



REGIONE AUTONOMA DELLA SARDEGNA

PROVINCE DI NUORO E SASSARI



COMUNE DI BITTI



COMUNE DI BUDDUSO'



PROGETTO PER LA REALIZZAZIONE DEL PARCO EOLICO "BITTI - TERENCESS"

Potenza complessiva 37,2 MW

PROGETTO DEFINITIVO
DELL'IMPIANTO, DELLE OPERE CONNESSE E DELLE
INFRASTRUTTURE INDISPENSABILI

RS-6

**STUDIO OMBREGGIAMENTO E
SHADOW FLICKERING**

COMMITTENTE

**GREEN
ENERGY
SARDEGNA 2**
S.r.l.

**Piazza del Grano 3
39100 Bolzano, Italia**

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SCALA:

FIRME

Rev.	Descrizione	Redatto	Verificato	Approvato	Data
00	Prima emissione				Luglio 2020
01	Integrazioni MIBACT DG ABAP Serv.V prot.31225 data 27/10/2020 e DG Ambiente della RAS prot.95596 data 19/11/2020	Ing. Giorgio Floris	Ing. Giorgio Floris	Ing. Giorgio Floris	01/10/2021



REGIONE AUTONOMA DELLA SARDEGNA

Comuni di Bitti (Nuoro) e Buddusò (Sassari)

GREENENERGYSARDEGNA2

Green Energy Sardegna 2 Srl

Piazza del Grano 3, Bolzano, P.IVA e Cod. Fisc. 02993950217

PROGETTO DEL PARCO EOLICO "Bitti - Terenass" da 37,2 MW DELLE OPERE CONNESSE E DELLE INFRASTRUTTURE INDISPENSABILI

ANALISI DI OMBREGGIAMENTO E SHADOW FLICKERING



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1 INTRODUZIONE

Il presente documento sostituisce il precedente in revisione 0 datata luglio 2020 e recepisce le integrazioni richieste dal Ministero della Cultura - Direzione Generale Archeologia, Belle Arti e Paesaggio – Servizio V con nota Prot. 31255 del 27/10/2020 e segnatamente al punto 20, laddove è richiesto di estendere la valutazione degli effetti del fenomeno del *shadow-flickering* considerando quali recettori anche i beni culturali (architettonici e archeologici) e i beni paesaggistici presenti nell'ambito distanziale utile.

Pertanto, si farà riferimento alla ricognizione dei beni culturali e paesaggistici di rilevanza operata in un buffer di 10km nell'intorno del parco eolico, così come richiesto al punto 24 del sopracitato documento del Ministero della Cultura - Direzione Generale Archeologia, Belle Arti e Paesaggio. In particolare, l'analisi di ombreggiamento verrà investigata per i beni sensibili sopra indicati interni al perimetro di massima estensione delle ombre indicato nell'elaborato SIA-Tav.10, beni che nel caso specifico, come riscontrabile dal citato elaborato, si riducono al solo nuraghe Ortai.

In riferimento a queste considerazioni, risulta necessario precisare che non esiste una specifica disciplina regolatoria a livello nazionale che contempli l'esigenza di tenere in considerazione siti e beni culturali o paesaggistici come potenziali recettori se non in casi di riconducibilità ad ambienti abitativi.

Per l'analisi di ombreggiamento e sfarfallio (flickering) è doveroso ricordare che il progetto in oggetto è costituito da 6 aerogeneratori tripala ad asse orizzontale con diametro massimo del rotore di 170 m e altezza massima complessiva fuori terra di 200,0 m.

2 ANALISI DI OMBREGGIAMENTO

L'analisi di ombreggiamento consiste nella valutazione del numero di ore annue di ombra proiettata sul terreno da tutti gli elementi che costituiscono le turbine eoliche (torre tubolare, navicella, rotore). Essa dipende sia dalle caratteristiche geometriche delle turbine, sia dalle caratteristiche di insolazione e di ventosità del sito.

Per stimare tale effetto è stato utilizzato il modulo SHADOW del software Windpro, che prende in considerazione tutti i parametri sopra specificati rendendo l'analisi specifica per il sito in oggetto.

Per ciò che concerne la statistica del vento, che discende direttamente dall'analisi dei dati raccolti dall'anemometro Nule 343, la seguente tabella riassume le ore annuali di presenza della risorsa ventosa in funzione della direzione divisa per 16 settori:

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271

Il numero delle ore di funzionamento delle turbine in un anno è di 8.084h, ovvero il 92,3% delle ore presenti in un anno (vento operativo sopra i 3 m/s e al di sotto dei 25 m/s).

Per ciò che concerne i dati di eliofania, si è deciso di utilizzare i dati della stazione di Olbia, che risulta essere la più vicina, esprimendo i dati mensili in ore medie giornaliere di sole:

Gen	Feb	Mar	Apr	Mag	Giu	Lug	Ago	Set	Ott	Nov	Dic
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87



3 ANALISI DELLO SFARFALLO

Lo sfarfallio, più comunemente definita col termine inglese *shadow flickering*, rappresenta l'ombra proiettata con intermittenza dalle pale del rotore dell'aerogeneratore su un determinato recettore. Questo fenomeno, anche se a bassa frequenza, può causare fastidio alle persone se esposte per lunghi periodi.

In accordo con le indicazioni del MIBACT indicate al capitolo 1, è stato individuato un solo bene culturale nell'ambito distanziale utile tra tutti i beni sensibili presi in considerazione: il nuraghe Ortai.

Tale sito è distante dagli aerogeneratori BT08 e BT09 rispettivamente 188m e 870m, mentre non è affetto da ombreggiamento causato dagli altri aerogeneratori che risultano essere troppo lontani.

4 RISULTATI

Tramite il programma di simulazione (WindPRO) è stato analizzato sia l'ombreggiamento che lo sfarfallio, il risultato viene presentato in diversi formati:

- Tabellare, in cui per ogni giorno sono indicate le ore si luce e l'intervallo di tempo di ombreggiamento.
- Grafico individuale, in cui per ogni recettore viene rappresentato il periodo dell'anno in cui si verifica il fenomeno di ombreggiamento e le turbine che generano tale fenomeno.
- Grafico globale, in cui vengono rappresentate isolinee che individuano l'incidenza dell'ombra in termini di ore/anno.

Il programma permette di simulare un caso reale tenendo in considerazione tre fattori principali:

- L'eliofania della zona, tenuta in considerazione con i dati di soleggiamento sopra riportati per la stazione di Olbia;
- La statistica del vento, che influisce sull'ombreggiamento principalmente per l'orientamento degli aerogeneratori e per il funzionamento (sotto i 3 m/s e sopra i 25 m/s le pale sono ferme);
- La modellizzazione della geometria dell'aerogeneratore;

I risultati in output dal programma di simulazione consentono di valutare sia l'impatto puntuale sul singolo recettore, in questo specifico caso il nuraghe Ortai, sia l'impatto distribuito sul territorio, con particolare attenzione per la formazione e permanenza di gelate sulle strade principali dovute a ombreggiamento.

L'elaborato SIA-Tav.10 riporta il risultato grafico della simulazione suddividendo le aree con ombreggiamento tra 0 e 5 h/anno (linee azzurre), 5 e 10 h/anno (linee verdi), 10 e 50 h/anno (linee rosse), oltre le 50 h/anno (linee arancioni) mediante linee di "iso-ombra".

5 CONCLUSIONI

Nell'Appendice 1 che segue sono allegati i report di calcolo di WindPRO in cui vengono indicati per il singolo recettore i valori totali di interferenza da *shadow flickering* espressi in ore/anno, il numero di giorni in cui tale fenomeno si verifica e la durata massima per singolo giorno.

Per quanto concerne lo sfarfallio, dalla simulazione risulta che il nuraghe Ortai è ombreggiato per 124 h/anno, dove i giorni più ombreggiati cadono nei mesi invernali (novembre, dicembre, gennaio) con un massimo di 197 min/giorno (~3 ore/giorno).



Nella tabella seguente è indicata l'influenza di ogni singolo aerogeneratore sul nuraghe Ortai espressa in ore potenziali di shadow flickering (SF_P) all'anno.

WTG	SF_P
BT05	0:00
BT06	0:00
BT07	0:00
BT08	115:12
BT09	9:02
BT11	0:00

Di seguito si riportano le foto del nuraghe Ortai che, essendo coperto e circondato da una fitta vegetazione, risulta difficilmente accessibile e completamente ombreggiato. Ciò rende il risultato dell'analisi di ombreggiamento irrilevante.



Per quanto riguarda l'ombreggiamento ed i potenziali pericoli di contributo alla formazione o permanenza di gelate sulle strade principali, dalle linee di "iso-ombra" della simulazione di cui alla tavola SIA-Tav.10 si evince che solo pochi tratti della viabilità principale sono interessati da ombra per più di 50 ore all'anno il che, in considerazione anche della buona esposizione di questi tratti all'irraggiamento solare, è ritenuto insignificante ai fini dei potenziali pericoli di contributo alla formazione o permanenza di gelate sul manto stradale.

Considerando che:

- non esiste una disciplina regolatoria nazionale che contempra la considerazione di siti e beni culturali o paesaggistici come potenziali recettori se non in casi di riconducibilità ad ambienti abitativi;
- non esistono classificazioni o indicazioni dell'incidenza del fenomeno di shadow flickering che possano essere considerati per la valutazione dell'entità di rischio di eventuali visitatori saltuari del nuraghe Ortai;
- ogni eventuale disturbo conseguente alla proiezione intermittente dell'ombra di parti dell'aerogeneratore può essere efficacemente e totalmente mitigato tramite l'interposizione di ostacoli vegetali di modesta altezza in prossimità del nuraghe Ortai,



si può ragionevolmente affermare che gli effetti associati allo shadow flickering conseguenti alla presenza e al funzionamento degli aerogeneratori del progetto di "Bitti-Terenass" saranno di natura transitoria, scarsamente significativa per i fruitori del sito nuragico Ortai e facilmente mitigabili.



