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LAS PLASSAS



VILLANOVAFRANCA



GENONI



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NURAGUS

PROGETTO

**PROGETTO DEFINITIVO PER LA REALIZZAZIONE DI UN PARCO EOLICO DENOMINATO "LUMINU" COMPOSTO DA 17 AEROGENERATORI DA 6.6 MW, PER UNA POTENZA COMPLESSIVA DI 112.2 MW SITO NEI COMUNI DI BARUMINI, ESCOLCA, GERGEI, LAS PLASSAS E VILLANOVAFRANCA (SU), CON OPERE DI CONNESSIONE NEI COMUNI DI BARUMINI, ESCOLCA, GENONI, GERGEI, GESTURI, LAS PLASSAS, NURAGUS E VILLANOVAFRANCA (SU)**

ELABORATO

Titolo:

**ANALISI DEGLI EFFETTI DI SHADOW - FLICKERING**

Tav. / Doc:

**WGG-RA9**

Codice elaborato:

WGG-RA9\_Analisi degli effetti di shadow - flickering

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## 1. CRITERI GENERALI DI ANALISI E VALUTAZIONE

Il presente elaborato, facente parte integrante dello Studio di impatto ambientale allegato al progetto del parco eolico denominato "Luminu" da 112 MW, proposto dalla GRV Wind Sardegna 6 S.r.l. - Gruppo GR Value, nei territori di Barumini, Escolca, Gergei, Las Plassas e Villanovafranca (SU), esamina compiutamente il potenziale disturbo da ombreggiamento intermittente (*shadow flickering*) sui potenziali ricettori individuati nell'area interessata dal proposto impianto, entro una distanza indicativa di 1000 metri dagli aerogeneratori.

A tal fine, nel seguito, si farà riferimento alla ricognizione sugli edifici esistenti eseguita nell'ambito della definizione del layout di impianto e dell'analisi ambientale, i cui risultati sono riepilogati in opportune "schede fabbricati" all'interno di apposito report allegato al progetto del parco eolico (Elaborato WGG\_RA11\_Report fabbricati censiti).

Sotto il profilo metodologico, il documento è strutturato in una sezione introduttiva atta a descrivere la natura del fenomeno dell'ombreggiamento intermittente e le ipotesi alla base dei calcoli previsionali, eseguiti a mezzo di specifico software specialistico.

## 2. DESCRIZIONE DEL FENOMENO

Un ostacolo solido opaco posto tra il sole e il terreno genera un'ombra. Generalmente se l'ostacolo è fermo, l'ombra si proietta al suolo seguendo le regole del movimento relativo del sole sull'orizzonte. Le dimensioni dell'ombra proiettata sono funzione inversa dell'angolo che i raggi del sole formano sull'orizzonte per cui si ha la massima dimensione (elongazione sul terreno) dell'ombra all'alba ed al tramonto con il minimo quando il sole raggiunge la massima altezza (mezzogiorno).

Anche gli aerogeneratori durante il giorno proiettano un'ombra che in parte è fissa (torre e navicella) e in parte è mobile (pale del rotore).

Se l'ombra del rotore invece che sul terreno si proietta sulle aperture di un fabbricato può venirsi a creare l'effetto di ombra intermittente o *shadow flickering* (sfarfallio dell'ombra); in talune circostanze, tale fenomeno di pulsazioni "luce - ombra" può potenzialmente essere all'origine di un disturbo alle normali attività che possono svolgersi all'interno dell'ambiente abitativo.

Il fenomeno si verifica durante il giorno in presenza di cielo sereno ed in assenza di ostacoli naturali, quali vegetazione, alberi, muri ecc., e con le turbine in movimento.

Per le ragioni anzidette, a distanze turbine-ricettore superiori a circa 300 metri solitamente il fenomeno di *shadow flickering* si manifesta all'alba o al tramonto, allorquando le ombre proiettate sono sufficientemente lunghe. Per le stesse ragioni il tremolio dell'ombra è un fenomeno particolarmente avvertito nelle regioni del nord Europa (Germania, Danimarca, ecc.) piuttosto che alle latitudini del Mediterraneo.

L'intensità del *shadow flickering* è definita come la differenza in luminosità, in un determinato sito, in presenza ed assenza di un'ombra.

Di seguito si riassumono alcuni aspetti caratteristici del fenomeno:

- la pala delle turbine eoliche è stretta in corrispondenza dell'estremità più esterna ed assume progressivamente maggiore larghezza verso la giunzione con il mozzo. Quando una turbina è posizionata sufficientemente vicino ad un ricettore, cosicché la porzione più larga della pala oscura una porzione maggiore del campo visivo (o meglio del disco solare), l'intensità di *shadow flickering* aumenterà. A distanze maggiori l'intensità del fenomeno sarà minore in quanto le pale copriranno una porzione inferiore del disco solare;
- l'intensità del *shadow flickering* è più bassa quando l'ombra che intercetta un ricettore si origina dall'estremità esterna del rotore (minore spessore della pala). L'intensità aumenterà allorché l'ombra si muove lungo lo sviluppo della pala fino ad arrivare ad un massimo in corrispondenza del mozzo; a tal punto l'intensità diminuisce quando l'ombra si sposta verso l'estremità della pala opposta;
- bassi impatti da *shadow flickering* sono generalmente indicativi di grandi distanze tra turbine e ricettore e ombre incidenti originate dalle estremità del rotore;
- situazioni di precaria visibilità determineranno modeste intensità di *S. flickering*;
- a distanze ancora maggiori le ombre proiettate risulteranno "fuori-fuoco". Ciò non è causa di un'intensità inferiore del *shadow flickering* ma contribuisce a rendere meno distinto il fenomeno;
- all'interno di un ambiente ben illuminato le ombre svaniscono. Conseguentemente l'accensione di luci in un ambiente riduce l'incidenza del *shadow flickering*;
- schermare una finestra (con tende o quant'altro) previene il fenomeno;
- schermare un edificio (ad esempio con alberature) può rappresentare una misura di mitigazione per prevenire il fenomeno.

La frequenza di pulsazione del tremolio dell'ombra è proporzionale alla velocità di rotazione del rotore. La tipica frequenza di passo fra le pale del rotore (tripala) è compresa tra 0.6 ed 1 Hz (velocità con cui le pale passano attraverso una posizione specifica).

Nel caso specifico, considerando un rotore del diametro indicativo di 170 metri con una velocità massima nominale di rotazione di circa 11 RPM si avrà una frequenza di passo pari a circa 0,5 Hz. Tali frequenze di oscillazione luminosa sono prive di rischi significativi per la salute.

Ricerche finalizzate alla definizione di relazioni cause-effetto tra fenomeni stroboscopici ed attacchi epilettici (Graham e Pamela Harding della *Aston University* e Arnold Wilkins della *University of Essex*) attestano che, al fine di escludere rischi sulla salute, le turbine eoliche dovrebbero ruotare a velocità superiori a 60 RPM (velocità di passo superiori a 3 Hz). Peraltro, non può disconoscersi come il fenomeno del *shadow flickering* possa talvolta costituire, in particolari situazioni, un disturbo per i ricettori più esposti.

Per analizzare i risultati e quindi definire l'effettiva portata del disturbo, è dunque fondamentale conoscere l'esatta destinazione del fabbricato ricettore. Nel seguito saranno considerati potenziali ricettori i soli edifici che, sulla base delle informazioni disponibili e delle verifiche condotte in sito, potrebbero prudenzialmente ricondursi alla fattispecie di "ambienti abitativi".

### 3. INDIVIDUAZIONE DEI RICETTORI

Al fine di procedere all'individuazione di potenziali ricettori nelle aree più direttamente interessate dalle installazioni eoliche, ricomprese entro una distanza massima di 1000 m dalle postazioni di macchina, si è proceduto ad una individuazione complessiva dei fabbricati con l'ausilio della cartografia ufficiale di riferimento (Carta Tecnica Regionale in scala 1:10.000). Successivamente si è proceduto a verificarne l'effettiva esistenza e consistenza dall'esame di foto aeree e satellitari nonché attraverso specifici sopralluoghi sul campo. In tal modo sono state acquisite le necessarie informazioni preliminari sulle caratteristiche tipologico-costruttive e le condizioni di utilizzo degli edifici. Per completezza di analisi sono stati inclusi nel censimento anche quei fabbricati che, in modo manifesto, non presentavano caratteristiche di potenziali abitazioni (p.e. ruderi o depositi). A valle di tali riscontri, si è proceduto ad accertare la categoria catastale di appartenenza degli edifici, laddove disponibile.

L'Elaborato WGG\_RA11\_1 (*Carta con individuazione dei fabbricati*) riporta l'individuazione dei fabbricati censiti in accordo con la metodologia precedentemente indicata. Lo stralcio della ripresa aerea zenitale, la categoria catastale di appartenenza ed una fotografia prospettica degli edifici sono riportati nell'Elaborato WGG\_RA11 allegato alla documentazione progettuale.

Nel caso specifico, ai fini dei calcoli di esposizione all'ombra intermittente, sono stati individuati come ricettori n. 13 fabbricati ubicati entro una distanza di 1000 m dalle postazioni eoliche, aventi destinazione abitativa accertata (n. 11 edifici con categoria catastale "A") o caratteristiche tipologico-costruttive assimilabili ad abitazioni (n. 2 edifici catastalmente classificati come D10).

Entro la distanza di 1000m è, infatti, ragionevole che si manifestino i più avvertiti effetti di disturbo in rapporto al fattore di impatto in esame. La Tabella 3.1 riporta, per ciascun ricettore individuato, le relative coordinate secondo il sistema Gauss Boaga, la categoria Catastale e la distanza dal più prossimo aerogeneratore.

Tabella 3.1: Fabbricati con destinazione abitativa esposti al potenziale disturbo da shadow flickering

FABBRICATO	COMUNE	GB EST	GB NORD	DISTANZA DAL PIÙ PROSSIMO WTG [M]	WTG PIÙ PROSSIMO [M]	CATEGORIA CATASTO FABBRICATI
F024	Barumini	1503949	4393552	563	WTG01	A3 - Abitazioni di tipo economico
F027	Barumini	1503933	4393469	600	WTG01	A3 - Abitazioni di tipo economico
F042	Barumini	1503814	4393354	753	WTG01	A3 - Abitazioni di tipo economico
F063	Barumini	1504364	4394241	595	WTG01	A4 - Abitazioni di tipo popolare
F064	Barumini	1503921	4392822	666	WTG16	A3 - Abitazioni di tipo economico
F083	Barumini	1503844	4392795	589	WTG16	A4 - Abitazioni di tipo popolare
F086	Barumini	1503851	4392769	578	WTG16	A4 - Abitazioni di tipo popolare
F088	Barumini	1503896	4392782	622	WTG16	A4 - Abitazioni di tipo popolare
F090	Gergei	1507773	4393693	808	WTG07	D10 - fabbricati per funzioni produttive connesse alla attività agricola
F098	Gergei	1507148	4393510	797	WTG06	D10 - fabbricati per funzioni produttive connesse alla attività agricola
F106	Gergei	1508735	4393666,	957	WTG07	A3 - Abitazioni di tipo economico
F119	Gergei	1507924	4393786	851	WTG07	A3 - Abitazioni di tipo economico
F143	Barumini	1502666	4392753	799	WTG16	A4 - Abitazioni di tipo popolare



#### 4. IPOTESI ALLA BASE DEL CALCOLO E SOGLIE DI RIFERIMENTO

L'analisi dell'effetto di shadow flickering è stata condotta con l'utilizzo del modulo SHADOW del software WindPro 3.4. Il programma esegue una simulazione completa del percorso del sole durante un intero anno.

I calcoli possono essere eseguiti secondo due scenari: lo scenario peggiore (*worst case*) e il caso reale (*real case*).

Nello scenario *worst case* nessuno, tra i fattori di influenza indicati al capitolo 2 è contemplato nei calcoli del modello di simulazione. In situazioni di cielo coperto o calma di vento, o in caso di direzione del vento tale da porre il piano del rotore in posizione parallela rispetto alla linea sole-ricettore, la WTG non produrrà ombra intermittente, ma il suo contributo teorico è comunque computato dal *software*.

Conseguentemente, nello scenario peggiore, è altamente verosimile che i ricettori considerati saranno soggetti ad un impatto da *shadow flickering* significativamente inferiore a quello ipotizzato dal modello.

Nello scenario *real case*, il software può tenere conto delle reali **condizioni di funzionamento degli aerogeneratori** (in termini di ore di funzionamento attese per ogni settore angolare di provenienza del vento) nonché delle condizioni di **Eliofania**, ossia di durata media del soleggiamento della specifica zona di studio.

Peraltro, in entrambi gli scenari di calcolo, se da un lato la simulazione contempla l'effetto dell'orografia sulla propagazione dell'ombra, dall'altro la stessa ignora l'azione schermante "sito-specifica" esercitata dai manufatti e dalle alberature. In altre parole, il calcolo è sempre conservativo e rappresenta quindi il massimo rischio potenziale di disturbo.

In definitiva, affinché il fenomeno dell'ombra intermittente possa costituire un disturbo per i soggetti più sensibili dovrebbero verificarsi simultaneamente le seguenti circostanze:

- il vento deve soffiare ad una velocità superiore a 3 m/s (velocità di *cut-in* del rotore);
- presenza di luminosità solare diretta;
- l'osservatore deve risultare sufficientemente vicino alla sorgente di *shadow flickering*;
- il ricettore deve essere effettivamente esposto al campo di luce tremolante;
- l'illuminazione dell'ambiente residenziale deve essere bassa;
- il contrasto tra luci ed ombre deve essere alto;
- non devono essere presenti schermature che ostacolano la propagazione dell'ombra (come tendaggi o alberature);
- gli individui potenzialmente soggetti ad un impatto da *shadow flickering* dovrebbero permanere esposti alla luce tremolante per un tempo sufficiente ad avvertire fastidio.

Per le finalità del presente studio, in assenza di una specifica disciplina normativa nazionale o regionale, si è fatto riferimento alle linee guida elaborate dal Gruppo Federale tedesco di Controllo delle Emissioni (*Bund-/Länder-Arbeitsgemeinschaft für Immissionsschutz - LAI*) - aggiornamento 2020.

Per la valutazione degli effetti del tremolio dell'ombra, peraltro, lo stesso legislatore tedesco non ha finora emanato, né risulta che sia in procinto di emanare, norme giuridicamente vincolanti.

Secondo le richiamate linee guida, affinché il fenomeno di ombreggiamento sia significativo dovrebbero essere simultaneamente verificate le seguenti circostanze

- L'angolo del sole sopra l'orizzonte deve essere almeno 3°;
- l'ingombro della pala della turbina eolica deve coprire almeno il 20% del disco solare.

Il massimo ombreggiamento su un edificio secondo tali linee-guida è stabilito in:

- 30 ore di ombreggiamento annuale;
- 30 minuti di ombreggiamento giornaliero.

In tali archi temporali (30 ore/anno e 30 minuti/giorno), trattandosi di un disturbo effettivamente avvertito dagli occupanti l'edificio, dovrebbero risultare simultaneamente verificate le seguenti condizioni:

- gli ambienti esposti all'ombreggiamento sono occupati;
- gli occupanti sono svegli.

Considerata l'esigua probabilità che si verifichino contemporaneamente tutte le condizioni precedentemente illustrate per l'intera durata del fenomeno, ne deriva che il risultato del calcolo rappresenta comunque una stima prudenziale dell'impatto.

La Figura 4.1 e la Figura 4.2 mostrano i parametri necessari al modello utilizzato dal modulo SHADOW per valutare l'impatto del tremolio dell'ombra.

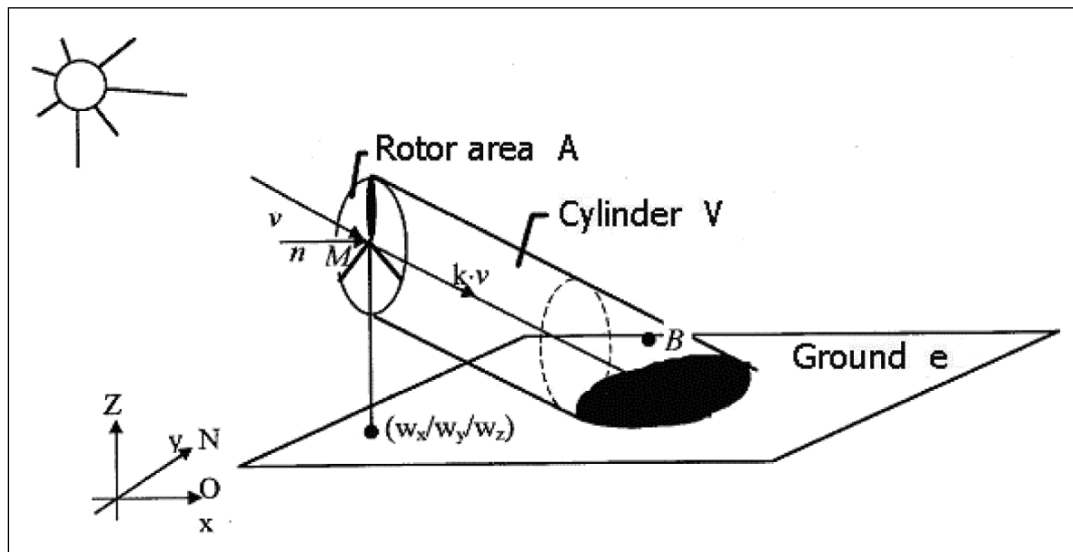


Figura 4.1: Rappresentazione schematica della proiezione dell'ombra del rotore.

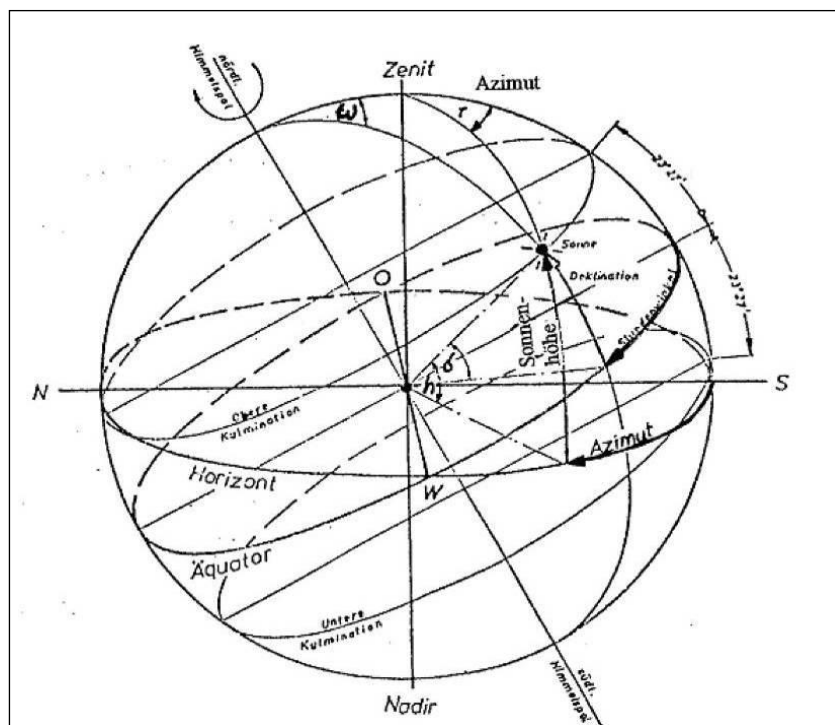


Figura 4.2: Schema dei moti terrestri e parametri di calcolo.

#### 4.1 LO SCENARIO PEGGIORE (WORST CASE)

Questi calcoli sono basati sullo scenario più conservativo (ombra massima astronomica, ossia basata sulla posizione del sole rispetto alle WTG). Se il cielo è coperto o c'è calma di vento, o la direzione del vento è tale da porre il piano del rotore in posizione parallela rispetto alla linea sole-edificio, la WTG non produrrà ombra, ma la sua influenza apparirà comunque nei calcoli. In altre parole, il calcolo descrive lo scenario peggiore possibile, e rappresenta quindi il massimo

rischio potenziale di impatto. Per ciascun ricettore il software produce un calendario che indica i giorni ed i periodi di tempo in cui l'ombra sarà presente.

#### 4.2 LO SCENARIO REALE (REAL CASE)

Oltre al calcolo che contempla le ore di "ombra massima astronomica" (detta anche ombra peggiore), il software WINDPRO consente di configurare i parametri statistici per calcolare l'"ombra meteorologica probabile" (detta anche ombra reale). In particolare, possono essere configurati due parametri statistici:

1. Statistica delle ore di funzionamento. È il periodo in cui le turbine saranno operative per ciascuna direzione di provenienza del vento nel corso dell'anno.
2. Statistica dell'eliofania. È la percentuale di ore di sole durante il dì (dall'alba al tramonto). Questa varia notevolmente da luogo a luogo, e si rende opportuno utilizzare, pertanto, una statistica proveniente da stazioni di misura vicine al sito.

WindPRO combina ZVI ed il calcolo dell'ombra in modo da escludere il contributo delle turbine non visibili dai recettori. Questo vale anche per la mappa dell'ombra, in cui saranno incluse solo le WTG visibili da ciascun punto di griglia.

Ai fini del calcolo del tremolio dell'ombra il software di simulazione considera i seguenti parametri:

- diametro del sole, D (1.390.000 km);
- distanza Terra-Sole, d (150.000.000 km);
- angolo di attacco (3°);
- coordinate geografiche e altitudine delle turbine in progetto;
- altezza al mozzo (115 m) e diametro del rotore (170 m);
- coordinate dei recettori;
- recettori considerati in modalità "serra", assumendo che vengano interessati dal fenomeno di shadow-flickering indipendentemente dall'orientamento delle finestre (ipotesi conservativa);
- modello digitale del terreno;
- eliofania del sito;
- statistica delle ore di funzionamento degli aerogeneratori in funzione delle frequenze di provenienza del vento su 12 quadranti convenzionali;
- modello di calcolo della simulazione, che tiene conto sia dell'orbita terrestre rispetto al Sole (rivoluzione), sia della rotazione rispetto al proprio asse.

## 5. RISULTATI

Il risultato dei calcoli è reso disponibile dal programma di simulazione (*Windpro*) sotto diversi formati:

- Tabellare, (calendario per ciascun ricettore) nel quale per ogni giorno dell'anno sono indicate le ore di luce e l'intervallo di tempo di esposizione all'ombra con l'orario in cui si verifica il fenomeno;
- Grafico, (per ciascun ricettore) nel quale vengono rappresentati i periodi dell'anno in cui si verifica il fenomeno, l'orario e le turbine responsabili dell'ombra;
- grafico globale, con la rappresentazione di isolinee rappresentanti l'incidenza dell'ombra espressa in ore/anno.

Con riferimento allo Scenario di progetto, le isolinee d'ombra sono state rappresentate su specifica tavola grafica, in scala adeguata alla dimensione territoriale da rappresentare, per facilitarne la lettura. La tavola è stata realizzata, pertanto, su base cartografica in scala 1:10.000 (Elaborato WGG\_RA9\_1).

I risultati forniti dal modello di calcolo consentono di valutare approssimativamente sia l'impatto puntuale sul singolo ricettore, sia l'impatto distribuito sul territorio (movimento e persistenza dell'ombra).

Nello specifico, all'interno degli allegati report di calcolo sono indicati, per il singolo ricettore, i valori totali di interferenza da *shadow flickering* (espressi in h/anno), il numero di giorni in cui si verifica l'interferenza ed infine la durata massima per singolo giorno.

I risultati numerici delle simulazioni modellistiche, condotti con riferimento a ciascuno scenario di calcolo (*worst e real case*), sono riportati in Appendice.

## 6. ANALISI E POST-ELABORAZIONE DEI RISULTATI

Le risultanze del calcolo modellistico atto a stimare i valori totali di potenziale interferenza da *shadow flickering* in corrispondenza dei ricettori nello scenario di progetto sono riportate in Tabella 6.1.

Tabella 6.1: Risultati dei calcoli di ombreggiamento intermittente presso i ricettori considerati

ID	RICETTORE	Cat. Catastale	WTG SF	WTG Più prossimo	Dist. Min. WTG	h/anno SF Worst Case	h/giorno SF Worst Case	h/anno SF Real Case
1	F024	A3	WTG01, WTG02, WTG04	WTG01	563	151:58:00	01:10	62:53:00
2	F027	A3	WTG01, WTG02, WTG04	WTG01	600	113:51:00	01:08	45:34:00
3	F042	A3	WTG01, WTG02	WTG01	753	61:53:00	00:51	24:10:00
4	F063	A4	WTG02	WTG01	595	29:04:00	00:30	9:16:00
5	F064	A3	WTG02, WTG03, WTG04, WTG16, WTG17	WTG16	666	153:35:00	01:29	42:49:00
6	F083	A4	WTG02, WTG03, WTG04, WTG16, WTG17	WTG16	589	164:55:00	01:34	43:35:00
7	F086	A4	WTG02, WTG03, WTG04, WTG16, WTG17	WTG16	578	173:48:00	01:37	47:38:00
8	F088	A4	WTG02, WTG03, WTG04, WTG16, WTG17	WTG16	622	162:43:00	01:32	45:59:00
9	F090	D10		WTG07	808	0:00:00	00:00	0:00:00
10	F098	D10	WTG02, WTG04, WTG07	WTG06	797	40:05:00	00:38	13:08:00
11	F106	A3	WTG06	WTG07	957	16:23:00	00:21	4:03:00
12	F119	A3		WTG07	851	00:00	00:00	0:00:00
13	F143	A4	WTG15, WTG16	WTG16	799	60:26:00	00:48	20:39:00

Come si può osservare dall'esame della Tabella 6.1, l'incidenza dell'ombreggiamento intermittente presso i ricettori considerati nello "scenario reale" è al disotto del valore guida di 30 h/anno in corrispondenza di 7 fabbricati (F042, F063, F090, F098, F106, F119, F143). In riferimento ai restanti 6 edifici (fabbricati F024, F027, F064, F083, F086, F088) l'incidenza dell'ombreggiamento intermittente presenta una durata variabile tra 62:53 h/anno (F024) e 42:49 h/anno (F064).

Nel seguito si procederà ad esaminare singolarmente le potenziali situazioni di maggiore incidenza del fenomeno di SF, riferibili ai fabbricati F024, F027, F064, F083, F086 e F088, pervenendo alla conclusione che può ragionevolmente escludersi che lo *shadow-flickering* possa rappresentare un effettivo disturbo a carico degli occupanti gli edifici considerati.

### Ricettore F024

Il calendario grafico dell'ombra relativo al ricettore F024 (Figura 6.9) mostra come il fenomeno dello SF sia atteso nelle prime ore del mattino (nella fascia oraria 06:30-08:30) ad opera, prevalentemente, dell'aerogeneratore WTG01 (indicativamente da fine aprile a fine agosto) e, in subordine, degli aerogeneratori WTG02 e WTG04 (periodo invernale e tardo-primaverile).

Analizzando più in dettaglio le caratteristiche del fenomeno presso il ricettore F024 si ritiene opportuno formulare le seguenti considerazioni:

- La facciata maggiormente esposta al fenomeno dello SF riferibile all'aerogeneratore WTG01 è quella nordest, contraddistinta da superfici fenestrate piuttosto limitate, risultando conseguentemente attenuata l'incidenza dell'ombreggiamento (Figura 6.4);
- la distanza dagli aerogeneratori WTG02 e WTG04 (a est-sudest del fabbricato) è significativa (indicativamente superiore ai 1.500 metri), il che presuppone che le relative ombre risulteranno "sfocate" e, dunque, meno avvertibili;
- in prossimità del prospetto sudest del fabbricato F024 sono presenti delle alberature, nonché un ulteriore corpo di fabbrica annesso, in grado di esercitare un'efficace azione schermante nelle prime ore del mattino, in particolare rispetto all'ombreggiamento esercitato dall'aerogeneratore WTG01;
- Affinché il fenomeno sia percepito come un disturbo da parte degli occupanti l'edificio tutte le seguenti circostanze dovrebbero essere verificate:
  - o Presenza degli occupanti presso l'ambiente esposto all'ombreggiamento;
  - o Elevato contrasto luci/ombre (assenza di schermature nelle finestre)
  - o gli individui potenzialmente soggetti ad un impatto da *shadow flickering* dovrebbero permanere esposti alla luce tremolante per un tempo sufficiente ad avvertire fastidio.

Tutto ciò considerato è ragionevole affermare che l'effettivo potenziale disturbo da *shadow flickering* risulterà significativamente più contenuto di quello prospettato dal software di simulazione, tale da potersi ricondurre ai predetti "valori guida" di 30 h/anno e da non arrecare apprezzabili disturbi agli occupanti l'edificio in esame.

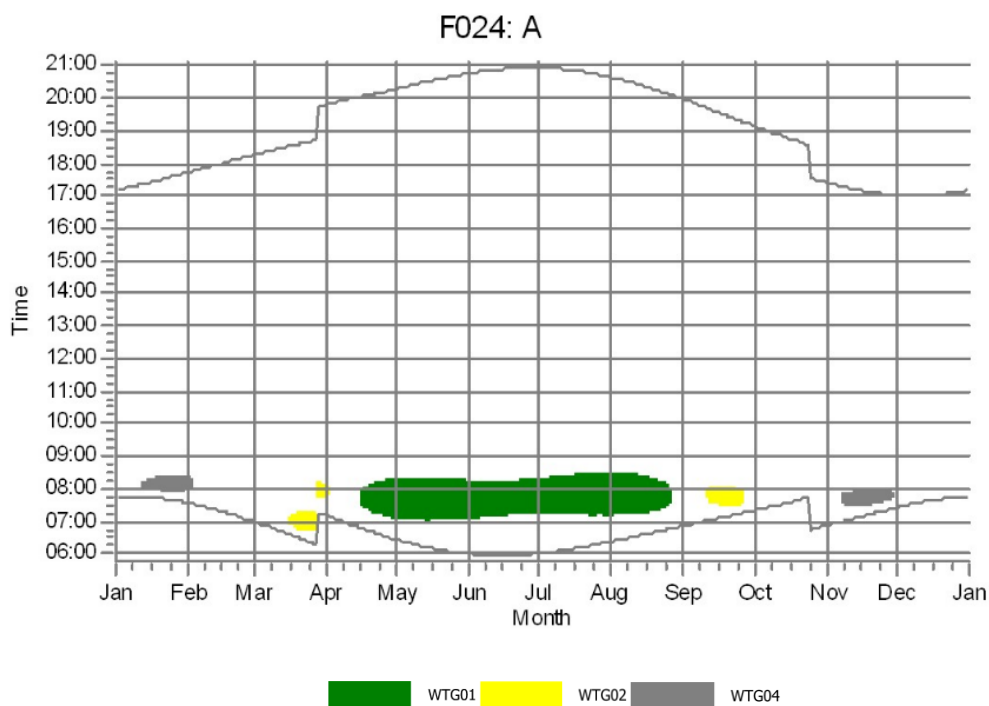


Figura 6.1 – Calendario dell'ombra relativo al ricettore F064

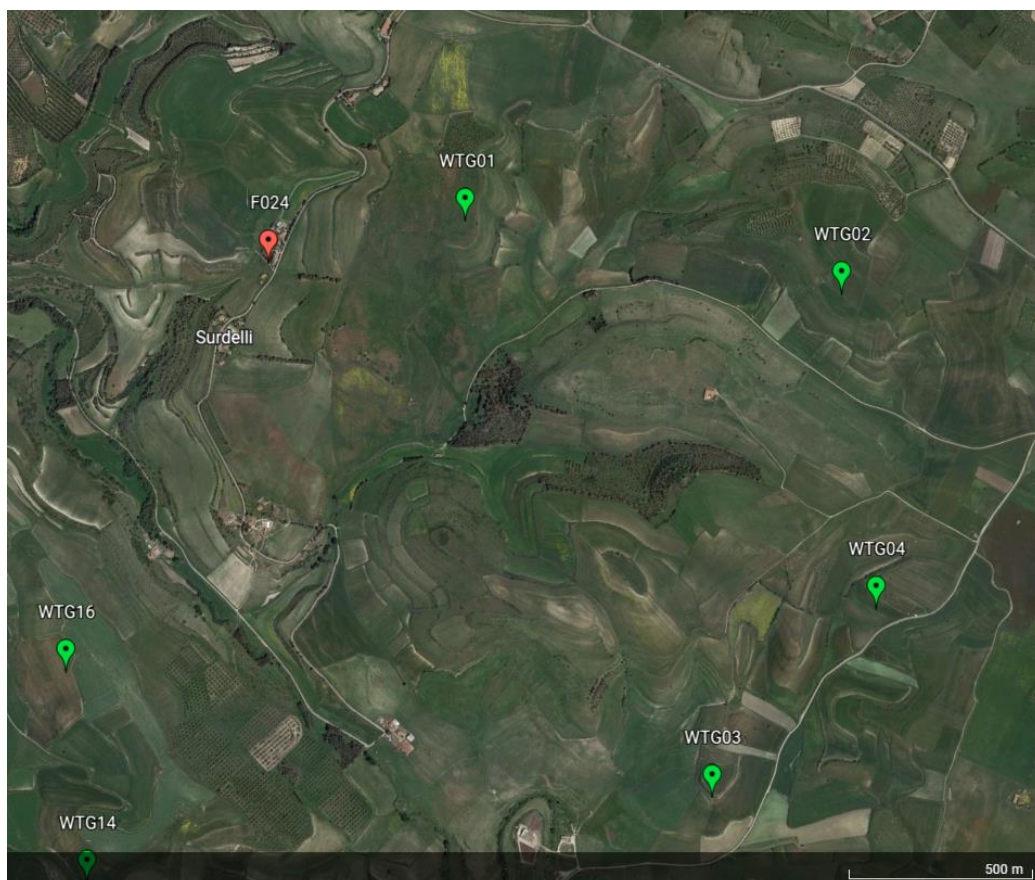
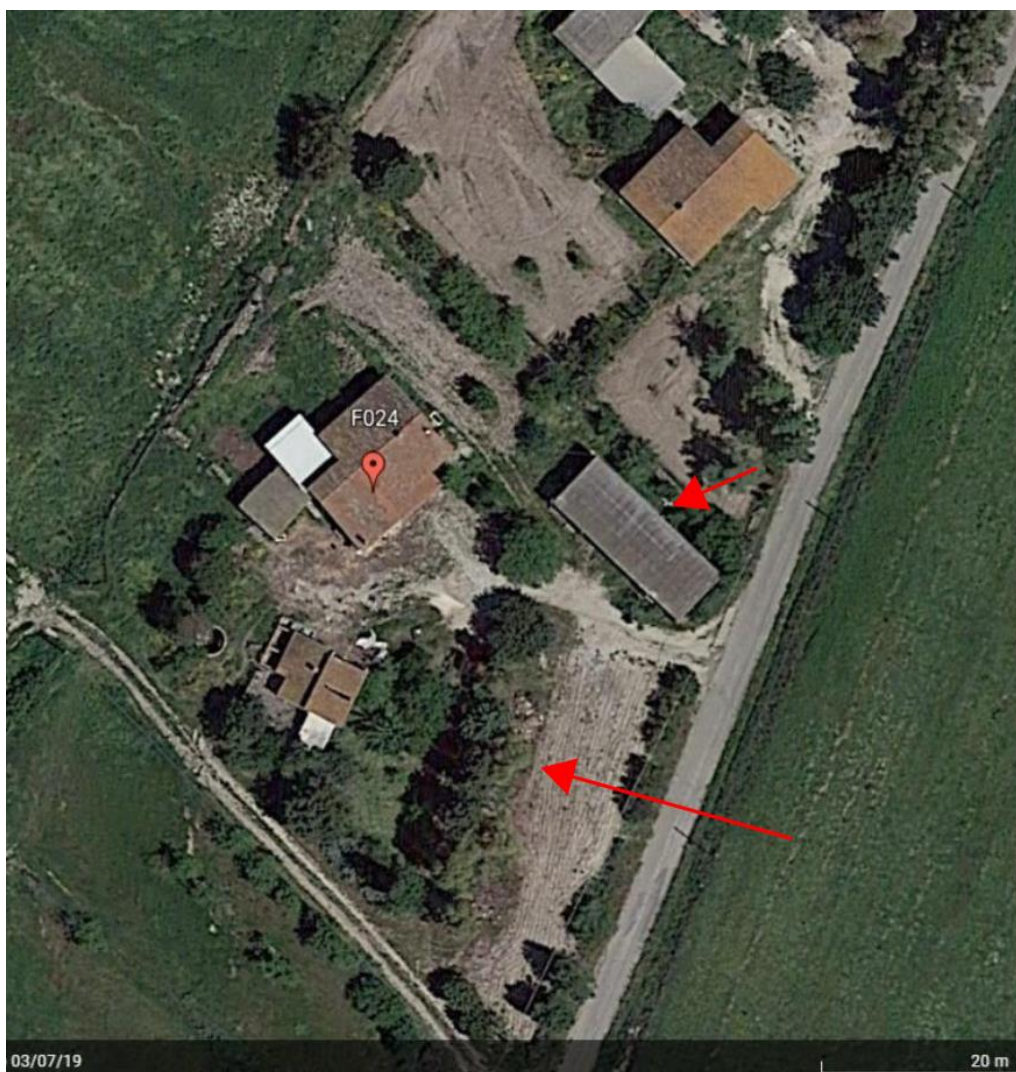


Figura 6.2 – Posizionamento del ricettore F024 rispetto agli aerogeneratori WTG01, WTG02 e WTG04, all'origine di un potenziale ombreggiamento intermittente sul fabbricato





*Figura 6.3 – Cortina arborea e edificio annesso posizionati a est-sudest del ricevitore F024. La barriera verde ed il limitrofo edificio esercitano un efficace effetto schermante sul potenziale ombreggiamento intermittente riferibile, in particolare, all'aerogeneratore WTG01, posizionato a est-norddest.*



Figura 6.4 – Edificio F024 (vista da nordovest). E' indicata con la freccia rossa la facciata maggiormente esposta al potenziale fenomeno dello SF ad opera dell'aerogeneratore WTG01, contraddistinta da una superficie fenestrata estremamente limitata

### Ricettore F027

Il calendario grafico dell'ombra relativo al ricettore F027 (Figura 6.9) è alquanto simile a quello prospettato per il ricettore F024, mostrando anch'esso come il fenomeno dello SF sia atteso nelle prime ore del mattino (indicativamente nella fascia oraria 06:30-08:30) ad opera degli aerogeneratori WTG01-02-04.

