16:40/23	06:03 19:33	05:03 19:19-19:36/17 20:22	04:30 19:23-19:39/16 21:00
12	07:47 14:03-14:33/30 16:00	07:08 15:32-16:00/28 16:53	06:10 16:00-16:11/11 17:42 16:10-16:38/28	06:00 19:34	05:02 19:18-19:38/20 20:23	04:30 19:24-19:39/15 21:01
13	07:47 14:05-14:34/29 16:01	07:06 15:32-16:01/29 16:55	06:08 16:00-16:25/25 17:44 16:24-16:37/13	05:58 19:36	05:00 19:16-19:39/23 20:25	04:29 19:25-19:39/14 21:02
14	07:46 14:05-14:33/28 16:03	07:04 15:31-16:01/30 16:56	06:06 16:01-16:21/20 17:46 16:20-16:37/17	05:56 19:38	04:59 19:16-19:40/24 20:26	04:29 19:26-19:39/13 21:02
15	07:45 14:06-14:33/27 16:04	07:02 15:30-16:03/33 16:58 16:03-16:05/2	06:03 16:01-16:36/35 17:47 16:36-16:37/1	05:54 19:39	04:57 19:15-19:40/25 20:28	04:29 19:25-19:38/13 21:03
16	07:44 14:07-14:33/26 16:06	07:00 15:30-16:03/33 17:00 16:03-16:09/6	06:01 16:00-16:33/33 17:49 16:33-16:36/3	05:52 19:41	04:55 19:15-19:41/26 20:29	04:29 19:26-19:38/12 21:03
17	07:43 14:08-14:33/25 16:07	06:58 15:30-16:03/33 17:02 16:03-16:11/8	05:59 16:01-16:29/28 17:51 16:29-16:35/6	05:50 19:43	04:54 19:15-19:42/27 20:31	04:29 19:27-19:38/11 21:04
18	07:43 14:09-14:33/24 16:09	06:56 15:30-16:03/33 17:04 16:03-16:13/10	05:57 16:02-16:34/32 17:53	05:47 19:44	04:53 19:14-19:41/27 20:32	04:29 19:27-19:38/11 21:04
19	07:42 14:10-14:32/22 16:11	06:55 15:30-16:03/33 17:05 16:03-16:14/11	05:54 16:02-16:33/31 17:54	05:45 19:46	04:51 19:14-19:42/28 20:34	04:29 19:27-19:38/11 21:05
20	07:41 14:12-14:32/20 16:12	06:53 15:30-16:03/33 17:07 16:03-16:17/14	05:52 16:03-16:31/28 17:56	05:43 19:48	04:50 19:14-19:42/28 20:35	04:29 19:28-19:37/9 21:05
21	07:40 14:12-14:30/18 16:14	06:51 15:31-16:03/32 17:09 16:02-16:20/18	05:50 16:05-16:30/25 17:58	05:41 19:49	04:48 19:14-19:43/29 20:37	04:29 19:29-19:38/9 21:05
22	07:39 14:15-14:29/14 16:15	06:49 15:31-16:03/32 17:11 16:02-16:22/20	05:48 16:07-16:28/21 17:59	05:39 19:51	04:47 19:14-19:43/29 20:38	04:29 19:29-19:38/9 21:06
23	07:38 14:18-14:27/9 16:17	06:47 15:32-16:02/30 17:13 16:01-16:25/24	05:45 16:08-16:25/17 18:01	05:37 19:53	04:46 19:13-19:42/29 20:39	04:29 19:29-19:38/9 21:06
24	07:36 16:19	06:45 15:33-16:01/28 17:14 16:00-16:27/27	05:43 16:13-16:20/7 18:03	05:35 19:54	04:45 19:14-19:42/28 20:41	04:29 19:29-19:38/9 21:06
25	07:35 16:20	06:42 15:34-16:00/26 17:16 15:59-16:29/30	05:41 18:04	05:33 19:56	04:43 19:14-19:42/28 20:42	04:30 19:29-19:40/11 21:06
26	07:34 16:22	06:40 15:36-15:59/23 17:18 15:58-16:30/32	05:39 18:06	05:31 19:57	04:42 19:14-19:42/28 20:43	04:30 19:29-19:40/11 21:06
27	07:33 16:24	06:38 15:37-15:56/19 17:20 15:55-16:34/39	05:36 18:08	05:29 19:59	04:41 19:14-19:42/28 20:45	04:30 19:29-19:41/12 21:06
28	07:31 16:26	06:36 15:41-15:51/10 17:21 15:51-16:36/45	05:34 18:09	05:27 20:01	04:40 19:15-19:42/27 20:46	04:31 19:29-19:41/12 21:06
29	07:30 16:27		06:32 19:11	05:25 20:02	04:39 19:16-19:43/27 20:47	04:31 19:28-19:41/13 21:06
30	07:29 16:29		06:29 19:13	05:23 20:04	04:38 19:16-19:42/26 20:48	04:32 19:28-19:42/14 21:06
31	07:27 16:31		06:27 19:14		04:37 19:16-19:42/26 20:50	
Potential sun hours	261	278	366	413	482	495
Sum of minutes with flicker	617	869	916	0	575	444