APPENDICE 1 – REPORT DEI RISULTATI DELLA SIMULAZIONE DI OMBREGGIAMENTO

SHADOW - Main Result

Calculation: Bitti Terenass - Flicker - INTEGRAZIONI
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) [OLBIA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3,87 4,61 5,62 6,73 8,36 10,04 11,06 9,91 8,03 6,21 4,80 3,87

Operational time
N NNE NE ENE E ESE SE SSE S SSW SW WSW
287 430 335 290 340 625 380 210 215 453 1.009 1.002

W WNW NW NNW Sum
969 746 522 271 8.084

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: Project Wizard Elevation Data Grid (Digital elevation data)
Obstacles used in calculation
Eye height for map: 1,5 m
Grid resolution: 1,0 m
Topographic shadow included in calculation

All coordinates are in
Italian Gauss-Boaga west-ROMA40 (IT)

WTGs

Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
				Valid	Manufact.					Calculation distance [m]	RPM [RPM]
1	1.533.363	4.490.767	897,0 BT05	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8
2	1.533.255	4.490.323	879,1 BT06	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8
3	1.532.964	4.489.838	872,0 BT07	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8
4	1.533.448	4.488.314	816,8 BT08	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8
5	1.534.295	4.488.327	802,3 BT09	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8
6	1.533.643	4.489.511	855,3 BT11	Yes	Siemens Gamesa	SG 6.0-170-6.200	6.200	170,0	115,0	2.041	8,8

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
		[m]	[m]	[m]	[m]	[m]	[m]	[°]		[m]
A	Nuraghe Ortai	1.533.445	4.488.502	823,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0

Calculation Results

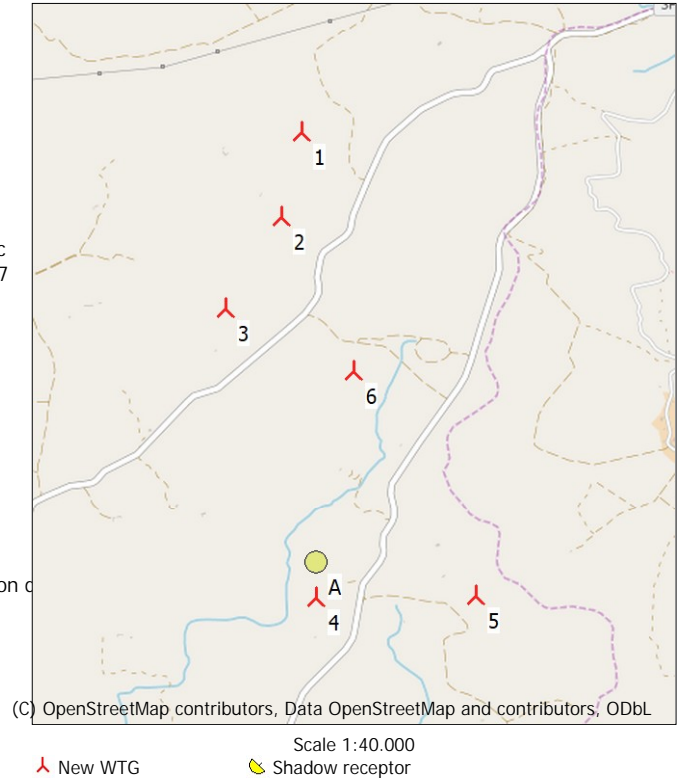
Shadow receptor

No.	Name	Shadow, expected values per year [h/year]
A	Nuraghe Ortai	124:05

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	BT05	0:00	0:00
2	BT06	0:00	0:00

To be continued on next page...



Project:
Bitti Terenass

Licensed user:
FRI -EL S.p.A
Piazza della Rotonda, n. 2
IT-00186 Roma
+39 (0)471 324210
windpro / it@fri-el.it
Calculated:
22/09/2021 17:01/3.4.424

SHADOW - Main Result

Calculation: Bitti Terenass - Flicker - INTEGRAZIONI

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
3	BT07	0:00	0:00
4	BT08	483:16	115:12
5	BT09	28:04	9:02
6	BT11	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Calendar

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIShadow receptor: A - Nuraghe Ortai

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3,87 4,61 5,62 6,73 8,36 10,04 11,06 9,91 8,03 6,21 4,80 3,87

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
287 430 335 290 340 625 380 210 215 453 1.009 1.002 969 746 522 271 8.084

	January	February	March	April	May	June
1	07:46 17:06 196	10:45 (4) 14:01 (4) 17:40 194	10:55 (4) 14:09 (4) 18:13 184	06:58 13:51 (4) 19:47	07:08 20:18	05:55 20:47
2	07:47 17:07 196	10:45 (4) 14:01 (4) 17:41 193	10:56 (4) 14:09 (4) 18:14 182	06:57 13:49 (4) 19:48	07:07 20:19	05:54 20:47
3	07:47 17:08 197	10:45 (4) 14:02 (4) 17:42 193	10:56 (4) 14:09 (4) 18:16 180	06:55 13:41 (4) 19:49	07:05 20:20	05:54 20:48
4	07:47 17:09 196	10:46 (4) 14:02 (4) 17:44 193	10:56 (4) 14:09 (4) 18:17 177	06:54 13:44 (4) 19:50	07:03 20:21	05:54 20:49
5	07:47 17:10 197	10:46 (4) 14:03 (4) 17:45 192	10:57 (4) 14:09 (4) 18:18 175	06:52 13:41 (4) 19:51	07:02 20:22	05:53 20:50
6	07:47 17:11 196	10:47 (4) 14:03 (4) 17:46 192	10:57 (4) 14:09 (4) 18:19 169	06:51 13:37 (4) 19:52	07:00 20:23	05:53 20:50
7	07:47 17:11 197	10:47 (4) 14:03 (4) 17:47 191	10:58 (4) 14:09 (4) 18:20 164	06:49 13:34 (4) 19:53	06:59 20:24	05:53 20:51
8	07:47 17:12 197	10:47 (4) 14:04 (4) 17:48 191	10:58 (4) 14:09 (4) 18:21 155	06:47 13:28 (4) 19:54	06:57 20:25	05:52 20:51
9	07:46 17:13 196	10:48 (4) 14:04 (4) 17:50 190	10:59 (4) 14:09 (4) 18:22 141	06:46 13:20 (4) 19:55	06:55 20:26	05:52 20:52
10	07:46 17:14 197	10:48 (4) 14:04 (4) 17:51 189	11:00 (4) 14:09 (4) 18:23 115	06:44 13:04 (4) 19:56	06:54 20:27	05:52 20:53
11	07:46 17:15 197	10:49 (4) 14:06 (4) 17:52 189	11:00 (4) 14:08 (4) 18:24 42	06:43 07:01 (5) 19:57	06:52 20:28	05:52 20:53
12	07:46 17:17 196	10:49 (4) 14:05 (4) 17:53 187	11:00 (4) 14:07 (4) 18:26 42	06:41 07:01 (5) 19:58	06:51 20:29	05:52 20:54
13	07:46 17:18 197	10:49 (4) 14:06 (4) 17:55 186	11:01 (4) 14:07 (4) 18:27 41	06:39 07:01 (5) 19:59	06:49 20:30	05:52 20:54
14	07:45 17:19 197	10:49 (4) 14:06 (4) 17:56 185	11:02 (4) 14:07 (4) 18:28 40	06:38 07:01 (5) 20:00	06:48 20:31	05:52 20:55
15	07:45 17:20 197	10:50 (4) 14:07 (4) 17:57 184	11:02 (4) 14:06 (4) 18:29 38	06:36 07:02 (5) 20:01	06:46 20:32	05:52 20:55
16	07:45 17:21 197	10:50 (4) 14:07 (4) 17:58 184	11:02 (4) 14:06 (4) 18:30 36	06:35 07:02 (5) 20:02	06:44 20:33	05:52 20:55
17	07:44 17:22 197	10:50 (4) 14:07 (4) 17:59 182	11:03 (4) 14:05 (4) 18:31 34	06:33 07:03 (5) 20:03	06:43 20:34	05:52 20:56
18	07:44 17:23 197	10:50 (4) 14:07 (4) 18:01 181	11:03 (4) 14:04 (4) 18:32 30	06:31 07:05 (5) 20:04	06:41 20:35	05:52 20:56
19	07:43 17:24 197	10:51 (4) 14:08 (4) 18:02 179	11:04 (4) 14:03 (4) 18:33 27	06:30 07:06 (5) 20:05	06:40 20:36	05:52 20:56
20	07:43 17:25 197	10:51 (4) 14:08 (4) 18:03 178	11:04 (4) 14:02 (4) 18:34 22	06:28 07:08 (5) 20:06	06:38 20:37	05:52 20:57
21	07:42 17:27 197	10:52 (4) 14:09 (4) 18:04 177	11:05 (4) 14:02 (4) 18:35 16	06:26 07:11 (5) 20:07	06:37 20:38	05:52 20:57
22	07:41 17:28 197	10:52 (4) 14:09 (4) 18:05 180	07:28 (5) 14:01 (4) 18:36	06:25 20:08	06:36 20:38	05:52 20:57
23	07:41 17:29 197	10:52 (4) 14:09 (4) 18:06 183	07:26 (5) 13:59 (4) 18:37	06:23 20:09	06:34 20:39	05:53 20:57
24	07:40 17:30 197	10:52 (4) 14:09 (4) 18:08 185	07:25 (5) 13:59 (4) 18:38	06:21 20:11	06:33 20:40	05:53 20:57
25	07:39 17:31 196	10:54 (4) 14:10 (4) 18:09 185	07:23 (5) 13:57 (4) 18:39	06:20 20:12	06:31 20:41	05:53 20:58
26	07:39 17:33 196	10:54 (4) 14:10 (4) 18:10 186	07:22 (5) 13:56 (4) 18:40	06:18 20:13	06:30 20:42	05:53 20:58
27	07:38 17:34 196	10:54 (4) 14:10 (4) 18:11 186	07:20 (5) 13:54 (4) 18:41	06:16 20:14	06:29 20:43	05:54 20:58
28	07:37 17:35 196	10:54 (4) 14:10 (4) 18:12 185	07:19 (5) 13:53 (4) 18:42	06:15 20:15	06:27 20:44	05:54 20:58
29	07:36 17:36 196	10:54 (4) 14:10 (4) 18:12 185	07:18 (5) 19:44	06:14 20:16	06:26 20:44	05:55 20:58
30	07:35 17:37 195	10:55 (4) 14:10 (4) 18:13 185	07:17 (5) 19:45	06:13 20:17	06:24 20:45	05:55 20:58
31	07:35 17:39 195	10:55 (4) 14:10 (4) 18:14 185	07:17 (5) 19:46	06:13 20:18	06:24 20:46	05:55 20:59
Potential sun hours	299	298	370	398	447	451
Total, worst case	6092	5220	2010			
Sun reduction	0,40	0,43	0,47			
Oper. time red.	0,92	0,92	0,92			
Wind dir. red.	0,57	0,57	0,60			
Total reduction	0,21	0,23	0,26			
Total, real	1284	1192	527			

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)

SHADOW - Calendar

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIShadow receptor: A - Nuraghe Ortai