Per il ricettore F027 possono formularsi conseguentemente le seguenti considerazioni:

- La facciata maggiormente esposta al fenomeno dello SF riferibile all'aerogeneratore WTG01 è quella a nordest, contraddistinta da superfici fenestrate piuttosto limitate, risultando conseguentemente attenuata l'incidenza dell'ombreggiamento (Figura 6.8);
- la distanza dagli aerogeneratori WTG02 e WTG04 (a est-sudest del fabbricato) è significativa (indicativamente superiore ai 1.500 metri), il che presuppone che le ombre proiettate risulteranno "sfocate" e, dunque, meno avvertibili;
- in prossimità del prospetto sudest del fabbricato F027 è presente un manufatto cilindrico di altezza 3/4 m, in grado di esercitare un'efficace azione schermante nelle prime ore del mattino, in particolare rispetto all'ombreggiamento esercitato dall'aerogeneratore WTG01;
- Affinché il fenomeno sia percepito come un disturbo da parte degli occupanti l'edificio tutte le seguenti circostanze dovrebbero essere verificate:
  - o Presenza degli occupanti presso l'ambiente esposto all'ombreggiamento;
  - o Elevato contrasto luci/ombre (assenza di schermature nelle finestre)

- gli individui potenzialmente soggetti ad un impatto da *shadow flickering* dovrebbero permanere esposti alla luce tremolante per un tempo sufficiente ad avvertire fastidio.

Tutto ciò considerato è ragionevole affermare che l'effettivo potenziale disturbo da *shadow flickering* risulterà significativamente più contenuto di quello prospettato dal software di simulazione, tale da potersi ricondurre ai predetti "valori guida" di 30 h/anno e da non arrecare apprezzabili disturbi agli occupanti l'edificio in esame.

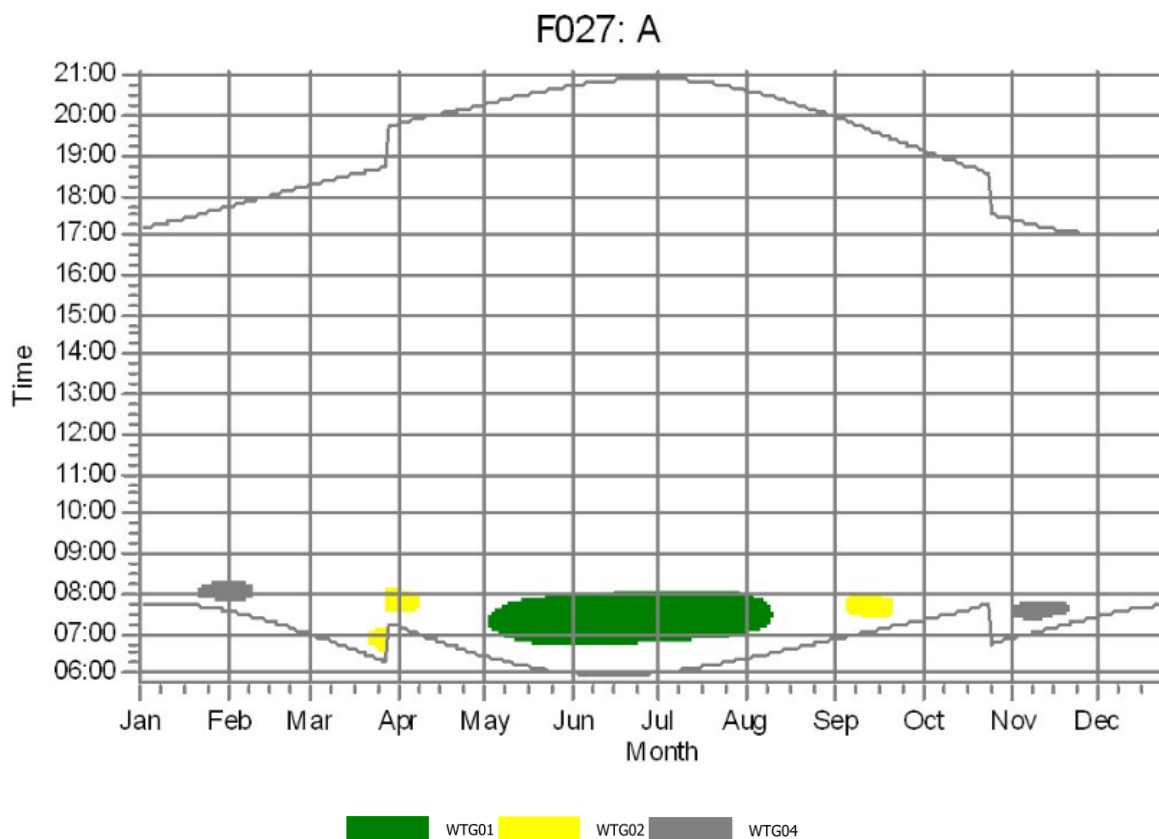


Figura 6.5 – Calendario dell’ombra relativo al ricevitore F027

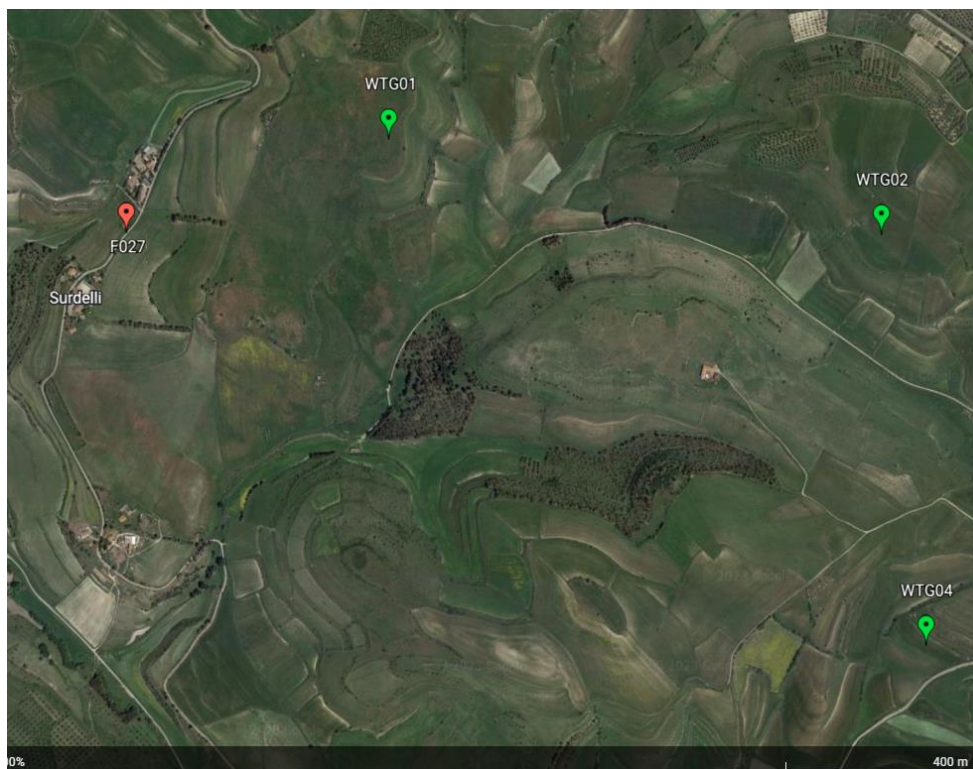
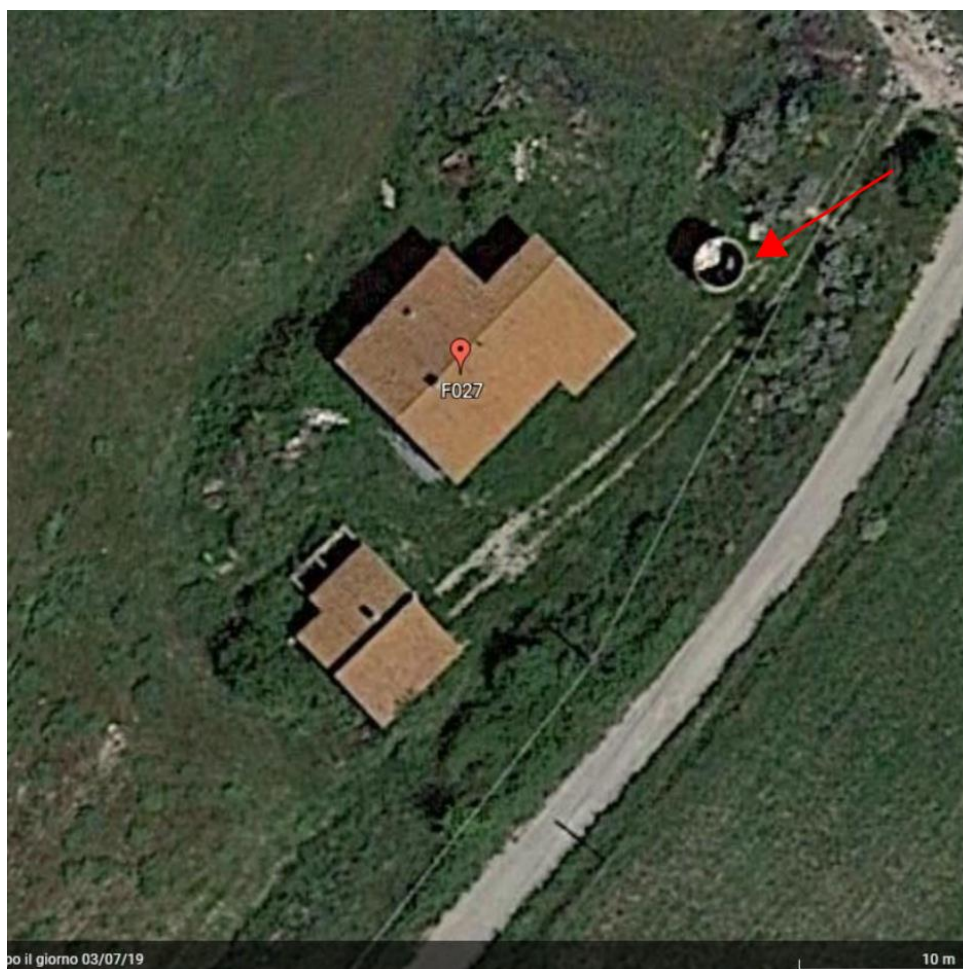


Figura 6.6 – Posizionamento del ricevitore F027 rispetto agli aerogeneratori WTG01, WTG02 e WTG04, all’origine di un potenziale ombreggiamento intermittente sul fabbricato



*Figura 6.7 – Manufatto cilindrico di altezza 3/4m posizionato a nordest del ricettore F027 in grado di esercitare un effetto schermante sul potenziale ombreggiamento intermittente esercitato dall'aerogeneratore WTG01, posizionato a nordest.*



Figura 6.8 – Edificio F027 (vista da nordovest). E' indicata con la freccia rossa la facciata maggiormente esposta al potenziale fenomeno dello SF ad opera dell'aerogeneratore WTG01, contraddistinta da una superficie fenestrata estremamente limitata

#### **Ricettore F064**

Il calendario grafico dell'ombra relativo al ricettore F064 (Figura 6.9) mostra come il fenomeno dello SF sia atteso nelle prime ore del mattino (indicativamente nella fascia oraria 06:30-08:30) ad opera degli aerogeneratori WTG02-03-04 e nel pomeriggio (indicativamente nella fascia oraria 15:30-17:00) per effetto degli aerogeneratori WTG16 e WTG17.

Analizzando più in dettaglio le caratteristiche del fenomeno presso il ricettore F064 si ritiene opportuno formulare le seguenti considerazioni:

- la distanza dagli aerogeneratori WTG02-03-04 (a est del fabbricato) e WTG017 (a sudovest) è significativa (indicativamente superiore ai 1.500 metri), il che presuppone che le ombre proiettate risulteranno "sfocate" e, dunque, meno avvertibili;
- il fabbricato F064 non risentirà verosimilmente dello SF proveniente dai seguenti aerogeneratori (Figura 6.10), il cui contributo all'incidenza complessiva dello SF è pari a circa il 20% del totale:
  - o WTG02 per effetto dell'azione schermante esercitata dal fabbricato F065, posto a nord-est del ricettore considerato (Figura 6.11);
  - o WTG03 ad opera di alberature localizzate a sud-est del fabbricato, in grado di esercitare un'efficace azione schermante nelle prime ore del mattino;
- Affinché il fenomeno sia percepito come un disturbo da parte degli occupanti l'edificio tutte le seguenti circostanze dovrebbero essere verificate:
  - o Presenza degli occupanti presso l'ambiente esposto all'ombreggiamento;
  - o Elevato contrasto luci/ombre (assenza di schermature nelle finestre)

- gli individui potenzialmente soggetti ad un impatto da *shadow flickering* dovrebbero permanere esposti alla luce tremolante per un tempo sufficiente ad avvertire fastidio.

Tutto ciò considerato è ragionevole affermare che l'effettivo potenziale disturbo da *shadow flickering* risulterà significativamente più contenuto di quello prospettato dal software di simulazione, tale da potersi ricondurre ai predetti "valori guida" di 30 h/anno e da non arrecare apprezzabili disturbi agli occupanti l'edificio in esame.

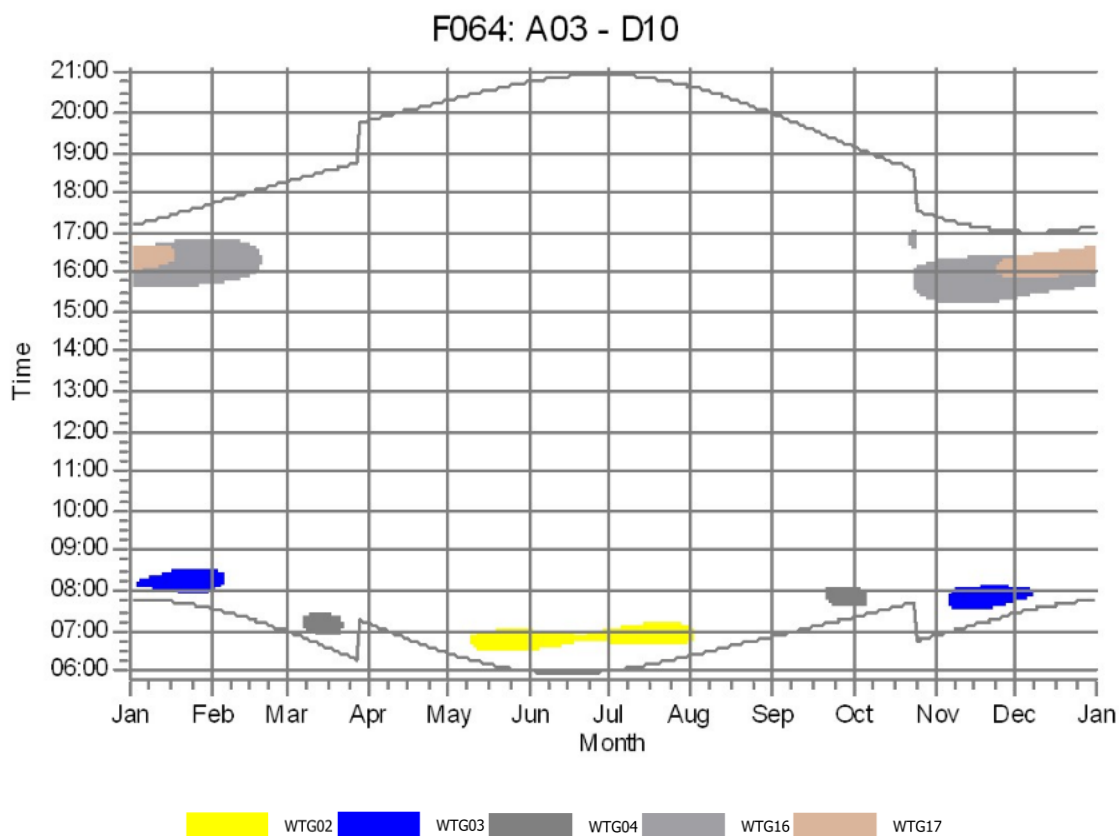


Figura 6.9 – Calendario dell'ombra relativo al ricevitore F064

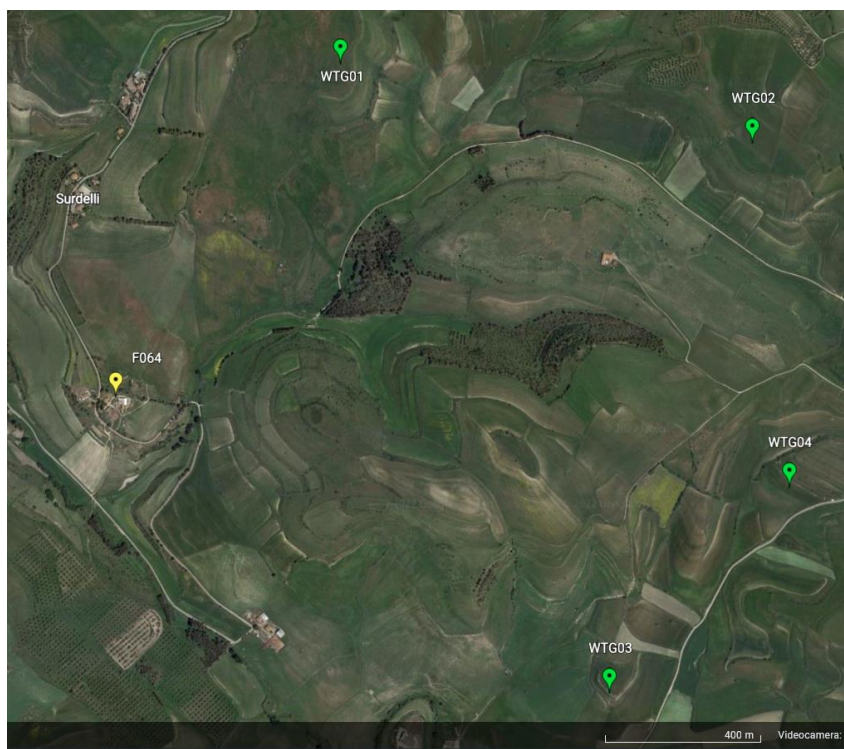
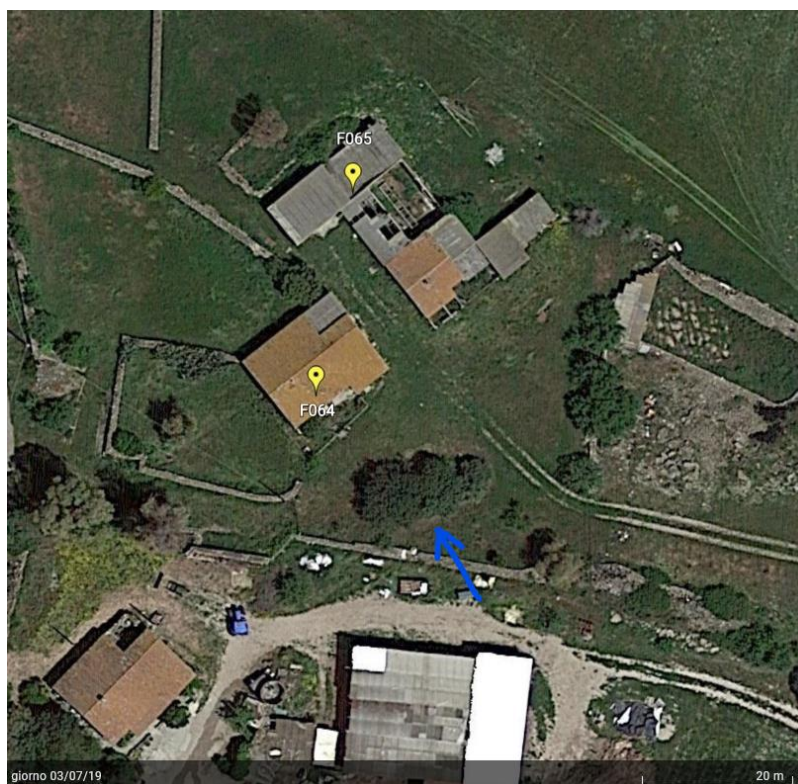


Figura 6.10 – Posizionamento del ricevitore F064 rispetto agli aerogeneratori WTG02, WTG03 e WTG04, all'origine di un potenziale ombreggiamento intermittente sul fabbricato





*Figura 6.11 – Cortina arborea posizionata a sudest del ricettore F064. La barriera verde esercita un efficace effetto schermante sul potenziale ombreggiamento intermittente esercitato dall'aerogeneratore WTG03, posizionato a sudest. Il limitrofo edificio F065, inoltre, scherma efficacemente l'ombreggiamento proveniente dall'aerogeneratore WTG02, posizionato a nordest.*

### **Ricettore F083**

Il calendario grafico dell'ombra del ricettore F083 è alquanto simile a quello del fabbricato F064, trovandosi in prossimità dell'edificio precedentemente esaminato.

Dall'esame della Figura 6.12 si evince che il principale contributo allo SF è attribuibile all'ombreggiamento esercitato dagli aerogeneratori WTG16 e WTG17 posizionati a sudovest dell'edificio, a distanze da questo di ~600 m e 1.400 m rispettivamente.

A tal riguardo si osserva che il fabbricato F083 non risentirà verosimilmente dello SF proveniente dai suddetti aerogeneratori, essendo schermato da una fitta cortina arborea sul lato sudovest, come osservabile in Figura 6.14.

Poiché il contributo allo SF dei predetti aerogeneratori WTG16 e WTG17 incide per circa il 60% sul totale (circa 25 h/anno su 43 h/anno di SF totali), è ragionevole ipotizzare che l'incidenza complessiva del fenomeno dello SF presso il ricettore F083 risulterà al di sotto della soglia di significatività di 30 h/anno.

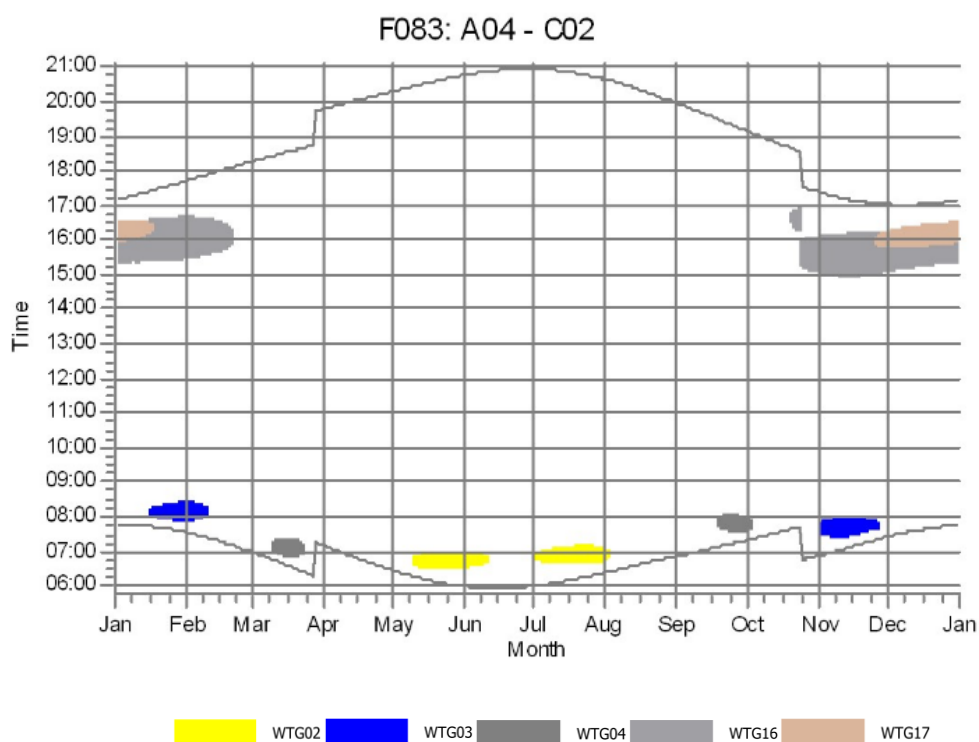
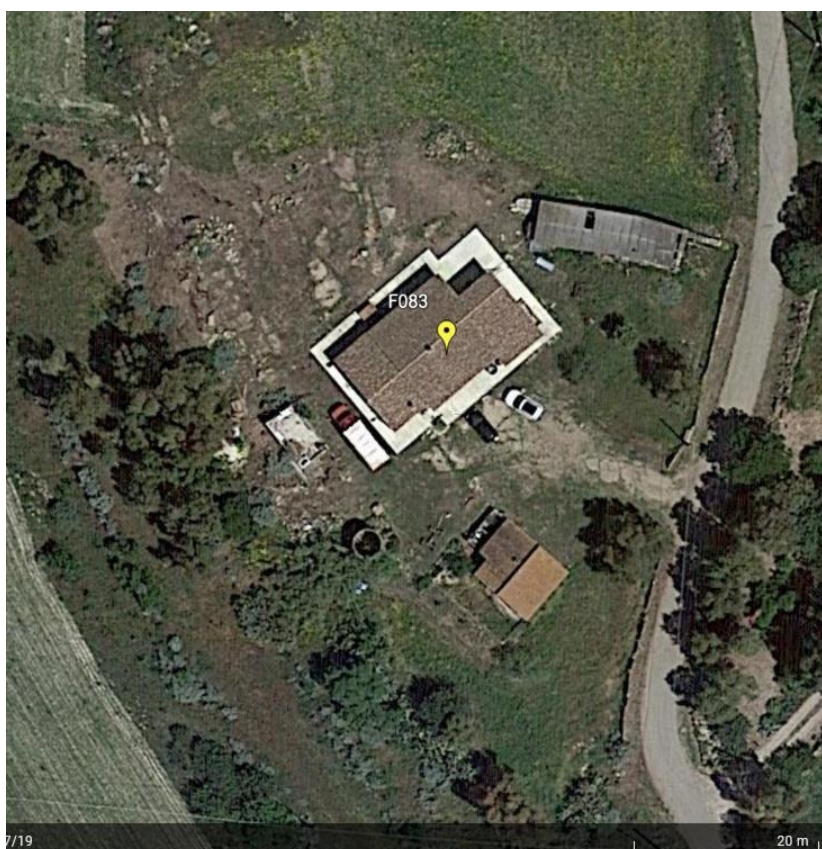


Figura 6.12 – Calendario dell'ombra relativo al ricettore F083



*Figura 6.13 – Posizionamento del ricettore F083 rispetto agli aerogeneratori WTG16 e WTG17, all’origine di un significativo contributo al potenziale ombreggiamento intermittente sul fabbricato*



*Figura 6.14 – Cortina arborea posizionata a sudovest del ricettore F083. La barriera verde esercita un efficace effetto schermante sul potenziale ombreggiamento intermittente esercitato dagli aerogeneratori WTG16 e WTG17, posizionati a sudovest rispetto al fabbricato.*

### Ricettore F086

Il fabbricato F086 presenta un distacco di appena 10 metri dal fabbricato F083.

Per quanto precede, come si evince dall'esame delle seguenti figure, possono ritenersi valide le considerazioni già espresse in riferimento al fabbricato F083. Ciò con particolare riferimento alla circostanza che l'edificio in esame non risentirà ragionevolmente dell'ombreggiamento esercitato dagli aerogeneratori WTG16 e WTG17 posizionati a sudovest dell'edificio, a distanze da questo di ~600 m e 1.400 m rispettivamente, ai quali è prevalentemente attribuibile l'incidenza del fenomeno.

Anche in questo caso, pertanto, è ragionevole ipotizzare che l'incidenza complessiva del fenomeno dello SF presso il ricettore F086 risulterà al disotto della soglia di significatività di 30 h/anno.

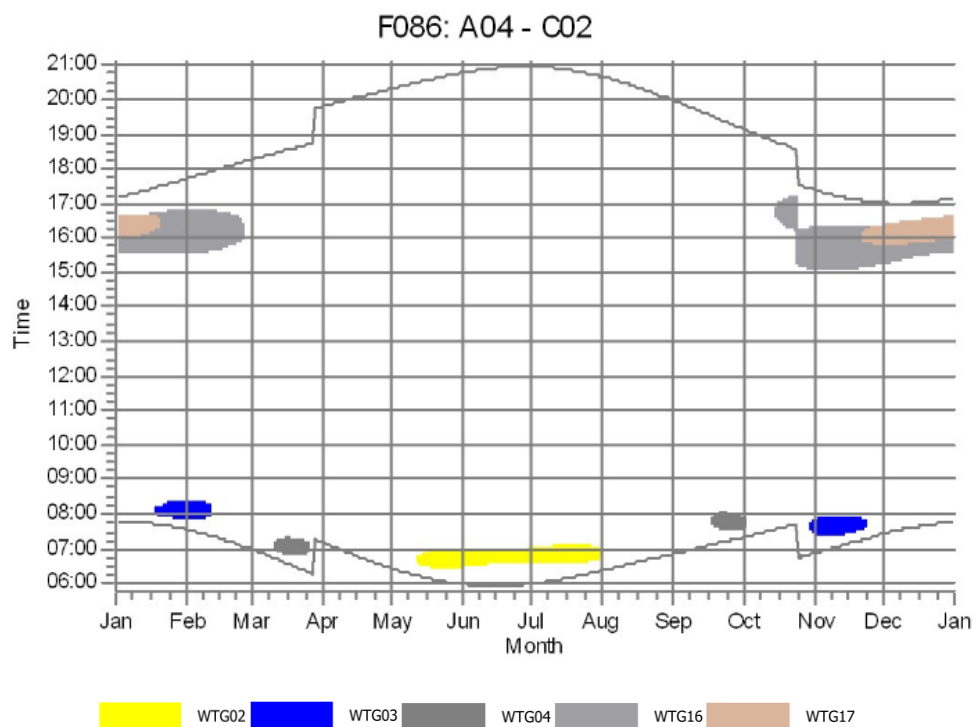


Figura 6.15 – Calendario dell'ombra relativo al ricettore F086

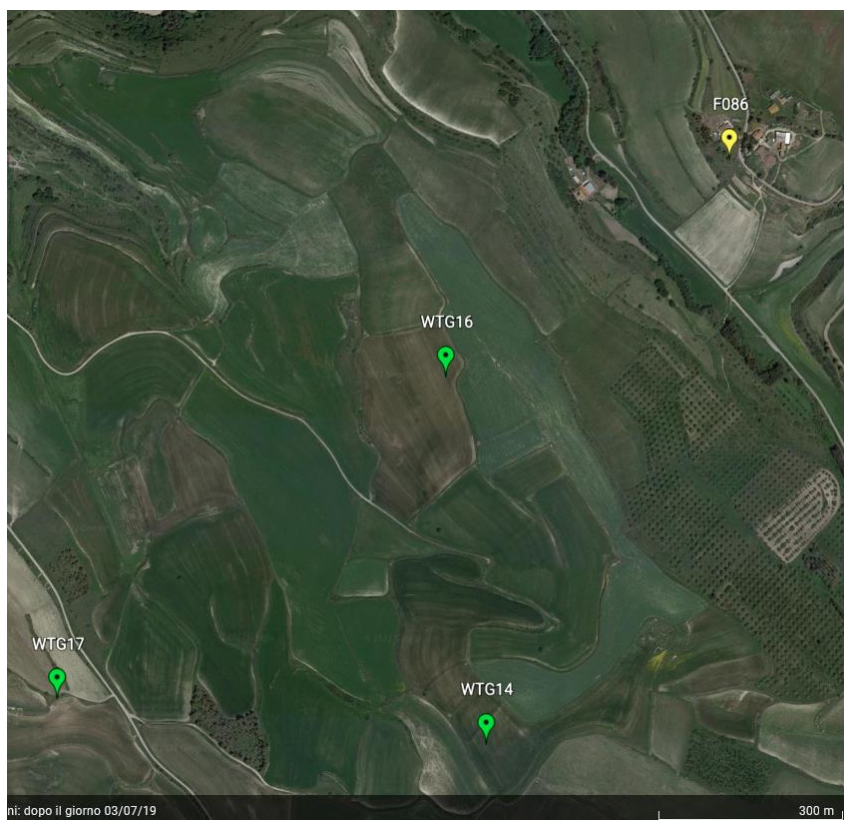


Figura 6.16 – Posizionamento del ricettore F086 rispetto agli aerogeneratori WTG16 e WTG17, all’origine di un significativo contributo al potenziale ombreggiamento intermittente sul fabbricato

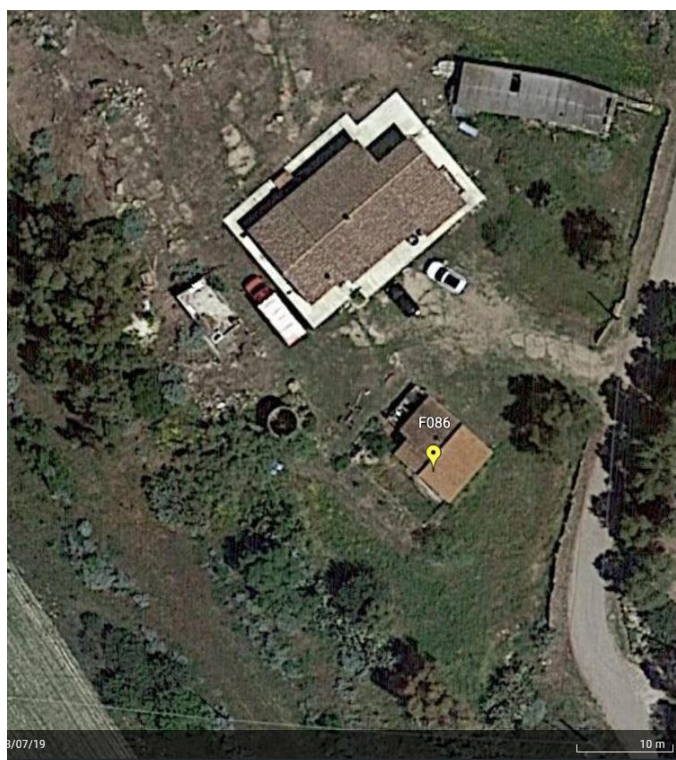


Figura 6.17 – Cortina arborea posizionata a sudovest del ricettore F086. La barriera verde esercita un efficace effetto schermante sul potenziale ombreggiamento intermittente esercitato dagli aerogeneratori WTG16 e WTG17, posizionati a sudovest rispetto al fabbricato.