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

**Elektrownie wiatrowe Galewice**

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Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Calendar per WTG

Calculation: Analiza migotania cienia - wariant proponowany WTG: 1 - E1

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	July	August	September	October	November	December	
1	04:33 19:29-19:43/14 21:05	05:07 19:27-19:50/23 20:36	05:56 19:35	06:43 16:40-17:02/22 18:27 17:01-17:17/16	06:36 15:03-15:29/26 16:22	07:26 13:45-14:14/29 15:42	
2	04:33 19:28-19:43/15 21:05	05:09 19:28-19:48/20 20:34	05:57 19:33	06:45 16:39-17:04/25 18:25 17:03-17:16/13	06:37 15:04-15:28/24 16:20	07:27 13:45-14:15/30 15:41	
3	04:34 19:28-19:44/16 21:05	05:10 19:29-19:47/18 20:32	05:59 19:31	06:47 16:39-16:52/13 18:23 16:50-17:17/27	06:39 15:05-15:27/22 16:18	07:29 13:45-14:15/30 15:41	
4	04:35 19:28-19:45/17 21:05	05:12 19:31-19:46/15 20:31	06:00 19:29	06:48 16:39-16:57/18 18:20 16:55-17:18/23	06:41 15:07-15:25/18 16:17	07:30 13:46-14:16/30 15:40	
5	04:35 19:27-19:45/18 21:04	05:13 19:32-19:43/11 20:29	06:02 19:26	06:50 16:36-16:58/22 18:18 16:56-17:17/21	06:43 15:09-15:23/14 16:15	07:31 13:46-14:17/31 15:40	
6	04:36 19:27-19:46/19 21:04	05:15 20:27	06:04 19:24	06:52 16:34-17:00/26 18:16 16:58-17:18/20	06:44 15:11-15:19/8 16:13	07:33 13:47-14:18/31 15:39	
7	04:37 19:27-19:47/20 21:03	05:16 20:26	06:05 19:22	06:53 16:33-16:43/10 18:14 16:41-17:18/37	06:46 16:11	07:34 13:47-14:18/31 15:39	
8	04:38 19:26-19:47/21 21:03	05:18 20:24	06:07 19:20	06:55 16:29-16:47/18 18:11 16:45-17:18/33	06:48 16:10	07:35 13:47-14:18/31 15:38	
9	04:39 19:26-19:48/22 21:02	05:19 20:22	06:08 19:17	06:56 16:25-16:49/24 18:09 16:46-17:16/30	06:50 16:08	07:36 13:47-14:18/31 15:38	
10	04:40 19:25-19:48/23 21:01	05:21 20:20	06:10 19:15	06:58 16:23-16:51/28 18:07 16:48-17:16/28	06:52 16:07	07:37 13:48-14:20/32 15:38	
11	04:41 19:25-19:48/23 21:01	05:23 20:18	06:12 19:13	07:00 16:22-16:52/30 18:05 16:49-17:15/26	06:53 16:05	07:39 13:48-14:20/32 15:38	
12	04:42 19:25-19:49/24 21:00	05:24 20:16	06:13 19:11	07:01 16:20-16:52/32 18:03 16:49-17:14/25	06:55 16:03	07:40 13:49-14:20/31 15:37	
13	04:43 19:24-19:49/25 20:59	05:26 20:15	06:15 19:08	07:03 16:19-16:53/34 18:00 16:50-17:13/23	06:57 16:02	07:41 13:49-14:21/32 15:37	
14	04:44 19:24-19:50/26 20:58	05:27 20:13	06:16 19:06	07:05 16:18-16:53/35 17:58 16:50-17:11/21	06:58 16:01	07:42 13:49-14:21/32 15:37	
15	04:45 19:24-19:50/26 20:57	05:29 20:11	06:18 19:04	07:06 16:14-16:24/10 17:56 16:24-17:10/46	07:00 15:59	07:42 13:50-14:22/32 15:37	