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

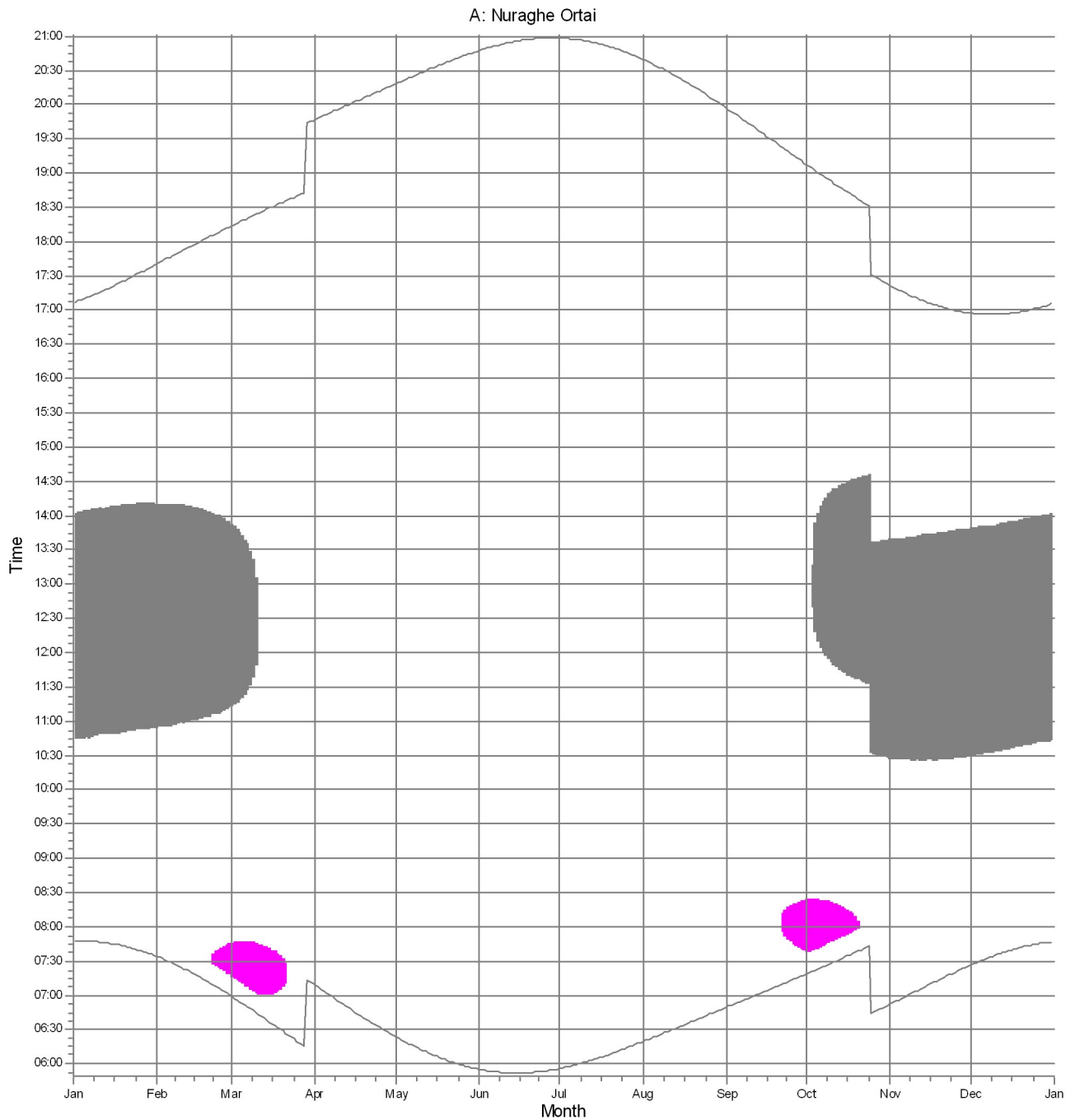
	July	August	September	October	November	December
1	05:56 20:58	06:19 20:39	06:49 19:57	07:18 19:07	07:39 (5) 17:21	10:28 (4) 16:57
2	05:56 20:57	06:20 20:38	06:50 19:55	07:19 19:05	08:22 (5) 17:20	10:28 (4) 16:57
3	05:57 20:57	06:21 20:37	06:51 19:53	07:20 19:03	07:40 (5) 13:15 (4)	10:28 (4) 16:56
4	05:57 20:57	06:22 20:36	06:52 19:52	07:21 19:02	07:41 (5) 13:52 (4)	10:28 (4) 16:56
5	05:58 20:57	06:23 20:35	06:53 19:50	07:22 19:00	07:42 (5) 14:01 (4)	10:27 (4) 16:56
6	05:58 20:57	06:24 20:33	06:54 19:48	07:23 18:59	07:43 (5) 14:07 (4)	10:27 (4) 16:56
7	05:59 20:56	06:25 20:32	06:55 19:47	07:24 18:57	07:44 (5) 14:11 (4)	10:27 (4) 16:56
8	05:59 20:56	06:26 20:31	06:56 19:45	07:26 18:55	07:45 (5) 14:14 (4)	10:27 (4) 16:56
9	06:00 20:56	06:27 20:30	06:57 19:44	07:27 18:54	07:47 (5) 14:18 (4)	10:26 (4) 16:56
10	06:01 20:55	06:28 20:29	06:58 19:42	07:28 18:52	07:48 (5) 14:20 (4)	10:26 (4) 16:56
11	06:01 20:55	06:29 20:27	06:59 19:40	07:29 18:51	07:49 (5) 14:22 (4)	10:27 (4) 16:56
12	06:02 20:54	06:30 20:26	07:00 19:39	07:30 18:49	07:50 (5) 14:23 (4)	10:26 (4) 16:56
13	06:03 20:54	06:31 20:25	07:01 19:37	07:31 18:47	07:51 (5) 14:25 (4)	10:26 (4) 16:56
14	06:04 20:53	06:32 20:23	07:02 19:35	07:32 18:46	07:52 (5) 14:26 (4)	10:26 (4) 16:56
15	06:04 20:53	06:33 20:22	07:03 19:34	07:33 18:44	07:53 (5) 14:27 (4)	10:27 (4) 16:57
16	06:05 20:52	06:34 20:21	07:04 19:32	07:34 18:43	07:54 (5) 14:28 (4)	10:27 (4) 16:57
17	06:06 20:52	06:34 20:19	07:05 19:30	07:35 18:41	07:55 (5) 14:29 (4)	10:26 (4) 16:57
18	06:07 20:51	06:35 20:18	07:06 19:28	07:36 18:40	07:57 (5) 14:31 (4)	10:26 (4) 16:58
19	06:07 20:50	06:36 20:16	07:07 19:27	07:37 18:38	07:58 (5) 14:31 (4)	10:27 (4) 16:58
20	06:08 20:50	06:37 20:15	07:08 19:25	07:38 18:37	07:59 (5) 14:32 (4)	10:27 (4) 16:58
21	06:09 20:49	06:38 20:13	07:08 19:23	07:39 18:35	07:15 14:32 (4)	10:27 (4) 16:59
22	06:10 20:48	06:39 20:12	07:09 19:22	07:41 18:34	11:35 (4) 14:33 (4)	10:27 (4) 16:59
23	06:11 20:47	06:40 20:10	07:10 19:20	07:42 18:33	11:34 (4) 14:33 (4)	10:28 (4) 17:00
24	06:12 20:47	06:41 20:09	07:11 19:18	07:43 18:31	11:33 (4) 14:34 (4)	10:28 (4) 17:00
25	06:13 20:46	06:42 20:07	07:12 19:17	07:44 18:30	10:33 (4) 13:35 (4)	10:29 (4) 16:59
26	06:13 20:45	06:43 20:06	07:13 19:15	07:45 18:28	10:32 (4) 13:35 (4)	10:29 (4) 17:02
27	06:14 20:44	06:44 20:04	07:14 19:13	07:46 18:27	10:31 (4) 13:36 (4)	10:29 (4) 17:02
28	06:15 20:43	06:45 20:03	07:15 19:12	07:43 18:26	10:30 (4) 13:36 (4)	10:29 (4) 17:03
29	06:16 20:42	06:46 20:01	07:16 19:10	07:41 18:25	10:30 (4) 13:37 (4)	10:29 (4) 17:04
30	06:17 20:41	06:47 20:00	07:17 19:08	07:40 18:24	10:30 (4) 13:37 (4)	10:30 (4) 17:04
31	06:18 20:40	06:48 19:58		06:51 17:22	10:29 (4) 13:37 (4)	10:44 (4) 17:05
Potential sun hours	457	427	375	346	299	289
Total, worst case			273	5151	5849	6085
Sun reduction			0,64	0,56	0,48	0,41
Oper. time red.			0,92	0,92	0,92	0,92
Wind dir. red.			0,66	0,58	0,57	0,57
Total reduction			0,39	0,30	0,25	0,22
Total, real			107	1533	1478	1324

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)

SHADOW - Calendar, graphical

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIS
Shadow receptor: A - Nuraghe Ortai