### Ricettore F088

Il fabbricato F088 è ubicato a circa 30 metri a nordest del ricettore F086 (Figura 6.20).

In ragione della presenza di una fitta vegetazione arborea in corrispondenza del lato sudovest dell'edificio, come si evince dall'esame delle seguenti immagini, possono ritenersi valide le considerazioni già espresse in riferimento ai fabbricati F083 e F086. Per questo edificio, al pari degli altri precedentemente menzionati, può ragionevolmente ritenersi dunque trascurabile l'ombreggiamento esercitato dagli aerogeneratori WTG16 e WTG17 posizionati a sudovest del fabbricato, a distanze da questo di ~600 m e 1.400 m rispettivamente, ai quali è prevalentemente attribuibile l'incidenza del fenomeno.

In definitiva, pertanto, è ragionevole ipotizzare che l'incidenza complessiva del fenomeno dello SF presso il ricettore F086 risulterà al di sotto della soglia di significatività di 30 h/anno.

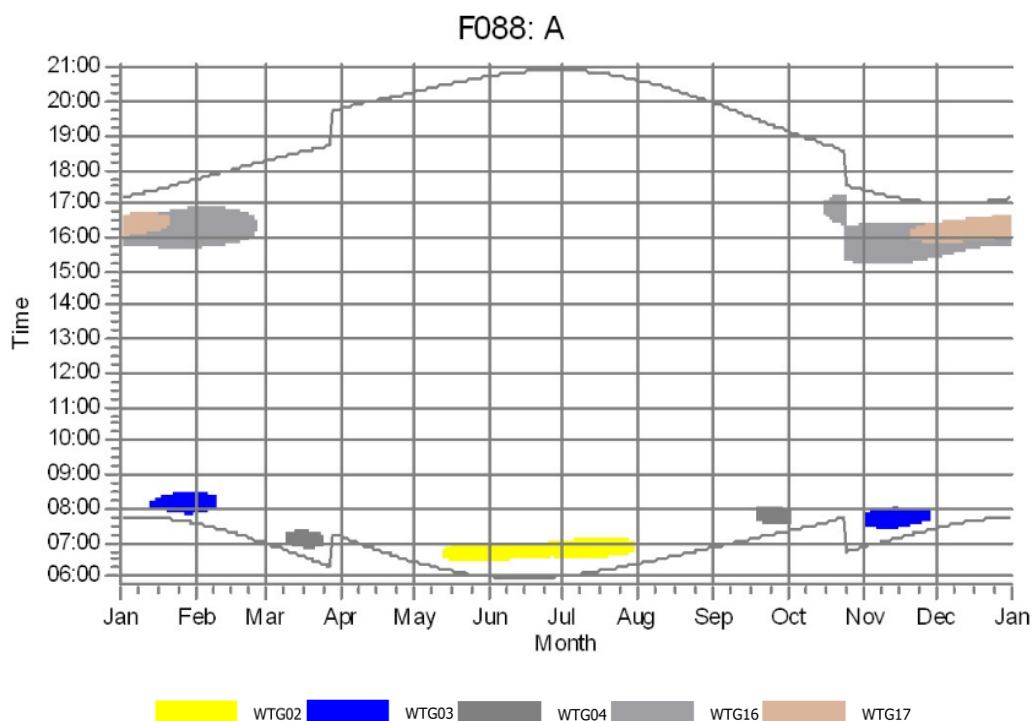


Figura 6.18 – Calendario dell'ombra relativo al ricettore F088

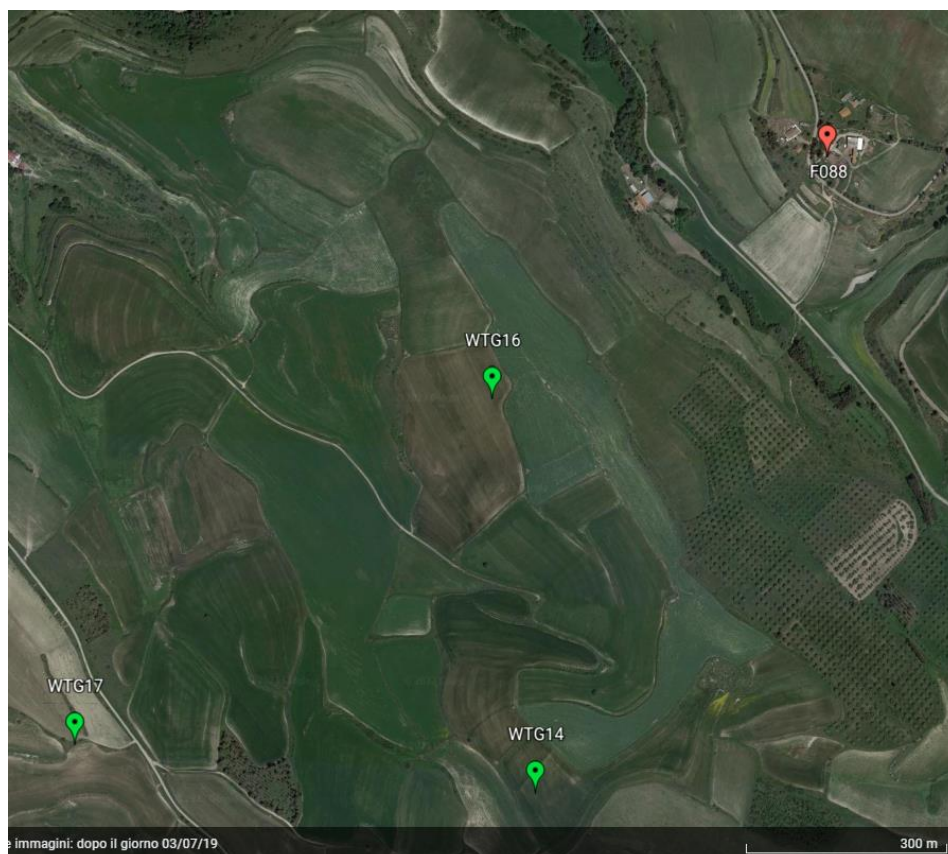


Figura 6.19 – Posizionamento del ricettore F088 rispetto agli aerogeneratori WTG16 e WTG17, all'origine di un significativo contributo al potenziale ombreggiamento intermittente sul fabbricato

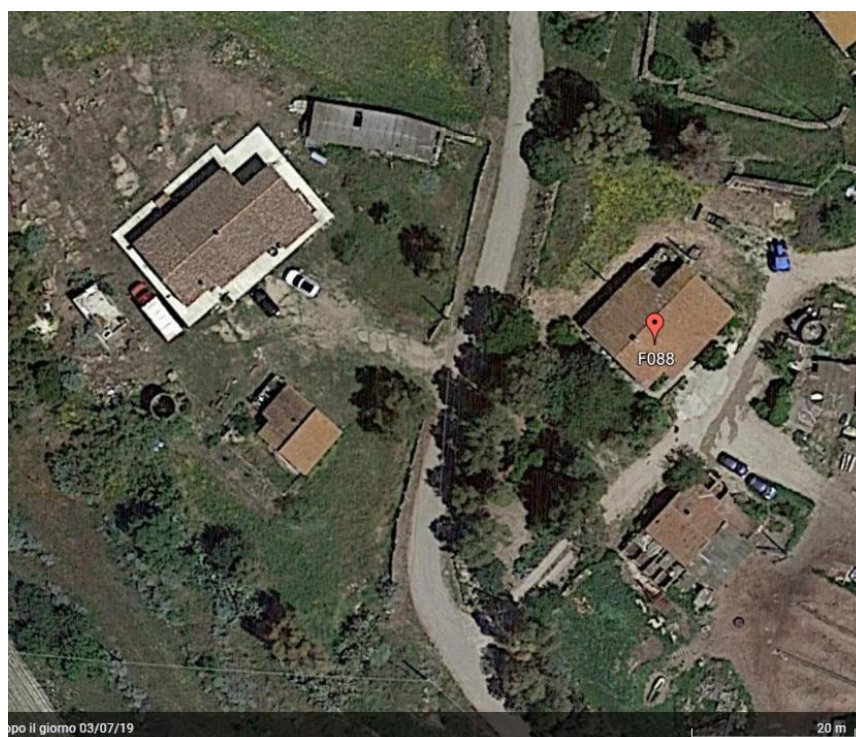


Figura 6.20 – Fitta cortina arborea posizionata a sudovest del ricettore F088. La barriera verde esercita un efficace effetto schermante sul potenziale ombreggiamento intermittente esercitato dagli aerogeneratori WTG16 e WTG17, posizionati a sudovest rispetto al fabbricato.

## 7. CONCLUSIONI

Il documento ha esaminato compiutamente il potenziale disturbo da ombreggiamento intermittente (*shadow flickering*) in corrispondenza dei più prossimi fabbricati presenti nell'area interessata dal proposto parco eolico. L'individuazione dei ricettori ha fatto riferimento alla ricognizione sugli edifici esistenti eseguita nell'ambito della definizione del layout di impianto e dell'analisi ambientale, i cui risultati sono riepilogati in opportune "schede fabbricati" all'interno di apposito report allegato alla documentazione progettuale.

Ai fini dei calcoli di esposizione all'ombra intermittente, sono stati individuati come ricettori n. 13 fabbricati, ubicati entro una distanza di 1000 m dalle postazioni eoliche, aventi destinazione abitativa accertata (n. 11 edifici con categoria catastale "A") o caratteristiche tipologico-costruttive assimilabili ad abitazioni (n. 2 edifici catastalmente classificati come D10).

Per le finalità del presente studio, in assenza di una specifica disciplina normativa nazionale o regionale, si è fatto riferimento alle linee guida elaborate dal Gruppo Federale tedesco di Controllo delle Emissioni (*Bund-/Länder-Arbeitsgemeinschaft für Immissionsschutz - LAI*) - aggiornamento 2020.

L'analisi dell'effetto di *shadow flickering* è stata condotta con l'utilizzo del modulo SHADOW del software WindPro 3.4. Il programma esegue una simulazione completa del percorso del sole durante un intero anno.

I calcoli possono essere eseguiti secondo due scenari: lo scenario peggiore (*worst case*) e il caso reale (*real case*).

Nello scenario *real case*, il software può tenere conto delle reali condizioni di funzionamento degli aerogeneratori (in termini di ore di funzionamento attese per ogni settore angolare di provenienza del vento) nonché delle condizioni di Eliofoania, ossia di durata media del soleggiamento della specifica zona di studio.

L'incidenza dell'ombreggiamento intermittente presso i ricettori considerati nello "scenario reale" è risultata al di sotto del valore guida di 30 h/anno in corrispondenza di 7 fabbricati (F042, F063, F090, F098, F106, F119, F143). In riferimento ai restanti 6 edifici (fabbricati F024, F027, F064, F083, F086, F088) l'incidenza dell'ombreggiamento intermittente presenta una durata variabile tra 62:53 h/anno (F024) e 42:49 h/anno (F064).

In riferimento a questi ultimi fabbricati gli approfondimenti condotti hanno riconosciuto la presenza di elementi antropici (edifici) e/o naturali (barriere verdi), non considerati dal modello di calcolo, in grado di esercitare un efficace effetto schermante rispetto all'azione di ombreggiamento attribuibile agli aerogeneratori. Inoltre, per taluni fabbricati (F024 e F027), la limitata presenza di aperture fenestrate in corrispondenza del prospetto degli edifici potenzialmente più esposto alla proiezione dell'ombra consente di ritenere convenientemente attenuata l'effettiva incidenza del fenomeno.

In definitiva, considerata la conservatività delle stime in rapporto all'effettivo manifestarsi di un disturbo per gli occupanti gli edifici (aleatorietà circa la presenza degli occupanti l'edificio, presenza di un sufficiente contrasto luci-ombre, assenza di elementi schermanti quali tendaggi e/o alberature) è altamente verosimile che l'effettiva incidenza dello *shadow flickering* risulterà comunque più contenuta di quella prospettata dal software di simulazione nello scenario "*real case*".

**Da tutto quanto precede si può concludere con ragionevole certezza che il potenziale disturbo associato al fenomeno di *shadow-flickering* risulterà inferiore alla soglia di significatività in corrispondenza di tutti i ricettori individuati.**

Peraltro, laddove durante la fase operativa dell'impianto dovesse essere avvertito un effettivo disturbo da parte degli occupanti gli edifici più esposti, saranno attuate - a cura e spese della



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società proponente - efficaci misure di mitigazione quali la creazione e/o il rafforzamento di alberature perimetrali.

## APPENDICE - REPORT DEI RISULTATI DEL CALCOLO MODELLISTICO

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

## SHADOW - Main Result

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14

### 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) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

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\_Progetto\_GRV\_Gergei

Obstacles used in calculation

Eye height for map: 1,5 m

Grid resolution: 1,0 m

All coordinates are in

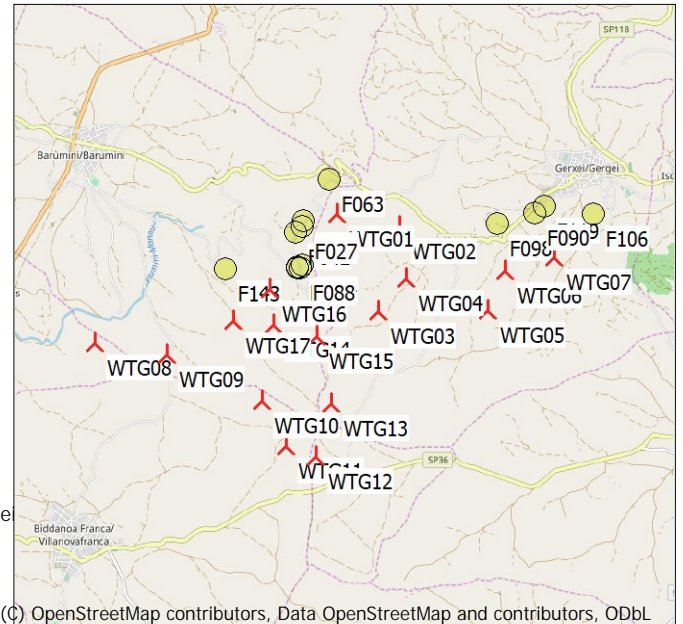
Italian Gauss-Boaga west-ROMA40 (IT-peninsular <±4m)

### WTGs

WTG	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
WTG01	1.504.501	4.393.663	290,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG02	1.505.538	4.393.459	317,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG03	1.505.187	4.392.070	259,1	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG04	1.505.638	4.392.596	290,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG05	1.506.986	4.392.084	320,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG06	1.507.289	4.392.726	342,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG07	1.508.097	4.392.953	327,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG08	1.500.496	4.391.537	239,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG09	1.501.689	4.391.351	240,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG10	1.503.256	4.390.595	300,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG11	1.503.656	4.389.846	334,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG12	1.504.149	4.389.686	340,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG13	1.504.401	4.390.546	300,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG14	1.503.456	4.391.840	289,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG15	1.504.162	4.391.658	260,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG16	1.503.391	4.392.418	270,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG17	1.502.774	4.391.909	279,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8

### Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l. [m]	window [°]		(ZVI) a.g.l. [m]
F024 A		1.503.949	4.393.552	245,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F027 A		1.503.933	4.393.469	244,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F042 A		1.503.814	4.393.354	242,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F063 A		1.504.364	4.394.242	300,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F064 A		1.503.921	4.392.822	231,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F083 A		1.503.844	4.392.795	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F086 A		1.503.851	4.392.769	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F088 A		1.503.896	4.392.782	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F090 D		1.507.773	4.393.693	358,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F098 D		1.507.148	4.393.510	346,1	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F106 A		1.508.735	4.393.666	337,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F119 A		1.507.924	4.393.786	357,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F143 A		1.502.666	4.392.753	190,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:125.000

▲ New WTG

● Shadow receptor

Project:

Progetto\_GRV\_Gergei

Licensed user:

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Calculated:

20/01/2023 16:32/3.4.415

## SHADOW - Main Result

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14

### Calculation Results

Shadow receptor

No.	Name	Shadow, expected values per year [h/year]
F024	A	62:53
F027	A	45:34
F042	A	24:10
F063	A	9:16
F064	A	42:49
F083	A	43:35
F086	A	47:38
F088	A	45:59
F090	D	0:00
F098	D	13:08
F106	A	4:03
F119	A	0:00
F143	A	20:39

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

No.	Name		Worst case [h/year]	Expected [h/year]
WTG01	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (29)	173:34	71:11
WTG02	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30)	85:12	31:26
WTG03	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (31)	27:48	9:15
WTG04	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (32)	38:04	13:07
WTG05	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (33)	0:00	0:00
WTG06	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (34)	16:23	4:03
WTG07	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (35)	30:57	10:11
WTG08	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (36)	0:00	0:00
WTG09	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (37)	0:00	0:00
WTG10	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (38)	0:00	0:00
WTG11	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (39)	0:00	0:00
WTG12	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (40)	0:00	0:00
WTG13	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (41)	0:00	0:00
WTG14	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (42)	0:00	0:00
WTG15	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (43)	19:33	6:04
WTG16	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)	188:56	50:13
WTG17	Siemens Gamesa SG 6.6-170!!	6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)	30:11	6:51

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: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F024 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	July	August	September	October	November	December						
1	06:00	07:18 (WTG01)	06:22	07:15 (WTG01)	06:51	07:20	06:52				07:25	
	20:56	57 08:15 (WTG01)	20:38	70 08:25 (WTG01)	19:57	19:08	17:24				17:01	
2	06:00	07:17 (WTG01)	06:23	07:16 (WTG01)	06:52	07:21	06:53				07:26	
	20:56	58 08:15 (WTG01)	20:37	69 08:25 (WTG01)	19:55	19:07	17:22				17:01	
3	06:01	07:18 (WTG01)	06:24	07:16 (WTG01)	06:53	07:21	06:54				07:27	
	20:56	57 08:15 (WTG01)	20:36	69 08:25 (WTG01)	19:54	19:05	17:21				17:00	
4	06:01	07:17 (WTG01)	06:25	07:16 (WTG01)	06:54	07:22	06:55				07:28	
	20:56	58 08:15 (WTG01)	20:35	69 08:25 (WTG01)	19:52	19:04	17:20				17:00	
5	06:02	07:18 (WTG01)	06:26	07:16 (WTG01)	06:55	07:23	06:56				07:29	
	20:56	58 08:16 (WTG01)	20:34	69 08:25 (WTG01)	19:51	19:02	17:19				17:00	
6	06:02	07:17 (WTG01)	06:27	07:16 (WTG01)	06:56	07:24	06:57				07:30	
	20:55	59 08:16 (WTG01)	20:33	68 08:24 (WTG01)	19:49	19:00	17:18				17:00	
7	06:03	07:17 (WTG01)	06:28	07:16 (WTG01)	06:57	07:25	06:59				07:31	
	20:55	60 08:17 (WTG01)	20:32	67 08:23 (WTG01)	19:48	18:59	17:17				17:00	
8	06:03	07:17 (WTG01)	06:29	07:16 (WTG01)	06:58	07:26	07:00			07:39 (WTG04)	07:32	
	20:55	60 08:17 (WTG01)	20:31	67 08:23 (WTG01)	19:46	18:57	17:16	3		07:42 (WTG04)	17:00	
9	06:04	07:17 (WTG01)	06:30	07:17 (WTG01)	06:59	07:27	07:01			07:36 (WTG04)	07:33	
	20:54	61 08:18 (WTG01)	20:29	66 08:23 (WTG01)	19:44	18:56	17:15	11		07:37 (WTG04)	17:00	
10	06:05	07:17 (WTG01)	06:31	07:17 (WTG01)	07:00	07:28	07:02			07:35 (WTG04)	07:34	
	20:54	62 08:19 (WTG01)	20:28	65 08:22 (WTG01)	19:43	18:54	17:14	13		07:52 (WTG04)	17:00	
11	06:05	07:17 (WTG01)	06:32	07:18 (WTG01)	07:01		07:03			07:33 (WTG04)	07:34	
	20:54	61 08:18 (WTG01)	20:27	64 08:22 (WTG01)	19:41	7	07:53 (WTG02)	18:53	17:13	16	07:49 (WTG04)	17:00
12	06:06	07:17 (WTG01)	06:33	07:18 (WTG01)	07:02		07:04			07:30	07:35	07:35
	20:53	62 08:19 (WTG01)	20:26	63 08:21 (WTG01)	19:39	13	07:56 (WTG02)	18:51	17:12	18	07:50 (WTG04)	17:00
13	06:07	07:17 (WTG01)	06:34	07:19 (WTG01)	07:03		07:05			07:31	07:36	07:36
	20:53	63 08:20 (WTG01)	20:24	62 08:21 (WTG01)	19:38	18	07:57 (WTG02)	18:50	17:11	19	07:51 (WTG04)	17:00
14	06:08	07:16 (WTG01)	06:35	07:19 (WTG01)	07:04		07:07			07:32	07:37	07:37
	20:52	64 08:20 (WTG01)	20:23	61 08:20 (WTG01)	19:36	20	07:58 (WTG02)	18:48	17:10	20	07:52 (WTG04)	17:00
15	06:08	07:16 (WTG01)	06:36	07:20 (WTG01)	07:04		07:08			07:33	07:38	07:37
	20:52	64 08:20 (WTG01)	20:22	59 08:19 (WTG01)	19:35	21	07:58 (WTG02)	18:47	17:10	20	07:52 (WTG04)	17:01
16	06:09	07:17 (WTG01)	06:36	07:20 (WTG01)	07:05		07:09			07:35	07:38	07:38
	20:51	64 08:21 (WTG01)	20:20	57 08:17 (WTG01)	19:33	23	07:59 (WTG02)	18:45	17:09	22	07:53 (WTG04)	17:01
17	06:10	07:17 (WTG01)	06:37	07:21 (WTG01)	07:06		07:10			07:36	07:39	07:39
	20:51	65 08:22 (WTG01)	20:19	55 08:16 (WTG01)	19:31	24	07:59 (WTG02)	18:44	17:08	21	07:53 (WTG04)	17:01
18	06:11	07:16 (WTG01)	06:38	07:22 (WTG01)	07:07		07:11			07:37	07:39	07:39
	20:50	65 08:21 (WTG01)	20:18	53 08:15 (WTG01)	19:30	25	07:59 (WTG02)	18:42	17:07	20	07:53 (WTG04)	17:02
19	06:11	07:16 (WTG01)	06:39	07:23 (WTG01)	07:08		07:12			07:38	07:40	07:40
	20:49	66 08:22 (WTG01)	20:16	51 08:14 (WTG01)	19:28	25	07:59 (WTG02)	18:41	17:07	19	07:54 (WTG04)	17:02
20	06:12	07:16 (WTG01)	06:40	07:24 (WTG01)	07:09		07:13			07:39	07:41	07:41
	20:49	67 08:23 (WTG01)	20:15	48 08:12 (WTG01)	19:26	24	07:58 (WTG02)	18:39	17:06	18	07:54 (WTG04)	17:02
21	06:13	07:16 (WTG01)	06:41	07:25 (WTG01)	07:10		07:14			07:40	07:41	07:41
	20:48	67 08:23 (WTG01)	20:13	46 08:11 (WTG01)	19:25	24	07:58 (WTG02)	18:38	17:05	16	07:53 (WTG04)	17:03
22	06:14	07:16 (WTG01)	06:42	07:27 (WTG01)	07:11		07:16			07:41	07:42	07:42
	20:47	68 08:24 (WTG01)	20:12	42 08:09 (WTG01)	19:23	23	07:57 (WTG02)	18:36	17:05	15	07:53 (WTG04)	17:03
23	06:15	07:15 (WTG01)	06:43	07:29 (WTG01)	07:12		07:17			07:42	07:42	07:42
	20:46	68 08:23 (WTG01)	20:11	38 08:07 (WTG01)	19:21	20	07:55 (WTG02)	18:35	17:04	14	07:53 (WTG04)	17:04
24	06:15	07:15 (WTG01)	06:44	07:31 (WTG01)	07:13		07:18			07:43	07:43	07:43
	20:46	69 08:24 (WTG01)	20:09	33 08:04 (WTG01)	19:20	18	07:53 (WTG02)	18:34	17:04	12	07:52 (WTG04)	17:04
25	06:16	07:16 (WTG01)	06:45	07:34 (WTG01)	07:14		07:19			06:44	07:43	07:43
	20:45	68 08:24 (WTG01)	20:08	27 08:01 (WTG01)	19:18	15	07:51 (WTG02)	17:32	17:03	11	07:53 (WTG04)	17:05
26	06:17	07:16 (WTG01)	06:46	07:37 (WTG01)	07:15		07:20			06:45	07:44	07:44
	20:44	68 08:24 (WTG01)	20:06	19 07:56 (WTG01)	19:16	9	07:48 (WTG02)	17:31	17:03	9	07:52 (WTG04)	17:06
27	06:18	07:16 (WTG01)	06:47		07:16		07:21			06:46	07:44	07:44
	20:43	69 08:25 (WTG01)	20:05		19:15		17:02			17:30	07:45 (WTG04)	17:06
28	06:19	07:16 (WTG01)	06:48		07:17		07:22			06:47	07:45 (WTG04)	07:44
	20:42	69 08:25 (WTG01)	20:03		19:13		17:02			17:29	07:50 (WTG04)	17:07
29	06:20	07:15 (WTG01)	06:49		07:18		07:23			06:48	07:46 (WTG04)	07:45
	20:41	69 08:24 (WTG01)	20:02		19:12		17:01			17:27	07:49 (WTG04)	17:08
30	06:21	07:15 (WTG01)	06:50		07:19		07:24			06:50	07:45	07:45
	20:40	69 08:24 (WTG01)	20:00		19:10		17:01			17:26	17:08	17:08
31	06:22	07:15 (WTG01)	06:51				07:25			06:51	07:45	07:45
	20:39	70 08:25 (WTG01)	19:59				17:25			17:25	17:09	17:09
Potential sun hours	455		425		374		347		301			292
Total, worst case	1985		1457		309				312			
Sun reduction	0,74		0,73		0,65				0,51			
Oper. time red.	0,86		0,86		0,86				0,86			
Wind dir. red.	0,73		0,73		0,79				0,80			
Total reduction	0,47		0,46		0,44				0,35			
Total, real	931		677		137				110			

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:

Progetto\_GRV\_Gergei

Licensed user:

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 Giuseppe Frongia / direttore@iatprogetti.it  
 Calculated:  
 20/01/2023 16:32/3.4.415

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F027 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June				
1	07:45	07:33	07:53 (WTG04)	06:59	07:10	07:37 (WTG02)	06:26	05:59	06:47 (WTG01)	
	17:10	17:43	21 08:14 (WTG04)	18:15	19:48	24 08:01 (WTG02)	20:17	20:46	66 07:53 (WTG01)	
2	07:45	07:32	07:53 (WTG04)	06:57	07:09	07:38 (WTG02)	06:25	05:58	06:46 (WTG01)	
	17:11	17:44	21 08:14 (WTG04)	18:17	19:49	22 08:00 (WTG02)	20:18	20:46	67 07:53 (WTG01)	
3	07:46	07:31	07:54 (WTG04)	06:56	07:07	07:37 (WTG02)	06:24	05:58	06:46 (WTG01)	
	17:12	17:45	20 08:14 (WTG04)	18:18	19:50	22 07:59 (WTG02)	20:19	20:47	67 07:53 (WTG01)	
4	07:46	07:30	07:54 (WTG04)	06:54	07:05	07:39 (WTG02)	06:23	07:15 (WTG01)	05:58	06:47 (WTG01)
	17:13	17:47	20 08:14 (WTG04)	18:19	19:51	19 07:58 (WTG02)	20:20	10 07:25 (WTG01)	20:48	67 07:54 (WTG01)
5	07:46	07:29	07:55 (WTG04)	06:53	07:04	07:39 (WTG02)	06:21	07:08 (WTG01)	05:57	06:47 (WTG01)
	17:14	17:48	18 08:13 (WTG04)	18:20	19:52	17 07:56 (WTG02)	20:21	21 07:29 (WTG01)	20:48	67 07:54 (WTG01)
6	07:46	07:28	07:56 (WTG04)	06:51	07:02	07:40 (WTG02)	06:20	07:05 (WTG01)	05:57	06:47 (WTG01)
	17:14	17:49	16 08:12 (WTG04)	18:21	19:53	14 07:54 (WTG02)	20:22	27 07:32 (WTG01)	20:49	67 07:54 (WTG01)
7	07:46	07:27	07:58 (WTG04)	06:50	07:01	07:44 (WTG02)	06:19	07:03 (WTG01)	05:57	06:47 (WTG01)
	17:15	17:50	13 08:11 (WTG04)	18:22	19:54	7 07:51 (WTG02)	20:23	32 07:35 (WTG01)	20:49	67 07:54 (WTG01)
8	07:46	07:26	07:59 (WTG04)	06:48	06:59		06:18	07:01 (WTG01)	05:57	06:47 (WTG01)
	17:16	17:51	9 08:08 (WTG04)	18:23	19:55		20:24	36 07:37 (WTG01)	20:50	68 07:55 (WTG01)
9	07:45	07:25		06:47	06:58		06:17	06:59 (WTG01)	05:56	06:47 (WTG01)
	17:17	17:53		18:24	19:56		20:25	39 07:38 (WTG01)	20:51	68 07:55 (WTG01)
10	07:45	07:24		06:45	06:56		06:16	06:58 (WTG01)	05:56	06:48 (WTG01)
	17:18	17:54		18:25	19:57		20:26	42 07:40 (WTG01)	20:51	67 07:55 (WTG01)
11	07:45	07:23		06:44	06:54		06:15	06:56 (WTG01)	05:56	06:47 (WTG01)
	17:19	17:55		18:26	19:58		20:27	45 07:41 (WTG01)	20:52	68 07:55 (WTG01)
12	07:45	07:22		06:42	06:53		06:14	06:55 (WTG01)	05:56	06:47 (WTG01)
	17:20	17:56		18:27	19:59		20:28	47 07:42 (WTG01)	20:52	68 07:55 (WTG01)
13	07:45	07:20		06:41	06:51		06:13	06:54 (WTG01)	05:56	06:47 (WTG01)
	17:21	17:57		18:28	19:59		20:29	49 07:43 (WTG01)	20:53	68 07:55 (WTG01)
14	07:44	07:19		06:39	06:50		06:12	06:53 (WTG01)	05:56	06:48 (WTG01)
	17:22	17:59		18:29	20:00		20:30	51 07:44 (WTG01)	20:53	67 07:55 (WTG01)
15	07:44	07:18		06:37	06:48		06:11	06:53 (WTG01)	05:56	06:48 (WTG01)
	17:23	18:00		18:30	20:01		20:31	53 07:46 (WTG01)	20:54	67 07:55 (WTG01)
16	07:44	07:17		06:36	06:47		06:10	06:52 (WTG01)	05:56	06:48 (WTG01)
	17:25	18:01		18:31	20:02		20:32	54 07:46 (WTG01)	20:54	68 07:56 (WTG01)
17	07:43	07:16		06:34	06:45		06:09	06:51 (WTG01)	05:56	06:49 (WTG01)
	17:26	18:02		18:32	20:03		20:33	56 07:47 (WTG01)	20:54	68 07:57 (WTG01)
18	07:43	07:14		06:33	06:44		06:08	06:50 (WTG01)	05:56	06:49 (WTG01)
	17:27	18:03		18:33	20:04		20:34	57 07:47 (WTG01)	20:55	68 07:57 (WTG01)
19	07:42	07:13		06:31	06:43		06:07	06:49 (WTG01)	05:56	06:49 (WTG01)
	17:28	18:04		18:34	20:05		20:35	59 07:48 (WTG01)	20:55	68 07:57 (WTG01)
20	07:42	07:12		06:29	06:41		06:06	06:49 (WTG01)	05:56	06:49 (WTG01)
	17:29	18:05		18:35	20:06		20:36	59 07:48 (WTG01)	20:55	68 07:57 (WTG01)
21	07:41	07:10		06:28	06:40		06:06	06:49 (WTG01)	05:56	06:49 (WTG01)
	17:30	18:07		18:36	20:07		20:37	60 07:49 (WTG01)	20:55	68 07:57 (WTG01)
22	07:41	08:01 (WTG04)	07:09	06:26	06:38		06:05	06:48 (WTG01)	05:57	06:49 (WTG01)
	17:31	4 08:05 (WTG04)	18:08	18:37	20:08		20:37	61 07:49 (WTG01)	20:56	68 07:57 (WTG01)
23	07:40	08:00 (WTG04)	07:08	06:25	06:37	06:49 (WTG02)	06:04	06:47 (WTG01)	05:57	06:50 (WTG01)
	17:32	7 08:07 (WTG04)	18:09	18:38	7 06:56 (WTG02)	20:09	20:38	63 07:50 (WTG01)	20:56	68 07:58 (WTG01)
24	07:39	07:59 (WTG04)	07:06	06:23	06:45 (WTG02)	06:35	06:03	06:48 (WTG01)	05:57	06:50 (WTG01)
	17:34	9 08:08 (WTG04)	18:10	18:39	13 06:58 (WTG02)	20:10	20:39	63 07:51 (WTG01)	20:56	68 07:58 (WTG01)
25	07:39	07:59 (WTG04)	07:05	06:21	06:43 (WTG02)	06:34	06:03	06:47 (WTG01)	05:57	06:50 (WTG01)
	17:35	11 08:10 (WTG04)	18:11	18:40	17 07:00 (WTG02)	20:11	20:40	64 07:51 (WTG01)	20:56	68 07:58 (WTG01)
26	07:38	07:58 (WTG04)	07:03	06:20	06:41 (WTG02)	06:33	06:02	06:47 (WTG01)	05:58	06:51 (WTG01)
	17:36	13 08:11 (WTG04)	18:12	18:42	20 07:01 (WTG02)	20:12	20:41	64 07:51 (WTG01)	20:56	68 07:59 (WTG01)
27	07:37	07:57 (WTG04)	07:02	06:18	06:39 (WTG02)	06:31	06:02	06:47 (WTG01)	05:58	06:51 (WTG01)
	17:37	15 08:12 (WTG04)	18:13	18:43	22 07:01 (WTG02)	20:13	20:42	64 07:51 (WTG01)	20:56	68 07:59 (WTG01)
28	07:37	07:56 (WTG04)	07:00	06:17	06:39 (WTG02)	06:30	06:01	06:47 (WTG01)	05:58	06:51 (WTG01)
	17:38	16 08:12 (WTG04)	18:14	18:44	23 07:02 (WTG02)	20:14	20:42	65 07:52 (WTG01)	20:56	67 07:58 (WTG01)
29	07:36	07:55 (WTG04)		07:15	07:38 (WTG02)	06:29	06:00	06:47 (WTG01)	05:59	06:51 (WTG01)
	17:40	18 08:13 (WTG04)		19:45	24 08:02 (WTG02)	20:15	20:43	65 07:52 (WTG01)	20:56	68 07:59 (WTG01)
30	07:35	07:55 (WTG04)		07:13	07:37 (WTG02)	06:28	06:00	06:47 (WTG01)	05:59	06:51 (WTG01)
	17:41	19 08:14 (WTG04)		19:46	24 08:01 (WTG02)	20:16	20:44	66 07:53 (WTG01)	20:56	68 07:59 (WTG01)
31	07:34	07:54 (WTG04)		07:12	07:37 (WTG02)		05:59	06:46 (WTG01)		
	17:42	20 08:14 (WTG04)		19:47	25 08:02 (WTG02)		20:45	66 07:52 (WTG01)		
Potential sun hours	301	299	370	397	445	448				2028
Total, worst case	132	138	175	125	1438					0,66
Sun reduction	0,45	0,47	0,49	0,53	0,59					0,86
Oper. time red.	0,86	0,86	0,86	0,86	0,86					0,70
Wind dir. red.	0,81	0,81	0,78	0,78	0,70					0,40
Total reduction	0,32	0,33	0,34	0,36	0,36					0,40
Total, real	42	46	59	45	512					812

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F027 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