16	04:46 19:25-19:51/26 20:56	05:30 20:09	06:19 19:01	07:08 16:10-16:26/16 17:54 16:26-17:06/40	07:02 15:58	07:43 13:51-14:22/31 15:37	
17	04:47 19:24-19:52/28 20:55	05:32 20:07	06:21 18:59	07:10 16:07-16:30/23 17:52 16:29-17:02/33	07:04 15:56	07:44 13:51-14:23/32 15:38	
18	04:48 19:24-19:52/28 20:54	05:34 20:05	06:23 18:57	07:12 16:06-16:31/25 17:50 16:30-17:01/31	07:05 15:55	07:45 13:51-14:23/32 15:38	
19	04:50 19:24-19:52/28 20:53	05:35 20:03	06:24 18:55	07:13 16:04-16:32/28 17:48 16:31-16:59/28	07:07 15:54	07:46 13:52-14:23/31 15:38	
20	04:51 19:24-19:52/28 20:52	05:37 20:01	06:26 18:52	07:15 16:03-16:33/30 17:46 16:32-16:56/24	07:09 13:54-14:01/7 15:53	07:46 13:53-14:24/31 15:38	
21	04:52 19:24-19:52/28 20:51	05:38 19:59	06:27 18:50	07:17 16:02-16:33/31 17:43 16:32-16:52/20	07:10 13:51-14:04/13 15:51	07:47 13:52-14:24/32 15:39	
22	04:53 19:24-19:53/29 20:50	05:40 19:57	06:29 18:48	07:18 16:01-16:34/33 17:41 16:33-16:50/17	07:12 13:49-14:05/16 15:50	07:48 13:53-14:25/32 15:39	
23	04:55 19:24-19:53/29 20:48	05:41 19:55	06:31 18:45	07:20 16:01-16:33/32 17:39 16:33-16:48/15	07:14 13:48-14:07/19 15:49	07:48 13:53-14:25/32 15:40	
24	04:56 19:24-19:52/28 20:47	05:43 19:53	06:32 18:43	07:22 16:00-16:33/33 17:37 16:33-16:45/12	07:15 13:47-14:09/22 15:48	07:49 13:54-14:26/32 15:40	
25	04:57 19:24-19:52/28 20:46	05:45 19:50	06:34 18:41	06:46-17:15/29 18:41	06:24 15:00-15:33/33 16:35 15:33-15:43/10	07:17 13:47-14:10/23 15:47	07:49 13:55-14:26/31 15:41
26	04:59 19:25-19:53/28 20:44	05:46 19:48	06:35 18:39	16:45-17:16/31 18:39	06:25 15:00-15:33/33 16:33 15:33-15:42/9	07:18 13:46-14:10/24 15:46	07:49 13:55-14:26/31 15:41
27	05:00 19:25-19:52/27 20:43	05:48 19:46	06:37 18:36	16:43-17:16/33 18:36	06:27 15:00-15:32/32 16:31 15:32-15:39/7	07:20 13:46-14:12/26 15:45	07:50 13:55-14:27/32 15:42
28	05:02 19:25-19:52/27 20:42	05:49 19:44	06:39 18:34	16:42-17:12/30 17:12-17:17/5	06:29 15:00-15:32/32 16:30 15:32-15:36/4	07:21 13:46-14:13/27 15:44	07:50 13:56-14:28/32 15:43
29	05:03 19:26-19:52/26 20:40	05:51 19:42	06:40 18:32	16:42-17:15/33 17:15-17:17/2	06:30 15:00-15:31/31 16:28	07:23 13:45-14:13/28 15:43	07:50 13:57-14:28/31 15:44
30	05:04 19:26-19:51/25 20:39	05:53 19:40	06:42 18:29	16:40-17:16/36 17:16-17:17/1	06:32 15:01-15:30/29 16:26	07:24 13:45-14:14/29 15:43	07:50 13:57-14:29/32 15:44
31	05:06 19:26-19:50/24 20:37	05:54 19:38			06:34 15:02-15:30/28 16:24		07:50 13:58-14:29/31 15:45
Potential sun hours	500	453	382	334	270	247	
Sum of minutes with flicker	746	87	278	1417	346	970	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
			First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker



Project:

**Elektrownie wiatrowe Galewice**

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 PL-62 030 Lubon  
 0048 662 643 300  
 ENVO / envo-i.nowicki@wp.pl  
 Calculated:  
 2015-03-07 10:39/2.9.285

## SHADOW - Calendar per WTG

**Calculation:** Analiza migotania cienia - wariant proponowany **WTG: 2 - E2**

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	January	February	March	April	May	June
1	07:51 15:02-15:15/13 15:47	07:26 15:48-16:03/15 16:33 16:03-16:05/2	06:34 17:23	06:25 19:16	05:21 20:06	04:36 20:51
2	07:51 15:02-15:15/13 15:48	07:24 15:48-16:03/15 16:35 16:03-16:07/4	06:32 17:25	06:23 19:18	05:19 20:07	04:36 20:52
3	07:50 15:02-15:16/14 15:49	07:23 15:48-16:04/16 16:36 16:03-16:09/6	06:30 17:27	06:20 19:19	05:17 20:09	04:35 20:53
4	07:50 15:03-15:17/14 15:50	07:21 15:49-16:04/15 16:38 16:03-16:11/8	06:28 17:29	06:18 19:21	05:16 20:11	04:34 20:54
5	07:50 15:03-15:17/14 15:51	07:20 15:50-16:03/13 16:40 16:02-16:13/11	06:26 17:30	06:16 19:23	05:14 20:12	04:33 20:55
6	07:50 15:04-15:18/14 15:52	07:18 15:51-16:02/11 16:42 16:01-16:15/14	06:23 17:32	06:14 19:24	05:12 20:14	04:33 20:56
7	07:50 15:04-15:19/15 15:53	07:16 15:54-15:58/4 16:44 15:58-16:16/18	06:21 17:34	06:11 19:26	05:10 20:15	04:32 20:57
8	07:49 15:04-15:19/15 15:55	07:15 15:57-16:13/16 16:45 16:10-16:19/9	06:19 17:35	06:09 19:28	05:08 20:17	04:31 20:58
9	07:49 15:04-15:19/15 15:56	07:13 15:57-16:12/15 16:47 16:09-16:21/12	06:17 17:37	06:07 19:29	05:07 20:19	04:31 20:59
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16	07:44 15:11-15:19/8 16:06	07:00 16:08-16:17/9 17:00	06:01 17:49	05:52 19:41	04:55 20:29	04:29 21:03
17	07:44 15:12-15:18/6 16:07	06:58 17:02 17:51	05:59 17:51	05:50 19:43	04:54 20:31	04:29 21:04
18	07:43 16:09 16:09	06:57 17:04 17:04	05:57 17:53	05:47 19:44	04:53 20:32	04:29 21:04
19	07:42 16:11 16:11	06:55 17:05 17:05	05:54 17:54	05:45 19:46	04:51 20:34	04:29 21:05
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23	07:38 16:17 16:17	06:47 17:13 17:13	05:45 18:01	05:37 19:53	04:46 20:39	04:29 21:06
24	07:36 16:19 16:19	06:45 17:14 17:14	05:43 18:03	05:35 19:54	04:45 20:41	04:29 21:06
25	07:35 16:21 16:21	06:42 17:16 17:16	05:41 18:04	05:33 19:56	04:43 20:42	04:30 21:06
26	07:34 16:22 16:22	06:40 17:18 17:18	05:39 18:06	05:31 19:57	04:42 20:43	04:30 21:06
27	07:33 15:50-15:55/5 16:24	06:38 17:20 17:20	05:36 18:08	05:29 19:59	04:41 20:45	04:31 21:06
28	07:31 15:49-15:57/8 16:26	06:36 17:22 17:22	05:34 18:09	05:27 20:01	04:40 20:46	04:31 21:06
29	07:30 15:48-15:59/11 16:27	06:32 19:11 19:11	06:32 19:11	05:25 20:02	04:39 20:47	04:31 21:06
30	07:29 15:48-16:01/13 16:29	06:29 19:13 19:13	06:29 19:13	05:23 20:04	04:38 20:48	04:32 21:06
31	07:27 15:48-16:02/14 16:31	06:27 19:14 19:14	06:27 19:14	05:21 20:04	04:37 20:50	04:31 21:06
Potential sun hours	261	278	366	413	481	495
Sum of minutes with flicker	269	312	102	195	0	0

**Table layout: For each day in each month the following matrix apply**

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

**Elektrownie wiatrowe Galewice**

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Calculated:

2015-03-07 10:39/2.9.285

## SHADOW - Calendar per WTG

Calculation: Analiza migotania cienia - wariant proponowany WTG: 2 - E2

### Assumptions for shadow calculations

Reference year for calendar

2015

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

	July	August	September	October	November	December
1	04:33 21:05	05:07 20:36	05:56 19:35	06:43 17:49-18:01/12 19:35	06:36 15:31-15:45/14 16:22 15:43-15:51/8	07:26 14:48-15:01/13 15:42
2	04:33 21:05	05:09 20:34	05:57 19:33	06:45 17:49-17:59/10 18:25	06:37 15:29-15:40/11 16:20 15:37-15:51/14	07:27 14:49-15:02/13 15:41
3	04:34 21:05	05:10 20:32	05:59 19:31	06:47 17:52-17:56/4 18:23	06:39 15:27-15:42/15 16:18 15:39-15:51/12	07:29 14:48-15:02/14 15:41
4	04:35 21:05	05:12 20:31	06:00 19:29	06:48 18:20	06:41 15:26-15:43/17 16:17 15:40-15:49/9	07:30 14:49-15:03/14 15:40
5	04:35 21:04	05:13 20:29	06:02 19:26	06:50 18:18	06:43 15:26-15:43/17 16:15 15:40-15:48/8	07:31 14:49-15:03/14 15:40
6	04:36 21:04	05:15 20:27	06:04 19:24	06:52 18:16	06:45 15:21-15:31/10 16:13 15:30-15:45/15	07:33 14:50-15:04/14 15:39
7	04:37 21:03	05:16 20:26	06:05 19:22	06:53 18:14	06:46 15:20-15:32/12 16:12 15:31-15:43/12	07:34 14:50-15:04/14 15:39
8	04:38 21:03	05:18 20:24	06:07 19:20	06:55 18:11	06:48 15:19-15:33/14 16:10 15:32-15:42/10	07:35 14:50-15:05/15 15:38
9	04:39 21:02	05:20 20:22	06:08 19:17	06:56 18:09	06:50 15:19-15:34/15 16:08 15:33-15:40/7	07:36 14:50-15:05/15 15:38
10	04:40 21:01	05:21 20:20	06:10 19:15	06:58 18:07	06:52 15:19-15:35/16 16:07 15:34-15:38/4	07:37 14:52-15:06/14 15:38
11	04:41 21:01	05:23 20:18	06:12 19:13	07:00 18:05	06:53 15:19-15:34/15 16:05 15:34-15:37/3	07:39 14:52-15:06/14 15:38
12	04:42 21:00	05:24 20:17	06:13 19:11	07:01 18:03	06:55 15:19-15:34/15 16:04 15:34-15:35/1	07:40 14:53-15:06/13 15:37
13	04:43 20:59	05:26 20:15	06:15 19:08	07:03 18:00	06:57 15:20-15:33/13 16:02	07:41 14:53-15:06/13 15:37
14	04:44 20:58	05:27 20:13	06:16 19:06	07:05 17:58	06:58 15:21-15:32/11 16:01	07:42 14:54-15:06/12 15:37
15	04:45 20:57	05:29 20:11	06:18 19:04	07:06 17:56	07:00 15:22-15:31/9 15:59	07:43 14:55-15:06/11 15:37
16	04:46 20:56	05:30 19:08-19:15/7 20:09	06:19 19:02	07:08 17:54	07:02 15:22-15:28/6 15:58	07:43 14:55-15:06/11 15:37
17	04:47 20:55	05:32 19:06-19:17/11 20:07	06:21 18:59	07:10 17:52	07:04 15:24-15:27/3 15:56	07:44 14:56-15:06/10 15:38
18	04:48 20:54	05:34 19:04-19:18/14 20:05	06:23 18:57	07:12 17:50	07:05 15:55	07:45 14:56-15:05/9 15:38
19	04:50 20:53	05:35 19:03-19:19/16 20:03	06:24 18:55	07:13 17:48	07:07 15:54	07:46 14:57-15:06/9 15:38
20	04:51 20:52	05:37 19:02-19:19/17 20:01	06:26 18:52	07:15 17:46	07:09 15:53	07:46 14:58-15:07/9 15:38
21	04:52 20:51	05:38 19:02-19:20/18 19:59	06:27 18:50	07:17 17:44	07:10 15:51	07:47 14:58-15:06/8 15:39
22	04:53 20:50	05:40 19:01-19:19/18 19:57	06:29 18:48	07:18 17:41	07:12 15:50	07:48 14:58-15:07/9 15:39
23	04:55 20:48	05:42 19:01-19:20/19 19:55	06:31 18:45	07:20 17:39	07:14 15:49	07:48 14:58-15:07/9 15:40
24	04:56 20:47	05:43 19:01-19:19/18 19:53	06:32 18:43	07:22 17:37	07:15 15:48	07:49 15:00-15:08/8 15:40
25	04:57 20:46	05:45 19:01-19:18/17 19:50	06:34 17:52-18:01/9 18:41	06:24 16:35	07:17 15:47	07:49 15:00-15:09/9 15:41
26	04:59 20:44	05:46 19:01-19:17/16 19:48	06:35 17:51-18:02/11 18:39	06:25 16:33	07:18 14:51-14:55/4 15:46	07:49 15:00-15:09/9 15:41
27	05:00 20:43	05:48 19:02-19:16/14 19:46	06:37 17:49-18:02/13 18:36	06:27 15:38-15:46/8 16:31	07:20 14:50-14:57/7 15:45	07:50 15:00-15:10/10 15:42
28	05:02 20:42	05:49 19:03-19:13/10 19:44	06:39 17:49-18:03/14 18:34	06:29 15:36-15:48/12 16:30	07:21 14:49-14:59/10 15:44	07:50 15:01-15:11/10 15:43
29	05:03 20:40	05:51 19:07-19:10/3 19:42	06:40 17:49-18:03/14 18:32	06:31 15:34-15:44/10 16:28 15:43-15:50/7	07:23 14:48-14:59/11 15:43	07:50 15:01-15:12/11 15:44
30	05:05 20:39	05:53 19:40	06:42 17:48-18:02/14 18:29	06:32 15:34-15:46/12 16:26 15:45-15:51/6	07:24 14:49-15:01/12 15:43	07:50 15:02-15:13/11 15:44
31	05:06 20:37	05:54 19:38		06:34 15:33-15:43/10 16:24 15:41-15:51/10		07:50 15:02-15:14/12 15:45
Potential sun hours	500	453	382	334	270	247
Sum of minutes with flicker	0	198	75	97	341	357