WTGs

4: BT08 5: BT09

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 1 - BT05

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47	07:34	06:58	07:08	06:23	05:55	05:55	06:19	06:49	07:18	06:52	07:26
	17:06	17:40	18:13	19:47	20:18	20:47	20:58	20:39	19:57	19:07	17:21	16:57
2	07:47	07:33	06:57	07:07	06:22	05:54	05:56	06:20	06:50	07:19	06:53	07:27
	17:07	17:41	18:14	19:48	20:19	20:48	20:58	20:38	19:55	19:05	17:20	16:57
3	07:47	07:32	06:55	07:05	06:21	05:54	05:56	06:21	06:51	07:20	06:54	07:28
	17:08	17:42	18:16	19:49	20:20	20:48	20:57	20:37	19:53	19:03	17:18	16:56
4	07:47	07:31	06:54	07:03	06:19	05:54	05:57	06:22	06:52	07:21	06:55	07:29
	17:09	17:44	18:17	19:50	20:21	20:49	20:57	20:36	19:52	19:02	17:17	16:56
5	07:47	07:30	06:52	07:02	06:18	05:53	05:58	06:23	06:53	07:22	06:57	07:30
	17:10	17:45	18:18	19:51	20:22	20:50	20:57	20:35	19:50	19:00	17:16	16:56
6	07:47	07:29	06:51	07:00	06:17	05:53	05:58	06:24	06:54	07:23	06:58	07:31
	17:10	17:46	18:19	19:52	20:23	20:50	20:57	20:33	19:49	18:59	17:15	16:56
7	07:47	07:28	06:49	06:59	06:16	05:53	05:59	06:25	06:55	07:25	06:59	07:32
	17:11	17:47	18:20	19:53	20:24	20:51	20:56	20:32	19:47	18:57	17:14	16:56
8	07:47	07:26	06:47	06:57	06:15	05:52	05:59	06:26	06:56	07:26	07:00	07:33
	17:12	17:48	18:21	19:54	20:25	20:51	20:56	20:31	19:45	18:55	17:13	16:56
9	07:47	07:25	06:46	06:55	06:13	05:52	06:00	06:27	06:57	07:27	07:01	07:34
	17:13	17:50	18:22	19:55	20:26	20:52	20:56	20:30	19:44	18:54	17:12	16:56
10	07:46	07:24	06:44	06:54	06:12	05:52	06:01	06:28	06:58	07:28	07:02	07:35
	17:14	17:51	18:23	19:56	20:27	20:53	20:55	20:29	19:42	18:52	17:11	16:56
11	07:46	07:23	06:43	06:52	06:11	05:52	06:01	06:29	06:59	07:29	07:04	07:36
	17:15	17:52	18:24	19:57	20:28	20:53	20:55	20:27	19:40	18:51	17:10	16:56
12	07:46	07:22	06:41	06:51	06:10	05:52	06:02	06:30	07:00	07:30	07:05	07:36
	17:16	17:53	18:26	19:58	20:29	20:54	20:55	20:26	19:39	18:49	17:09	16:56
13	07:46	07:21	06:39	06:49	06:09	05:52	06:03	06:31	07:01	07:31	07:06	07:37
	17:18	17:55	18:27	19:59	20:30	20:54	20:54	20:25	19:37	18:47	17:08	16:56
14	07:45	07:19	06:38	06:47	06:08	05:52	06:03	06:32	07:02	07:32	07:07	07:38
	17:19	17:56	18:28	20:00	20:31	20:55	20:54	20:23	19:35	18:46	17:07	16:56
15	07:45	07:18	06:36	06:46	06:07	05:52	06:04	06:32	07:03	07:33	07:08	07:39
	17:20	17:57	18:29	20:01	20:32	20:55	20:53	20:22	19:34	18:44	17:06	16:57
16	07:45	07:17	06:35	06:44	06:06	05:52	06:05	06:33	07:04	07:34	07:09	07:39
	17:21	17:58	18:30	20:02	20:33	20:55	20:52	20:21	19:32	18:43	17:05	16:57
17	07:44	07:15	06:33	06:43	06:05	05:52	06:06	06:34	07:05	07:35	07:11	07:40
	17:22	17:59	18:31	20:03	20:34	20:56	20:52	20:19	19:30	18:41	17:05	16:57
18	07:44	07:14	06:31	06:41	06:04	05:52	06:07	06:35	07:06	07:36	07:12	07:41
	17:23	18:01	18:32	20:04	20:35	20:56	20:51	20:18	19:28	18:40	17:04	16:58
19	07:43	07:13	06:30	06:40	06:04	05:52	06:07	06:36	07:07	07:37	07:13	07:41
	17:24	18:02	18:33	20:05	20:36	20:56	20:50	20:16	19:27	18:38	17:03	16:58
20	07:43	07:11	06:28	06:38	06:03	05:52	06:08	06:37	07:08	07:38	07:14	07:42
	17:25	18:03	18:34	20:06	20:37	20:57	20:50	20:15	19:25	18:37	17:02	16:58
21	07:42	07:10	06:26	06:37	06:02	05:52	06:09	06:38	07:08	07:39	07:15	07:43
	17:27	18:04	18:35	20:07	20:38	20:57	20:49	20:13	19:23	18:35	17:02	16:59
22	07:41	07:09	06:25	06:36	06:01	05:52	06:10	06:39	07:09	07:41	07:16	07:43
	17:28	18:05	18:36	20:08	20:38	20:57	20:48	20:12	19:22	18:34	17:01	16:59
23	07:41	07:07	06:23	06:34	06:00	05:53	06:11	06:40	07:10	07:42	07:18	07:44
	17:29	18:06	18:37	20:10	20:39	20:57	20:47	20:11	19:20	18:33	17:00	17:00
24	07:40	07:06	06:21	06:33	06:00	05:53	06:12	06:41	07:11	07:43	07:19	07:44
	17:30	18:08	18:38	20:11	20:40	20:57	20:47	20:09	19:18	18:31	17:00	17:00
25	07:39	07:04	06:20	06:31	05:59	05:53	06:13	06:42	07:12	06:44	07:20	07:44
	17:31	18:09	18:39	20:12	20:41	20:58	20:46	20:08	19:17	17:30	16:59	17:01
26	07:39	07:03	06:18	06:30	05:58	05:53	06:13	06:43	07:13	06:45	07:21	07:45
	17:33	18:10	18:40	20:13	20:42	20:58	20:45	20:06	19:15	17:28	16:59	17:01
27	07:38	07:01	06:16	06:28	05:58	05:54	06:14	06:44	07:14	06:46	07:22	07:45
	17:34	18:11	18:41	20:14	20:43	20:58	20:44	20:04	19:13	17:27	16:58	17:02
28	07:37	07:00	06:15	06:27	05:57	05:54	06:15	06:45	07:15	06:47	07:23	07:46
	17:35	18:12	18:42	20:15	20:44	20:58	20:43	20:03	19:12	17:26	16:58	17:03
29	07:36		07:13	06:26	05:56	05:55	06:16	06:46	07:16	06:48	07:24	07:46
	17:36		19:44	20:16	20:44	20:58	20:42	20:01	19:10	17:25	16:58	17:04
30	07:35		07:12	06:24	05:56	05:55	06:17	06:47	07:17	06:50	07:25	07:46
	17:37		19:45	20:17	20:45	20:58	20:41	20:00	19:08	17:23	16:57	17:04
31	07:35		07:10		05:55		06:18	06:48		06:51		07:46
	17:39		19:46		20:46		20:40	19:58		17:22		17:05
Potential sun hours	299	298	370	398	447	451	458	427	375	346	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 2 - BT06

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3,87 4,61 5,62 6,73 8,36 10,04 11,06 9,91 8,03 6,21 4,80 3,87

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
287 430 335 290 340 625 380 210 215 453 1.009 1.002 969 746 522 271 8.084