		July		August		September		October		November		December	
1	06:00	06:52 (WTG01)	06:22	07:06 (WTG01)	06:51	07:20	06:52	07:25					07:25
	20:56	68	08:00 (WTG01)	20:38	47	07:53 (WTG01)	19:57	19:08	17:24				17:01
2	06:00	06:52 (WTG01)	06:23	07:07 (WTG01)	06:52	07:21	06:53	07:26					07:26
	20:56	67	07:59 (WTG01)	20:37	44	07:51 (WTG01)	19:55	19:07	17:22				17:01
3	06:01	06:53 (WTG01)	06:24	07:09 (WTG01)	06:53	07:21	06:54	07:27		07:29 (WTG04)			07:27
	20:56	67	08:00 (WTG01)	20:36	41	07:50 (WTG01)	19:54	19:05	17:21	10	07:39 (WTG04)		17:00
4	06:01	06:52 (WTG01)	06:25	07:10 (WTG01)	06:54	07:22	06:55	07:27		06:55			07:28
	20:56	68	08:00 (WTG01)	20:35	39	07:49 (WTG01)	19:52	19:04	17:20	13	07:40 (WTG04)		17:00
5	06:02	06:53 (WTG01)	06:26	07:12 (WTG01)	06:55	07:23	06:56	07:29		06:56			07:29
	20:56	67	08:00 (WTG01)	20:34	35	07:47 (WTG02)	19:51	19:02	17:19	16	07:42 (WTG04)		17:00
6	06:02	06:53 (WTG01)	06:27	07:13 (WTG01)	06:56	07:24	06:57	07:30		06:57			07:30
	20:55	67	08:00 (WTG01)	20:33	31	07:44 (WTG02)	19:49	19:00	17:18	18	07:43 (WTG04)		17:00
7	06:03	06:53 (WTG01)	06:28	07:16 (WTG01)	06:57	07:25	06:59	07:31		06:59			07:31
	20:55	67	08:00 (WTG01)	20:32	25	07:41 (WTG02)	19:48	18:59	17:17	20	07:44 (WTG04)		17:00
8	06:03	06:53 (WTG01)	06:29	07:19 (WTG01)	06:58	07:26	07:00	07:32		07:00			07:32
	20:55	67	08:00 (WTG01)	20:31	19	07:38 (WTG02)	19:46	18:57	17:16	20	07:44 (WTG04)		17:00
9	06:04	06:54 (WTG01)	06:30	07:28 (WTG01)	06:59	07:27	07:01	07:33		07:01			07:33
	20:54	66	08:00 (WTG01)	20:29	1	07:53 (WTG02)	19:44	18:56	17:15	21	07:45 (WTG04)		17:00
10	06:05	06:54 (WTG01)	06:31	07:00	07:00	07:28	07:02	07:34		07:02			07:34
	20:54	67	08:01 (WTG01)	20:28	19	07:43 (WTG02)	19:43	18:54	17:14	21	07:45 (WTG04)		17:00
11	06:05	06:54 (WTG01)	06:32	07:01	07:01	07:29	07:03	07:35		07:03			07:34
	20:54	66	08:00 (WTG01)	20:27	19	07:54 (WTG02)	18:53	18:53	17:13	20	07:45 (WTG04)		17:00
12	06:06	06:55 (WTG01)	06:33	07:02	07:02	07:30	07:04	07:36		07:04			07:35
	20:53	66	08:01 (WTG01)	20:26	19	07:54 (WTG02)	18:51	18:51	17:12	19	07:45 (WTG04)		17:00
13	06:07	06:55 (WTG01)	06:34	07:03	07:03	07:31	07:05	07:37		07:05			07:36
	20:53	66	08:01 (WTG01)	20:24	19	07:53 (WTG02)	18:50	18:50	17:11	18	07:45 (WTG04)		17:00
14	06:08	06:55 (WTG01)	06:35	07:04	07:04	07:32	07:07	07:38		07:07			07:37
	20:52	65	08:00 (WTG01)	20:23	19	07:52 (WTG02)	18:48	18:48	17:10	16	07:45 (WTG04)		17:00
15	06:08	06:55 (WTG01)	06:36	07:04	07:04	07:33	07:08	07:39		07:08			07:37
	20:52	66	08:01 (WTG01)	20:22	19	07:52 (WTG02)	18:47	18:47	17:10	15	07:45 (WTG04)		17:01
16	06:09	06:56 (WTG01)	06:36	07:05	07:05	07:34	07:09	07:40		07:09			07:38
	20:51	65	08:01 (WTG01)	20:20	19	07:51 (WTG02)	18:45	18:45	17:09	13	07:44 (WTG04)		17:01
17	06:10	06:57 (WTG01)	06:37	07:06	07:06	07:35	07:10	07:41		07:10			07:39
	20:51	64	08:01 (WTG01)	20:19	19	07:50 (WTG02)	18:44	18:44	17:08	11	07:43 (WTG04)		17:01
18	06:11	06:56 (WTG01)	06:38	07:07	07:07	07:36	07:11	07:42		07:11			07:39
	20:50	64	08:00 (WTG01)	20:18	19	07:50 (WTG02)	18:42	18:42	17:07	9	07:42 (WTG04)		17:02
19	06:11	06:57 (WTG01)	06:39	07:08	07:08	07:37	07:12	07:43		07:12			07:40
	20:49	63	08:00 (WTG01)	20:16	19	07:46 (WTG02)	18:41	18:41	17:07	7	07:42 (WTG04)		17:02
20	06:12	06:58 (WTG01)	06:40	07:09	07:09	07:38	07:13	07:44		07:13			07:41
	20:49	62	08:00 (WTG01)	20:15	9	07:43 (WTG02)	18:39	18:39	17:06	4	07:40 (WTG04)		17:02
21	06:13	06:58 (WTG01)	06:41	07:10	07:10	07:39	07:14	07:45		07:14			07:41
	20:48	62	08:00 (WTG01)	20:13	19	07:54 (WTG02)	18:38	18:38	17:05				17:03
22	06:14	06:59 (WTG01)	06:42	07:11	07:11	07:40	07:16	07:46		07:16			07:42
	20:47	61	08:00 (WTG01)	20:12	19	07:54 (WTG02)	18:36	18:36	17:05				17:03
23	06:15	06:59 (WTG01)	06:43	07:12	07:12	07:41	07:17	07:47		07:17			07:42
	20:46	60	07:59 (WTG01)	20:11	19	07:54 (WTG02)	18:35	18:35	17:04				17:04
24	06:15	06:59 (WTG01)	06:44	07:13	07:13	07:42	07:18	07:48		07:18			07:43
	20:46	59	07:58 (WTG01)	20:09	19	07:54 (WTG02)	18:34	18:34	17:04				17:04
25	06:16	07:00 (WTG01)	06:45	07:14	07:14	07:43	07:19	07:49		07:19			07:43
	20:45	58	07:58 (WTG01)	20:08	19	07:54 (WTG02)	18:32	18:32	17:03				17:05
26	06:17	07:01 (WTG01)	06:46	07:15	07:15	07:44	07:20	07:50		07:20			07:44
	20:44	57	07:58 (WTG01)	20:06	19	07:54 (WTG02)	18:31	18:31	17:03				17:06
27	06:18	07:02 (WTG01)	06:47	07:16	07:16	07:45	07:21	07:51		07:21			07:44
	20:43	55	07:57 (WTG01)	20:05	19	07:54 (WTG02)	18:30	18:30	17:02				17:06
28	06:19	07:03 (WTG01)	06:48	07:17	07:17	07:46	07:22	07:52		07:22			07:44
	20:42	54	07:57 (WTG01)	20:03	19	07:54 (WTG02)	18:29	18:29	17:02				17:07
29	06:20	07:03 (WTG01)	06:49	07:18	07:18	07:47	07:23	07:53		07:23			07:45
	20:41	52	07:55 (WTG01)	20:02	19	07:54 (WTG02)	18:27	18:27	17:01				17:08
30	06:21	07:04 (WTG01)	06:50	07:19	07:19	07:48	07:24	07:54		07:24			07:45
	20:40	50	07:54 (WTG01)	20:00	19	07:54 (WTG02)	18:26	18:26	17:01				17:08
31	06:22	07:05 (WTG01)	06:51	07:20	07:20	07:49	07:25	07:55		07:25			07:45
	20:39	49	07:54 (WTG01)	19:59	19	07:54 (WTG02)	18:25	18:25	17:00				17:09
Potential sun hours	455		425		374		347		301				292
Total, worst case	1935		282		307				271				
Sun reduction	0,74		0,73		0,65				0,51				
Oper. time red.	0,86		0,86		0,86				0,86				
Wind dir. red.	0,70		0,70		0,78				0,81				
Total reduction	0,45		0,44		0,44				0,35				
Total, real	863		125		135				96				

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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## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F042 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June	
1	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:48	07:30 (WTG02) 20:17	06:26 20:46	06:35 (WTG01) 43 07:18 (WTG01)
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	07:29 (WTG02) 20:18	06:25 20:46	06:34 (WTG01) 44 07:18 (WTG01)
3	07:46 17:12	07:31 17:45	07:51 (WTG04) 06:56 18:18	07:07 19:50	07:27 (WTG02) 20:19	06:24 20:47	06:34 (WTG01) 45 07:19 (WTG01)
4	07:46 17:13	07:30 17:47	07:50 (WTG04) 06:54 18:19	07:05 19:51	07:27 (WTG02) 20:20	06:23 20:48	06:34 (WTG01) 46 07:20 (WTG01)
5	07:46 17:14	07:29 17:48	07:49 (WTG04) 06:53 18:20	07:04 19:52	07:26 (WTG02) 20:21	06:21 20:48	06:34 (WTG01) 46 07:20 (WTG01)
6	07:46 17:14	07:28 17:49	07:48 (WTG04) 06:51 18:21	07:02 19:53	07:25 (WTG02) 20:22	06:20 20:49	06:33 (WTG01) 47 07:20 (WTG01)
7	07:46 17:15	07:27 17:50	07:47 (WTG04) 06:50 18:22	07:01 19:54	07:25 (WTG02) 20:23	06:19 20:49	06:34 (WTG01) 47 07:21 (WTG01)
8	07:46 17:16	07:26 17:51	07:45 (WTG04) 06:48 18:23	06:59 19:55	07:24 (WTG02) 20:24	06:18 20:50	06:34 (WTG01) 47 07:21 (WTG01)
9	07:45 17:17	07:25 17:53	07:44 (WTG04) 06:47 18:24	06:58 19:56	07:25 (WTG02) 20:25	06:17 20:51	06:34 (WTG01) 48 07:22 (WTG01)
10	07:45 17:18	07:24 17:54	07:43 (WTG04) 06:45 18:25	06:56 19:57	07:25 (WTG02) 20:26	06:16 20:51	06:34 (WTG01) 48 07:22 (WTG01)
11	07:45 17:19	07:23 17:55	07:42 (WTG04) 06:44 18:26	06:54 19:58	07:26 (WTG02) 20:27	06:15 20:52	06:34 (WTG01) 49 07:23 (WTG01)
12	07:45 17:20	07:22 17:56	07:41 (WTG04) 06:42 18:27	06:53 19:59	07:27 (WTG02) 20:28	06:14 20:52	06:33 (WTG01) 49 07:22 (WTG01)
13	07:45 17:21	07:20 17:57	07:42 (WTG04) 06:41 18:28	06:51 20:00	07:29 (WTG02) 20:29	06:13 20:53	06:33 (WTG01) 50 07:23 (WTG01)
14	07:44 17:22	07:19 17:59	07:42 (WTG04) 06:39 18:29	06:50 20:01	07:32 (WTG02) 20:30	06:12 20:53	06:33 (WTG01) 50 07:23 (WTG01)
15	07:44 17:24	07:18 18:00	07:43 (WTG04) 06:37 18:30	06:48 20:02	07:36 (WTG02) 20:31	06:11 20:54	06:33 (WTG01) 50 07:23 (WTG01)
16	07:44 17:25	07:17 18:01	07:44 (WTG04) 06:36 18:31	06:47 20:03	07:32 (WTG02) 20:32	06:10 20:54	06:33 (WTG01) 51 07:24 (WTG01)
17	07:43 17:26	07:16 18:02	07:45 (WTG04) 06:34 18:32	06:45 20:03	07:32 (WTG02) 20:33	06:09 20:54	06:34 (WTG01) 51 07:25 (WTG01)
18	07:43 17:27	07:14 18:03	07:49 (WTG04) 06:33 18:33	06:44 20:04	07:32 (WTG02) 20:34	06:08 20:55	06:34 (WTG01) 51 07:25 (WTG01)
19	07:42 17:28	07:13 18:04	07:53 (WTG04) 06:31 18:34	06:43 20:05	07:32 (WTG02) 20:35	06:07 20:55	06:35 (WTG01) 50 07:25 (WTG01)
20	07:42 17:29	07:12 18:05	06:29 18:35	06:41 20:06	06:06 20:36	06:49 (WTG01) 20:55	06:35 (WTG01) 50 07:25 (WTG01)
21	07:41 17:30	07:10 18:07	06:28 18:36	06:40 20:07	06:06 20:37	06:46 (WTG01) 20:55	06:35 (WTG01) 50 07:25 (WTG01)
22	07:41 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	06:44 (WTG01) 20:56	06:35 (WTG01) 50 07:25 (WTG01)
23	07:40 17:32	07:08 18:09	06:25 18:38	06:37 20:09	06:04 20:38	06:42 (WTG01) 20:56	06:36 (WTG01) 50 07:26 (WTG01)
24	07:39 17:34	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	06:41 (WTG01) 20:56	06:35 (WTG01) 51 07:26 (WTG01)
25	07:39 17:35	07:05 18:11	06:21 18:41	06:34 20:11	06:03 20:40	06:39 (WTG01) 20:56	06:35 (WTG01) 51 07:26 (WTG01)
26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:13	06:02 20:41	06:39 (WTG01) 20:56	06:36 (WTG01) 51 07:27 (WTG01)
27	07:37 17:37	07:02 18:13	06:18 18:43	06:31 20:14	06:02 20:42	06:38 (WTG01) 20:56	06:36 (WTG01) 50 07:26 (WTG01)
28	07:37 17:38	07:00 18:14	06:17 18:44	06:30 20:15	06:01 20:42	06:37 (WTG01) 20:56	06:36 (WTG01) 50 07:26 (WTG01)
29	07:36 17:40		07:15 19:45	06:29 20:16	06:00 20:43	07:15 (WTG01) 20:56	06:37 (WTG01) 50 07:27 (WTG01)
30	07:35 17:41		07:13 19:46	06:28 20:16	06:00 20:44	06:36 (WTG01) 20:56	06:37 (WTG01) 50 07:27 (WTG01)
31	07:34 17:42		07:12 19:47	07:33 (WTG02) 07:44 (WTG02)	05:59 20:45	06:35 (WTG01) 07:17 (WTG01)	
Potential sun hours	301	299	370	397	445	448	1465
Total, worst case		216	11	255	370		0,66
Sun reduction		0,47	0,49	0,53	0,59		0,86
Oper. time red.		0,86	0,86	0,86	0,86		0,67
Wind dir. red.		0,81	0,77	0,77	0,67		0,39
Total reduction		0,33	0,33	0,36	0,34		566
Total, real		72	4	91	127		

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F042 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	July	August	September	October	November	December
1	06:00 20:56	06:38 (WTG01) 07:27 (WTG01)	06:22 20:38	06:51 19:57	07:25 (WTG02) 07:43 (WTG02)	07:20 19:08
2	06:00 20:56	06:38 (WTG01) 07:27 (WTG01)	06:23 20:37	06:52 19:55	07:24 (WTG02) 07:44 (WTG02)	07:21 19:07
3	06:01 20:56	06:39 (WTG01) 07:27 (WTG01)	06:24 20:36	06:53 19:54	07:23 (WTG02) 07:45 (WTG02)	07:21 19:05
4	06:01 20:56	06:39 (WTG01) 07:27 (WTG01)	06:25 20:35	06:54 19:52	07:22 (WTG02) 07:44 (WTG02)	07:22 19:04
5	06:02 20:56	06:40 (WTG01) 07:27 (WTG01)	06:26 20:34	06:55 19:51	07:21 (WTG02) 07:44 (WTG02)	07:23 19:02
6	06:02 20:55	06:40 (WTG01) 07:26 (WTG01)	06:27 20:33	06:56 19:49	07:21 (WTG02) 07:44 (WTG02)	07:24 19:00
7	06:03 20:55	06:40 (WTG01) 07:27 (WTG01)	06:28 20:32	06:57 19:48	07:21 (WTG02) 07:43 (WTG02)	07:25 18:59
8	06:03 20:55	06:40 (WTG01) 07:26 (WTG01)	06:29 20:31	06:58 19:46	07:21 (WTG02) 07:42 (WTG02)	07:26 18:57
9	06:04 20:54	06:41 (WTG01) 07:26 (WTG01)	06:30 20:29	06:59 19:44	07:21 (WTG02) 07:42 (WTG02)	07:27 18:56
10	06:05 20:54	06:42 (WTG01) 07:26 (WTG01)	06:31 20:28	07:00 19:43	07:22 (WTG02) 07:40 (WTG02)	07:28 18:54
11	06:05 20:54	06:42 (WTG01) 07:25 (WTG01)	06:32 20:27	07:01 19:41	07:23 (WTG02) 07:39 (WTG02)	07:29 18:53
12	06:06 20:53	06:43 (WTG01) 07:25 (WTG01)	06:33 20:26	07:02 19:39	07:25 (WTG02) 07:37 (WTG02)	07:30 18:51
13	06:07 20:53	06:44 (WTG01) 07:25 (WTG01)	06:34 20:24	07:03 19:38	07:28 (WTG02) 07:31 (WTG02)	07:31 18:50
14	06:08 20:52	06:44 (WTG01) 07:24 (WTG01)	06:35 20:23	07:04 19:36	07:32 18:48	07:32 18:48
15	06:08 20:52	06:45 (WTG01) 07:24 (WTG01)	06:36 20:22	07:04 19:35	07:33 18:47	07:33 18:47
16	06:09 20:51	06:47 (WTG01) 07:23 (WTG01)	06:36 20:20	07:05 19:33	07:35 18:45	07:38 18:45
17	06:10 20:51	06:48 (WTG01) 07:23 (WTG01)	06:37 20:19	07:06 19:31	07:36 18:44	07:39 18:44
18	06:11 20:50	06:48 (WTG01) 07:21 (WTG01)	06:38 20:18	07:07 19:30	07:37 18:42	07:39 18:42
19	06:11 20:49	06:50 (WTG01) 07:20 (WTG01)	06:39 20:16	07:08 19:28	07:38 18:41	07:40 18:41
20	06:12 20:49	06:51 (WTG01) 07:19 (WTG01)	06:40 20:15	07:09 19:26	07:39 18:39	07:41 18:39
21	06:13 20:48	06:53 (WTG01) 07:18 (WTG01)	06:41 20:13	07:10 19:25	07:40 18:38	07:41 18:38
22	06:14 20:47	06:55 (WTG01) 07:16 (WTG01)	06:42 20:12	07:11 19:23	07:41 18:37	07:42 18:37
23	06:15 20:46	06:57 (WTG01) 07:13 (WTG01)	06:43 20:11	07:12 19:21	07:42 18:35	07:42 18:35
24	06:15 20:46	07:01 (WTG01) 07:09 (WTG01)	06:44 20:09	07:13 19:20	07:43 18:34	07:43 18:34
25	06:16 20:45	07:09 (WTG01) 07:08 (WTG01)	06:45 20:08	07:14 19:18	08:17 (WTG04) 07:15 (WTG04)	07:18 07:19
26	06:17 20:44	07:09 (WTG01) 07:07 (WTG01)	06:46 20:06	07:15 19:16	07:15 (WTG04) 07:27 (WTG04)	07:20 17:03
27	06:18 20:43	07:09 (WTG01) 20:05	06:47 20:05	07:16 19:15	07:12 (WTG04) 07:30 (WTG04)	07:21 17:02
28	06:19 20:42	07:09 (WTG01) 20:03	06:48 20:03	07:17 19:13	07:11 (WTG04) 07:30 (WTG04)	07:22 17:02
29	06:20 20:41	07:09 (WTG01) 20:02	06:49 20:02	07:18 19:12	07:11 (WTG04) 07:30 (WTG04)	07:23 17:01
30	06:21 20:40	07:09 (WTG01) 20:00	06:50 20:00	07:19 19:10	07:10 (WTG04) 07:30 (WTG04)	07:24 17:01
31	06:22 20:39	07:09 (WTG01) 19:59	06:51 19:59	07:20 19:09	07:10 (WTG04) 07:31 (WTG04)	07:24 17:01
Potential sun hours	455	425	374	347	301	292
Total, worst case	906	31	241	129	89	
Sun reduction	0,74	0,73	0,65	0,54	0,51	
Oper. time red.	0,86	0,86	0,86	0,86	0,86	
Wind dir. red.	0,67	0,77	0,77	0,81	0,81	
Total reduction	0,43	0,49	0,43	0,38	0,36	
Total, real	390	15	105	49	32	

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F063 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:45 17:10	08:07 (WTG02) 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:46	06:00 20:56	06:22 20:38	06:51 19:57	07:20 19:08	06:52 17:24	07:25 17:01	07:48 (WTG02) 28 08:16 (WTG02)
2	07:45 17:11	08:07 (WTG02) 17:44	06:57 18:17	07:09 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00	07:49 (WTG02) 27 08:16 (WTG02)
3	07:46 17:12	08:07 (WTG02) 17:45	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00	07:50 (WTG02) 26 08:16 (WTG02)
4	07:46 17:13	08:07 (WTG02) 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00	07:51 (WTG02) 26 08:17 (WTG02)
5	07:46 17:13	08:07 (WTG02) 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00	07:52 (WTG02) 25 08:17 (WTG02)
6	07:46 17:14	08:07 (WTG02) 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00	07:53 (WTG02) 24 08:17 (WTG02)
7	07:46 17:15	08:07 (WTG02) 17:50	06:48 18:22	07:01 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:48	07:25 18:59	06:59 17:17	07:31 17:00	07:54 (WTG02) 24 08:18 (WTG02)
8	07:46 17:16	08:07 (WTG02) 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:57 20:50	06:03 20:55	06:29 20:31	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00	07:55 (WTG02) 23 08:18 (WTG02)
9	07:45 17:17	08:07 (WTG02) 17:53	06:47 18:24	06:58 19:55	06:17 20:25	05:56 20:51	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:01 17:15	07:33 17:00	07:56 (WTG02) 22 08:18 (WTG02)
10	07:45 17:18	08:07 (WTG02) 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:34 17:00	07:57 (WTG02) 22 08:19 (WTG02)
11	07:45 17:19	08:06 (WTG02) 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	07:03 17:13	07:34 17:00	07:57 (WTG02) 21 08:18 (WTG02)
12	07:45 17:20	08:06 (WTG02) 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00	07:58 (WTG02) 21 08:19 (WTG02)
13	07:45 17:21	08:05 (WTG02) 17:57	06:41 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00	07:59 (WTG02) 20 08:19 (WTG02)
14	07:44 17:22	08:05 (WTG02) 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:35 20:23	07:03 19:36	07:32 18:48	07:07 17:10	07:37 17:00	08:00 (WTG02) 20 08:20 (WTG02)
15	07:44 17:23	08:06 (WTG02) 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:54	06:08 20:52	06:35 20:22	07:04 19:35	07:33 18:47	07:08 17:09	07:38 17:00	08:00 (WTG02) 14 08:01 (WTG02)
16	07:44 17:25	08:06 (WTG02) 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:39 17:00	08:01 (WTG02) 17 08:05 (WTG02)
17	07:43 17:26	08:07 (WTG02) 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08	07:40 17:00	08:02 (WTG02) 20 08:07 (WTG02)
18	07:43 17:27	08:07 (WTG02) 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:55	06:10 20:50	06:38 20:18	07:07 19:30	07:37 18:42	07:11 17:07	07:41 17:00	08:02 (WTG02) 22 08:08 (WTG02)
19	07:42 17:28	08:08 (WTG02) 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:06	07:42 17:00	08:03 (WTG02) 24 08:10 (WTG02)
20	07:42 17:29	08:08 (WTG02) 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:43 17:00	08:03 (WTG02) 25 08:11 (WTG02)
21	07:41 17:30	08:09 (WTG02) 18:07	06:28 18:36	06:40 20:07	06:06 20:37	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:44 17:00	08:04 (WTG02) 26 08:11 (WTG02)
22	07:41 17:31	08:10 (WTG02) 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:16 17:05	07:45 17:00	08:04 (WTG02) 27 08:12 (WTG02)
23	07:40 17:32	08:11 (WTG02) 18:09	06:25 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:46 17:00	08:05 (WTG02) 28 08:12 (WTG02)
24	07:39 17:34	08:12 (WTG02) 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:47 17:00	08:05 (WTG02) 28 08:14 (WTG02)
25	07:39 17:35	08:14 (WTG02) 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:08	07:14 19:18	07:44 17:32	07:19 17:03	07:48 17:00	08:06 (WTG02) 29 08:15 (WTG02)
26	07:38 17:36	08:15 (WTG02) 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	07:45 17:31	07:20 17:03	07:49 17:00	08:06 (WTG02) 29 08:14 (WTG02)
27	07:37 17:37	08:17 (WTG02) 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:21 17:02	07:50 17:00	08:06 (WTG02) 30 08:15 (WTG02)
28	07:37 17:38	08:19 (WTG02) 18:14	06:17 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:17 19:13	07:47 17:29	07:22 17:02	07:51 17:00	08:06 (WTG02) 30 08:15 (WTG02)
29	07:36 17:39	08:21 (WTG02) 18:15	06:16 18:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	07:48 17:27	07:23 17:01	07:52 17:00	08:07 (WTG02) 29 08:15 (WTG02)
30	07:35 17:41	08:23 (WTG02) 18:16	06:15 18:45	06:27 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	07:49 17:26	07:24 17:01	07:53 17:00	08:07 (WTG02) 28 08:15 (WTG02)
31	07:34 17:42	08:25 (WTG02) 18:17	06:14 18:46	06:25 20:17	06:00 20:45	05:59 20:56	06:22 20:39	06:50 19:59	07:20 19:59	07:50 17:25	07:25 17:01	07:54 17:00	08:07 (WTG02) 20 08:27 (WTG02)
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292	647
Total, worst case	682										415		647
Sun reduction	0,45										0,51		0,45
Oper. time red.	0,86										0,86		0,86
Wind dir. red.	0,79										0,79		0,79
Total reduction	0,31										0,35		0,31
Total, real	212										144		201

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: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F064 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

January		February		March		April		May		June		
1	07:45	15:42 (WTG16)	07:33	08:06 (WTG03)	06:59	07:10	06:26	05:59	06:35 (WTG02)			
	17:10	52 16:34 (WTG17)	17:43	80 16:46 (WTG16)	18:15	19:48	20:17	20:45	21 06:56 (WTG02)			
2	07:45	15:42 (WTG16)	07:32	08:08 (WTG03)	06:57	07:09	06:25	05:58	06:35 (WTG02)			
	17:11	52 16:34 (WTG17)	17:44	77 16:46 (WTG16)	18:17	19:49	20:18	20:46	20 06:55 (WTG02)			
3	07:46	15:42 (WTG16)	07:31	08:09 (WTG03)	06:56	07:07	06:24	05:58	06:36 (WTG02)			
	17:12	52 16:34 (WTG17)	17:45	72 16:45 (WTG16)	18:18	19:50	20:19	20:47	19 06:55 (WTG02)			
4	07:46	15:42 (WTG16)	07:30	08:12 (WTG03)	06:54	07:05	06:23	05:58	06:37 (WTG02)			
	17:13	52 16:34 (WTG17)	17:47	67 16:45 (WTG16)	18:19	19:51	20:20	20:48	18 06:55 (WTG02)			
5	07:46	08:07 (WTG03)	07:29	15:49 (WTG16)	06:53	07:04	06:21	05:57	06:37 (WTG02)			
	17:14	55 16:35 (WTG17)	17:48	56 16:45 (WTG16)	18:20	19:52	20:21	20:48	18 06:55 (WTG02)			
6	07:46	08:07 (WTG03)	07:28	15:50 (WTG16)	06:51	07:02	06:20	05:57	06:37 (WTG02)			
	17:14	57 16:35 (WTG17)	17:49	55 16:45 (WTG16)	18:21	19:53	20:22	20:49	17 06:54 (WTG02)			
7	07:46	08:07 (WTG03)	07:27	15:51 (WTG16)	06:50	07:01	06:19	05:57	06:38 (WTG02)			
	17:15	59 16:35 (WTG17)	17:50	53 16:44 (WTG16)	18:22	19:54	20:23	20:49	16 06:54 (WTG02)			
8	07:46	08:07 (WTG03)	07:26	15:51 (WTG16)	06:48	07:09 (WTG04)	06:59	06:18	05:57	06:39 (WTG02)		
	17:16	61 16:35 (WTG17)	17:51	52 16:43 (WTG16)	18:23	5 07:14 (WTG04)	19:55	20:24	15 06:54 (WTG02)			
9	07:45	08:07 (WTG03)	07:25	15:52 (WTG16)	06:47	07:05 (WTG04)	06:58	06:17	05:56	06:40 (WTG02)		
	17:17	64 16:36 (WTG17)	17:53	50 16:42 (WTG16)	18:24	12 07:17 (WTG04)	19:56	20:25	14 06:54 (WTG02)			
10	07:45	08:06 (WTG03)	07:24	15:53 (WTG16)	06:45	07:04 (WTG04)	06:56	06:16	05:56	06:41 (WTG02)		
	17:18	64 16:35 (WTG17)	17:54	49 16:42 (WTG16)	18:25	15 07:19 (WTG04)	19:56	20:26	12 06:53 (WTG02)			
11	07:45	08:06 (WTG03)	07:23	15:54 (WTG16)	06:44	07:02 (WTG04)	06:54	06:15	06:42 (WTG02)	05:56	06:41 (WTG02)	
	17:19	67 16:36 (WTG16)	17:55	47 16:41 (WTG16)	18:26	18 07:20 (WTG04)	19:57	20:27	4 06:46 (WTG02)	05:52	12 06:53 (WTG02)	
12	07:45	08:06 (WTG03)	07:22	15:56 (WTG16)	06:42	07:01 (WTG04)	06:53	06:14	06:38 (WTG02)	05:56	06:41 (WTG02)	
	17:20	69 16:37 (WTG16)	17:56	44 16:40 (WTG16)	18:27	20 07:21 (WTG04)	19:58	20:28	11 06:49 (WTG02)	05:52	11 06:52 (WTG02)	
13	07:45	08:05 (WTG03)	07:20	15:58 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13	06:36 (WTG02)	05:56	06:42 (WTG02)	
	17:21	70 16:37 (WTG16)	17:57	41 16:39 (WTG16)	18:28	22 07:21 (WTG04)	19:59	20:29	15 06:51 (WTG02)	05:53	10 06:52 (WTG02)	
14	07:44	08:05 (WTG03)	07:19	15:58 (WTG16)	06:39	06:58 (WTG04)	06:50	06:12	06:35 (WTG02)	05:56	06:43 (WTG02)	
	17:22	73 16:38 (WTG16)	17:59	39 16:37 (WTG16)	18:29	23 07:21 (WTG04)	20:00	20:30	17 06:52 (WTG02)	05:53	8 06:51 (WTG02)	
15	07:44	08:05 (WTG03)	07:18	16:01 (WTG16)	06:37	06:59 (WTG04)	06:48	06:11	06:35 (WTG02)	05:56	06:44 (WTG02)	
	17:24	75 16:39 (WTG16)	18:00	35 16:36 (WTG16)	18:30	22 07:21 (WTG04)	20:01	20:31	19 06:54 (WTG02)	05:54	7 06:51 (WTG02)	
16	07:44	08:04 (WTG03)	07:17	16:03 (WTG16)	06:36	06:58 (WTG04)	06:47	06:10	06:34 (WTG02)	05:56	06:45 (WTG02)	
	17:25	77 16:40 (WTG16)	18:01	31 16:34 (WTG16)	18:31	22 07:20 (WTG04)	20:02	20:32	20 06:54 (WTG02)	05:54	6 06:51 (WTG02)	
17	07:43	08:04 (WTG03)	07:16	16:05 (WTG16)	06:34	06:59 (WTG04)	06:45	06:09	06:33 (WTG02)	05:56	06:46 (WTG02)	
	17:26	79 16:41 (WTG16)	18:02	26 16:31 (WTG16)	18:32	21 07:20 (WTG04)	20:03	20:33	22 06:55 (WTG02)	05:54	5 06:51 (WTG02)	
18	07:43	08:03 (WTG03)	07:14	16:09 (WTG16)	06:33	06:59 (WTG04)	06:44	06:08	06:33 (WTG02)	05:56	06:47 (WTG02)	
	17:27	81 16:41 (WTG16)	18:03	19 16:28 (WTG16)	18:33	20 07:19 (WTG04)	20:04	20:34	22 06:55 (WTG02)	05:55	3 06:50 (WTG02)	
19	07:42	08:03 (WTG03)	07:13	16:15 (WTG16)	06:31	06:59 (WTG04)	06:43	06:07	06:32 (WTG02)	05:56	06:47 (WTG02)	
	17:28	82 16:42 (WTG16)	18:04	7 16:22 (WTG16)	18:34	18 07:17 (WTG04)	20:05	20:35	23 06:55 (WTG02)	05:55	3 06:50 (WTG02)	
20	07:42	08:02 (WTG03)	07:12	06:29	06:29	07:00 (WTG04)	06:41	06:06	06:33 (WTG02)	05:56	06:48 (WTG02)	
	17:29	84 16:42 (WTG16)	18:05	18:35	16 07:16 (WTG04)	20:06	20:36	23 06:56 (WTG02)	05:55	1 06:49 (WTG02)		
21	07:41	08:01 (WTG03)	07:10	06:28	06:28	07:02 (WTG04)	06:40	06:06	06:32 (WTG02)	05:56		
	17:30	85 16:42 (WTG16)	18:07	18:36	12 07:14 (WTG04)	20:07	20:37	24 06:56 (WTG02)	05:55			
22	07:41	08:01 (WTG03)	07:09	06:26	06:26	07:05 (WTG04)	06:38	06:05	06:32 (WTG02)	05:57	06:48 (WTG02)	
	17:31	86 16:43 (WTG16)	18:08	18:37	4 07:09 (WTG04)	20:08	20:37	24 06:56 (WTG02)	05:56	1 06:49 (WTG02)		
23	07:40	08:00 (WTG03)	07:07	06:25	06:25	06:37	06:04	06:32 (WTG02)	05:57	06:49 (WTG02)		
	17:32	87 16:43 (WTG16)	18:09	18:38	20:09	20:38	24 06:56 (WTG02)	05:56	2 06:51 (WTG02)			
24	07:39	08:00 (WTG03)	07:06	06:23	06:23	06:35	06:03	06:32 (WTG02)	05:57	06:48 (WTG02)		
	17:34	88 16:44 (WTG16)	18:10	18:39	20:10	20:39	24 06:56 (WTG02)	05:56	3 06:51 (WTG02)			
25	07:39	08:01 (WTG03)	07:05	06:21	06:21	06:34	06:03	06:32 (WTG02)	05:57	06:47 (WTG02)		
	17:35	89 16:45 (WTG16)	18:11	18:40	20:11	20:40	24 06:56 (WTG02)	05:56	5 06:52 (WTG02)			
26	07:38	08:01 (WTG03)	07:03	06:20	06:20	06:33	06:02	06:33 (WTG02)	05:58	06:48 (WTG02)		
	17:36	89 16:45 (WTG16)	18:12	18:42	20:12	20:41	24 06:57 (WTG02)	05:56	5 06:53 (WTG02)			
27	07:37	08:02 (WTG03)	07:02	06:18	06:18	06:31	06:02	06:33 (WTG02)	05:58	06:47 (WTG02)		
	17:37	87 16:45 (WTG16)	18:13	18:43	20:13	20:42	23 06:56 (WTG02)	05:56	7 06:54 (WTG02)			
28	07:37	08:02 (WTG03)	07:00	06:17	06:17	06:30	06:01	06:34 (WTG02)	05:58	06:46 (WTG02)		
	17:38	86 16:45 (WTG16)	18:14	18:44	20:14	20:42	22 06:56 (WTG02)	05:56	8 06:54 (WTG02)			
29	07:36	08:02 (WTG03)	06:15	06:15	06:15	06:29	06:00	06:33 (WTG02)	05:59	06:46 (WTG02)		
	17:40	86 16:45 (WTG16)	19:45	19:45	20:15	20:43	23 06:56 (WTG02)	05:56	9 06:55 (WTG02)			
30	07:35	08:04 (WTG03)	07:13	06:13	06:13	06:28	06:00	06:34 (WTG02)	05:59	06:46 (WTG02)		
	17:41	84 16:46 (WTG16)	19:46	19:46	20:16	20:44	22 06:56 (WTG02)	05:56	10 06:56 (WTG02)			
31	07:34	08:05 (WTG03)	07:12	06:12	06:12	05:59	06:34 (WTG02)					
	17:42	83 16:46 (WTG16)	19:47	19:47		20:45	21 06:55 (WTG02)					
Potential sun hours	301		299		370		397		448			
Total, worst case	2275		900		250		431		286			
Sun reduction	0,45		0,47		0,49		0,59		0,66			
Oper. time red.	0,86		0,86		0,86		0,86		0,86			
Wind dir. red.	0,63		0,60		0,80		0,68		0,68			
Total reduction	0,24		0,24		0,34		0,35		0,39			
Total, real	557		218		85		149		111			

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
Via Santa Margherita 4
IT-09124 Cagliari
+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F064 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (July to December) and rows for each day of the month, showing sun rise/set times, shadow reduction percentages, and operational time. Includes a summary row at the bottom for 'Potential sun hours' and 'Total, real'.