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

Project:

**Elektrownie wiatrowe Galewice**

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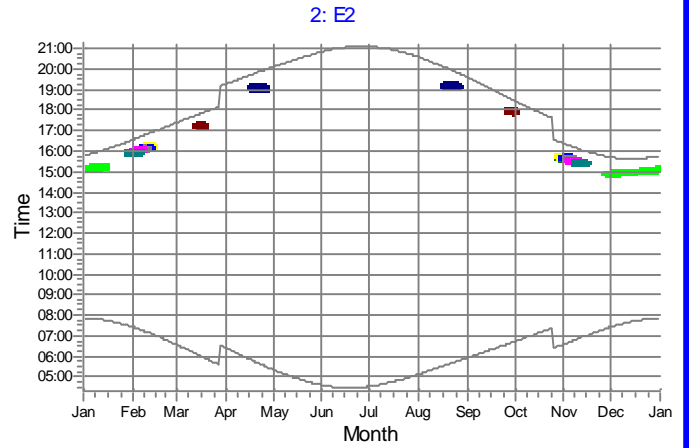
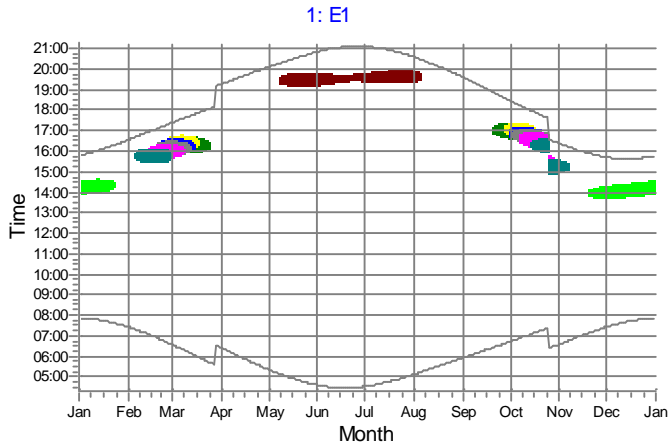
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## SHADOW - Calendar per WTG, graphical

Calculation: Analiza migotania cienia - wariant proponowany



### Shadow receptors

 A: SH1	 C: SH3	 E: SH5	 G: Sh7	 I: SH9
 B: SH2	 D: SH4	 F: SH6	 H: SH8	