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47 17:06	07:34 17:40	06:58 18:13	07:08 19:47	06:23 20:18	05:55 20:47	05:55 20:58	06:19 20:39	06:49 19:57	07:18 19:07	06:52 17:21	07:26 16:57
2	07:47 17:07	07:33 17:41	06:57 18:14	07:07 19:48	06:22 20:19	05:54 20:48	05:56 20:57	06:20 20:38	06:50 19:55	07:19 19:05	06:53 17:20	07:27 16:57
3	07:47 17:08	07:32 17:42	06:55 18:16	07:05 19:49	06:21 20:20	05:54 20:48	05:56 20:57	06:21 20:37	06:51 19:53	07:20 19:03	06:54 17:18	07:28 16:56
4	07:47 17:09	07:31 17:44	06:54 18:17	07:03 19:50	06:19 20:21	05:54 20:49	05:57 20:57	06:22 20:36	06:52 19:52	07:21 19:02	06:55 17:17	07:29 16:56
5	07:47 17:10	07:30 17:45	06:52 18:18	07:02 19:51	06:18 20:22	05:53 20:50	05:58 20:57	06:23 20:35	06:53 19:50	07:22 19:00	06:57 17:16	07:30 16:56
6	07:47 17:11	07:29 17:46	06:51 18:19	07:00 19:52	06:17 20:23	05:53 20:50	05:58 20:57	06:24 20:33	06:54 19:49	07:23 18:59	06:58 17:15	07:31 16:56
7	07:47 17:11	07:28 17:47	06:49 18:20	06:59 19:53	06:16 20:24	05:53 20:51	05:59 20:56	06:25 20:32	06:55 19:47	07:25 18:57	06:59 17:14	07:32 16:56
8	07:47 17:12	07:26 17:48	06:47 18:21	06:57 19:54	06:15 20:25	05:52 20:51	05:59 20:56	06:26 20:31	06:56 19:45	07:26 18:55	07:00 17:13	07:33 16:56
9	07:47 17:13	07:25 17:50	06:46 18:22	06:55 19:55	06:14 20:26	05:52 20:52	06:00 20:56	06:27 20:30	06:57 19:44	07:27 18:54	07:01 17:12	07:34 16:56
10	07:46 17:14	07:24 17:51	06:44 18:23	06:54 19:56	06:12 20:27	05:52 20:53	06:01 20:55	06:28 20:29	06:58 19:42	07:28 18:52	07:02 17:11	07:35 16:56
11	07:46 17:15	07:23 17:52	06:43 18:24	06:52 19:57	06:11 20:28	05:52 20:53	06:01 20:55	06:29 20:27	06:59 19:40	07:29 18:51	07:04 17:10	07:36 16:56
12	07:46 17:16	07:22 17:53	06:41 18:26	06:51 19:58	06:10 20:29	05:52 20:54	06:02 20:55	06:30 20:26	07:00 19:39	07:30 18:49	07:05 17:09	07:36 16:56
13	07:46 17:18	07:21 17:55	06:39 18:27	06:49 19:59	06:09 20:30	05:52 20:54	06:03 20:54	06:31 20:25	07:01 19:37	07:31 18:47	07:06 17:08	07:37 16:56
14	07:45 17:19	07:19 17:56	06:38 18:28	06:48 20:00	06:08 20:31	05:52 20:55	06:03 20:54	06:32 20:23	07:02 19:35	07:32 18:46	07:07 17:07	07:38 16:56
15	07:45 17:20	07:18 17:57	06:36 18:29	06:46 20:01	06:07 20:32	05:52 20:55	06:04 20:53	06:32 20:22	07:03 19:34	07:33 18:44	07:08 17:06	07:39 16:57
16	07:45 17:21	07:17 17:58	06:35 18:30	06:44 20:02	06:06 20:33	05:52 20:55	06:05 20:52	06:33 20:21	07:04 19:32	07:34 18:43	07:09 17:05	07:39 16:57
17	07:44 17:22	07:15 17:59	06:33 18:31	06:43 20:03	06:05 20:34	05:52 20:56	06:06 20:52	06:34 20:19	07:05 19:30	07:35 18:41	07:11 17:05	07:40 16:57
18	07:44 17:23	07:14 18:01	06:31 18:32	06:41 20:04	06:04 20:35	05:52 20:56	06:04 20:51	06:35 20:18	07:06 19:28	07:36 18:40	07:12 17:04	07:41 16:58
19	07:43 17:24	07:13 18:02	06:30 18:33	06:40 20:05	06:04 20:36	05:52 20:56	06:07 20:50	06:36 20:16	07:07 19:27	07:37 18:38	07:13 17:03	07:41 16:58
20	07:43 17:25	07:11 18:03	06:28 18:34	06:38 20:06	06:03 20:37	05:52 20:57	06:08 20:50	06:37 20:15	07:08 19:25	07:38 18:37	07:14 17:02	07:42 16:58
21	07:42 17:27	07:10 18:04	06:26 18:35	06:37 20:07	06:02 20:38	05:52 20:57	06:09 20:49	06:38 20:13	07:08 19:23	07:39 18:35	07:15 17:02	07:43 16:59
22	07:41 17:28	07:09 18:05	06:25 18:36	06:36 20:08	06:01 20:38	05:52 20:57	06:10 20:48	06:39 20:12	07:09 19:22	07:41 18:34	07:16 17:01	07:43 16:59
23	07:41 17:29	07:07 18:06	06:23 18:37	06:34 20:10	06:00 20:39	05:53 20:57	06:11 20:47	06:40 20:11	07:10 19:20	07:42 18:33	07:18 17:00	07:44 17:00
24	07:40 17:30	07:06 18:08	06:21 18:38	06:33 20:11	06:00 20:40	05:53 20:57	06:12 20:47	06:41 20:09	07:11 19:18	07:43 18:31	07:19 17:00	07:44 17:00
25	07:39 17:31	07:04 18:09	06:20 18:39	06:31 20:12	05:59 20:41	05:53 20:58	06:13 20:46	06:42 20:08	07:12 19:17	06:44 17:30	07:20 16:59	07:44 17:01
26	07:39 17:33	07:03 18:10	06:18 18:40	06:30 20:13	05:58 20:42	05:53 20:58	06:13 20:45	06:43 20:06	07:13 19:15	06:45 17:28	07:21 16:59	07:45 17:01
27	07:38 17:34	07:01 18:11	06:16 18:41	06:28 20:14	05:58 20:43	05:54 20:58	06:14 20:44	06:44 20:04	07:14 19:13	06:46 17:27	07:22 16:58	07:45 17:02
28	07:37 17:35	07:00 18:12	06:15 18:42	06:27 20:15	05:57 20:44	05:54 20:58	06:15 20:43	06:45 20:03	07:15 19:12	06:47 17:26	07:23 16:58	07:46 17:03
29	07:36 17:36		07:13 19:44	06:26 20:16	05:56 20:44	05:55 20:58	06:16 20:42	06:46 20:01	07:16 19:10	06:48 17:25	07:24 16:58	07:46 17:04
30	07:35 17:37		07:12 19:45	06:24 20:17	05:56 20:45	05:55 20:58	06:17 20:41	06:47 20:00	07:17 19:08	06:50 17:23	07:25 16:57	07:46 17:04
31	07:35 17:39		07:10 19:46		05:55 20:46		06:18 20:40	06:48 19:58		06:51 17:22		07:46 17:05
Potential sun hours	299	298	370	398	447	451	458	427	375	346	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 3 - BT07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47	07:34	06:58	07:08	06:23	05:55	05:55	06:19	06:49	07:18	06:52	07:26
	17:06	17:40	18:13	19:47	20:18	20:47	20:58	20:39	19:57	19:07	17:21	16:57
2	07:47	07:33	06:57	07:07	06:22	05:54	05:56	06:20	06:50	07:19	06:53	07:27
	17:07	17:41	18:14	19:48	20:19	20:48	20:57	20:38	19:55	19:05	17:20	16:57
3	07:47	07:32	06:55	07:05	06:21	05:54	05:56	06:21	06:51	07:20	06:54	07:28
	17:08	17:42	18:16	19:49	20:20	20:48	20:57	20:37	19:53	19:03	17:18	16:56
4	07:47	07:31	06:54	07:03	06:19	05:54	05:57	06:22	06:52	07:21	06:55	07:29
	17:09	17:44	18:17	19:50	20:21	20:49	20:57	20:36	19:52	19:02	17:17	16:56
5	07:47	07:30	06:52	07:02	06:18	05:53	05:58	06:23	06:53	07:22	06:57	07:30
	17:10	17:45	18:18	19:51	20:22	20:50	20:57	20:35	19:50	19:00	17:16	16:56
6	07:47	07:29	06:51	07:00	06:17	05:53	05:58	06:24	06:54	07:23	06:58	07:31
	17:11	17:46	18:19	19:52	20:23	20:50	20:57	20:33	19:49	18:59	17:15	16:56
7	07:47	07:28	06:49	06:59	06:16	05:53	05:59	06:25	06:55	07:25	06:59	07:32
	17:11	17:47	18:20	19:53	20:24	20:51	20:56	20:32	19:47	18:57	17:14	16:56
8	07:47	07:26	06:48	06:57	06:15	05:52	05:59	06:26	06:56	07:26	07:00	07:33
	17:12	17:48	18:21	19:54	20:25	20:51	20:56	20:31	19:45	18:55	17:13	16:56
9	07:47	07:25	06:46	06:55	06:14	05:52	06:00	06:27	06:57	07:27	07:01	07:34
	17:13	17:50	18:22	19:55	20:26	20:52	20:56	20:30	19:44	18:54	17:12	16:56
10	07:46	07:24	06:44	06:54	06:12	05:52	06:01	06:28	06:58	07:28	07:02	07:35
	17:14	17:51	18:23	19:56	20:27	20:53	20:55	20:29	19:42	18:52	17:11	16:56
11	07:46	07:23	06:43	06:52	06:11	05:52	06:01	06:29	06:59	07:29	07:04	07:36
	17:15	17:52	18:24	19:57	20:28	20:53	20:55	20:27	19:40	18:51	17:10	16:56
12	07:46	07:22	06:41	06:51	06:10	05:52	06:02	06:30	07:00	07:30	07:05	07:36
	17:17	17:53	18:26	19:58	20:29	20:54	20:55	20:26	19:39	18:49	17:09	16:56
13	07:46	07:21	06:40	06:49	06:09	05:52	06:03	06:31	07:01	07:31	07:06	07:37
	17:18	17:55	18:27	19:59	20:30	20:54	20:54	20:25	19:37	18:47	17:08	16:56
14	07:45	07:19	06:38	06:48	06:08	05:52	06:04	06:32	07:02	07:32	07:07	07:38
	17:19	17:56	18:28	20:00	20:31	20:55	20:54	20:23	19:35	18:46	17:07	16:56
15	07:45	07:18	06:36	06:46	06:07	05:52	06:04	06:33	07:03	07:33	07:08	07:39
	17:20	17:57	18:29	20:01	20:32	20:55	20:53	20:22	19:34	18:44	17:06	16:57
16	07:45	07:17	06:35	06:44	06:06	05:52	06:05	06:33	07:04	07:34	07:09	07:39
	17:21	17:58	18:30	20:02	20:33	20:55	20:52	20:21	19:32	18:43	17:05	16:57
17	07:44	07:15	06:33	06:43	06:05	05:52	06:06	06:34	07:05	07:35	07:11	07:40
	17:22	17:59	18:31	20:03	20:34	20:56	20:52	20:19	19:30	18:41	17:05	16:57
18	07:44	07:14	06:31	06:41	06:04	05:52	06:07	06:35	07:06	07:36	07:12	07:41
	17:23	18:01	18:32	20:04	20:35	20:56	20:51	20:18	19:29	18:40	17:04	16:58
19	07:43	07:13	06:30	06:40	06:04	05:52	06:07	06:36	07:07	07:37	07:13	07:41
	17:24	18:02	18:33	20:05	20:36	20:56	20:50	20:16	19:27	18:38	17:03	16:58
20	07:43	07:11	06:28	06:38	06:03	05:52	06:08	06:37	07:08	07:38	07:14	07:42
	17:25	18:03	18:34	20:06	20:37	20:57	20:50	20:15	19:25	18:37	17:02	16:58
21	07:42	07:10	06:26	06:37	06:02	05:52	06:09	06:38	07:08	07:39	07:15	07:43
	17:27	18:04	18:35	20:07	20:38	20:57	20:49	20:13	19:23	18:35	17:02	16:59
22	07:41	07:09	06:25	06:36	06:01	05:52	06:10	06:39	07:09	07:41	07:16	07:43
	17:28	18:05	18:36	20:08	20:38	20:57	20:48	20:12	19:22	18:34	17:01	16:59
23	07:41	07:07	06:23	06:34	06:00	05:53	06:11	06:40	07:10	07:42	07:18	07:44
	17:29	18:06	18:37	20:10	20:39	20:57	20:47	20:11	19:20	18:33	17:00	17:00
24	07:40	07:06	06:21	06:33	06:00	05:53	06:12	06:41	07:11	07:43	07:19	07:44
	17:30	18:08	18:38	20:11	20:40	20:57	20:47	20:09	19:18	18:31	17:00	17:00
25	07:39	07:04	06:20	06:31	05:59	05:53	06:13	06:42	07:12	06:44	07:20	07:44
	17:31	18:09	18:39	20:12	20:41	20:58	20:46	20:08	19:17	17:30	16:59	17:01
26	07:39	07:03	06:18	06:30	05:58	05:53	06:13	06:43	07:13	06:45	07:21	07:45
	17:33	18:10	18:40	20:13	20:42	20:58	20:45	20:06	19:15	17:28	16:59	17:02
27	07:38	07:01	06:17	06:29	05:58	05:54	06:14	06:44	07:14	06:46	07:22	07:45
	17:34	18:11	18:41	20:14	20:43	20:58	20:44	20:04	19:13	17:27	16:58	17:02
28	07:37	07:00	06:15	06:27	05:57	05:54	06:15	06:45	07:15	06:47	07:23	07:46
	17:35	18:12	18:42	20:15	20:44	20:58	20:43	20:03	19:12	17:26	16:58	17:03
29	07:36		07:13	06:26	05:56	05:55	06:16	06:46	07:16	06:48	07:24	07:46
	17:36		19:44	20:16	20:44	20:58	20:42	20:01	19:10	17:25	16:58	17:04
30	07:35		07:12	06:24	05:56	05:55	06:17	06:47	07:17	06:50	07:25	07:46
	17:37		19:45	20:17	20:45	20:58	20:41	20:00	19:08	17:23	16:57	17:04
31	07:35		07:10		05:55		06:18	06:48		06:51		07:46
	17:39		19:46		20:46		20:40	19:58		17:22		17:05
Potential sun hours	299	298	370	398	447	451	457	427	375	346	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWTG: 4 - BT08