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)

### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F083 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

January		February		March		April		May		June			
1	07:45	15:24 (WTG16)	07:33	07:56 (WTG03)	06:59	07:10	06:26			05:59	06:36 (WTG02)		
	17:10	65	16:29 (WTG17)	17:43	92	16:37 (WTG16)	18:15	19:48	20:17	20:45	18	06:54 (WTG02)	
2	07:45	15:24 (WTG16)	07:32	07:56 (WTG03)	06:57	07:09	06:25	07:09	06:25	05:59	06:36 (WTG02)		
	17:11	65	16:29 (WTG17)	17:44	92	16:37 (WTG16)	18:17	19:49	20:18	20:46	17	06:53 (WTG02)	
3	07:46	15:25 (WTG16)	07:31	07:57 (WTG03)	06:56	07:07	06:24	07:07	06:24	05:58	06:37 (WTG02)		
	17:12	64	16:29 (WTG17)	17:45	90	16:37 (WTG16)	18:18	19:50	20:19	20:47	16	06:53 (WTG02)	
4	07:46	15:25 (WTG16)	07:30	07:58 (WTG03)	06:54	07:05	06:23	07:05	06:23	05:58	06:38 (WTG02)		
	17:13	65	16:30 (WTG17)	17:47	86	16:36 (WTG16)	18:19	19:51	20:20	20:48	15	06:53 (WTG02)	
5	07:46	15:25 (WTG16)	07:29	07:59 (WTG03)	06:53	07:04	06:21	07:04	06:21	05:57	06:39 (WTG02)		
	17:14	65	16:30 (WTG17)	17:48	85	16:36 (WTG16)	18:20	19:52	20:21	20:48	14	06:53 (WTG02)	
6	07:46	15:25 (WTG16)	07:28	08:00 (WTG03)	06:51	07:02	06:20	07:02	06:20	05:57	06:39 (WTG02)		
	17:14	65	16:30 (WTG17)	17:49	82	16:36 (WTG16)	18:21	19:53	20:22	20:49	12	06:51 (WTG02)	
7	07:46	15:25 (WTG16)	07:27	08:02 (WTG03)	06:50	07:01	06:19	07:01	06:19	05:57	06:40 (WTG02)		
	17:15	65	16:30 (WTG17)	17:50	78	16:36 (WTG16)	18:22	19:54	20:23	20:49	11	06:51 (WTG02)	
8	07:46	15:26 (WTG16)	07:26	08:03 (WTG03)	06:48	07:02	06:18	06:59	06:18	05:57	06:41 (WTG02)		
	17:16	64	16:30 (WTG17)	17:51	72	16:34 (WTG16)	18:23	19:55	20:24	20:50	10	06:51 (WTG02)	
9	07:45	15:26 (WTG16)	07:25	08:06 (WTG03)	06:47	06:58	06:17	06:58	06:17	05:56	06:42 (WTG02)		
	17:17	64	16:30 (WTG17)	17:53	65	16:34 (WTG16)	18:24	19:56	20:25	20:51	8	06:50 (WTG02)	
10	07:45	15:25 (WTG16)	07:24	15:37 (WTG16)	06:45	06:56	06:16	06:56	06:16	05:56	06:44 (WTG02)		
	17:18	64	16:29 (WTG17)	17:54	56	16:33 (WTG16)	18:25	19:57	20:26	20:51	5	06:49 (WTG02)	
11	07:45	15:26 (WTG16)	07:23	15:38 (WTG16)	06:44	07:02 (WTG04)	06:54	06:15	06:39 (WTG02)	05:56	06:46 (WTG02)		
	17:19	63	16:29 (WTG17)	17:55	55	16:33 (WTG16)	18:26	10	07:12 (WTG04)	19:58	20:27	8	06:47 (WTG02)
12	07:45	15:26 (WTG16)	07:22	15:40 (WTG16)	06:42	07:01 (WTG04)	06:53	06:14	06:37 (WTG02)	05:56	06:48 (WTG02)		
	17:20	63	16:29 (WTG17)	17:56	52	16:32 (WTG16)	18:27	14	07:15 (WTG04)	19:58	20:28	12	06:49 (WTG02)
13	07:45	15:26 (WTG16)	07:20	15:41 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13	06:36 (WTG02)	05:56	06:50 (WTG02)		
	17:21	63	16:29 (WTG16)	17:57	50	16:31 (WTG16)	18:28	17	07:16 (WTG04)	19:59	20:29	14	06:50 (WTG02)
14	07:44	15:26 (WTG16)	07:19	15:42 (WTG16)	06:39	06:57 (WTG04)	06:50	06:12	06:34 (WTG02)	05:56	06:51 (WTG02)		
	17:22	64	16:30 (WTG16)	17:59	47	16:29 (WTG16)	18:29	19	07:16 (WTG04)	20:00	20:30	17	06:51 (WTG02)
15	07:44	15:27 (WTG16)	07:18	15:44 (WTG16)	06:37	06:56 (WTG04)	06:48	06:11	06:35 (WTG02)	05:56	06:52 (WTG02)		
	17:24	64	16:31 (WTG16)	18:00	44	16:28 (WTG16)	18:30	21	07:17 (WTG04)	20:01	20:31	18	06:53 (WTG02)
16	07:44	08:04 (WTG03)	07:17	15:46 (WTG16)	06:36	06:55 (WTG04)	06:47	06:10	06:34 (WTG02)	05:56	06:53 (WTG02)		
	17:25	67	16:31 (WTG16)	18:01	41	16:27 (WTG16)	18:31	21	07:16 (WTG04)	20:02	20:32	20	06:54 (WTG02)
17	07:43	08:04 (WTG03)	07:16	15:47 (WTG16)	06:34	06:55 (WTG04)	06:45	06:09	06:33 (WTG02)	05:56	06:54 (WTG02)		
	17:26	71	16:32 (WTG16)	18:02	37	16:24 (WTG16)	18:32	22	07:17 (WTG04)	20:03	20:33	21	06:54 (WTG02)
18	07:43	08:03 (WTG03)	07:14	15:50 (WTG16)	06:33	06:55 (WTG04)	06:44	06:08	06:33 (WTG02)	05:56	06:55 (WTG02)		
	17:27	75	16:32 (WTG16)	18:03	32	16:22 (WTG16)	18:33	21	07:16 (WTG04)	20:04	20:34	21	06:54 (WTG02)
19	07:42	08:03 (WTG03)	07:13	15:53 (WTG16)	06:31	06:54 (WTG04)	06:43	06:07	06:32 (WTG02)	05:56	06:55 (WTG02)		
	17:28	77	16:33 (WTG16)	18:04	27	16:20 (WTG16)	18:34	21	07:15 (WTG04)	20:05	20:35	22	06:54 (WTG02)
20	07:42	08:02 (WTG03)	07:12	15:57 (WTG16)	06:29	06:55 (WTG04)	06:41	06:06	06:33 (WTG02)	05:56	06:55 (WTG02)		
	17:29	80	16:34 (WTG16)	18:05	19	16:16 (WTG16)	18:35	20	07:15 (WTG04)	20:06	20:36	22	06:55 (WTG02)
21	07:41	08:01 (WTG03)	07:10	06:28	06:28	06:55 (WTG04)	06:40	06:06	06:32 (WTG02)	05:56	06:56 (WTG02)		
	17:30	82	16:34 (WTG16)	18:07	18	18:36	18:36	18	07:13 (WTG04)	20:07	20:37	23	06:55 (WTG02)
22	07:41	08:01 (WTG03)	07:09	06:26	06:26	06:56 (WTG04)	06:38	06:05	06:32 (WTG02)	05:57	06:56 (WTG02)		
	17:31	84	16:35 (WTG16)	18:08	15	18:37	18:37	15	07:11 (WTG04)	20:08	20:37	23	06:55 (WTG02)
23	07:40	08:00 (WTG03)	07:08	06:25	06:25	06:59 (WTG04)	06:37	06:04	06:32 (WTG02)	05:57	06:57 (WTG02)		
	17:32	86	16:35 (WTG16)	18:09	10	18:38	18:38	10	07:09 (WTG04)	20:09	20:38	23	06:55 (WTG02)
24	07:39	07:59 (WTG03)	07:06	06:23	06:23	06:35	06:03	06:03	06:33 (WTG02)	05:57	06:58 (WTG02)		
	17:34	88	16:35 (WTG16)	18:10	06:29	06:36	06:03	22	06:55 (WTG02)	20:10	20:39	22	06:55 (WTG02)
25	07:39	07:59 (WTG03)	07:05	06:21	06:21	06:34	06:03	06:03	06:32 (WTG02)	05:57	06:59 (WTG02)		
	17:35	89	16:36 (WTG16)	18:11	06:20	06:37	06:03	23	06:55 (WTG02)	20:11	20:40	23	06:55 (WTG02)
26	07:38	07:58 (WTG03)	07:03	06:20	06:20	06:33	06:02	06:02	06:33 (WTG02)	05:58	06:60 (WTG02)		
	17:36	91	16:36 (WTG16)	18:12	06:19	06:34	06:02	22	06:55 (WTG02)	20:12	20:41	22	06:55 (WTG02)
27	07:37	07:57 (WTG03)	07:02	06:18	06:18	06:31	06:02	06:02	06:33 (WTG02)	05:58	06:61 (WTG02)		
	17:37	92	16:36 (WTG16)	18:13	06:17	06:32	06:01	22	06:55 (WTG02)	20:13	20:42	22	06:55 (WTG02)
28	07:37	07:56 (WTG03)	07:00	06:17	06:17	06:30	06:01	06:01	06:34 (WTG02)	05:58	06:62 (WTG02)		
	17:38	92	16:36 (WTG16)	18:14	06:16	06:31	06:00	21	06:55 (WTG02)	20:14	20:42	21	06:55 (WTG02)
29	07:36	07:55 (WTG03)		06:15	06:15	06:29	06:00	06:00	06:34 (WTG02)	05:59	06:63 (WTG02)		
	17:40	93	16:36 (WTG16)		06:14	06:30	06:00	20	06:54 (WTG02)	20:15	20:43	20	06:54 (WTG02)
30	07:35	07:55 (WTG03)		06:13	06:13	06:28	06:00	06:00	06:35 (WTG02)	05:59	06:64 (WTG02)		
	17:41	94	16:37 (WTG16)		06:12	06:29	06:00	20	06:55 (WTG02)	20:16	20:44	20	06:55 (WTG02)
31	07:34	07:56 (WTG03)		06:11	06:11	06:27	06:00	06:00	06:35 (WTG02)	05:59	06:65 (WTG02)		
	17:42	93	16:37 (WTG16)		06:10	06:28	06:00	19	06:54 (WTG02)	20:17	20:45	19	06:54 (WTG02)
Potential sun hours	301		299		370		397		445		448		
Total, worst case	2317		1202		229		413		128		0,66		
Sun reduction	0,45		0,47		0,49		0,59		0,86		0,86		
Oper. time red.	0,86		0,86		0,86		0,86		0,68		0,68		
Wind dir. red.	0,59		0,60		0,80		0,68		0,39		0,39		
Total reduction	0,23		0,24		0,34		0,35		50		50		
Total, real	533		292		77		143						

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

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+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F083 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	July	August	September	October	November	December								
1	06:00	06:23	06:51	07:20	07:39 (WTG04)	06:52	15:07 (WTG16)	07:25	15:08 (WTG16)					
	20:56	20:38	19:57	19:08	15	07:54 (WTG04)	17:24	56	16:03 (WTG16)	17:01	63	16:11 (WTG17)		
2	06:00	06:23	06:52	07:21	07:40 (WTG04)	06:53	07:35 (WTG03)	07:26	15:08 (WTG16)					
	20:56	20:37	19:55	19:07	12	07:52 (WTG04)	17:22	66	16:04 (WTG16)	17:01	64	16:12 (WTG17)		
3	06:01	06:24	06:53	07:21	07:42 (WTG04)	06:54	07:32 (WTG03)	07:27	15:09 (WTG16)					
	20:56	20:36	19:54	19:05	7	07:49 (WTG04)	17:21	73	16:04 (WTG16)	17:00	64	16:13 (WTG17)		
4	06:01	06:25	06:54	07:22	07:40 (WTG04)	06:55	07:30 (WTG03)	07:28	15:10 (WTG16)					
	20:56	20:35	19:52	19:04	17:20	78	16:04 (WTG16)	17:00	64	16:14 (WTG17)				
5	06:02	06:26	06:55	07:23	07:40 (WTG04)	06:56	07:30 (WTG03)	07:29	15:11 (WTG16)					
	20:56	20:34	19:51	19:02	17:19	82	16:06 (WTG16)	17:00	64	16:15 (WTG17)				
6	06:02	06:27	06:56	07:24	07:42 (WTG04)	06:57	07:29 (WTG03)	07:30	15:12 (WTG16)					
	20:55	20:33	19:49	19:00	17:18	85	16:06 (WTG16)	17:00	65	16:16 (WTG17)				
7	06:03	06:28	06:57	07:25	07:43 (WTG04)	06:59	07:28 (WTG03)	07:31	15:12 (WTG16)					
	20:55	20:32	19:48	18:59	17:17	87	16:06 (WTG16)	17:00	65	16:17 (WTG17)				
8	06:03	06:29	06:58	07:26	07:44 (WTG04)	07:00	07:27 (WTG03)	07:32	15:13 (WTG16)					
	20:55	20:31	19:46	18:57	17:16	90	16:07 (WTG16)	17:00	65	16:18 (WTG17)				
9	06:04	06:30	06:59	07:27	07:45 (WTG04)	07:01	07:27 (WTG03)	07:33	15:14 (WTG16)					
	20:54	20:29	19:44	18:56	17:15	92	16:08 (WTG16)	17:00	64	16:18 (WTG17)				
10	06:05	06:31	07:00	07:28	07:46 (WTG04)	07:02	07:27 (WTG03)	07:34	15:14 (WTG16)					
	20:54	20:28	19:43	18:54	17:14	92	16:08 (WTG16)	17:00	65	16:19 (WTG17)				
11	06:05	06:32	07:01	07:29	07:47 (WTG04)	07:03	07:27 (WTG03)	07:34	15:14 (WTG16)					
	20:54	20:27	19:41	18:53	17:13	93	16:08 (WTG16)	17:00	65	16:19 (WTG17)				
12	06:06	06:33	07:02	07:30	07:48 (WTG04)	07:04	07:26 (WTG03)	07:35	15:15 (WTG16)					
	20:53	20:26	19:39	18:51	17:12	94	16:08 (WTG16)	17:00	65	16:20 (WTG17)				
13	06:07	06:34	07:03	07:31	07:49 (WTG04)	07:05	07:27 (WTG03)	07:36	15:16 (WTG16)					
	20:53	20:24	19:38	18:50	17:11	93	16:08 (WTG16)	17:00	65	16:21 (WTG17)				
14	06:08	06:35	07:04	07:32	07:50 (WTG04)	07:07	07:29 (WTG03)	07:37	15:17 (WTG16)					
	20:52	20:23	19:36	18:48	17:10	92	16:09 (WTG16)	17:00	64	16:21 (WTG17)				
15	06:08	06:36	07:04	07:33	07:51 (WTG04)	07:08	07:30 (WTG03)	07:37	15:17 (WTG16)					
	20:52	20:22	19:35	18:47	17:10	92	16:09 (WTG16)	17:01	64	16:21 (WTG17)				
16	06:09	06:36	07:05	07:35	07:52 (WTG04)	07:09	07:31 (WTG03)	07:38	15:18 (WTG16)					
	20:51	20:20	19:33	18:45	17:09	91	16:09 (WTG16)	17:01	64	16:22 (WTG17)				
17	06:10	06:37	07:06	07:36	07:53 (WTG04)	07:10	07:32 (WTG03)	07:39	15:19 (WTG16)					
	20:51	20:19	19:31	18:44	17:08	89	16:09 (WTG16)	17:01	64	16:23 (WTG17)				
18	06:11	06:38	07:07	07:37	07:54 (WTG04)	07:11	07:33 (WTG03)	07:39	15:19 (WTG16)					
	20:50	20:18	19:30	18:42	17:07	88	16:09 (WTG16)	17:02	64	16:23 (WTG17)				
19	06:11	06:39	07:08	07:38	07:55 (WTG04)	07:12	07:35 (WTG03)	07:40	15:20 (WTG16)					
	20:49	20:16	19:28	18:41	17:07	86	16:10 (WTG16)	17:02	64	16:24 (WTG17)				
20	06:12	06:40	07:09	07:39	07:56 (WTG04)	07:13	07:36 (WTG03)	07:41	15:20 (WTG16)					
	20:49	20:15	19:26	8	07:54 (WTG04)	18:39	17:06	84	16:10 (WTG16)	17:02	64	16:24 (WTG17)		
21	06:13	06:41	07:10	07:40	07:57 (WTG04)	07:14	07:37 (WTG03)	07:41	15:21 (WTG16)					
	20:48	20:13	19:25	14	07:57 (WTG04)	18:38	10	16:42 (WTG16)	17:05	82	16:10 (WTG16)	17:03	64	16:25 (WTG17)
22	06:14	06:42	07:11	07:41	07:58 (WTG04)	07:16	07:38 (WTG03)	07:42	15:21 (WTG16)					
	20:47	20:12	19:23	17	07:58 (WTG04)	18:37	21	16:47 (WTG16)	17:05	80	16:10 (WTG16)	17:03	64	16:25 (WTG17)
23	06:15	06:43	07:12	07:42	07:59 (WTG04)	07:17	07:39 (WTG03)	07:42	15:22 (WTG16)					
	20:46	20:11	19:21	19	07:59 (WTG04)	18:35	28	16:50 (WTG16)	17:04	77	16:09 (WTG16)	17:04	64	16:26 (WTG17)
24	06:15	06:44	07:13	07:43	08:00 (WTG04)	07:18	07:40 (WTG03)	07:43	15:22 (WTG16)					
	20:46	20:09	19:20	20	07:58 (WTG04)	18:34	34	16:53 (WTG16)	17:04	75	16:09 (WTG16)	17:04	64	16:26 (WTG17)
25	06:16	06:45	07:14	07:44	08:01 (WTG04)	07:19	07:42 (WTG03)	07:43	15:23 (WTG16)					
	20:45	20:08	19:18	21	07:58 (WTG04)	17:32	37	15:55 (WTG16)	17:03	71	16:10 (WTG16)	17:05	64	16:27 (WTG17)
26	06:17	06:46	07:15	07:45	08:02 (WTG04)	07:20	07:43 (WTG03)	07:44	15:23 (WTG16)					
	20:44	20:06	19:16	21	07:58 (WTG04)	17:31	42	15:57 (WTG16)	17:03	68	16:10 (WTG16)	17:06	64	16:27 (WTG17)
27	06:18	06:47	07:16	07:46	08:03 (WTG04)	07:21	07:44 (WTG03)	07:44	15:23 (WTG16)					
	20:43	20:05	19:15	22	07:58 (WTG04)	17:30	45	15:58 (WTG16)	17:02	64	16:10 (WTG16)	17:06	64	16:27 (WTG17)
28	06:19	06:48	07:17	07:47	08:04 (WTG04)	07:22	07:45 (WTG03)	07:44	15:23 (WTG16)					
	20:42	20:03	19:13	21	07:57 (WTG04)	17:29	48	15:59 (WTG16)	17:02	64	16:10 (WTG16)	17:07	64	16:27 (WTG17)
29	06:20	06:49	07:18	07:48	08:05 (WTG04)	07:23	07:46 (WTG03)	07:45	15:24 (WTG16)					
	20:41	20:02	19:12	20	07:57 (WTG04)	17:27	50	16:00 (WTG16)	17:01	63	16:10 (WTG16)	17:08	64	16:28 (WTG17)
30	06:21	06:50	07:19	07:49	08:06 (WTG04)	07:24	07:47 (WTG03)	07:45	15:24 (WTG16)					
	20:40	20:00	19:10	17	07:55 (WTG04)	17:26	53	16:01 (WTG16)	17:01	63	16:10 (WTG16)	17:08	64	16:28 (WTG17)
31	06:22	06:51	07:20	07:50	08:07 (WTG04)	07:25	07:48 (WTG03)	07:45	15:24 (WTG16)					
	20:39	19:59	19:09	17	07:55 (WTG04)	17:26	53	16:01 (WTG16)	17:01	63	16:10 (WTG16)	17:08	64	16:28 (WTG17)
Potential sun hours	455	425	374	347	301	292								
Total, worst case	535	14	200	456	2410	1991								
Sun reduction	0,74	0,73	0,65	0,54	0,51	0,45								
Oper. time red.	0,86	0,86	0,86	0,86	0,86	0,86								
Wind dir. red.	0,68	0,68	0,80	0,58	0,61	0,56								
Total reduction	0,43	0,43	0,44	0,27	0,26	0,22								
Total, real	232	6	89	124	636	435								

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
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+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F086 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to June) and rows for each day of the month, showing sun rise/set times, shadow reduction, and operational time. Includes summary rows for 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

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)



Project:

Progetto\_GRV\_Gergei

Licensed user:

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+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F086 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	July	August	September	October	November	December				
1	06:00	06:41 (WTG02)	06:23	06:51	07:20	07:39 (WTG04)	06:52	07:31 (WTG03)	07:25	15:19 (WTG16)
	20:56	15 06:56 (WTG02)	20:38	19:57	19:08	10 07:49 (WTG04)	17:24	77 16:13 (WTG16)	17:01	58 16:17 (WTG17)
2	06:00	06:41 (WTG02)	06:23	06:52	07:21		06:53	07:29 (WTG03)	07:26	15:19 (WTG16)
	20:56	15 06:56 (WTG02)	20:37	19:55	19:07		17:22	82 16:14 (WTG16)	17:01	59 16:18 (WTG17)
3	06:01	06:41 (WTG02)	06:24	06:53	07:21		06:54	07:27 (WTG03)	07:27	15:20 (WTG16)
	20:56	16 06:57 (WTG02)	20:36	19:54	19:05		17:21	86 16:14 (WTG16)	17:00	59 16:19 (WTG17)
4	06:01	06:40 (WTG02)	06:25	06:54	07:22		06:55	07:26 (WTG03)	07:28	15:21 (WTG16)
	20:56	17 06:57 (WTG02)	20:35	19:52	19:04		17:20	89 16:14 (WTG16)	17:00	58 16:19 (WTG17)
5	06:02	06:41 (WTG02)	06:26	06:55	07:23		06:56	07:26 (WTG03)	07:29	15:22 (WTG16)
	20:56	17 06:58 (WTG02)	20:34	19:51	19:02		17:19	91 16:15 (WTG16)	17:00	58 16:20 (WTG17)
6	06:02	06:40 (WTG02)	06:27	06:56	07:24		06:57	07:25 (WTG03)	07:30	15:23 (WTG16)
	20:55	18 06:58 (WTG02)	20:33	19:49	19:00		17:18	92 16:15 (WTG16)	17:00	58 16:21 (WTG17)
7	06:03	06:40 (WTG02)	06:28	06:57	07:25		06:59	07:24 (WTG03)	07:31	15:24 (WTG16)
	20:55	19 06:59 (WTG02)	20:32	19:48	18:59		17:17	94 16:15 (WTG16)	17:00	57 16:21 (WTG17)
8	06:03	06:39 (WTG02)	06:29	06:58	07:26		07:00	07:24 (WTG03)	07:32	15:25 (WTG16)
	20:55	20 06:59 (WTG02)	20:31	19:46	18:57		17:16	95 16:15 (WTG16)	17:00	57 16:22 (WTG17)
9	06:04	06:40 (WTG02)	06:30	06:59	07:27		07:01	07:25 (WTG03)	07:33	15:26 (WTG16)
	20:54	20 07:00 (WTG02)	20:29	19:44	18:56		17:15	95 16:16 (WTG16)	17:00	57 16:23 (WTG17)
10	06:05	06:40 (WTG02)	06:31	07:00	07:28		07:02	07:24 (WTG03)	07:34	15:27 (WTG16)
	20:54	20 07:00 (WTG02)	20:28	19:43	18:54		17:14	97 16:16 (WTG16)	17:00	56 16:23 (WTG17)
11	06:05	06:39 (WTG02)	06:32	07:01	07:29		07:03	07:25 (WTG03)	07:34	15:27 (WTG16)
	20:54	21 07:00 (WTG02)	20:27	19:41	18:53		17:13	95 16:15 (WTG16)	17:00	56 16:23 (WTG17)
12	06:06	06:39 (WTG02)	06:33	07:02	07:30		07:04	07:26 (WTG03)	07:35	15:28 (WTG16)
	20:53	22 07:01 (WTG02)	20:26	19:39	18:51		17:12	93 16:15 (WTG16)	17:00	56 16:24 (WTG17)
13	06:07	06:40 (WTG02)	06:34	07:03	07:31		07:05	07:27 (WTG03)	07:36	15:29 (WTG16)
	20:53	22 07:02 (WTG02)	20:24	19:38	18:50		17:11	92 16:15 (WTG16)	17:00	56 16:25 (WTG17)
14	06:08	06:39 (WTG02)	06:35	07:04	07:32		07:07	07:29 (WTG03)	07:37	15:30 (WTG16)
	20:52	22 07:01 (WTG02)	20:23	19:36	18:48		17:10	91 16:16 (WTG16)	17:00	55 16:25 (WTG17)
15	06:08	06:39 (WTG02)	06:36	07:04	07:33		07:08	07:30 (WTG03)	07:37	15:30 (WTG16)
	20:52	23 07:02 (WTG02)	20:22	19:35	18:47		17:10	89 16:16 (WTG16)	17:01	55 16:25 (WTG17)
16	06:09	06:39 (WTG02)	06:36	07:05	07:35		07:09	07:31 (WTG03)	07:38	15:31 (WTG16)
	20:51	23 07:02 (WTG02)	20:20	19:33	18:45	11 16:50 (WTG16)	17:09	86 16:15 (WTG16)	17:01	55 16:26 (WTG17)
17	06:10	06:40 (WTG02)	06:37	07:06	07:36		07:10	07:32 (WTG03)	07:39	15:32 (WTG16)
	20:51	23 07:03 (WTG02)	20:19	19:31	18:44	22 16:56 (WTG16)	17:08	84 16:15 (WTG16)	17:01	55 16:27 (WTG17)
18	06:11	06:39 (WTG02)	06:38	07:07	07:37		07:11	07:33 (WTG03)	07:39	15:32 (WTG16)
	20:50	23 07:02 (WTG02)	20:18	19:30	18:42	29 16:59 (WTG16)	17:07	82 16:15 (WTG16)	17:02	55 16:27 (WTG17)
19	06:11	06:39 (WTG02)	06:39	07:08	07:38		07:12	07:35 (WTG03)	07:40	15:34 (WTG16)
	20:49	23 07:02 (WTG02)	20:16	19:28	18:41	34 17:01 (WTG16)	17:07	80 16:15 (WTG16)	17:02	54 16:28 (WTG17)
20	06:12	06:40 (WTG02)	06:40	07:09	07:39		07:13	07:36 (WTG03)	07:41	15:34 (WTG16)
	20:49	23 07:03 (WTG02)	20:15	19:26	18:39	38 17:03 (WTG16)	17:06	77 16:15 (WTG16)	17:02	54 16:28 (WTG17)
21	06:13	06:40 (WTG02)	06:41	07:10	07:40		07:14	07:37 (WTG03)	07:41	15:35 (WTG16)
	20:48	23 07:03 (WTG02)	20:13	19:25	18:38	42 17:04 (WTG16)	17:05	74 16:15 (WTG16)	17:03	53 16:28 (WTG17)
22	06:14	06:41 (WTG02)	06:42	07:11	07:41		07:16	07:38 (WTG03)	07:42	15:35 (WTG16)
	20:47	22 07:03 (WTG02)	20:12	19:23	18:37	46 17:06 (WTG16)	17:05	71 16:15 (WTG16)	17:03	53 16:28 (WTG17)
23	06:15	06:40 (WTG02)	06:43	07:12	07:42		07:17	07:39 (WTG03)	07:42	15:36 (WTG16)
	20:46	22 07:02 (WTG02)	20:11	19:21	18:35	49 17:07 (WTG16)	17:04	67 16:14 (WTG16)	17:04	53 16:29 (WTG17)
24	06:15	06:41 (WTG02)	06:44	07:13	07:43		07:18	07:40 (WTG03)	07:43	15:36 (WTG16)
	20:46	21 07:02 (WTG02)	20:09	19:20	18:34	51 17:08 (WTG16)	17:04	61 16:14 (WTG16)	17:04	54 16:30 (WTG17)
25	06:16	06:42 (WTG02)	06:45	07:14	07:44		07:19	07:41 (WTG03)	07:43	15:36 (WTG16)
	20:45	19 07:01 (WTG02)	20:08	19:18	18:32	53 16:09 (WTG16)	17:03	61 16:15 (WTG16)	17:05	55 16:31 (WTG17)
26	06:17	06:42 (WTG02)	06:46	07:15	07:45		07:20	07:42 (WTG03)	07:44	15:36 (WTG16)
	20:44	19 07:01 (WTG02)	20:06	19:16	18:31	55 16:10 (WTG16)	17:03	59 16:14 (WTG16)	17:06	55 16:31 (WTG17)
27	06:18	06:43 (WTG02)	06:47	07:16	07:46		07:21	07:43 (WTG03)	07:44	15:36 (WTG16)
	20:43	17 07:00 (WTG02)	20:05	19:15	18:30	58 16:11 (WTG16)	17:02	58 16:14 (WTG16)	17:06	55 16:31 (WTG17)
28	06:19	06:45 (WTG02)	06:48	07:17	07:47		07:22	07:44 (WTG03)	07:44	15:36 (WTG16)
	20:42	14 06:59 (WTG02)	20:03	19:13	18:29	59 16:11 (WTG16)	17:02	59 16:15 (WTG16)	17:07	55 16:31 (WTG17)
29	06:20	06:45 (WTG02)	06:49	07:18	07:48		07:23	07:45 (WTG03)	07:45	15:37 (WTG16)
	20:41	12 06:57 (WTG02)	20:02	19:12	18:27	61 16:12 (WTG16)	17:01	59 16:16 (WTG16)	17:08	55 16:32 (WTG17)
30	06:21	06:47 (WTG02)	06:50	07:19	07:49		07:24	07:46 (WTG03)	07:45	15:37 (WTG16)
	20:40	8 06:55 (WTG02)	20:00	19:10	18:26	62 16:12 (WTG16)	17:01	58 16:16 (WTG16)	17:08	56 16:33 (WTG17)
31	06:22		06:51		06:51		07:34 (WTG03)		07:45	15:37 (WTG16)
	20:39		19:59		17:25	70 16:13 (WTG16)			17:09	56 16:33 (WTG17)
Potential sun hours	455		425	374	347		301		292	
Total, worst case		579		227	750		2394		1728	
Sun reduction		0,74		0,65	0,54		0,51		0,45	
Oper. time red.		0,86		0,86	0,86		0,86		0,86	
Wind dir. red.		0,68		0,80	0,59		0,62		0,58	
Total reduction		0,43		0,44	0,27		0,27		0,22	
Total, real		249		101	206		648		389	