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

	January	February	March	April	May	June
1	07:46 10:45-14:01/196 17:06	07:34 10:55-14:09/194 17:40	06:58 11:14-13:51/157 18:13	07:08 19:47	06:23 20:18	05:55 20:47
2	07:47 10:45-14:01/196 17:07	07:33 10:56-14:09/193 17:41	06:57 11:16-13:49/153 18:14	07:07 19:48	06:22 20:19	05:54 20:47
3	07:47 10:45-14:02/197 17:08	07:32 10:56-14:09/193 17:42	06:55 11:17-13:46/149 18:16	07:05 19:49	06:21 20:20	05:54 20:48
4	07:47 10:46-14:02/196 17:09	07:31 10:56-14:09/193 17:44	06:54 11:20-13:44/144 18:17	07:03 19:50	06:19 20:21	05:54 20:49
5	07:47 10:46-14:03/197 17:10	07:30 10:57-14:09/192 17:45	06:52 11:21-13:41/140 18:18	07:02 19:51	06:18 20:22	05:53 20:50
6	07:47 10:47-14:03/196 17:11	07:29 10:57-14:09/192 17:46	06:51 11:24-13:37/133 18:19	07:00 19:52	06:17 20:23	05:53 20:50
7	07:47 10:46-14:03/197 17:11	07:27 10:58-14:09/191 17:47	06:49 11:28-13:34/126 18:20	06:59 19:53	06:16 20:24	05:53 20:51
8	07:47 10:47-14:04/197 17:12	07:26 10:58-14:09/191 17:48	06:47 11:32-13:28/116 18:21	06:57 19:54	06:15 20:25	05:52 20:51
9	07:46 10:48-14:04/196 17:13	07:25 10:59-14:09/190 17:50	06:46 11:39-13:20/101 18:22	06:55 19:55	06:14 20:26	05:52 20:52
10	07:46 10:48-14:05/197 17:14	07:24 11:00-14:09/189 17:51	06:44 11:50-13:04/74 18:23	06:54 19:56	06:12 20:27	05:52 20:53
11	07:46 10:49-14:06/197 17:15	07:23 10:59-14:08/189 17:52	06:43 18:24	06:52 19:57	06:11 20:28	05:52 20:53
12	07:46 10:49-14:05/196 17:17	07:22 11:00-14:07/187 17:53	06:41 18:26	06:51 19:58	06:10 20:29	05:52 20:54
13	07:46 10:49-14:06/197 17:18	07:20 11:01-14:07/186 17:55	06:39 18:27	06:49 19:59	06:09 20:30	05:52 20:54
14	07:45 10:49-14:06/197 17:19	07:19 11:02-14:07/185 17:56	06:38 18:28	06:48 20:00	06:08 20:31	05:52 20:55
15	07:45 10:50-14:07/197 17:20	07:18 11:02-14:06/184 17:57	06:36 18:29	06:46 20:01	06:07 20:32	05:52 20:55
16	07:45 10:50-14:07/197 17:21	07:17 11:02-14:06/184 17:58	06:35 18:30	06:44 20:02	06:06 20:33	05:52 20:55
17	07:44 10:50-14:07/197 17:22	07:15 11:03-14:05/182 17:59	06:33 18:31	06:43 20:03	06:05 20:34	05:52 20:56
18	07:44 10:50-14:07/197 17:23	07:14 11:03-14:04/181 18:01	06:31 18:32	06:41 20:04	06:04 20:35	05:52 20:56
19	07:43 10:51-14:08/197 17:24	07:13 11:04-14:03/179 18:02	06:30 18:33	06:40 20:05	06:04 20:36	05:52 20:56
20	07:43 10:51-14:08/197 17:25	07:11 11:04-14:02/178 18:03	06:28 18:34	06:38 20:06	06:03 20:37	05:52 20:57
21	07:42 10:52-14:09/197 17:27	07:10 11:05-14:02/177 18:04	06:26 18:35	06:37 20:07	06:02 20:38	05:52 20:57
22	07:41 10:52-14:09/197 17:28	07:09 11:07-14:01/174 18:05	06:25 18:36	06:36 20:08	06:01 20:38	05:52 20:57
23	07:41 10:52-14:09/197 17:29	07:07 11:07-13:59/172 18:06	06:23 18:37	06:34 20:09	06:00 20:39	05:53 20:57
24	07:40 10:52-14:09/197 17:30	07:06 11:08-13:59/171 18:08	06:21 18:38	06:33 20:11	06:00 20:40	05:53 20:57
25	07:39 10:54-14:10/196 17:31	07:04 11:09-13:57/168 18:09	06:20 18:39	06:31 20:12	05:59 20:41	05:53 20:58
26	07:39 10:54-14:10/196 17:33	07:03 11:10-13:56/166 18:10	06:18 18:40	06:30 20:13	05:58 20:42	05:54 20:58
27	07:38 10:54-14:10/196 17:34	07:01 11:11-13:54/163 18:11	06:16 18:41	06:29 20:14	05:58 20:43	05:54 20:58
28	07:37 10:54-14:10/196 17:35	07:00 11:13-13:53/160 18:12	06:15 18:42	06:27 20:15	05:57 20:44	05:54 20:58
29	07:36 10:54-14:10/196 17:36		07:13 19:44	06:26 20:16	05:56 20:44	05:55 20:58
30	07:35 10:55-14:10/195 17:37		07:12 19:45	06:24 20:17	05:56 20:45	05:55 20:58
31	07:34 10:55-14:10/195 17:39		07:10 19:46		05:55 20:46	
Potential sun hours	299	298	370	398	447	451
Sum of minutes with flicker	6092	5104	1293	0	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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 4 - BT08

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

	July	August	September	October	November	December
1	05:56 20:58	06:19 20:39	06:49 19:57	07:18 19:07	06:52 17:21	10:28-13:38/190 16:57
2	05:56 20:57	06:20 20:38	06:50 19:55	07:19 19:05	06:53 17:20	10:28-13:38/190 16:57
3	05:57 20:57	06:21 20:37	06:51 19:53	07:20 19:03	06:54 17:18	10:28-13:39/191 16:56
4	05:57 20:57	06:22 20:36	06:52 19:52	07:21 19:02	06:55 17:17	10:28-13:39/191 16:56
5	05:58 20:57	06:23 20:35	06:53 19:50	07:22 19:00	06:57 17:16	10:27-13:39/192 16:56
6	05:58 20:57	06:24 20:33	06:54 19:48	07:23 18:59	06:58 17:15	10:27-13:39/192 16:56
7	05:59 20:56	06:25 20:32	06:55 19:47	07:24 18:57	06:59 17:14	10:27-13:40/193 16:56
8	05:59 20:56	06:26 20:31	06:56 19:45	07:26 18:55	07:00 17:13	10:27-13:40/193 16:56
9	06:00 20:56	06:27 20:30	06:57 19:44	07:27 18:54	07:01 17:12	10:26-13:40/194 16:56
10	06:01 20:55	06:28 20:29	06:58 19:42	07:28 18:52	07:02 17:11	10:26-13:40/194 16:56
11	06:01 20:55	06:29 20:27	06:59 19:40	07:29 18:51	07:04 17:10	10:27-13:41/194 16:56
12	06:02 20:54	06:30 20:26	07:00 19:39	07:30 18:49	07:05 17:09	10:26-13:41/195 16:56
13	06:03 20:54	06:31 20:25	07:01 19:37	07:31 18:47	07:06 17:08	10:26-13:42/196 16:56
14	06:04 20:53	06:32 20:23	07:02 19:35	07:32 18:46	07:07 17:07	10:26-13:42/196 16:56
15	06:04 20:53	06:33 20:22	07:03 19:34	07:33 18:44	07:08 17:06	10:27-13:43/196 16:57
16	06:05 20:52	06:34 20:21	07:04 19:32	07:34 18:43	07:09 17:05	10:27-13:43/196 16:57
17	06:06 20:52	06:34 20:19	07:05 19:30	07:35 18:41	07:11 17:05	10:26-13:43/197 16:57
18	06:07 20:51	06:35 20:18	07:06 19:28	07:36 18:40	07:12 17:04	10:26-13:43/197 16:58
19	06:07 20:50	06:36 20:16	07:07 19:27	07:37 18:38	07:13 17:03	10:27-13:44/197 16:58
20	06:08 20:50	06:37 20:15	07:08 19:25	07:38 18:37	07:14 17:02	10:27-13:44/197 16:58
21	06:09 20:49	06:38 20:13	07:08 19:23	07:39 18:35	07:15 17:02	10:27-13:44/197 16:59
22	06:10 20:48	06:39 20:12	07:09 19:22	07:41 18:34	07:16 17:01	10:27-13:44/197 16:59
23	06:11 20:47	06:40 20:10	07:10 19:20	07:42 18:33	07:17 17:00	10:28-13:45/197 17:00
24	06:12 20:47	06:41 20:09	07:11 19:18	07:43 18:31	07:19 17:00	10:28-13:45/197 17:00
25	06:13 20:46	06:42 20:07	07:12 19:17	06:44 17:30	07:20 16:59	10:29-13:45/196 17:01
26	06:13 20:45	06:43 20:06	07:13 19:15	06:45 17:28	07:21 16:59	10:29-13:46/197 17:02
27	06:14 20:44	06:44 20:04	07:14 19:13	06:46 17:27	07:22 16:58	10:29-13:46/197 17:02
28	06:15 20:43	06:45 20:03	07:15 19:12	06:47 17:26	07:23 16:58	10:29-13:46/197 17:03
29	06:16 20:42	06:46 20:01	07:16 19:10	06:48 17:25	07:24 16:58	10:29-13:46/197 17:04
30	06:17 20:41	06:47 20:00	07:17 19:08	06:50 17:23	07:25 16:57	10:30-13:46/196 17:04
31	06:18 20:40	06:48 19:58		06:51 17:22		10:44-14:00/196 17:05
Potential sun hours	457	427	375	346	299	289
Sum of minutes with flicker	0	0	0	4573	5849	6085

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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 5 - BT09