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	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F088 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June					
1	07:45	15:50 (WTG16)	07:33	07:58 (WTG03)	06:59	07:10	06:26	05:59	06:31 (WTG02)		
	17:10	46 16:36 (WTG17)	17:43	91 16:50 (WTG16)	18:15	19:48	20:17	20:45	23 06:54 (WTG02)		
2	07:45	15:50 (WTG16)	07:32	07:58 (WTG03)	06:57	07:09	06:25	05:58	06:31 (WTG02)		
	17:11	46 16:36 (WTG17)	17:44	90 16:50 (WTG16)	18:17	19:49	20:18	20:46	22 06:53 (WTG02)		
3	07:46	15:49 (WTG16)	07:31	07:59 (WTG03)	06:56	07:07	06:24	05:58	06:32 (WTG02)		
	17:12	47 16:36 (WTG17)	17:45	88 16:50 (WTG16)	18:18	19:50	20:19	20:47	21 06:53 (WTG02)		
4	07:46	15:49 (WTG16)	07:30	08:00 (WTG03)	06:54	07:05	06:23	05:58	06:32 (WTG02)		
	17:13	48 16:37 (WTG17)	17:47	86 16:50 (WTG16)	18:19	19:51	20:20	20:48	22 06:54 (WTG02)		
5	07:46	15:49 (WTG16)	07:29	08:01 (WTG03)	06:53	07:04	06:21	05:57	06:33 (WTG02)		
	17:14	48 16:37 (WTG17)	17:48	84 16:50 (WTG16)	18:20	19:52	20:21	20:48	21 06:54 (WTG02)		
6	07:46	15:49 (WTG16)	07:28	08:02 (WTG03)	06:51	07:02	06:20	05:57	06:33 (WTG02)		
	17:14	49 16:38 (WTG17)	17:49	81 16:50 (WTG16)	18:21	19:53	20:22	20:49	20 06:53 (WTG02)		
7	07:46	15:49 (WTG16)	07:27	08:04 (WTG03)	06:50	07:01	06:19	05:57	06:33 (WTG02)		
	17:15	49 16:38 (WTG17)	17:50	78 16:50 (WTG16)	18:22	19:54	20:23	20:49	20 06:53 (WTG02)		
8	07:46	15:49 (WTG16)	07:26	08:05 (WTG03)	06:48	06:59	06:18	05:57	06:34 (WTG02)		
	17:16	49 16:38 (WTG17)	17:51	73 16:49 (WTG16)	18:23	19:55	20:24	20:50	19 06:53 (WTG02)		
9	07:45	15:49 (WTG16)	07:25	15:48 (WTG16)	06:47	06:58	06:17	05:56	06:35 (WTG02)		
	17:17	50 16:39 (WTG17)	17:53	61 16:49 (WTG16)	18:24	19:56	20:25	20:51	18 06:53 (WTG02)		
10	07:45	15:48 (WTG16)	07:24	15:49 (WTG16)	06:45	06:56	06:16	05:56	06:35 (WTG02)		
	17:18	50 16:38 (WTG17)	17:54	60 16:49 (WTG16)	18:25	19:56	20:26	20:51	18 06:53 (WTG02)		
11	07:45	15:48 (WTG16)	07:23	15:50 (WTG16)	06:44	07:03 (WTG04)	06:54	06:15	05:56	06:36 (WTG02)	
	17:19	50 16:38 (WTG17)	17:55	59 16:49 (WTG16)	18:26	8 07:11 (WTG04)	19:57	20:27	20:52	17 06:53 (WTG02)	
12	07:45	15:48 (WTG16)	07:22	15:51 (WTG16)	06:42	07:01 (WTG04)	06:53	06:14	05:56	06:35 (WTG02)	
	17:20	51 16:39 (WTG17)	17:56	58 16:49 (WTG16)	18:27	13 07:14 (WTG04)	19:58	20:28	20:52	17 06:52 (WTG02)	
13	07:45	15:47 (WTG16)	07:20	15:52 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13	05:56	06:36 (WTG02)	
	17:21	51 16:38 (WTG17)	17:57	56 16:48 (WTG16)	18:28	16 07:15 (WTG04)	19:59	20:29	20:53	16 06:52 (WTG02)	
14	07:44	08:05 (WTG03)	07:19	15:52 (WTG16)	06:39	06:57 (WTG04)	06:50	06:12	06:36 (WTG02)	05:56	06:36 (WTG02)
	17:22	53 16:38 (WTG17)	17:59	55 16:47 (WTG16)	18:29	18 07:15 (WTG04)	20:00	20:30	6 06:44 (WTG02)	20:53	16 06:52 (WTG02)
15	07:44	08:05 (WTG03)	07:18	15:53 (WTG16)	06:37	06:56 (WTG04)	06:48	06:11	06:36 (WTG02)	05:56	06:37 (WTG02)
	17:24	57 16:39 (WTG16)	18:00	53 16:46 (WTG16)	18:30	21 07:17 (WTG04)	20:01	20:31	11 06:47 (WTG02)	20:54	15 06:52 (WTG02)
16	07:44	08:04 (WTG03)	07:17	15:55 (WTG16)	06:36	06:55 (WTG04)	06:47	06:10	06:34 (WTG02)	05:56	06:38 (WTG02)
	17:25	62 16:40 (WTG16)	18:01	51 16:46 (WTG16)	18:31	21 07:16 (WTG04)	20:02	20:32	14 06:48 (WTG02)	20:54	15 06:53 (WTG02)
17	07:43	08:04 (WTG03)	07:16	15:55 (WTG16)	06:34	06:55 (WTG04)	06:45	06:09	06:33 (WTG02)	05:56	06:38 (WTG02)
	17:26	65 16:41 (WTG16)	18:02	49 16:44 (WTG16)	18:32	22 07:17 (WTG04)	20:03	20:33	16 06:49 (WTG02)	20:54	15 06:53 (WTG02)
18	07:43	08:03 (WTG03)	07:14	15:57 (WTG16)	06:33	06:54 (WTG04)	06:44	06:08	06:32 (WTG02)	05:56	06:38 (WTG02)
	17:27	68 16:41 (WTG16)	18:03	46 16:43 (WTG16)	18:33	22 07:16 (WTG04)	20:04	20:34	18 06:50 (WTG02)	20:55	15 06:53 (WTG02)
19	07:42	08:03 (WTG03)	07:13	15:58 (WTG16)	06:31	06:54 (WTG04)	06:43	06:07	06:31 (WTG02)	05:56	06:39 (WTG02)
	17:28	71 16:43 (WTG16)	18:04	44 16:42 (WTG16)	18:34	21 07:15 (WTG04)	20:05	20:35	20 06:51 (WTG02)	20:55	14 06:53 (WTG02)
20	07:42	08:02 (WTG03)	07:12	15:59 (WTG16)	06:29	06:54 (WTG04)	06:41	06:06	06:31 (WTG02)	05:56	06:39 (WTG02)
	17:29	74 16:43 (WTG16)	18:05	41 16:40 (WTG16)	18:35	21 07:15 (WTG04)	20:06	20:36	21 06:52 (WTG02)	20:55	14 06:53 (WTG02)
21	07:41	08:01 (WTG03)	07:10	16:02 (WTG16)	06:28	06:54 (WTG04)	06:40	06:06	06:31 (WTG02)	05:56	06:39 (WTG02)
	17:30	75 16:43 (WTG16)	18:07	36 16:38 (WTG16)	18:36	20 07:14 (WTG04)	20:07	20:37	21 06:52 (WTG02)	20:55	14 06:53 (WTG02)
22	07:41	08:01 (WTG03)	07:09	16:04 (WTG16)	06:26	06:55 (WTG04)	06:38	06:05	06:30 (WTG02)	05:57	06:39 (WTG02)
	17:31	79 16:45 (WTG16)	18:08	33 16:37 (WTG16)	18:37	17 07:12 (WTG04)	20:08	20:37	22 06:52 (WTG02)	20:56	14 06:53 (WTG02)
23	07:40	08:00 (WTG03)	07:07	16:06 (WTG16)	06:25	06:56 (WTG04)	06:37	06:04	06:30 (WTG02)	05:57	06:40 (WTG02)
	17:32	80 16:45 (WTG16)	18:09	27 16:33 (WTG16)	18:38	15 07:11 (WTG04)	20:09	20:38	22 06:52 (WTG02)	20:56	14 06:54 (WTG02)
24	07:39	07:59 (WTG03)	07:06	16:10 (WTG16)	06:23	06:58 (WTG04)	06:35	06:03	06:30 (WTG02)	05:57	06:40 (WTG02)
	17:34	84 16:46 (WTG16)	18:10	20 16:30 (WTG16)	18:39	10 07:08 (WTG04)	20:10	20:39	23 06:53 (WTG02)	20:56	14 06:54 (WTG02)
25	07:39	07:59 (WTG03)	07:05	16:16 (WTG16)	06:21	06:34	06:03	06:03	06:30 (WTG02)	05:57	06:39 (WTG02)
	17:35	85 16:47 (WTG16)	18:11	8 16:24 (WTG16)	18:40	20:11	20:40	23 06:53 (WTG02)	20:56	15 06:54 (WTG02)	
26	07:38	07:58 (WTG03)	07:03	06:20	06:33	06:02	06:02	06:30 (WTG02)	05:58	06:40 (WTG02)	
	17:36	86 16:47 (WTG16)	18:12	18:42	20:12	20:41	24 06:54 (WTG02)	20:56	15 06:55 (WTG02)		
27	07:37	07:57 (WTG03)	07:02	06:18	06:31	06:02	06:30 (WTG02)	05:58	06:40 (WTG02)		
	17:37	90 16:48 (WTG16)	18:13	18:43	20:13	20:42	23 06:53 (WTG02)	20:56	15 06:55 (WTG02)		
28	07:37	07:56 (WTG03)	07:00	06:17	06:30	06:01	06:30 (WTG02)	05:58	06:39 (WTG02)		
	17:38	91 16:48 (WTG16)	18:14	18:44	20:14	20:42	24 06:54 (WTG02)	20:56	16 06:55 (WTG02)		
29	07:36	07:56 (WTG03)	07:00	07:15	06:29	06:00	06:30 (WTG02)	05:59	06:40 (WTG02)		
	17:40	91 16:48 (WTG16)	18:15	19:45	20:15	20:43	24 06:54 (WTG02)	20:56	16 06:56 (WTG02)		
30	07:35	07:57 (WTG03)	07:00	07:13	06:28	06:00	06:31 (WTG02)	05:59	06:39 (WTG02)		
	17:41	91 16:49 (WTG16)	18:16	19:46	20:16	20:44	23 06:54 (WTG02)	20:56	17 06:56 (WTG02)		
31	07:34	07:57 (WTG03)	07:00	07:12	06:27	06:00	06:31 (WTG02)	05:59	06:39 (WTG02)		
	17:42	92 16:50 (WTG16)	18:17	19:47	20:17	20:45	22 06:53 (WTG02)	20:56	17 06:56 (WTG02)		
Potential sun hours	301	299	370	397	445	448	508				
Total, worst case	2028	1428	245	357	448	508					
Sun reduction	0,45	0,47	0,49	0,59	0,66						
Oper. time red.	0,86	0,86	0,86	0,86	0,86						
Wind dir. red.	0,63	0,62	0,80	0,68	0,68						
Total reduction	0,24	0,25	0,34	0,34	0,39						
Total, real	494	359	83	123	196						

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: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F088 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	July	August	September	October	November	December				
1	06:00	06:40 (WTG02)	06:23	06:51	07:20	07:39 (WTG04)	06:52	15:19 (WTG16)	07:25	15:30 (WTG16)
	20:56	17 06:57 (WTG02)	20:38	19:57	19:08	14 07:53 (WTG04)	17:24	60 16:19 (WTG16)	17:01	50 16:20 (WTG17)
2	06:00	06:39 (WTG02)	06:23	06:52	07:21	07:40 (WTG04)	06:53	07:39 (WTG03)	07:26	15:31 (WTG16)
	20:56	18 06:57 (WTG02)	20:37	19:55	19:07	11 07:51 (WTG04)	17:22	66 16:19 (WTG16)	17:01	50 16:21 (WTG17)
3	06:01	06:40 (WTG02)	06:24	06:53	07:21		06:54	07:35 (WTG03)	07:27	15:32 (WTG16)
	20:56	18 06:58 (WTG02)	20:36	19:54	19:05		17:21	73 16:19 (WTG16)	17:00	50 16:22 (WTG17)
4	06:01	06:39 (WTG02)	06:25	06:54	07:22		06:55	07:33 (WTG03)	07:28	15:33 (WTG16)
	20:56	19 06:58 (WTG02)	20:35	19:52	19:04		17:20	78 16:19 (WTG16)	17:00	49 16:22 (WTG17)
5	06:02	06:40 (WTG02)	06:26	06:55	07:23		06:56	07:32 (WTG03)	07:29	15:34 (WTG16)
	20:56	19 06:59 (WTG02)	20:34	19:51	19:02		17:19	81 16:20 (WTG16)	17:00	49 16:23 (WTG17)
6	06:02	06:39 (WTG02)	06:27	06:56	07:24		06:57	07:31 (WTG03)	07:30	15:35 (WTG16)
	20:55	20 06:59 (WTG02)	20:33	19:49	19:00		17:18	84 16:20 (WTG16)	17:00	49 16:24 (WTG17)
7	06:03	06:39 (WTG02)	06:28	06:57	07:25		06:59	07:30 (WTG03)	07:31	15:36 (WTG16)
	20:55	21 07:00 (WTG02)	20:32	19:48	18:59		17:17	86 16:20 (WTG16)	17:00	48 16:24 (WTG17)
8	06:03	06:39 (WTG02)	06:29	06:58	07:26		07:00	07:29 (WTG03)	07:32	15:37 (WTG16)
	20:55	21 07:00 (WTG02)	20:31	19:46	18:57		17:16	88 16:20 (WTG16)	17:00	48 16:25 (WTG17)
9	06:04	06:39 (WTG02)	06:30	06:59	07:27		07:01	07:29 (WTG03)	07:33	15:38 (WTG16)
	20:54	22 07:01 (WTG02)	20:29	19:44	18:56		17:15	90 16:21 (WTG16)	17:00	48 16:26 (WTG17)
10	06:05	06:39 (WTG02)	06:31	07:00	07:28		07:02	07:29 (WTG03)	07:34	15:40 (WTG16)
	20:54	22 07:01 (WTG02)	20:28	19:43	18:54		17:14	91 16:21 (WTG16)	17:00	46 16:26 (WTG17)
11	06:05	06:39 (WTG02)	06:32	07:01	07:29		07:03	07:28 (WTG03)	07:34	15:40 (WTG16)
	20:54	22 07:01 (WTG02)	20:27	19:41	18:53		17:13	91 16:20 (WTG16)	17:00	46 16:26 (WTG17)
12	06:06	06:39 (WTG02)	06:33	07:02	07:30		07:04	07:28 (WTG03)	07:35	15:41 (WTG16)
	20:53	23 07:02 (WTG02)	20:26	19:39	18:51		17:12	91 16:20 (WTG16)	17:00	46 16:27 (WTG17)
13	06:07	06:39 (WTG02)	06:34	07:03	07:31		07:05	07:28 (WTG03)	07:36	15:42 (WTG16)
	20:53	23 07:02 (WTG02)	20:24	19:38	18:50		17:11	91 16:20 (WTG16)	17:00	45 16:27 (WTG17)
14	06:08	06:38 (WTG02)	06:35	07:04	07:32		07:07	07:29 (WTG03)	07:37	15:43 (WTG16)
	20:52	24 07:02 (WTG02)	20:23	19:36	18:48		17:10	91 16:21 (WTG16)	17:00	45 16:28 (WTG17)
15	06:08	06:39 (WTG02)	06:36	07:04	07:33		07:08	07:30 (WTG03)	07:37	15:44 (WTG16)
	20:52	23 07:02 (WTG02)	20:22	19:35	18:47		17:10	89 16:20 (WTG16)	17:01	44 16:28 (WTG17)
16	06:09	06:39 (WTG02)	06:36	07:05	07:35		07:09	07:31 (WTG03)	07:38	15:45 (WTG16)
	20:51	24 07:03 (WTG02)	20:20	19:33	18:45		17:09	86 16:20 (WTG16)	17:01	44 16:29 (WTG17)
17	06:10	06:40 (WTG02)	06:37	07:06	07:36		07:10	07:32 (WTG03)	07:39	15:46 (WTG16)
	20:51	23 07:03 (WTG02)	20:19	19:31	18:44	14 16:45 (WTG16)	17:08	85 16:20 (WTG16)	17:01	43 16:29 (WTG17)
18	06:11	06:39 (WTG02)	06:38	07:07	07:37		07:11	07:33 (WTG03)	07:39	15:46 (WTG16)
	20:50	23 07:02 (WTG02)	20:18	19:30	18:42	23 17:03 (WTG16)	17:07	84 16:20 (WTG16)	17:02	43 16:29 (WTG17)
19	06:11	06:39 (WTG02)	06:39	07:08	07:38		07:12	07:35 (WTG03)	07:40	15:47 (WTG16)
	20:49	24 07:03 (WTG02)	20:16	19:28	18:41	29 17:06 (WTG16)	17:07	80 16:20 (WTG16)	17:02	43 16:30 (WTG17)
20	06:12	06:40 (WTG02)	06:40	07:09	07:39		07:13	07:36 (WTG03)	07:41	15:47 (WTG16)
	20:49	23 07:03 (WTG02)	20:15	19:26	18:39	34 17:08 (WTG16)	17:06	79 16:20 (WTG16)	17:02	43 16:30 (WTG17)
21	06:13	06:40 (WTG02)	06:41	07:10	07:40		07:14	07:37 (WTG03)	07:41	15:48 (WTG16)
	20:48	23 07:03 (WTG02)	20:13	19:25	18:38	38 17:10 (WTG16)	17:05	75 16:19 (WTG16)	17:03	43 16:31 (WTG17)
22	06:14	06:41 (WTG02)	06:42	07:11	07:41		07:16	07:38 (WTG03)	07:42	15:48 (WTG16)
	20:47	22 07:03 (WTG02)	20:12	19:23	18:37	41 17:11 (WTG16)	17:05	74 16:19 (WTG16)	17:03	43 16:31 (WTG17)
23	06:15	06:40 (WTG02)	06:43	07:12	07:42		07:17	07:39 (WTG03)	07:42	15:49 (WTG16)
	20:46	22 07:02 (WTG02)	20:11	19:21	18:35	44 17:12 (WTG16)	17:04	71 16:19 (WTG16)	17:04	43 16:32 (WTG17)
24	06:15	06:41 (WTG02)	06:44	07:13	07:43		07:18	07:40 (WTG03)	07:43	15:49 (WTG16)
	20:46	20 07:01 (WTG02)	20:09	19:20	18:34	47 17:13 (WTG16)	17:04	68 16:18 (WTG16)	17:04	43 16:32 (WTG17)
25	06:16	06:42 (WTG02)	06:45	07:14	07:44		07:19	07:42 (WTG03)	07:43	15:50 (WTG16)
	20:45	19 07:01 (WTG02)	20:08	19:18	18:32	50 16:15 (WTG16)	17:03	65 16:19 (WTG16)	17:05	43 16:33 (WTG17)
26	06:17	06:43 (WTG02)	06:46	07:15	07:45		07:20	07:43 (WTG03)	07:44	15:50 (WTG16)
	20:44	17 07:00 (WTG02)	20:06	19:16	18:31	51 16:15 (WTG16)	17:03	62 16:19 (WTG16)	17:06	43 16:33 (WTG17)
27	06:18	06:44 (WTG02)	06:47	07:16	07:46		07:21	07:44 (WTG03)	07:44	15:50 (WTG16)
	20:43	16 07:00 (WTG02)	20:05	19:15	18:30	53 16:16 (WTG16)	17:02	58 16:18 (WTG16)	17:06	43 16:33 (WTG17)
28	06:19	06:45 (WTG02)	06:48	07:17	07:47		07:22	07:45 (WTG03)	07:44	15:50 (WTG16)
	20:42	14 06:59 (WTG02)	20:03	19:13	18:29	55 16:17 (WTG16)	17:02	54 16:18 (WTG17)	17:07	44 16:34 (WTG17)
29	06:20	06:46 (WTG02)	06:49	07:18	07:48		07:23	07:46 (WTG03)	07:45	15:50 (WTG16)
	20:41	10 06:56 (WTG02)	20:02	19:12	18:27	57 16:17 (WTG16)	17:01	51 16:19 (WTG17)	17:08	45 16:35 (WTG17)
30	06:21		06:50	07:19	07:49		07:24	07:47 (WTG03)	07:45	15:50 (WTG16)
	20:40		20:00	19:10	18:26	58 16:17 (WTG16)	17:01	51 16:20 (WTG17)	17:08	45 16:35 (WTG17)
31	06:22		06:51		06:51		07:25	07:48 (WTG03)	07:45	15:50 (WTG16)
	20:39		19:59		17:25	59 16:19 (WTG16)		17:09	45 16:35 (WTG17)	
Potential sun hours	455		425	374	347		301		292	
Total, worst case		592		225		678		2293		1409
Sun reduction		0,74		0,65		0,54		0,51		0,45
Oper. time red.		0,86		0,86		0,86		0,86		0,86
Wind dir. red.		0,68		0,80		0,60		0,64		0,59
Total reduction		0,43		0,44		0,28		0,28		0,23
Total, real		255		100		191		637		322

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
 Via Santa Margherita 4  
 IT-09124 Cagliari  
 +39 070 658297  
 Giuseppe Frongia / direttore@iatprogetti.it  
 Calculated:  
 20/01/2023 16:32/3.4.415

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F090 - D

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00
3	07:45 17:12	07:31 17:45	06:56 18:17	07:07 19:49	06:24 20:19	05:58 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:45 17:12	07:30 17:46	06:54 18:19	07:05 19:50	06:22 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:45 17:13	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:45 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:45 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:58 17:17	07:31 17:00
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:56 20:50	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	06:58 17:16	07:32 17:00
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:17 20:25	05:56 20:50	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:55	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:33 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:52	07:03 17:13	07:34 17:00
12	07:45 17:20	07:21 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:25	07:01 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:00
16	07:43 17:24	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:09	07:38 17:01
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:32 18:33	06:44 20:04	06:08 20:34	05:56 20:54	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:28	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:41	07:12 17:06	07:40 17:02
20	07:42 17:29	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	06:39 20:07	06:05 20:36	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
22	07:40 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:56 20:55	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03
23	07:40 17:32	07:07 18:09	06:24 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:33	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:07	07:14 19:18	06:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	06:45 17:31	07:20 17:02	07:43 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:16 19:13	06:47 17:28	07:22 17:02	07:44 17:07
29	07:36 17:39	07:36 19:44	07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:48 20:01	07:17 19:11	06:48 17:27	07:23 17:01	07:44 17:07
30	07:35 17:41	07:35 19:45	07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	06:49 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42	07:34 19:46	07:12 19:46	06:27 20:16	06:00 20:44	05:59 20:56	06:21 20:39	06:50 19:58	07:19 17:25	06:51 17:25	07:25 17:09	07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F098 - D

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June
1	07:45 17:10	08:07 (WTG07)   07:33 16:45 (WTG04)   17:43	07:58 (WTG07)   06:59 08:30 (WTG07)   18:15		07:10 19:47	06:26 20:17
2	07:45 17:11	08:07 (WTG07)   07:32 08:16 (WTG07)   17:44	07:59 (WTG07)   06:57 08:29 (WTG07)   18:16		07:08 19:48	06:25 20:18
3	07:45 17:12	08:07 (WTG07)   07:31 16:46 (WTG04)   17:45	08:01 (WTG07)   06:56 08:28 (WTG07)   18:17		07:07 19:49	06:24 20:19
4	07:45 17:12	08:07 (WTG07)   07:30 16:47 (WTG04)   17:47	08:02 (WTG07)   06:54 08:27 (WTG07)   18:19		07:05 19:50	06:22 20:20
5	07:46 17:13	08:07 (WTG07)   07:29 16:48 (WTG04)   17:48	08:04 (WTG07)   06:53 08:25 (WTG07)   18:20		07:04 19:51	06:21 20:21
6	07:46 17:14	08:07 (WTG07)   07:28 16:49 (WTG04)   17:49	08:06 (WTG07)   06:51 08:24 (WTG07)   18:21		07:02 19:52	06:20 20:22
7	07:45 17:15	08:07 (WTG07)   07:27 16:50 (WTG04)   17:50	08:08 (WTG07)   06:50 08:20 (WTG07)   18:22		07:01 19:53	06:19 20:23
8	07:45 17:16	08:07 (WTG07)   07:26 16:51 (WTG04)   17:51	08:07 (WTG07)   06:48 18:23		06:59 19:54	06:18 20:24
9	07:45 17:17	08:06 (WTG07)   07:25 16:52 (WTG04)   17:52	08:06 (WTG07)   06:47 18:24		06:57 19:55	06:17 20:25
10	07:45 17:18	08:06 (WTG07)   07:24 16:53 (WTG04)   17:54	08:05 (WTG07)   06:45 18:25		06:56 19:56	06:16 20:26
11	07:45 17:19	08:06 (WTG07)   07:23 16:54 (WTG04)   17:55	08:04 (WTG07)   06:44 18:26		06:55 19:57	06:15 20:27
12	07:45 17:20	08:06 (WTG07)   07:22 16:56 (WTG04)   17:56	08:03 (WTG07)   06:42 18:27		06:53 19:58	06:14 20:28
13	07:44 17:21	08:05 (WTG07)   07:20 16:56 (WTG04)   17:57	08:02 (WTG07)   06:40 18:28		06:51 19:59	06:13 20:29
14	07:44 17:22	08:05 (WTG07)   07:19 16:58 (WTG04)   17:58	08:01 (WTG07)   06:39 18:29		06:50 20:00	06:12 20:30
15	07:44 17:23	08:05 (WTG07)   07:18 16:59 (WTG04)   18:00	08:00 (WTG07)   06:37 18:30		06:48 20:01	06:11 20:31
16	07:43 17:24	08:04 (WTG07)   07:17 17:00 (WTG04)   18:01	07:59 (WTG07)   06:36 18:31		06:47 20:02	06:10 20:32
17	07:43 17:26	08:04 (WTG07)   07:15 17:01 (WTG04)   18:02	07:58 (WTG07)   06:34 18:32	18:09 (WTG02)	06:45 20:03	06:09 20:33
18	07:43 17:27	08:03 (WTG07)   07:14 17:02 (WTG04)   18:03	07:57 (WTG07)   06:32 18:33	18:11 (WTG02) 18:08 (WTG02)	06:44 20:04	06:08 20:34
19	07:42 17:28	08:03 (WTG07)   07:13 17:04 (WTG04)   18:04	07:56 (WTG07)   06:31 18:34	18:13 (WTG02) 18:06 (WTG02)	06:44 20:05	06:07 20:35
20	07:42 17:29	08:02 (WTG07)   07:11 17:05 (WTG04)   18:05	07:55 (WTG07)   06:29 18:35	18:14 (WTG02) 18:05 (WTG02)	06:41 20:06	06:06 20:36
21	07:41 17:30	08:01 (WTG07)   07:10 17:05 (WTG04)   18:06	07:54 (WTG07)   06:28 18:36	18:15 (WTG02) 18:05 (WTG02)	06:40 20:07	06:05 20:37
22	07:41 17:31	08:01 (WTG07)   07:09 17:07 (WTG04)   18:08	07:53 (WTG07)   06:26 18:37	18:16 (WTG02) 18:05 (WTG02)	06:38 20:08	06:05 20:38
23	07:40 17:32	08:00 (WTG07)   07:07 17:07 (WTG04)   18:09	07:52 (WTG07)   06:24 18:38	18:16 (WTG02) 18:05 (WTG02)	06:37 20:09	06:04 20:39
24	07:39 17:33	07:59 (WTG07)   07:06 08:30 (WTG07)   18:10	07:51 (WTG07)   06:23 18:39	18:18 (WTG02) 18:05 (WTG02)	06:35 20:10	06:03 20:40
25	07:39 17:35	07:59 (WTG07)   07:05 08:31 (WTG07)   18:11	07:50 (WTG07)   06:21 18:40	18:19 (WTG02) 18:06 (WTG02)	06:34 20:11	06:03 20:41
26	07:38 17:36	07:58 (WTG07)   07:03 08:31 (WTG07)   18:12	07:49 (WTG07)   06:20 18:41	18:19 (WTG02) 18:06 (WTG02)	06:33 20:12	06:02 20:42
27	07:37 17:37	07:57 (WTG07)   07:02 08:31 (WTG07)   18:13	07:48 (WTG07)   06:18 18:42	18:21 (WTG02) 18:08 (WTG02)	06:31 20:13	06:01 20:43
28	07:36 17:38	07:56 (WTG07)   07:00 08:31 (WTG07)   18:14	07:47 (WTG07)   06:16 18:43	18:21 (WTG02) 18:23 (WTG02)	06:30 20:14	06:01 20:44
29	07:36 17:39	07:55 (WTG07)   07:00 08:30 (WTG07)   18:15	07:46 (WTG07)   06:15 19:44	19:10 (WTG02) 19:20 (WTG02)	06:29 20:15	06:00 20:45
30	07:35 17:41	07:55 (WTG07)   07:00 08:30 (WTG07)   18:16	07:45 (WTG07)   06:14 19:45	20:16	06:27 20:16	06:00 20:46
31	07:34 17:42	07:57 (WTG07)   07:00 08:30 (WTG07)   18:17	07:44 (WTG07)   06:13 19:46		06:26 20:17	05:59 20:47
Potential sun hours	301	299	370	397	445	448
Total, worst case	842	165	142			
Sun reduction	0,45	0,47	0,49			
Oper. time red.	0,86	0,86	0,86			
Wind dir. red.	0,77	0,80	0,78			
Total reduction	0,30	0,33	0,33			
Total, real	255	54	47			

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F098 - D

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	July	August	September	October	November	December		
1	06:00	06:22	06:51	07:19	06:52	07:25	07:48 (WTG07)	
	20:56	20:38	19:57	19:08	17:23	17:01	24 16:36 (WTG04)	
2	06:00	06:23	06:52	07:20	06:53	07:26	07:49 (WTG07)	
	20:56	20:37	19:55	19:07	17:22	17:00	22 16:36 (WTG04)	
3	06:00	06:24	06:53	07:21	06:54	07:27	07:50 (WTG07)	
	20:56	20:36	19:54	19:05	17:21	17:00	21 16:36 (WTG04)	
4	06:01	06:25	06:54	07:22	06:55	07:28	07:51 (WTG07)	
	20:56	20:35	19:52	19:03	17:20	13 07:37 (WTG07)	17:00 21 16:35 (WTG04)	
5	06:02	06:26	06:55	07:23	06:56	07:29	07:52 (WTG07)	
	20:55	20:34	19:51	19:02	17:19	19 07:54 (WTG07)	17:00 17 16:35 (WTG04)	
6	06:02	06:27	06:56	07:24	06:57	07:30	07:53 (WTG07)	
	20:55	20:33	19:49	19:00	17:18	23 07:56 (WTG07)	17:00 16 16:35 (WTG04)	
7	06:03	06:28	06:57	07:25	06:58	07:31	07:54 (WTG07)	
	20:55	20:32	19:47	18:59	17:17	25 07:57 (WTG07)	17:00 14 16:35 (WTG04)	
8	06:03	06:29	06:58	07:26	07:00	07:32	07:55 (WTG07)	
	20:55	20:30	19:46	18:57	17:16	28 07:58 (WTG07)	17:00 13 16:35 (WTG04)	
9	06:04	06:30	06:59	07:27	07:01	07:33	07:56 (WTG07)	
	20:54	20:29	19:44	18:56	17:15	30 07:59 (WTG07)	17:00 11 16:35 (WTG04)	
10	06:05	06:31	07:00	07:28	07:02	07:33	07:56 (WTG07)	
	20:54	20:28	19:43	18:54	17:14	32 08:01 (WTG07)	17:00 10 16:35 (WTG04)	
11	06:05	06:32	07:01	07:29	07:03	07:34	07:57 (WTG07)	
	20:54	20:27	19:41	18:52	17:13	33 08:01 (WTG07)	17:00 8 08:05 (WTG07)	
12	06:06	06:33	07:02	07:30	07:04	07:35	07:58 (WTG07)	
	20:53	20:26	19:39	18:51	17:12	34 08:02 (WTG07)	17:00 8 08:06 (WTG07)	
13	06:07	06:33	07:02	07:31	07:05	07:36	07:59 (WTG07)	
	20:53	20:24	19:38	18:49	17:11	35 08:02 (WTG07)	17:00 7 08:06 (WTG07)	
14	06:07	06:34	07:03	8 19:01 (WTG02)	07:32	07:06	07:28 (WTG07)	07:37 08:00 (WTG07)
	20:52	20:23	19:36	18:48	17:10	35 08:03 (WTG07)	17:00 6 08:06 (WTG07)	
15	06:08	06:35	07:04	18:58 (WTG02)	07:33	07:08	07:30 (WTG07)	07:37 08:00 (WTG07)
	20:52	20:22	19:34	14 19:12 (WTG02)	18:46	17:09	34 08:04 (WTG07)	17:01 6 08:06 (WTG07)
16	06:09	06:36	07:05	18:56 (WTG02)	07:34	07:09	07:31 (WTG07)	07:38 08:01 (WTG07)
	20:51	20:20	19:33	15 19:11 (WTG02)	18:45	17:09	33 08:04 (WTG07)	17:01 5 08:06 (WTG07)
17	06:10	06:37	07:06	18:54 (WTG02)	07:35	07:10	07:32 (WTG07)	07:39 08:02 (WTG07)
	20:50	20:19	19:31	15 19:09 (WTG02)	18:43	17:08	32 08:04 (WTG07)	17:01 5 08:07 (WTG07)
18	06:10	06:38	07:07	18:53 (WTG02)	07:36	07:11	07:33 (WTG07)	07:39 08:02 (WTG07)
	20:50	20:18	19:29	15 19:08 (WTG02)	18:42	17:07	31 08:04 (WTG07)	17:01 4 08:06 (WTG07)
19	06:11	06:39	07:08	18:52 (WTG02)	07:38	07:12	07:34 (WTG07)	07:40 08:03 (WTG07)
	20:49	20:16	19:28	14 19:06 (WTG02)	18:41	17:06	37 16:41 (WTG04)	17:02 4 08:07 (WTG07)
20	06:12	06:40	07:09	18:51 (WTG02)	07:39	07:13	07:36 (WTG07)	07:41 08:03 (WTG07)
	20:49	20:15	19:26	14 19:05 (WTG02)	18:39	17:06	38 16:42 (WTG04)	17:02 4 08:07 (WTG07)
21	06:13	06:41	07:10	18:51 (WTG02)	07:40	07:14	07:37 (WTG07)	07:41 08:04 (WTG07)
	20:48	20:13	19:25	12 19:03 (WTG02)	18:38	17:05	38 16:41 (WTG04)	17:03 3 08:07 (WTG07)
22	06:14	06:42	07:11	18:50 (WTG02)	07:41	07:15	07:38 (WTG07)	07:42 08:04 (WTG07)
	20:47	20:12	19:23	11 19:01 (WTG02)	18:36	17:04	38 16:41 (WTG04)	17:03 3 08:07 (WTG07)
23	06:14	06:43	07:12	18:50 (WTG02)	07:42	07:17	07:39 (WTG07)	07:42 08:05 (WTG07)
	20:46	20:10	19:21	9 18:59 (WTG02)	18:35	17:04	36 16:40 (WTG04)	17:04 4 08:09 (WTG07)
24	06:15	06:44	07:13	18:50 (WTG02)	07:43	07:18	07:40 (WTG07)	07:43 08:05 (WTG07)
	20:46	20:09	19:20	7 18:57 (WTG02)	18:34	17:03	35 16:39 (WTG04)	17:04 4 08:09 (WTG07)
25	06:16	06:45	07:14	18:50 (WTG02)	06:44	07:19	07:41 (WTG07)	07:43 08:05 (WTG07)
	20:45	20:08	19:18	6 18:56 (WTG02)	17:32	17:03	33 16:38 (WTG04)	17:05 4 08:09 (WTG07)
26	06:17	06:46	07:15	18:51 (WTG02)	06:45	07:20	07:43 (WTG07)	07:43 08:06 (WTG07)
	20:44	20:06	19:16	3 18:54 (WTG02)	17:31	17:02	32 16:39 (WTG04)	17:05 4 08:10 (WTG07)
27	06:18	06:47	07:16	18:52 (WTG02)	06:46	07:21	07:44 (WTG07)	07:44 08:06 (WTG07)
	20:43	20:05	19:15	1 18:53 (WTG02)	17:30	17:02	30 16:38 (WTG04)	17:06 5 08:11 (WTG07)
28	06:19	06:48	07:17	06:47	07:22	07:22	07:45 (WTG07)	07:44 08:06 (WTG07)
	20:42	20:03	19:13	17:28	17:02	29 16:38 (WTG04)	17:07 5 08:11 (WTG07)	
29	06:20	06:49	07:17	06:48	07:23	07:23	07:46 (WTG07)	07:44 08:07 (WTG07)
	20:41	20:02	19:11	17:27	17:01	27 16:37 (WTG04)	17:07 6 08:13 (WTG07)	
30	06:21	06:49	07:18	06:49	07:24	07:24	07:47 (WTG07)	07:45 08:07 (WTG07)
	20:40	20:00	19:10	17:26	17:01	26 16:37 (WTG04)	17:08 7 08:14 (WTG07)	
31	06:21	06:50		06:51			07:45 08:07 (WTG07)	
	20:39	19:58		17:25			17:09 7 08:14 (WTG07)	
Potential sun hours	455	425	374	347	301	292		
Total, worst case			144		836	276		
Sun reduction			0,65		0,51	0,45		
Oper. time red.			0,86		0,86	0,86		
Wind dir. red.			0,78		0,78	0,78		
Total reduction			0,44		0,34	0,31		
Total, real			63		285	84		

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
Via Santa Margherita 4
IT-09124 Cagliari
+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F106 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to December) and rows for time intervals (07:45 to 17:42). Includes summary rows for 'Potential sun hours', 'Total, worst case', 'Sun reduction', 'Oper. time red.', 'Wind dir. red.', 'Total reduction', and 'Total, real'.