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:46 17:06	07:34 17:40	06:58 18:13	07:17-07:44/27	07:08 19:47	06:23 20:18	05:55 20:47	05:55 20:57	06:19 20:39	06:49 19:57	07:18 17:21	07:39-08:22/43 16:57
2	07:47 17:07	07:33 17:41	06:57 18:14	07:16-07:45/29	07:07 19:48	06:22 20:19	05:54 20:47	05:56 20:57	06:20 20:38	06:50 19:55	07:19 17:20	07:39-08:22/43 16:57
3	07:47 17:08	07:32 17:42	06:55 18:16	07:14-07:45/31	07:05 19:49	06:21 20:20	05:54 20:48	05:56 20:57	06:21 20:37	06:51 19:53	07:20 17:18	07:40-08:22/42 16:56
4	07:47 17:09	07:31 17:44	06:54 18:17	07:13-07:46/33	07:03 19:50	06:19 20:21	05:54 20:49	05:57 20:57	06:22 20:36	06:52 19:52	07:21 17:17	07:41-08:22/41 16:56
5	07:47 17:10	07:30 17:45	06:52 18:18	07:11-07:46/35	07:02 19:51	06:18 20:22	05:53 20:49	05:58 20:57	06:23 20:35	06:53 19:50	07:22 17:16	07:42-08:22/40 16:56
6	07:47 17:10	07:29 17:46	06:51 18:19	07:09-07:45/36	07:00 19:52	06:17 20:23	05:53 20:50	05:58 20:57	06:24 20:33	06:54 19:48	07:23 17:15	07:43-08:21/38 16:56
7	07:47 17:11	07:27 17:47	06:49 18:20	07:08-07:46/38	06:59 19:53	06:16 20:24	05:53 20:51	05:59 20:56	06:25 20:32	06:55 19:47	07:24 17:14	07:44-08:21/37 16:56
8	07:47 17:12	07:26 17:48	06:47 18:21	07:06-07:45/39	06:57 19:54	06:15 20:25	05:52 20:51	05:59 20:56	06:26 20:31	06:56 19:45	07:25 17:13	07:45-08:21/36 16:56
9	07:46 17:13	07:25 17:50	06:46 18:22	07:05-07:45/40	06:55 19:55	06:13 20:26	05:52 20:52	06:00 20:56	06:27 20:30	06:57 19:43	07:27 17:12	07:47-08:21/34 16:56
10	07:46 17:14	07:24 17:51	06:44 18:23	07:03-07:44/41	06:54 19:56	06:12 20:27	05:52 20:53	06:01 20:55	06:28 20:28	06:58 19:42	07:28 17:11	07:48-08:20/32 16:56
11	07:46 17:15	07:23 17:52	06:43 18:24	07:01-07:43/42	06:52 19:57	06:11 20:28	05:52 20:53	06:01 20:55	06:29 20:27	06:59 19:40	07:29 17:10	07:49-08:19/30 16:56
12	07:46 17:16	07:22 17:53	06:41 18:25	07:01-07:43/42	06:51 19:58	06:10 20:29	05:52 20:54	06:02 20:54	06:30 20:26	07:00 19:39	07:30 17:09	07:50-08:18/28 16:56
13	07:46 17:18	07:20 17:55	06:39 18:27	07:01-07:42/41	06:49 19:59	06:09 20:30	05:52 20:54	06:03 20:54	06:31 20:25	07:01 19:37	07:31 17:08	07:51-08:17/26 16:56
14	07:45 17:19	07:19 17:56	06:38 18:28	07:01-07:41/40	06:47 20:00	06:08 20:31	05:52 20:54	06:03 20:53	06:32 20:23	07:02 19:35	07:32 17:07	07:52-08:16/24 16:56
15	07:45 17:20	07:18 17:57	06:36 18:29	07:02-07:40/38	06:46 20:01	06:07 20:32	05:52 20:55	06:04 20:53	06:32 20:22	07:03 19:33	07:33 17:06	07:53-08:15/22 16:57
16	07:44 17:21	07:17 17:58	06:35 18:30	07:02-07:38/36	06:44 20:02	06:06 20:33	05:52 20:55	06:05 20:52	06:33 20:21	07:04 19:32	07:34 17:05	07:54-08:13/19 16:57
17	07:44 17:22	07:15 17:59	06:33 18:31	07:03-07:37/34	06:43 20:03	06:05 20:34	05:52 20:56	06:06 20:52	06:34 20:19	07:05 19:30	07:35 17:05	07:55-08:11/16 16:57
18	07:44 17:23	07:14 18:01	06:31 18:32	07:05-07:35/30	06:41 20:04	06:04 20:35	05:52 20:56	06:07 20:51	06:35 20:18	07:06 19:28	07:36 17:04	07:57-08:10/13 16:58
19	07:43 17:24	07:13 18:02	06:30 18:33	07:06-07:33/27	06:40 20:05	06:04 20:36	05:52 20:56	06:07 20:50	06:36 20:16	07:06 19:27	07:37 17:03	07:58-08:07/9 16:58
20	07:43 17:25	07:11 18:03	06:28 18:34	07:08-07:30/22	06:38 20:06	06:03 20:37	05:52 20:57	06:08 20:50	06:37 20:15	07:07 19:25	07:38 17:02	07:59-08:04/5 16:58
21	07:42 17:27	07:10 18:04	06:26 18:35	07:11-07:27/16	06:37 20:07	06:02 20:37	05:52 20:57	06:09 20:49	06:38 20:13	07:08 19:23	07:39 17:02	07:59-08:04/5 16:59
22	07:41 17:28	07:08 18:05	06:25 18:36	07:28-07:34/6	06:35 20:08	06:01 20:38	05:52 20:57	06:10 20:48	06:39 20:12	07:09 19:22	07:40 17:01	07:57-08:10/13 16:59
23	07:41 17:29	07:07 18:06	06:23 18:37	07:26-07:37/11	06:34 20:09	06:00 20:39	05:53 20:57	06:11 20:47	06:40 20:10	07:10 19:20	07:42 17:00	07:53-08:13/20 17:00
24	07:40 17:30	07:06 18:08	06:21 18:38	07:25-07:39/14	06:33 20:10	06:00 20:40	05:53 20:57	06:12 20:47	06:41 20:09	07:11 19:18	07:43 17:00	07:50-08:16/26 17:00
25	07:39 17:31	07:04 18:09	06:20 18:39	07:23-07:40/17	06:31 20:12	05:59 20:41	05:53 20:57	06:13 20:46	06:42 20:07	07:12 19:17	07:44 17:00	07:48-08:17/29 17:00
26	07:39 17:33	07:03 18:10	06:18 18:40	07:22-07:42/20	06:30 20:13	05:58 20:42	05:53 20:58	06:13 20:45	06:43 20:06	07:13 19:15	07:46 17:00	07:46-08:18/32 17:02
27	07:38 17:34	07:01 18:11	06:16 18:41	07:20-07:43/23	06:28 20:14	05:58 20:43	05:54 20:58	06:14 20:44	06:44 20:04	07:14 19:13	07:44 17:00	07:44-08:19/35 17:02
28	07:37 17:35	07:00 18:12	06:15 18:42	07:19-07:44/25	06:27 20:15	05:57 20:44	05:54 20:58	06:15 20:43	06:45 20:03	07:15 19:12	07:43 17:00	07:43-08:20/37 17:02
29	07:36 17:36	07:00 18:12	06:14 18:41	07:18-07:43/22	06:26 20:14	05:56 20:43	05:55 20:58	06:16 20:42	06:46 20:01	07:16 19:10	07:44 17:00	07:41-08:21/40 17:04
30	07:35 17:37	07:00 18:13	06:13 18:40	07:17-07:42/24	06:25 20:13	05:55 20:42	05:55 20:58	06:17 20:41	06:47 20:00	07:17 19:08	07:45 17:00	07:40-08:21/41 17:04
31	07:34 17:39	07:00 18:14	06:12 18:39	07:16-07:41/21	06:24 20:12	05:54 20:41	05:55 20:58	06:18 20:40	06:48 19:58	07:18 19:08	07:46 17:00	07:40-08:21/41 17:05
Potential sun hours	299	298	370	398	447	451	457	427	375	346	299	289
Sum of minutes with flicker	0	116	717	0	0	0	0	0	273	578	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

SHADOW - Calendar per WTG

Calculation: Bitti Terenass - Flicker - INTEGRAZIONIWGTG: 6 - BT11

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [OLBIA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3,87	4,61	5,62	6,73	8,36	10,04	11,06	9,91	8,03	6,21	4,80	3,87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
287	430	335	290	340	625	380	210	215	453	1.009	1.002	969	746	522	271	8.084