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)



Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F119 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00
3	07:45 17:12	07:31 17:45	06:56 18:17	07:07 19:49	06:24 20:19	05:58 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:45 17:12	07:30 17:46	06:54 18:19	07:05 19:50	06:22 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:45 17:13	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:45 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:45 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:58 17:17	07:31 17:00
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:56 20:50	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:17 20:25	05:56 20:50	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:55	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:33 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:52	07:03 17:13	07:34 17:00
12	07:45 17:20	07:21 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:25	07:01 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:00
16	07:43 17:24	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:09	07:38 17:01
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:32 18:33	06:44 20:04	06:08 20:34	05:56 20:54	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:28	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:41	07:12 17:06	07:40 17:02
20	07:42 17:29	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	06:39 20:07	06:05 20:36	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:24	07:40 18:38	07:14 17:05	07:41 17:03
22	07:40 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:05 20:37	05:56 20:55	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03
23	07:40 17:32	07:07 18:09	06:24 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:33	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:07	07:14 19:18	07:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	07:45 17:31	07:20 17:02	07:43 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:16 19:13	07:47 17:28	07:22 17:02	07:44 17:07
29	07:36 17:39	07:36 19:44	07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:48 20:01	07:17 19:11	07:48 17:27	07:23 17:01	07:44 17:07
30	07:35 17:41	07:35 19:45	07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:49 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42	07:34 19:46	07:12 19:46	06:26 20:45	06:00 20:45	05:59 20:56	06:21 20:39	06:50 19:58	07:19 17:25	07:50 17:25	07:25 17:01	07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F143 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

	January	February	March	April	May	June	
1	07:45 17:10 23	08:12 (WTG15)   07:33 08:35 (WTG15)   17:43		06:59 18:16 45	08:00 (WTG16)   07:10 08:45 (WTG16)   19:48	06:26 20:18 05:59	
2	07:45 17:11 23	08:12 (WTG15)   07:32 08:35 (WTG15)   17:44		06:58 18:17 44	08:00 (WTG16)   07:09 08:44 (WTG16)   19:49	06:25 20:19 05:58	
3	07:46 17:12 23	08:13 (WTG15)   07:31 08:36 (WTG15)   17:46		06:56 18:18 42	08:01 (WTG16)   07:07 08:43 (WTG16)   19:50	06:24 20:20 05:57	
4	07:46 17:13 23	08:13 (WTG15)   07:30 08:36 (WTG15)   17:47		06:55 18:19 40	08:01 (WTG16)   07:05 08:41 (WTG16)   19:51	06:23 20:21 05:57	
5	07:46 17:14 22	08:14 (WTG15)   07:29 08:36 (WTG15)   17:48		06:53 18:20 39	08:02 (WTG16)   07:04 08:41 (WTG16)   19:52	06:21 20:22 05:57	
6	07:46 17:15 23	08:14 (WTG15)   07:28 08:37 (WTG15)   17:49		06:52 18:21 36	08:03 (WTG16)   07:02 08:39 (WTG16)   19:53	06:20 20:23 05:57	
7	07:46 17:15 22	08:15 (WTG15)   07:27 08:37 (WTG15)   17:50	8	08:20 (WTG16)   06:50 08:28 (WTG16)   18:22	32	08:04 (WTG16)   07:01 08:36 (WTG16)   19:54	06:19 20:23 05:57
8	07:46 17:16 22	08:16 (WTG15)   07:26 08:38 (WTG15)   17:52	17	08:15 (WTG16)   06:48 08:32 (WTG16)   18:23	29	08:06 (WTG16)   06:59 08:35 (WTG16)   19:55	06:18 20:24 05:57
9	07:45 17:17 21	08:17 (WTG15)   07:25 08:38 (WTG15)   17:53	23	08:12 (WTG16)   06:47 08:35 (WTG16)   18:24	25	08:07 (WTG16)   06:58 08:32 (WTG16)   19:56	06:17 20:25 05:56
10	07:45 17:18 22	08:16 (WTG15)   07:24 08:38 (WTG15)   17:54	28	08:10 (WTG16)   06:45 08:38 (WTG16)   18:25	19	08:10 (WTG16)   06:56 08:29 (WTG16)   19:57	06:16 20:26 05:56
11	07:45 17:19 21	08:17 (WTG15)   07:23 08:38 (WTG15)   17:55	31	08:09 (WTG16)   06:44 08:40 (WTG16)   18:26	10	08:14 (WTG16)   06:55 08:24 (WTG16)   19:58	06:15 20:27 05:56
12	07:45 17:20 20	08:18 (WTG15)   07:22 08:38 (WTG15)   17:56	34	08:07 (WTG16)   06:42 08:41 (WTG16)   18:27		06:53 19:59	06:14 20:28 05:56
13	07:45 17:21 18	08:19 (WTG15)   07:21 08:37 (WTG15)   17:57	37	08:06 (WTG16)   06:41 08:43 (WTG16)   18:28		06:51 20:00	06:13 20:29 05:56
14	07:44 17:23 18	08:20 (WTG15)   07:19 08:38 (WTG15)   17:59	39	08:04 (WTG16)   06:39 08:43 (WTG16)   18:29		06:50 20:01	06:12 20:30 05:56
15	07:44 17:24 17	08:21 (WTG15)   07:18 08:38 (WTG15)   18:00	40	08:04 (WTG16)   06:37 08:44 (WTG16)   18:30		06:48 20:02	06:11 20:31 05:56
16	07:44 17:25 15	08:22 (WTG15)   07:17 08:37 (WTG15)   18:01	42	08:03 (WTG16)   06:36 08:45 (WTG16)   18:31		06:47 20:03	06:10 20:32 05:56
17	07:43 17:26 12	08:24 (WTG15)   07:16 08:36 (WTG15)   18:02	43	08:02 (WTG16)   06:34 08:45 (WTG16)   18:32		06:46 20:04	06:09 20:33 05:56
18	07:43 17:27 10	08:25 (WTG15)   07:14 08:35 (WTG15)   18:03	45	08:01 (WTG16)   06:33 08:46 (WTG16)   18:33		06:44 20:05	06:08 20:34 05:56
19	07:42 17:28 4	08:29 (WTG15)   07:13 08:33 (WTG15)   18:04	46	08:01 (WTG16)   06:31 08:47 (WTG16)   18:34		06:43 20:06	06:07 20:35 05:56
20	07:42 17:29	07:12 18:05	47	08:00 (WTG16)   06:29 08:47 (WTG16)   18:36		06:41 20:07	06:06 20:36 05:56
21	07:41 17:30	07:10 18:07	47	08:00 (WTG16)   06:28 08:47 (WTG16)   18:37		06:40 20:08	06:06 20:37 05:56
22	07:41 17:31	07:09 18:08	48	08:00 (WTG16)   06:26 08:48 (WTG16)   18:38		06:38 20:09	06:05 20:38 05:57
23	07:40 17:33	07:08 18:09	48	07:59 (WTG16)   06:25 08:47 (WTG16)   18:39		06:37 20:10	06:04 20:38 05:57
24	07:39 17:34	07:06 18:10	48	07:59 (WTG16)   06:23 08:47 (WTG16)   18:40		06:36 20:11	06:04 20:39 05:57
25	07:39 17:35	07:05 18:11	47	07:59 (WTG16)   06:21 08:46 (WTG16)   18:41		06:34 20:12	06:03 20:40 05:57
26	07:38 17:36	07:03 18:12	47	07:59 (WTG16)   06:20 08:46 (WTG16)   18:42		06:33 20:13	06:02 20:41 05:58
27	07:37 17:37	07:02 18:13	46	08:00 (WTG16)   06:18 08:46 (WTG16)   18:43		06:31 20:14	06:02 20:42 05:58
28	07:37 17:38	07:00 18:14	46	07:59 (WTG16)   06:17 08:45 (WTG16)   18:44		06:30 20:15	06:01 20:43 05:58
29	07:36 17:40			07:15 19:45		06:29 20:16	06:00 20:43 05:59
30	07:35 17:41			07:13 19:46		06:28 20:17	06:00 20:44 05:59
31	07:34 17:42			07:12 19:47		06:27 20:18	05:59 20:45 05:59
Potential sun hours	301	299	370	397	445	448	
Total, worst case	359	857	361				
Sun reduction	0,45	0,47	0,49				
Oper. time red.	0,86	0,86	0,86				
Wind dir. red.	0,78	0,81	0,81				
Total reduction	0,31	0,33	0,34				
Total, real	110	283	124				

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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### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14Shadow receptor: F143 - A

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,40	5,05	5,88	7,00	8,45	9,88	10,82	10,03	8,08	6,09	5,07	4,27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
319	183	190	436	759	530	340	319	409	721	2.333	1.038	7.577

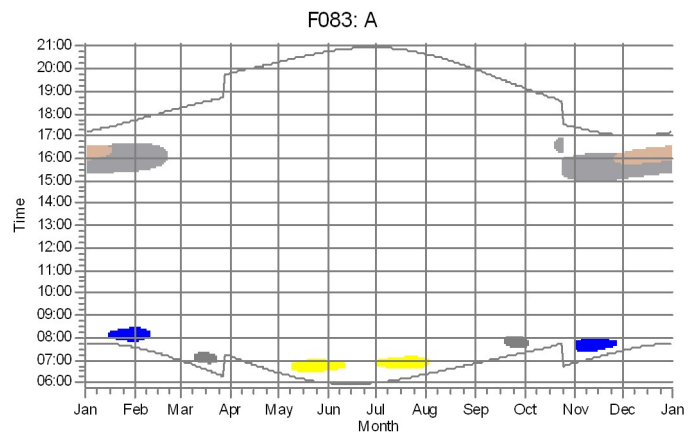
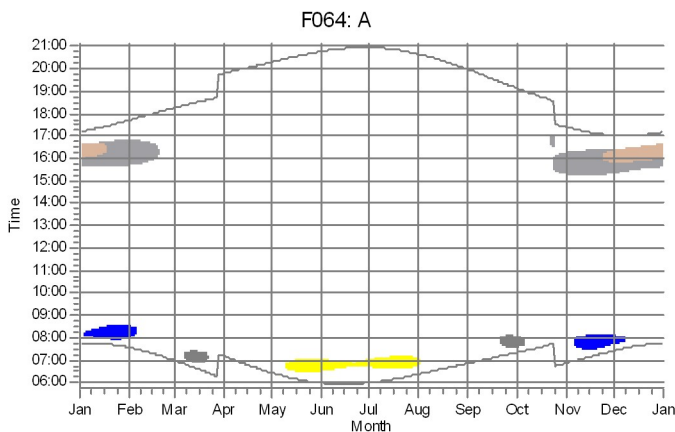
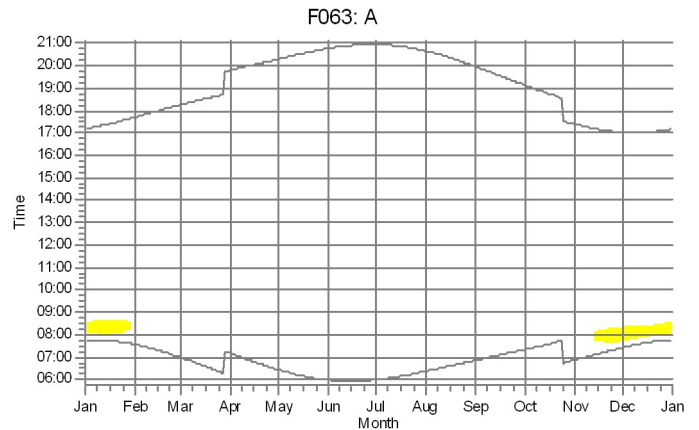
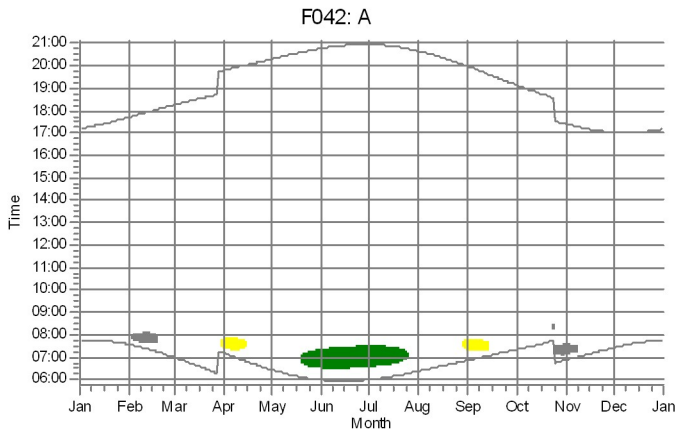
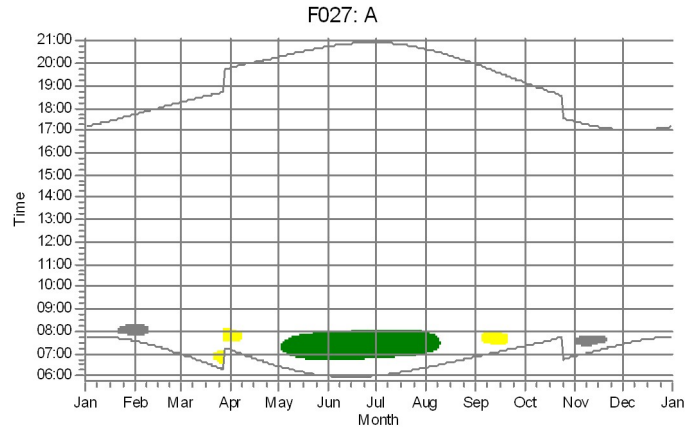
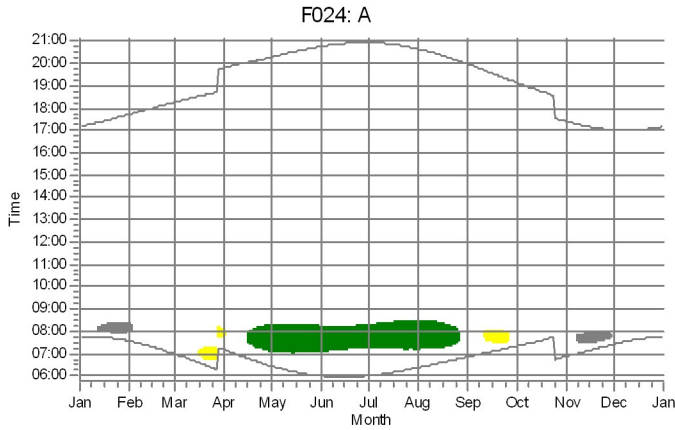
	July	August	September	October	November	December
1	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	06:00 20:56	06:23 20:37	06:52 19:56	07:21 19:07	06:53 17:23	07:26 17:01
3	06:01 20:56	06:24 20:36	06:53 19:54	07:22 19:05	08:49 (WTG16) 09:05 (WTG16)	07:27 17:00
4	06:01 20:56	06:25 20:35	06:54 19:52	07:23 19:04	08:46 (WTG16) 09:08 (WTG16)	07:28 17:00
5	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	08:43 (WTG16) 09:11 (WTG16)	07:29 17:00
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	08:41 (WTG16) 09:12 (WTG16)	07:30 17:00
7	06:03 20:55	06:28 20:32	06:57 19:48	07:25 18:59	08:39 (WTG16) 09:14 (WTG16)	07:31 17:00
8	06:04 20:55	06:29 20:31	06:58 19:46	07:26 18:57	08:38 (WTG16) 09:15 (WTG16)	07:32 17:00
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	08:36 (WTG16) 09:16 (WTG16)	07:33 17:00
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	08:35 (WTG16) 09:16 (WTG16)	07:34 17:00
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	08:34 (WTG16) 09:17 (WTG16)	07:34 17:00
12	06:06 20:53	06:33 20:26	07:02 19:40	07:30 18:51	08:33 (WTG16) 09:17 (WTG16)	07:35 17:00
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	08:32 (WTG16) 09:18 (WTG16)	07:36 17:00
14	06:08 20:52	06:35 20:23	07:04 19:36	07:33 18:48	08:32 (WTG16) 09:18 (WTG16)	07:37 17:01
15	06:08 20:52	06:36 20:22	07:05 19:35	07:34 18:47	08:31 (WTG16) 09:18 (WTG16)	07:37 17:01
16	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	08:32 (WTG16) 09:19 (WTG16)	07:38 17:01
17	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	08:31 (WTG16) 09:19 (WTG16)	07:39 17:01
18	06:11 20:50	06:38 20:18	07:07 19:30	07:37 18:42	08:31 (WTG16) 09:19 (WTG16)	07:40 17:02
19	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	08:31 (WTG16) 09:19 (WTG16)	07:40 17:02
20	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	08:31 (WTG16) 09:18 (WTG16)	07:41 17:02
21	06:13 20:48	06:41 20:14	07:10 19:25	07:40 18:38	08:30 (WTG16) 09:18 (WTG16)	07:41 17:03
22	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	08:31 (WTG16) 09:17 (WTG16)	07:42 17:03
23	06:15 20:47	06:43 20:11	07:12 19:21	07:42 18:35	08:31 (WTG16) 09:16 (WTG16)	07:42 17:04
24	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	08:31 (WTG16) 09:16 (WTG16)	07:43 17:04
25	06:16 20:45	06:45 20:08	07:14 19:18	07:44 17:33	07:32 (WTG16) 08:16 (WTG16)	07:43 17:05
26	06:17 20:44	06:46 20:06	07:15 19:17	07:45 17:31	07:33 (WTG16) 08:15 (WTG16)	07:44 17:06
27	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:34 (WTG16) 08:14 (WTG16)	07:44 17:06
28	06:19 20:42	06:48 20:03	07:17 19:13	07:47 17:29	07:34 (WTG16) 08:13 (WTG16)	07:44 17:07
29	06:20 20:41	06:49 20:02	07:18 19:12	07:49 17:27	07:35 (WTG16) 08:11 (WTG16)	07:45 17:08
30	06:21 20:40	06:50 20:00	07:19 19:10	07:50 17:26	07:36 (WTG16) 08:10 (WTG16)	07:45 17:08
31	06:22 20:39	06:51 19:59	07:20 19:08	07:51 17:25	07:37 (WTG16) 08:09 (WTG16)	07:46 17:09
Potential sun hours	455	425	374	347	301	292
Total, worst case				1163	185	701
Sun reduction				0,54	0,51	0,45
Oper. time red.				0,86	0,86	0,86
Wind dir. red.				0,81	0,79	0,78
Total reduction				0,38	0,35	0,31
Total, real				442	64	215

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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## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14



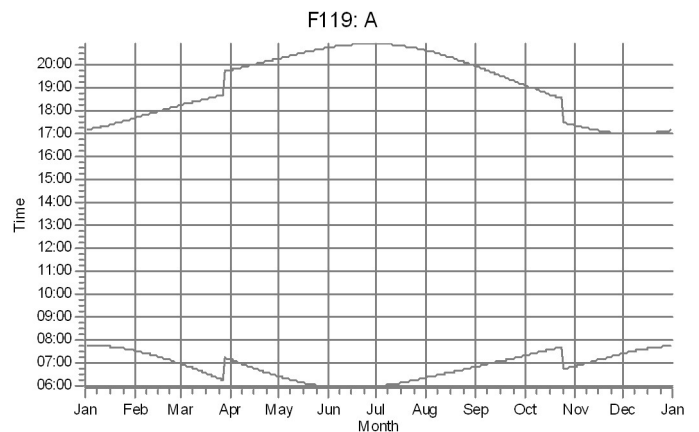
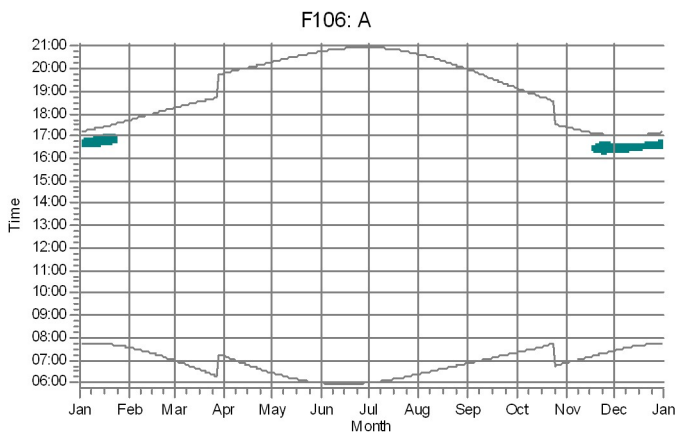
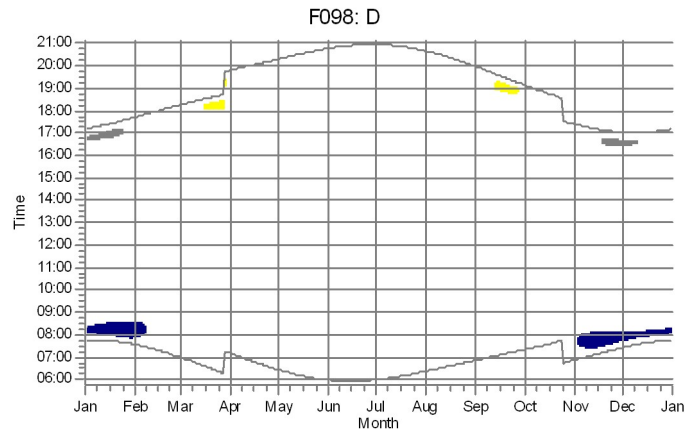
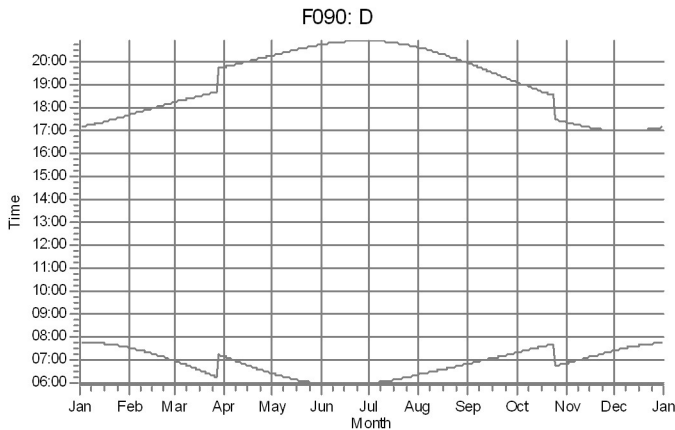
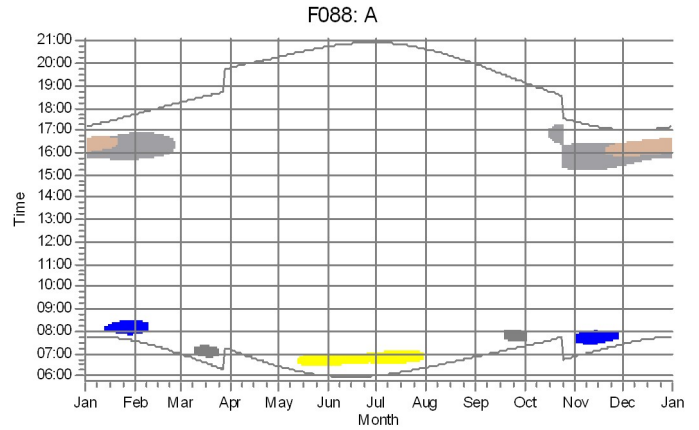
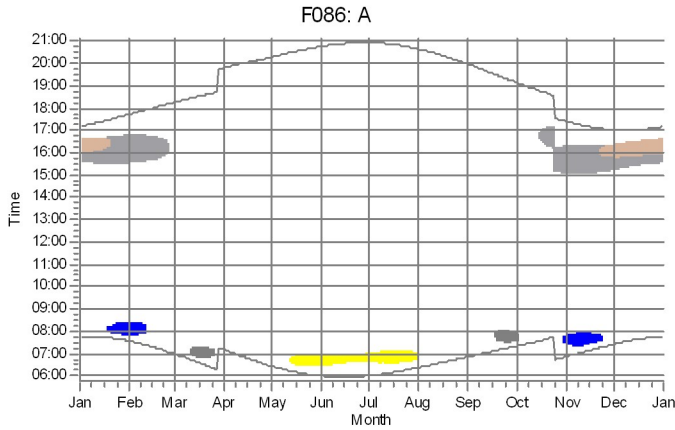
WTGs

- WTG01: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (29)
- WTG02: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (30)
- WTG03: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (31)

- WTG04: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (32)
- WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)
- WTG17: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45)

## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14



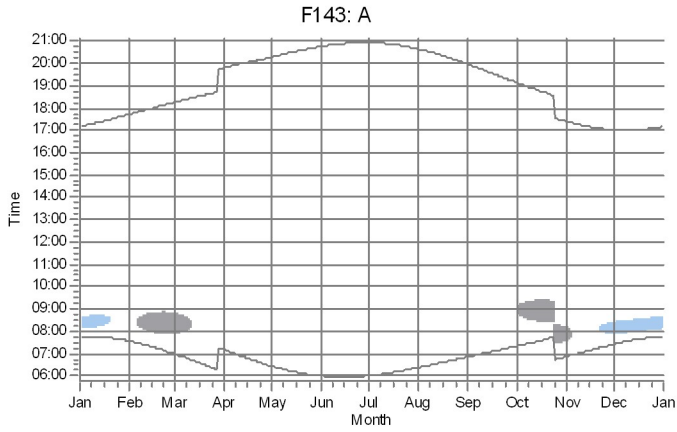
WTGs

- WTG02: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (30)
- WTG03: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (31)
- WTG04: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (32)
- WTG06: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (34)

- WTG07: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (35)
- WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)
- WTG17: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45)

## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14



### WTGs

WTG15: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (43)

WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
Via Santa Margherita 4
IT-09124 Cagliari
+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG01 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (29)
Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]
Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a 2x2 matrix of times (Sun rise/set and First/Last time with flicker) and a 'Sum of minutes with flicker' at the bottom.

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG02 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June
1	07:45 08:07-08:28/21 17:10	07:33 17:43 17:43	06:59 18:15 18:15	07:10 07:30-08:01/31 19:47	06:26 20:17 20:17	05:59 06:31-06:56/25 20:45
2	07:45 08:07-08:29/22 17:11	07:32 17:44 17:44	06:57 18:16 18:16	07:08 07:29-08:00/31 19:48	06:25 20:18 20:18	05:58 06:31-06:55/24 20:46
3	07:45 08:07-08:29/22 17:12	07:31 17:45 17:45	06:56 18:18 18:18	07:07 07:27-07:59/32 19:49	06:24 20:19 20:19	05:58 06:32-06:55/23 20:47
4	07:46 08:07-08:30/23 17:13	07:30 17:47 17:47	06:54 18:19 18:19	07:05 07:27-07:58/31 19:50	06:22 20:20 20:20	05:58 06:32-06:55/23 20:48
5	07:46 08:07-08:30/23 17:13	07:29 17:48 17:48	06:53 18:20 18:20	07:04 07:26-07:56/30 19:51	06:21 20:21 20:21	05:57 06:33-06:55/22 20:48
6	07:46 08:07-08:31/24 17:14	07:28 17:49 17:49	06:51 18:21 18:21	07:02 07:25-07:54/29 19:52	06:20 20:22 20:22	05:57 06:33-06:54/21 20:49
7	07:46 08:07-08:32/25 17:15	07:27 17:50 17:50	06:50 18:22 18:22	07:01 07:25-07:51/26 19:53	06:19 20:23 20:23	05:57 06:33-06:54/21 20:49
8	07:45 08:07-08:33/26 17:16	07:26 17:51 17:51	06:48 18:23 18:23	06:59 07:24-07:47/23 19:54	06:18 20:24 20:24	05:57 06:34-06:54/20 20:50
9	07:45 08:07-08:33/26 17:17	07:25 17:53 17:53	06:47 18:24 18:24	06:57 07:25-07:47/22 19:55	06:17 20:25 20:25	05:56 06:35-06:54/19 20:51
10	07:45 08:06-08:33/27 17:18	07:24 17:54 17:54	06:45 18:25 18:25	06:56 07:25-07:45/20 19:56	06:16 20:26 20:26	05:56 06:35-06:53/18 20:51
11	07:45 08:06-08:34/28 17:19	07:23 17:55 17:55	06:44 18:26 18:26	06:54 07:26-07:44/18 19:57	06:15 06:39-06:47/8 20:27	05:56 06:36-06:53/17 20:52
12	07:45 08:06-08:34/28 17:20	07:22 17:56 17:56	06:42 18:27 18:27	06:53 07:27-07:42/15 19:58	06:14 06:37-06:49/12 20:28	05:56 06:35-06:52/17 20:52
13	07:45 08:05-08:34/29 17:21	07:20 17:57 17:57	06:41 18:28 18:28	06:51 07:29-07:41/12 19:59	06:13 06:36-06:51/15 20:29	05:56 06:36-06:52/16 20:53
14	07:44 08:05-08:35/30 17:22	07:19 17:58 17:58	06:39 18:29 18:29	06:50 07:32-07:36/4 20:00	06:12 06:34-06:52/18 20:30	05:56 06:36-06:52/16 20:53
15	07:44 08:06-08:36/30 17:23	07:18 18:00 18:00	06:37 18:30 18:30	06:48 20:01 20:01	06:11 06:35-06:54/19 20:31	05:56 06:37-06:52/15 20:53
16	07:44 08:06-08:35/29 17:25	07:17 18:01 18:01	06:36 18:31 18:31	06:47 20:02 20:02	06:10 06:34-06:54/20 20:32	05:56 06:38-06:53/15 20:54
17	07:43 08:07-08:36/29 17:26	07:15 18:02 18:02	06:34 18:09-18:11/2 18:32 06:59-07:04/5	06:45 20:03 20:03	06:09 06:32-06:55/23 20:33	05:56 06:38-06:53/15 20:54
18	07:43 08:07-08:35/28 17:27	07:14 18:03 18:03	06:33 18:08-18:13/5 18:33 06:55-07:08/13	06:44 20:04 20:04	06:08 06:32-06:55/23 20:34	05:56 06:38-06:53/15 20:55
19	07:42 08:08-08:36/28 17:28	07:13 18:04 18:04	06:31 18:06-18:14/8 18:34 06:52-07:09/17	06:42 20:05 20:05	06:07 06:31-06:55/24 20:35	05:56 06:39-06:53/14 20:55
20	07:42 08:08-08:35/27 17:29	07:12 18:05 18:05	06:29 18:06-18:15/9 18:35 06:51-07:11/20	06:41 20:06 20:06	06:06 06:31-06:56/25 20:36	05:56 06:39-06:53/14 20:55
21	07:41 08:09-08:35/26 17:30	07:10 18:06 18:06	06:28 18:05-18:16/11 18:36 06:49-07:11/22	06:40 20:07 20:07	06:06 06:31-06:56/25 20:37	05:56 06:39-06:53/14 20:55
22	07:41 08:10-08:35/25 17:31	07:09 18:08 18:08	06:26 18:05-18:16/11 18:37 06:48-07:11/23	06:38 20:08 20:08	06:05 06:30-06:56/26 20:37	05:57 06:39-06:53/14 20:56
23	07:40 08:11-08:35/24 17:32	07:07 18:09 18:09	06:25 18:05-18:18/13 18:38 06:48-07:12/24	06:37 20:09 20:09	06:04 06:30-06:56/26 20:38	05:57 06:40-06:54/14 20:56
24	07:39 08:12-08:34/22 17:34	07:06 18:10 18:10	06:23 18:05-18:19/14 18:39 06:45-07:11/26	06:35 20:10 20:10	06:03 06:30-06:56/26 20:39	05:57 06:40-06:54/14 20:56
25	07:39 08:14-08:34/20 17:35	07:05 18:11 18:11	06:21 18:05-18:19/14 18:40 06:43-07:12/29	06:34 20:11 20:11	06:03 06:30-06:56/26 20:40	05:57 06:39-06:54/15 20:56
26	07:38 08:15-08:32/17 17:36	07:03 18:12 18:12	06:20 18:06-18:21/15 18:41 06:41-07:11/30	06:33 20:12 20:12	06:02 06:30-06:57/27 20:41	05:58 06:40-06:55/15 20:56
27	07:37 08:17-08:31/14 17:37	07:02 18:13 18:13	06:18 18:06-18:21/15 18:42 06:39-07:10/31	06:31 20:13 20:13	06:01 06:30-06:56/26 20:42	05:58 06:40-06:55/15 20:56
28	07:36 08:19-08:28/9 17:38	07:00 18:14 18:14	06:16 18:08-18:23/15 18:43 06:39-07:09/30	06:30 20:14 20:14	06:01 06:30-06:56/26 20:42	05:58 06:39-06:55/16 20:56
29	07:36 17:39 17:39		07:15 19:10-19:20/10 19:44 07:38-08:08/30	06:29 20:15 20:15	06:00 06:30-06:56/26 20:43	05:59 06:40-06:56/16 20:56
30	07:35 17:41 17:41		07:13 07:37-08:06/29 19:45	06:27 20:16 20:16	06:00 06:31-06:56/25 20:44	05:59 06:39-06:56/17 20:56
31	07:34 17:42		07:12 07:33-08:04/31 19:46		05:59 06:31-06:55/24 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	682	0	502	324	470	520

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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG02 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	July	August	September	October	November	December
1	06:00 06:40-06:57/17 20:56	06:22 06:49-06:59/10 20:38	06:51 07:25-07:43/18 19:57	07:19 19:08	06:52 17:24	07:25 07:48-08:16/28 17:01
2	06:00 06:39-06:57/18 20:56	06:23 06:52-06:56/4 20:37	06:52 07:24-07:44/20 19:55	07:20 19:07	06:53 17:22	07:26 07:49-08:16/27 17:00
3	06:01 06:40-06:58/18 20:56	06:24 20:36	06:53 07:23-07:45/22 19:54	07:21 19:05	06:54 17:21	07:27 07:50-08:16/26 17:00
4	06:01 06:39-06:59/20 20:56	06:25 20:35	06:54 07:22-07:44/22 19:52	07:22 19:03	06:55 17:20	07:28 07:51-08:17/26 17:00
5	06:02 06:40-07:00/20 20:56	06:26 20:34	06:55 07:21-07:47/26 19:51	07:23 19:02	06:56 17:19	07:29 07:52-08:17/25 17:00
6	06:02 06:39-07:00/21 20:55	06:27 20:33	06:56 07:21-07:50/29 19:49	07:24 19:00	06:57 17:18	07:30 07:53-08:17/24 17:00
7	06:03 06:39-07:01/22 20:55	06:28 20:32	06:57 07:21-07:51/30 19:47	07:25 18:59	06:59 17:17	07:31 07:54-08:18/24 17:00
8	06:03 06:39-07:01/22 20:55	06:29 20:30	06:58 07:21-07:52/31 19:46	07:26 18:57	07:00 17:16	07:32 07:55-08:18/23 17:00
9	06:04 06:39-07:02/23 20:54	06:30 20:29	06:59 07:21-07:53/32 19:44	07:27 18:56	07:01 17:15	07:33 07:56-08:18/22 17:00
10	06:05 06:39-07:03/24 20:54	06:31 20:28	07:00 07:22-07:54/32 19:43	07:28 18:54	07:02 17:14	07:33 07:57-08:19/22 17:00
11	06:05 06:39-07:03/24 20:54	06:32 20:27	07:01 07:23-07:54/31 19:41	07:29 18:53	07:03 17:13	07:34 07:57-08:18/21 17:00
12	06:06 06:39-07:03/24 20:53	06:33 20:26	07:02 07:25-07:56/31 19:39	07:30 18:51	07:04 17:12	07:35 07:58-08:19/21 17:00
13	06:07 06:39-07:04/25 20:53	06:34 20:24	07:03 07:28-07:57/29 19:38	07:31 18:49	07:05 17:11	07:36 07:59-08:19/20 17:00
14	06:07 06:38-07:04/26 20:52	06:35 20:23	07:03 19:01-19:09/8 19:36	07:32 18:48	07:07 07:52-08:01/9 17:10	07:37 08:00-08:20/20 17:00
15	06:08 06:39-07:05/26 20:52	06:35 20:22	07:04 18:58-19:12/14 19:34	07:33 18:46	07:08 07:50-08:04/14 17:09	07:37 08:00-08:19/19 17:01
16	06:09 06:39-07:05/26 20:51	06:36 20:20	07:05 18:56-19:11/15 19:33	07:34 18:45	07:09 07:48-08:05/17 17:09	07:38 08:01-08:20/19 17:01
17	06:10 06:40-07:06/26 20:51	06:37 20:19	07:06 18:54-19:09/15 19:31	07:35 18:44	07:10 07:47-08:07/20 17:08	07:39 08:02-08:21/19 17:01
18	06:10 06:39-07:05/26 20:50	06:38 20:18	07:07 18:53-19:08/15 19:30	07:37 18:42	07:11 07:46-08:08/22 17:07	07:39 08:02-08:20/18 17:02
19	06:11 06:39-07:06/27 20:49	06:39 20:16	07:08 18:52-19:06/14 19:28	07:38 18:41	07:12 07:46-08:10/24 17:06	07:40 08:03-08:21/18 17:02
20	06:12 06:40-07:06/26 20:49	06:40 20:15	07:09 18:51-19:05/14 19:26	07:39 18:39	07:13 07:45-08:10/25 17:06	07:41 08:03-08:21/18 17:02
21	06:13 06:40-07:06/26 20:48	06:41 20:13	07:10 18:51-19:03/12 19:25	07:40 18:38	07:14 07:45-08:11/26 17:05	07:41 08:04-08:22/18 17:03
22	06:14 06:41-07:06/25 20:47	06:42 20:12	07:11 18:50-19:01/11 19:23	07:41 18:36	07:16 07:44-08:11/27 17:05	07:42 08:04-08:22/18 17:03
23	06:14 06:40-07:06/26 20:46	06:43 20:11	07:12 18:50-18:59/9 19:21	07:42 18:35	07:17 07:44-08:12/28 17:04	07:42 08:05-08:23/18 17:04
24	06:15 06:41-07:06/25 20:46	06:44 20:09	07:13 18:50-18:57/7 19:20	07:43 18:34	07:18 07:44-08:12/28 17:03	07:43 08:05-08:23/18 17:04
25	06:16 06:42-07:05/23 20:45	06:45 20:08	07:14 18:50-18:56/6 19:18	07:44 17:32	07:19 07:45-08:14/29 17:03	07:43 08:06-08:24/18 17:05
26	06:17 06:42-07:05/23 20:44	06:46 20:06	07:15 18:51-18:54/3 19:16	07:45 17:31	07:20 07:45-08:14/29 17:02	07:43 08:06-08:25/19 17:05
27	06:18 06:43-07:05/22 20:43	06:47 20:05	07:16 18:52-18:53/1 19:15	07:46 17:30	07:21 07:45-08:15/30 17:02	07:44 08:06-08:25/19 17:06
28	06:19 06:45-07:04/19 20:42	06:48 20:03	07:17 19:13	07:47 17:28	07:22 07:45-08:15/30 17:02	07:44 08:06-08:25/19 17:07
29	06:20 06:44-07:03/19 20:41	06:49 07:33-07:37/4 20:02	07:18 19:12	07:48 17:27	07:23 07:46-08:15/29 17:01	07:44 08:07-08:27/20 17:08
30	06:21 06:45-07:02/17 20:40	06:50 07:29-07:41/12 20:00	07:19 19:10	07:49 17:26	07:24 07:47-08:15/28 17:01	07:45 08:07-08:27/20 17:08
31	06:22 06:47-07:01/14 20:39	06:50 07:27-07:42/15 19:59	06:51 17:25	06:51 17:25	06:51 17:25	07:45 08:07-08:27/20 17:09
Potential sun hours	455	425	374	347	301	292
Sum of minutes with flicker	700	45	807	0	415	647

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
Via Santa Margherita 4
IT-09124 Cagliari
+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG03 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (31)
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to December) and rows for each day of the year (1-31), showing sunrise and sunset times and shadow flicker minutes.