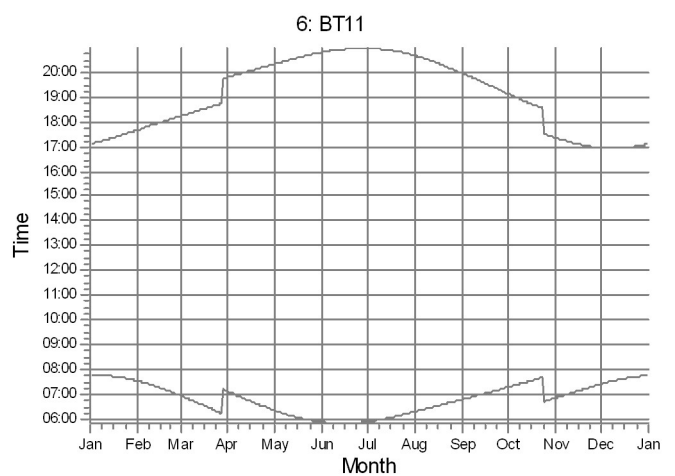
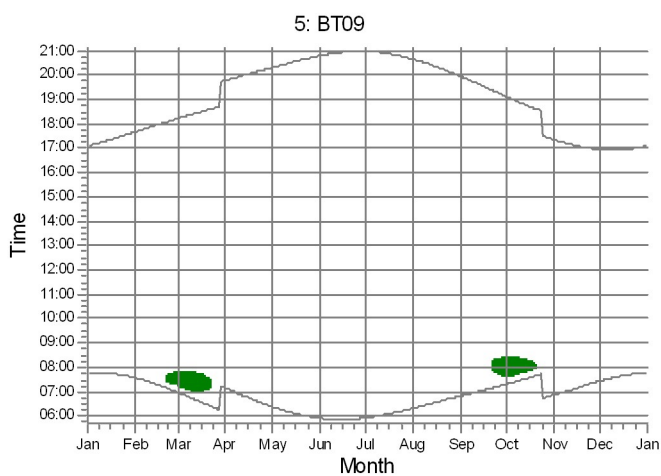
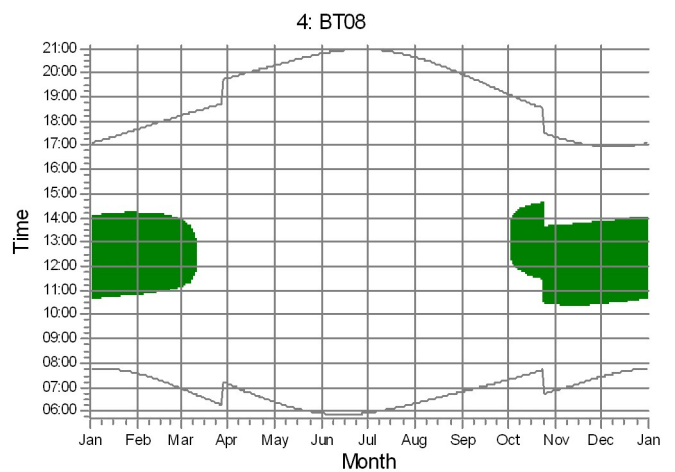
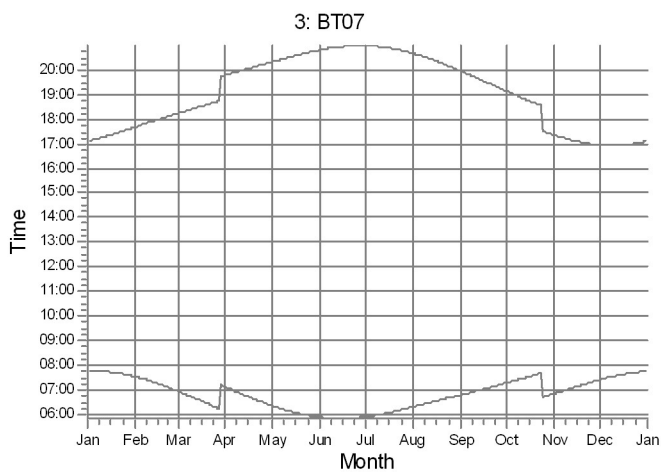
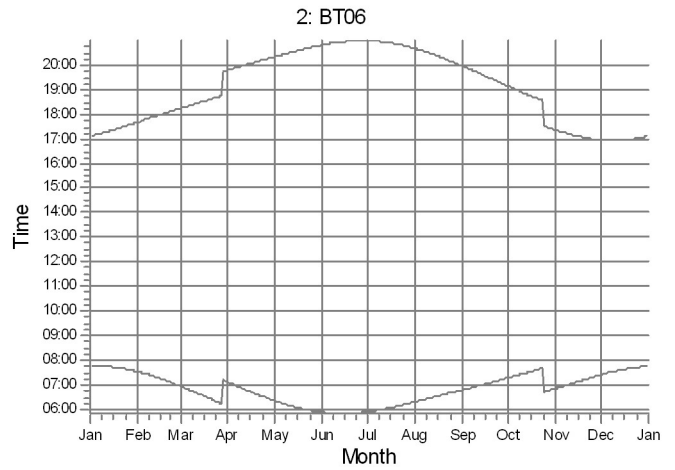
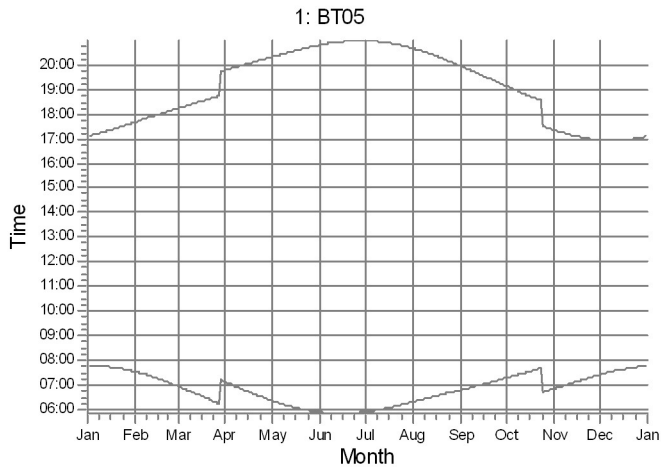
	January	February	March	April	May	June	July	August	September	October	November	December
1	07:47	07:34	06:58	07:08	06:23	05:55	05:55	06:19	06:49	07:18	06:52	07:26
	17:06	17:40	18:13	19:47	20:18	20:47	20:58	20:39	19:57	19:07	17:21	16:57
2	07:47	07:33	06:57	07:07	06:22	05:54	05:56	06:20	06:50	07:19	06:53	07:27
	17:07	17:41	18:14	19:48	20:19	20:47	20:57	20:38	19:55	19:05	17:20	16:57
3	07:47	07:32	06:55	07:05	06:21	05:54	05:56	06:21	06:51	07:20	06:54	07:28
	17:08	17:42	18:16	19:49	20:20	20:48	20:57	20:37	19:53	19:03	17:18	16:56
4	07:47	07:31	06:54	07:03	06:19	05:54	05:57	06:22	06:52	07:21	06:55	07:29
	17:09	17:44	18:17	19:50	20:21	20:49	20:57	20:36	19:52	19:02	17:17	16:56
5	07:47	07:30	06:52	07:02	06:18	05:53	05:58	06:23	06:53	07:22	06:57	07:30
	17:10	17:45	18:18	19:51	20:22	20:50	20:57	20:35	19:50	19:00	17:16	16:56
6	07:47	07:29	06:51	07:00	06:17	05:53	05:58	06:24	06:54	07:23	06:58	07:31
	17:10	17:46	18:19	19:52	20:23	20:50	20:57	20:33	19:48	18:59	17:15	16:56
7	07:47	07:27	06:49	06:59	06:16	05:53	05:59	06:25	06:55	07:24	06:59	07:32
	17:11	17:47	18:20	19:53	20:24	20:51	20:56	20:32	19:47	18:57	17:14	16:56
8	07:47	07:26	06:47	06:57	06:15	05:52	05:59	06:26	06:56	07:26	07:00	07:33
	17:12	17:48	18:21	19:54	20:25	20:51	20:56	20:31	19:45	18:55	17:13	16:56
9	07:47	07:25	06:46	06:55	06:14	05:52	06:00	06:27	06:57	07:27	07:01	07:34
	17:13	17:50	18:22	19:55	20:26	20:52	20:56	20:30	19:44	18:54	17:12	16:56
10	07:46	07:24	06:44	06:54	06:12	05:52	06:01	06:28	06:58	07:28	07:02	07:35
	17:14	17:51	18:23	19:56	20:27	20:53	20:55	20:29	19:42	18:52	17:11	16:56
11	07:46	07:23	06:43	06:52	06:11	05:52	06:01	06:29	06:59	07:29	07:04	07:36
	17:15	17:52	18:24	19:57	20:28	20:53	20:55	20:27	19:40	18:51	17:10	16:56
12	07:46	07:22	06:41	06:51	06:10	05:52	06:02	06:30	07:00	07:30	07:05	07:36
	17:16	17:53	18:26	19:58	20:29	20:54	20:54	20:26	19:39	18:49	17:09	16:56
13	07:46	07:20	06:39	06:49	06:09	05:52	06:03	06:31	07:01	07:31	07:06	07:37
	17:18	17:55	18:27	19:59	20:30	20:54	20:54	20:25	19:37	18:47	17:08	16:56
14	07:45	07:19	06:38	06:47	06:08	05:52	06:03	06:32	07:02	07:32	07:07	07:38
	17:19	17:56	18:28	20:00	20:31	20:55	20:53	20:23	19:35	18:46	17:07	16:56
15	07:45	07:18	06:36	06:46	06:07	05:52	06:04	06:32	07:03	07:33	07:08	07:39
	17:20	17:57	18:29	20:01	20:32	20:55	20:53	20:22	19:34	18:44	17:06	16:57
16	07:45	07:17	06:35	06:44	06:06	05:52	06:05	06:33	07:04	07:34	07:09	07:39
	17:21	17:58	18:30	20:02	20:33	20:55	20:52	20:21	19:32	18:43	17:05	16:57
17	07:44	07:15	06:33	06:43	06:05	05:52	06:06	06:34	07:05	07:35	07:11	07:40
	17:22	17:59	18:31	20:03	20:34	20:56	20:52	20:19	19:30	18:41	17:05	16:57
18	07:44	07:14	06:31	06:41	06:04	05:52	06:07	06:35	07:06	07:36	07:12	07:41
	17:23	18:01	18:32	20:04	20:35	20:56	20:51	20:18	19:28	18:40	17:04	16:58
19	07:43	07:13	06:30	06:40	06:04	05:52	06:07	06:36	07:07	07:37	07:13	07:41
	17:24	18:02	18:33	20:05	20:36	20:56	20:50	20:16	19:27	18:38	17:03	16:58
20	07:43	07:11	06:28	06:38	06:03	05:52	06:08	06:37	07:07	07:38	07:14	07:42
	17:25	18:03	18:34	20:06	20:37	20:57	20:50	20:15	19:25	18:37	17:02	16:58
21	07:42	07:10	06:26	06:37	06:02	05:52	06:09	06:38	07:08	07:39	07:15	07:43
	17:27	18:04	18:35	20:07	20:38	20:57	20:49	20:13	19:23	18:35	17:02	16:59
22	07:41	07:09	06:25	06:36	06:01	05:52	06:10	06:39	07:09	07:41	07:16	07:43
	17:28	18:05	18:36	20:08	20:38	20:57	20:48	20:12	19:22	18:34	17:01	16:59
23	07:41	07:07	06:23	06:34	06:00	05:53	06:11	06:40	07:10	07:42	07:17	07:44
	17:29	18:06	18:37	20:09	20:39	20:57	20:47	20:10	19:20	18:33	17:00	17:00
24	07:40	07:06	06:21	06:33	06:00	05:53	06:12	06:41	07:11	07:43	07:19	07:44
	17:30	18:08	18:38	20:11	20:40	20:57	20:47	20:09	19:18	18:31	17:00	17:00
25	07:39	07:04	06:20	06:31	05:59	05:53	06:13	06:42	07:12	06:44	07:20	07:44
	17:31	18:09	18:39	20:12	20:41	20:58	20:46	20:07	19:17	17:30	16:59	17:01
26	07:39	07:03	06:18	06:30	05:58	05:53	06:13	06:43	07:13	06:45	07:21	07:45
	17:33	18:10	18:40	20:13	20:42	20:58	20:45	20:06	19:15	17:28	16:59	17:02
27	07:38	07:01	06:16	06:28	05:58	05:54	06:14	06:44	07:14	06:46	07:22	07:45
	17:34	18:11	18:41	20:14	20:43	20:58	20:44	20:04	19:13	17:27	16:58	17:02
28	07:37	07:00	06:15	06:27	05:57	05:54	06:15	06:45	07:15	06:47	07:23	07:46
	17:35	18:12	18:42	20:15	20:44	20:58	20:43	20:03	19:12	17:26	16:58	17:03
29	07:36		07:13	06:26	05:56	05:55	06:16	06:46	07:16	06:48	07:24	07:46
	17:36		19:43	20:16	20:44	20:58	20:42	20:01	19:10	17:25	16:58	17:04
30	07:35		07:12	06:24	05:56	05:55	06:17	06:47	07:17	06:50	07:25	07:46
	17:37		19:45	20:17	20:45	20:58	20:41	20:00	19:08	17:23	16:57	17:04
31	07:35		07:10		05:55		06:18	06:48		06:51		07:46
	17:39		19:46		20:46		20:40	19:58		17:22		17:05
Potential sun hours	299	298	370	398	447	451	457	427	375	346	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	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

SHADOW - Calendar per WTG, graphical

Calculation: Bitti Terenass - Flicker - INTEGRAZIONI



Shadow receptors

A: Nuraghe Ortai