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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG04 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (32) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June
1	07:45 16:44-16:45/1 17:10	07:33 07:53-08:17/24 17:43	06:59	07:10	06:26	05:59
2	07:45 17:11	07:32 07:53-08:15/22 17:44	06:57	07:08	06:25	05:58
3	07:45 16:45-16:46/1 17:12	07:31 07:51-07:52/1 17:45 07:54-08:14/20	06:56	07:07	06:24	05:58
4	07:46 16:45-16:47/2 17:13	07:30 07:50-08:14/24 17:47	06:54	07:05	06:23	05:58
5	07:46 16:46-16:48/2 17:13	07:29 07:49-08:13/24 17:48	06:53	07:04	06:21	05:57
6	07:46 16:46-16:49/3 17:14	07:28 07:48-08:12/24 17:49	06:51	07:02	06:20	05:57
7	07:46 16:47-16:50/3 17:15	07:27 07:47-08:11/24 17:50	06:50	07:01	06:19	05:57
8	07:45 16:47-16:51/4 17:16	07:26 07:45-08:08/23 17:51	06:48 07:09-07:14/5	06:59	06:18	05:57
9	07:45 16:47-16:52/5 17:17	07:25 07:44-08:01/17 17:53	06:47 07:05-07:17/12	06:57	06:17	05:56
10	07:45 16:48-16:53/5 17:18	07:24 07:43-08:01/18 17:54	06:45 07:04-07:19/15	06:56	06:16	05:56
11	07:45 16:48-16:54/6 17:19	07:23 07:42-08:02/20 17:55	06:44 07:02-07:20/18	06:54	06:15	05:56
12	07:45 16:49-16:56/7 17:20	07:22 07:41-08:02/21 17:56	06:42 07:01-07:21/20	06:53	06:14	05:56
13	07:45 16:49-16:56/7 17:21 08:05-08:08/3	07:20 07:42-08:02/20 17:57	06:41 06:59-07:21/22	06:51	06:13	05:56
14	07:44 16:50-16:58/8 17:22 08:05-08:10/5	07:19 07:42-08:00/18 17:58	06:39 06:57-07:21/24	06:50	06:12	05:56
15	07:44 16:51-16:59/8 17:23 08:05-08:12/7	07:18 07:43-08:00/17 18:00	06:37 06:56-07:21/25	06:48	06:11	05:56
16	07:44 16:51-17:00/9 17:25 08:04-08:13/9	07:17 07:44-07:59/15 18:01	06:36 06:54-07:20/26	06:47	06:10	05:56
17	07:43 16:52-17:01/9 17:26 08:04-08:15/11	07:15 07:45-07:56/11 18:02	06:34 06:53-07:20/27	06:45	06:09	05:56
18	07:43 16:53-17:02/9 17:27 08:03-08:15/12	07:14 07:49-07:53/4 18:03	06:33 06:52-07:19/27	06:44	06:08	05:56
19	07:42 16:54-17:04/10 17:28 08:03-08:17/14	07:13 18:04	06:31 06:52-07:17/25	06:42	06:07	05:56
20	07:42 16:55-17:05/10 17:29 08:02-08:17/15	07:11 18:05	06:29 06:52-07:16/24	06:41	06:06	05:56
21	07:41 16:56-17:05/9 17:30 08:01-08:17/16	07:10 18:06	06:28 06:52-07:14/22	06:40	06:06	05:56
22	07:41 16:59-17:07/8 17:31 08:01-08:18/17	07:09 18:08	06:26 06:52-07:12/20	06:38	06:05	05:57
23	07:40 17:01-17:07/6 17:32 08:00-08:19/19	07:07 18:09	06:25 06:54-07:11/17	06:37	06:04	05:57
24	07:39 07:59-08:19/20 17:34	07:06 18:10	06:23 06:55-07:08/13	06:35	06:03	05:57
25	07:39 07:59-08:20/21 17:35	07:05 18:11	06:21 06:58-07:05/7	06:34	06:03	05:57
26	07:38 07:58-08:20/22 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56
27	07:37 07:57-08:19/22 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:58 20:56
28	07:36 07:56-08:19/23 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56
29	07:36 07:55-08:19/24 17:39		07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56
30	07:35 07:55-08:19/24 17:41		07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56
31	07:34 07:54-08:18/24 17:42		07:12 19:46		05:59 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	440	347	349	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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG04 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (32)  
 Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	July	August	September	October	November	December
1	06:00 20:56	06:22 20:38	06:51 19:57	07:19 07:39-08:00/21 19:08	06:52 07:13-07:31/18 17:24	07:25 16:30-16:36/6 17:01
2	06:00 20:56	06:23 20:37	06:52 19:55	07:20 07:40-07:59/19 19:07	06:53 07:14-07:31/17 17:22	07:26 16:31-16:36/5 17:00
3	06:01 20:56	06:24 20:36	06:53 19:54	07:21 07:41-07:58/17 19:05	06:54 07:15-07:39/24 17:21	07:27 16:31-16:36/5 17:00
4	06:01 20:56	06:25 20:35	06:54 19:52	07:22 07:42-07:56/14 19:03	06:55 07:16-07:40/24 17:20	07:28 16:31-16:35/4 17:00
5	06:02 20:55	06:26 20:34	06:55 19:51	07:23 07:43-07:53/10 19:02	06:56 07:18-07:42/24 17:19	07:29 16:32-16:35/3 17:00
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 07:19-07:43/24 17:18	07:30 16:32-16:35/3 17:00
7	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:59 07:20-07:44/24 17:17	07:31 16:33-16:35/2 17:00
8	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:00 07:24-07:44/20 17:16	07:32 16:33-16:35/2 17:00
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:01 07:24-07:47/23 17:15	07:33 16:34-16:35/1 17:00
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 07:24-07:48/24 17:14	07:33 16:34-16:35/1 17:00
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	07:03 07:25-07:49/24 17:13	07:34 17:00
12	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 07:26-07:50/24 17:12	07:35 17:00
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:49	07:05 07:27-07:51/24 17:11	07:36 17:00
14	06:07 20:52	06:35 20:23	07:03 19:36	07:32 18:48	07:06 07:29-07:52/23 17:10	07:37 17:00
15	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 07:30-07:52/22 17:09	07:37 17:01
16	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 07:31-07:53/22 17:09	07:38 17:01
17	06:10 20:51	06:37 20:19	07:06 19:31	07:35 18:44	07:10 07:32-07:53/21 17:08	07:39 17:01
18	06:10 20:50	06:38 20:18	07:07 07:46-07:52/6 19:30	07:37 18:42	07:11 07:33-07:53/20 17:07	07:39 17:02
19	06:11 20:49	06:39 20:16	07:08 07:42-07:55/13 19:28	07:38 18:41	07:12 16:35-16:41/6 17:06	07:40 17:02
20	06:12 20:49	06:40 20:15	07:09 07:40-07:57/17 19:26	07:39 18:39	07:13 16:34-16:42/8 17:06	07:41 17:02
21	06:13 20:48	06:41 20:13	07:10 07:39-07:58/19 19:25	07:40 18:38	07:14 16:32-16:41/9 17:05	07:41 17:03
22	06:14 20:47	06:42 20:12	07:11 07:38-07:59/21 19:23	07:41 18:36	07:15 16:31-16:41/10 17:05	07:42 17:03
23	06:15 20:46	06:43 20:11	07:12 07:37-08:00/23 19:21	07:42 18:35	07:17 16:31-16:40/9 17:04	07:42 17:04
24	06:15 20:46	06:44 20:09	07:13 07:35-08:00/25 19:20	07:43 08:17-08:24/7 18:34	07:18 16:30-16:39/9 17:03	07:43 17:04
25	06:16 20:45	06:45 20:08	07:14 07:35-08:01/26 19:18	06:44 07:15-07:27/12 17:32	07:19 16:30-16:38/8 17:03	07:43 17:05
26	06:17 20:44	06:46 20:06	07:15 07:35-08:02/27 19:16	06:45 07:14-07:29/15 17:31	07:20 16:30-16:39/9 17:03	07:43 17:06
27	06:18 20:43	06:47 20:05	07:16 07:35-08:02/27 19:15	06:46 07:12-07:30/18 17:30	07:21 16:30-16:38/8 17:02	07:44 17:06
28	06:19 20:42	06:48 20:03	07:17 07:36-08:02/26 19:13	06:47 07:11-07:30/19 17:28	07:22 16:30-16:38/8 17:02	07:44 17:07
29	06:20 20:41	06:49 20:02	07:18 07:37-08:01/24 19:12	06:48 07:11-07:30/19 17:27	07:23 16:30-16:37/7 17:01	07:44 17:08
30	06:21 20:40	06:50 20:00	07:18 07:38-08:01/23 19:10	06:49 07:10-07:30/20 17:26	07:24 16:30-16:37/7 17:01	07:45 17:08
31	06:22 20:39	06:50 19:58		06:51 07:12-07:31/19 17:25		07:45 17:09
Potential sun hours	455	425	374	347	301	292
Sum of minutes with flicker	0	0	277	210	629	32

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG05 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (33) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:22	06:51	07:19	06:52	07:25
	17:10	17:43	18:15	19:47	20:17	20:45	20:56	20:38	19:57	19:08	17:24	17:01
2	07:45	07:32	06:57	07:08	06:25	05:58	06:00	06:23	06:52	07:20	06:53	07:26
	17:11	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:07	17:22	17:00
3	07:45	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:21	06:54	07:27
	17:12	17:45	18:18	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:45	07:30	06:54	07:05	06:22	05:58	06:01	06:25	06:54	07:22	06:55	07:28
	17:13	17:47	18:19	19:50	20:20	20:47	20:56	20:35	19:52	19:03	17:20	17:00
5	07:45	07:29	06:53	07:04	06:21	05:57	06:02	06:26	06:55	07:23	06:56	07:29
	17:13	17:48	18:20	19:51	20:21	20:48	20:55	20:34	19:51	19:02	17:19	17:00
6	07:45	07:28	06:51	07:02	06:20	05:57	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:21	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:45	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:25	06:58	07:31
	17:15	17:50	18:22	19:53	20:23	20:49	20:55	20:32	19:47	18:59	17:17	17:00
8	07:45	07:26	06:48	06:59	06:18	05:56	06:03	06:29	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:16	17:00
9	07:45	07:25	06:47	06:57	06:17	05:56	06:04	06:30	06:59	07:27	07:01	07:33
	17:17	17:53	18:24	19:55	20:25	20:50	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:28	07:02	07:33
	17:18	17:54	18:25	19:56	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:54	06:15	05:56	06:05	06:32	07:01	07:29	07:03	07:34
	17:19	17:55	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:52	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:25	19:39	18:51	17:12	17:00
13	07:44	07:20	06:40	06:51	06:13	05:56	06:07	06:34	07:02	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:52	20:53	20:24	19:38	18:49	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:07	06:34	07:03	07:32	07:06	07:37
	17:22	17:58	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:00
15	07:44	07:18	06:37	06:48	06:11	05:56	06:08	06:35	07:04	07:33	07:08	07:37
	17:23	18:00	18:30	20:01	20:31	20:53	20:52	20:22	19:34	18:46	17:09	17:01
16	07:43	07:17	06:36	06:47	06:10	05:56	06:09	06:36	07:05	07:34	07:09	07:38
	17:24	18:01	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:09	17:01
17	07:43	07:15	06:34	06:45	06:09	05:56	06:10	06:37	07:06	07:35	07:10	07:39
	17:26	18:02	18:32	20:03	20:33	20:54	20:50	20:19	19:31	18:43	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:10	06:38	07:07	07:36	07:11	07:39
	17:27	18:03	18:33	20:04	20:34	20:54	20:50	20:18	19:29	18:42	17:07	17:01
19	07:42	07:13	06:31	06:42	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:41	17:06	17:02
20	07:42	07:11	06:29	06:41	06:06	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:02
21	07:41	07:10	06:28	06:40	06:06	05:56	06:13	06:41	07:10	07:40	07:14	07:41
	17:30	18:06	18:36	20:07	20:36	20:55	20:48	20:13	19:25	18:38	17:05	17:03
22	07:40	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:15	07:42
	17:31	18:08	18:37	20:08	20:37	20:55	20:47	20:12	19:23	18:36	17:05	17:03
23	07:40	07:07	06:24	06:37	06:04	05:57	06:14	06:43	07:12	07:42	07:17	07:42
	17:32	18:09	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:04	17:04
24	07:39	07:06	06:23	06:35	06:03	05:57	06:15	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:39	20:10	20:39	20:56	20:46	20:09	19:20	18:34	17:03	17:04
25	07:39	07:05	06:21	06:34	06:03	05:57	06:16	06:45	07:14	07:44	07:19	07:43
	17:35	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	07:45	07:20	07:43
	17:36	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05
27	07:37	07:02	06:18	06:31	06:01	05:58	06:18	06:47	07:16	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:41	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:36	07:00	06:16	06:30	06:01	05:58	06:19	06:48	07:17	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:02	17:07
29	07:36		07:15	06:29	06:00	05:59	06:20	06:49	07:17	07:48	07:23	07:44
	17:39		19:44	20:15	20:43	20:56	20:41	20:01	19:11	17:27	17:01	17:07
30	07:35		07:13	06:27	06:00	05:59	06:21	06:49	07:18	07:49	07:24	07:45
	17:41		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		05:59		06:21	06:50		06:51		07:45
	17:42		19:46		20:45		20:39	19:58		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.
Via Santa Margherita 4
IT-09124 Cagliari
+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG06 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (34)
Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (e.g., 07:45 16:33-16:45/12) and a sum of minutes with flicker at the bottom.

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
Via Santa Margherita 4  
IT-09124 Cagliari  
+39 070 658297  
Giuseppe Frongia / direttore@iatprogetti.it  
Calculated:  
20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG07 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (35) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:45 08:07-08:15/8	07:33 07:58-08:30/32	06:59 07:10	06:26 07:10	06:26 05:59	06:00 06:00	06:22 06:51	07:19 06:52	07:25 07:19	06:52 07:19	07:25 07:48-08:06/18		
2	17:10 17:11	17:43 17:44	18:15 18:16	19:47 19:48	20:17 20:18	20:45 20:46	20:56 20:57	20:38 20:39	19:57 19:58	19:08 19:09	17:23 17:24		
3	07:45 08:07-08:17/10	07:31 08:01-08:28/27	06:56 07:07	06:24 07:07	06:24 05:58	06:00 06:00	06:24 06:53	07:21 06:54	07:27 06:54	07:28 07:51-08:06/15	07:26 07:49-08:06/17		
4	17:12 17:12	17:45 17:46	18:17 18:19	19:49 19:50	20:19 20:20	20:47 20:47	20:56 20:56	20:36 20:35	19:55 19:52	19:07 19:03	17:22 17:20		
5	07:45 08:07-08:18/11	07:30 08:02-08:27/25	06:54 07:05	06:22 07:05	06:22 05:58	06:01 06:01	06:25 06:54	07:22 06:55	07:37-07:50/13	07:28 07:51-08:06/15	07:29 07:52-08:06/14		
6	17:13 17:14	17:48 17:49	18:20 18:21	19:51 19:52	20:21 20:22	20:48 20:49	20:55 20:55	20:34 20:33	19:51 19:49	19:02 19:00	17:20 17:18		
7	07:45 08:07-08:21/14	07:28 08:06-08:24/18	06:51 07:02	06:20 07:02	06:20 05:57	06:02 06:02	06:27 06:56	07:24 06:57	07:33-07:56/23	07:30 07:53-08:06/13	07:31 07:54-08:06/12		
8	17:15 17:16	17:50 17:51	18:22 18:23	19:53 19:54	20:23 20:24	20:49 20:50	20:55 20:56	20:32 20:31	19:47 19:46	18:59 18:58	17:17 17:16		
9	07:45 08:07-08:22/15	07:26 07:25	06:48 06:59	06:18 06:57	06:18 05:56	06:03 06:04	06:29 06:58	07:26 07:00	07:30-07:58/28	07:32 07:55-08:06/11	07:33 07:56-08:06/10		
10	17:17 17:18	17:52 17:54	18:24 18:25	19:55 19:56	20:25 20:26	20:50 20:51	20:54 20:54	20:29 20:28	19:44 19:43	18:55 18:54	17:15 17:14		
11	07:45 08:06-08:23/17	07:24 07:23	06:45 06:56	06:16 06:56	06:16 05:56	06:05 06:05	06:31 06:32	07:00 07:01	07:28-08:01/32	07:30 07:56-08:05/9	07:33 07:57-08:05/8		
12	17:19 17:20	17:55 17:56	18:26 18:27	19:57 19:58	20:27 20:28	20:52 20:53	20:53 20:53	20:27 20:25	19:41 19:39	18:52 18:51	17:13 17:12		
13	07:45 08:06-08:25/19	07:21 07:20	06:42 06:53	06:14 06:53	06:14 05:56	06:06 06:06	06:33 07:01	07:30 07:04	07:28-08:02/34	07:35 07:58-08:06/8	07:36 07:59-08:06/7		
14	17:21 17:22	17:57 17:58	18:28 18:29	19:59 20:00	20:29 20:30	20:52 20:53	20:53 20:52	20:24 20:23	19:38 19:36	18:49 18:48	17:11 17:10		
15	07:44 08:05-08:26/21	07:19 07:18	06:39 06:50	06:12 06:50	06:12 05:56	06:07 06:07	06:34 07:03	07:32 07:06	07:28-08:03/35	07:37 08:00-08:06/6	07:38 08:01-08:06/5		
16	17:23 17:23	17:59 17:59	18:30 18:31	20:01 20:01	20:31 20:31	20:53 20:53	20:52 20:52	20:22 20:22	19:34 19:34	18:46 18:46	17:09 17:09		
17	07:43 08:04-08:27/23	07:17 07:16	06:36 06:47	06:10 06:49	06:10 05:56	06:09 06:10	06:36 07:05	07:34 07:09	07:31-08:04/33	07:38 08:01-08:06/5	07:41 08:04-08:07/3		
18	17:24 17:25	18:01 18:02	18:31 18:32	20:02 20:03	20:32 20:33	20:54 20:54	20:50 20:50	20:20 20:19	19:33 19:31	18:45 18:43	17:09 17:08		
19	07:43 08:04-08:28/24	07:15 07:14	06:34 06:45	06:09 06:48	06:09 05:56	06:10 06:10	06:37 07:06	07:35 07:10	07:32-08:04/32	07:39 08:02-08:07/5	07:42 08:03-08:07/4		
20	17:27 17:28	18:03 18:04	18:33 18:34	20:04 20:05	20:34 20:35	20:54 20:55	20:50 20:49	20:17 20:16	19:29 19:28	18:42 18:41	17:07 17:06		
21	07:42 08:03-08:29/26	07:14 07:13	06:32 06:44	06:08 06:47	06:08 05:56	06:10 06:11	06:38 07:07	07:36 07:12	07:33-08:04/31	07:39 08:02-08:06/4	07:40 08:03-08:07/4		
22	17:28 17:29	18:04 18:05	18:34 18:35	20:05 20:06	20:35 20:36	20:55 20:55	20:49 20:48	20:16 20:15	19:28 19:26	18:41 18:39	17:06 17:05		
23	07:42 08:02-08:30/28	07:11 07:10	06:29 06:41	06:06 06:45	06:06 05:56	06:12 06:12	06:40 07:09	07:39 07:14	07:36-08:06/30	07:40 08:03-08:07/4	07:41 08:04-08:07/3		
24	17:30 17:31	18:06 18:07	18:36 18:37	20:07 20:08	20:36 20:37	20:55 20:55	20:48 20:47	20:13 20:12	19:24 19:23	18:38 18:36	17:05 17:04		
25	07:40 08:01-08:31/30	07:09 07:08	06:26 06:38	06:05 06:44	06:05 05:56	06:14 06:14	06:42 07:11	07:41 07:15	07:38-08:06/28	07:42 08:04-08:07/3	07:43 08:05-08:07/4		
26	17:32 17:33	18:09 18:10	18:38 18:39	20:09 20:10	20:38 20:39	20:56 20:56	20:46 20:45	20:10 20:09	19:21 19:20	18:35 18:34	17:04 17:03		
27	07:39 07:59-08:30/31	07:06 07:05	06:23 06:35	06:03 06:42	06:03 05:57	06:15 06:15	06:44 07:13	07:43 07:17	07:40-08:06/26	07:43 08:05-08:09/4	07:44 08:06-08:11/5		
28	17:35 17:36	18:11 18:12	18:40 18:41	20:11 20:12	20:40 20:41	20:56 20:56	20:45 20:44	20:07 20:06	19:18 19:16	18:32 18:31	17:03 17:02		
29	07:39 07:59-08:31/32	07:05 07:04	06:21 06:34	06:03 06:42	06:03 05:57	06:16 06:16	06:45 07:14	07:44 07:18	07:41-08:06/25	07:43 08:05-08:09/4	07:44 08:06-08:11/5		
30	17:37 17:38	18:13 18:14	18:42 18:43	20:13 20:14	20:41 20:42	20:56 20:56	20:43 20:42	20:04 20:03	19:15 19:13	18:30 18:28	17:02 17:01		
31	07:37 07:57-08:31/34	07:02 07:01	06:18 06:31	06:01 06:40	06:01 05:58	06:18 06:18	06:47 07:16	07:46 07:20	07:44-08:06/22	07:44 08:06-08:11/5	07:45 08:07-08:14/7		
32	17:39 17:40	18:15 18:16	18:44 18:45	20:15 20:16	20:43 20:44	20:56 20:56	20:41 20:40	20:01 20:00	19:11 19:10	18:27 18:26	17:01 17:00		
33	07:36 07:56-08:31/35	07:00 07:00	06:16 06:30	06:01 06:40	06:01 05:58	06:19 06:19	06:48 07:16	07:47 07:21	07:45-08:06/21	07:44 08:06-08:11/5	07:45 08:07-08:14/7		
34	17:41 17:42	18:14 18:14	18:43 18:44	20:14 20:15	20:42 20:43	20:56 20:56	20:40 20:39	20:00 19:58	19:10 19:09	18:26 18:25	17:01 17:00		
35	07:36 07:55-08:30/35	07:03 07:02	06:15 06:29	06:00 06:39	06:00 05:59	06:20 06:20	06:48 07:17	07:48 07:22	07:46-08:06/20	07:44 08:07-08:13/6	07:45 08:07-08:14/7		
36	17:39 17:40	18:15 18:16	18:44 18:45	20:15 20:16	20:43 20:44	20:56 20:56	20:41 20:40	20:01 20:00	19:11 19:10	18:27 18:26	17:01 17:00		
37	07:35 07:56-08:30/34	07:00 07:00	06:16 06:30	06:01 06:40	06:01 05:58	06:20 06:20	06:49 07:16	07:49 07:23	07:47-08:06/19	07:45 08:07-08:14/7	07:46 08:08-08:14/7		
38	17:41 17:42	18:14 18:14	18:43 18:44	20:15 20:16	20:43 20:44	20:56 20:56	20:41 20:40	20:01 20:00	19:10 19:09	18:26 18:25	17:01 17:00		
39	07:34 07:57-08:30/33	07:00 07:00	06:16 06:30	06:01 06:40	06:01 05:58	06:21 06:21	06:50 06:50	07:25 07:00	07:47-08:06/19	07:45 08:07-08:14/7	07:46 08:08-08:14/7		
40	17:42 17:42	18:14 18:14	18:43 18:44	20:15 20:16	20:43 20:44	20:56 20:56	20:41 20:40	20:01 20:00	19:10 19:09	18:26 18:25	17:01 17:00		
41	Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
42	Sum of minutes with flicker	710	165	0	0	0	0	0	0	0	738	244	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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG08 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (36) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:52	07:20	06:52	07:25
	17:10	17:43	18:16	19:48	20:18	20:46	20:56	20:38	19:57	19:09	17:24	17:01
2	07:46	07:32	06:58	07:09	06:25	05:59	06:00	06:24	06:53	07:21	06:53	07:26
	17:11	17:44	18:17	19:49	20:19	20:46	20:56	20:37	19:56	19:07	17:23	17:01
3	07:46	07:31	06:56	07:07	06:24	05:58	06:01	06:25	06:53	07:22	06:54	07:27
	17:12	17:46	18:18	19:50	20:20	20:47	20:56	20:36	19:54	19:05	17:22	17:01
4	07:46	07:30	06:55	07:06	06:23	05:58	06:01	06:25	06:54	07:23	06:55	07:28
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:22	05:58	06:02	06:26	06:55	07:24	06:56	07:29
	17:14	17:48	18:20	19:52	20:22	20:48	20:56	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:52	07:02	06:20	05:57	06:02	06:27	06:56	07:25	06:58	07:30
	17:15	17:49	18:21	19:53	20:23	20:49	20:55	20:33	19:49	19:01	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:26	06:59	07:31
	17:16	17:50	18:22	19:54	20:24	20:50	20:55	20:32	19:48	18:59	17:17	17:00
8	07:46	07:26	06:49	06:59	06:18	05:57	06:04	06:29	06:58	07:27	07:00	07:32
	17:17	17:52	18:23	19:55	20:25	20:50	20:55	20:31	19:46	18:57	17:16	17:00
9	07:46	07:25	06:47	06:58	06:17	05:57	06:04	06:30	06:59	07:28	07:01	07:33
	17:18	17:53	18:24	19:56	20:26	20:51	20:55	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:29	07:02	07:34
	17:18	17:54	18:25	19:57	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:55	06:15	05:56	06:06	06:32	07:01	07:30	07:03	07:35
	17:20	17:55	18:26	19:58	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:31	07:04	07:35
	17:21	17:56	18:27	19:59	20:28	20:52	20:53	20:26	19:40	18:51	17:12	17:00
13	07:45	07:21	06:41	06:52	06:13	05:56	06:07	06:34	07:03	07:32	07:06	07:36
	17:22	17:58	18:28	20:00	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:33	07:07	07:37
	17:23	17:59	18:29	20:01	20:30	20:53	20:52	20:23	19:36	18:48	17:11	17:01
15	07:44	07:18	06:38	06:49	06:11	05:56	06:08	06:36	07:05	07:34	07:08	07:38
	17:24	18:00	18:30	20:02	20:31	20:54	20:52	20:22	19:35	18:47	17:10	17:01
16	07:44	07:17	06:36	06:47	06:10	05:56	06:09	06:37	07:06	07:35	07:09	07:38
	17:25	18:01	18:32	20:03	20:32	20:54	20:51	20:21	19:33	18:45	17:09	17:01
17	07:43	07:16	06:34	06:46	06:09	05:56	06:10	06:38	07:06	07:36	07:10	07:39
	17:26	18:02	18:33	20:04	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:11	06:39	07:07	07:37	07:11	07:40
	17:27	18:03	18:34	20:05	20:34	20:55	20:50	20:18	19:30	18:42	17:07	17:02
19	07:42	07:13	06:31	06:43	06:07	05:56	06:12	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:35	20:06	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:30	06:41	06:07	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:06	18:36	20:07	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:03
21	07:41	07:10	06:28	06:40	06:06	05:57	06:13	06:41	07:10	07:40	07:15	07:41
	17:30	18:07	18:37	20:08	20:37	20:56	20:48	20:14	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:16	07:42
	17:32	18:08	18:38	20:09	20:38	20:56	20:47	20:12	19:23	18:37	17:05	17:04
23	07:40	07:08	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:39	20:10	20:38	20:56	20:47	20:11	19:22	18:35	17:04	17:04
24	07:40	07:06	06:23	06:36	06:04	05:57	06:16	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:40	20:11	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:05
25	07:39	07:05	06:22	06:34	06:03	05:58	06:16	06:45	07:14	06:44	07:19	07:43
	17:35	18:11	18:41	20:12	20:40	20:56	20:45	20:08	19:18	17:33	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	06:45	07:20	07:44
	17:36	18:12	18:42	20:13	20:41	20:56	20:44	20:06	19:17	17:31	17:03	17:06
27	07:37	07:02	06:18	06:32	06:02	05:58	06:18	06:47	07:16	06:46	07:21	07:44
	17:37	18:13	18:43	20:14	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:37	07:01	06:17	06:30	06:01	05:59	06:19	06:48	07:17	06:48	07:22	07:44
	17:39	18:15	18:44	20:15	20:43	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:01	05:59	06:20	06:49	07:18	06:49	07:23	07:45
	17:40		19:45	20:16	20:43	20:56	20:41	20:02	19:12	17:27	17:02	17:08
30	07:35		07:14	06:28	06:00	05:59	06:21	06:50	07:19	06:50	07:24	07:45
	17:41		19:46	20:17	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:09
31	07:34		07:12		06:00		06:22	06:51		06:51		07:45
	17:42		19:47		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

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+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG09 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (37) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:52	07:20	06:52	07:25
	17:10	17:43	18:16	19:48	20:18	20:46	20:56	20:38	19:57	19:08	17:24	17:01
2	07:46	07:32	06:58	07:09	06:25	05:59	06:00	06:24	06:53	07:21	06:53	07:26
	17:11	17:44	18:17	19:49	20:19	20:46	20:56	20:37	19:56	19:07	17:23	17:01
3	07:46	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:22	06:54	07:27
	17:12	17:46	18:18	19:50	20:20	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:55	07:06	06:23	05:58	06:01	06:25	06:54	07:23	06:55	07:28
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:22	05:58	06:02	06:26	06:55	07:24	06:56	07:29
	17:14	17:48	18:20	19:52	20:22	20:48	20:56	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:52	07:02	06:20	05:57	06:02	06:27	06:56	07:25	06:58	07:30
	17:15	17:49	18:21	19:53	20:23	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:26	06:59	07:31
	17:16	17:50	18:22	19:54	20:24	20:50	20:55	20:32	19:48	18:59	17:17	17:00
8	07:46	07:26	06:48	06:59	06:18	05:57	06:04	06:29	06:58	07:27	07:00	07:32
	17:16	17:52	18:23	19:55	20:24	20:50	20:55	20:31	19:46	18:57	17:16	17:00
9	07:45	07:25	06:47	06:58	06:17	05:57	06:04	06:30	06:59	07:27	07:01	07:33
	17:17	17:53	18:24	19:56	20:25	20:51	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:29	07:02	07:34
	17:18	17:54	18:25	19:57	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:55	06:15	05:56	06:06	06:32	07:01	07:30	07:03	07:34
	17:19	17:55	18:26	19:58	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:31	07:04	07:35
	17:20	17:56	18:27	19:59	20:28	20:52	20:53	20:26	19:40	18:51	17:12	17:00
13	07:45	07:21	06:41	06:52	06:13	05:56	06:07	06:34	07:03	07:32	07:06	07:36
	17:22	17:57	18:28	20:00	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:33	07:07	07:37
	17:23	17:59	18:29	20:01	20:30	20:53	20:52	20:23	19:36	18:48	17:11	17:01
15	07:44	07:18	06:38	06:49	06:11	05:56	06:08	06:36	07:05	07:34	07:08	07:38
	17:24	18:00	18:30	20:02	20:31	20:54	20:52	20:22	19:35	18:47	17:10	17:01
16	07:44	07:17	06:36	06:47	06:10	05:56	06:09	06:37	07:05	07:35	07:09	07:38
	17:25	18:01	18:31	20:03	20:32	20:54	20:51	20:20	19:33	18:45	17:09	17:01
17	07:43	07:16	06:34	06:46	06:09	05:56	06:10	06:38	07:06	07:36	07:10	07:39
	17:26	18:02	18:32	20:04	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:11	06:38	07:07	07:37	07:11	07:40
	17:27	18:03	18:34	20:05	20:34	20:55	20:50	20:18	19:30	18:42	17:07	17:02
19	07:42	07:13	06:31	06:43	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:35	20:06	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:30	06:41	06:07	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:06	18:36	20:07	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:03
21	07:41	07:10	06:28	06:40	06:06	05:57	06:13	06:41	07:10	07:40	07:15	07:41
	17:30	18:07	18:37	20:08	20:37	20:55	20:48	20:14	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:16	07:42
	17:31	18:08	18:38	20:09	20:38	20:56	20:47	20:12	19:23	18:37	17:05	17:03
23	07:40	07:08	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:39	20:10	20:38	20:56	20:47	20:11	19:22	18:35	17:04	17:04
24	07:39	07:06	06:23	06:36	06:04	05:57	06:16	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:40	20:11	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:05
25	07:39	07:05	06:22	06:34	06:03	05:58	06:16	06:45	07:14	07:44	07:19	07:43
	17:35	18:11	18:41	20:12	20:40	20:56	20:45	20:08	19:18	17:33	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	07:45	07:20	07:44
	17:36	18:12	18:42	20:13	20:41	20:56	20:44	20:06	19:17	17:31	17:03	17:06
27	07:37	07:02	06:18	06:32	06:02	05:58	06:18	06:47	07:16	07:46	07:21	07:44
	17:37	18:13	18:43	20:14	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:37	07:00	06:17	06:30	06:01	05:59	06:19	06:48	07:17	07:47	07:22	07:44
	17:38	18:14	18:44	20:15	20:43	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:01	05:59	06:20	06:49	07:18	07:49	07:23	07:45
	17:40		19:45	20:16	20:43	20:56	20:41	20:02	19:12	17:27	17:02	17:08
30	07:35		07:13	06:28	06:00	05:59	06:21	06:50	07:19	07:50	07:24	07:45
	17:41		19:46	20:17	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		06:00		06:22	06:51		06:51		07:45
	17:42		19:47		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG10 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (38)  
 Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:10	07:33 17:43	06:59 18:16	07:10 19:48	06:26 20:17	05:59 20:45	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 17:23	07:26 17:01
3	07:46 17:12	07:31 17:46	06:56 18:18	07:07 19:50	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:22 19:05	06:54 17:21	07:27 17:00
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:51	06:23 20:20	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:52	06:21 20:21	05:58 20:48	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:46 17:15	07:28 17:49	06:51 18:21	07:02 19:53	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:46 17:15	07:27 17:50	06:50 18:22	07:01 19:54	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:48	07:25 18:59	06:59 17:17	07:31 17:00
8	07:46 17:16	07:26 17:52	06:48 18:23	06:59 19:55	06:18 20:24	05:57 20:50	06:04 20:55	06:29 20:31	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00
9	07:45 17:17	07:25 17:53	06:47 18:24	06:58 19:56	06:17 20:25	05:57 20:51	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:57	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:34 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:55 19:58	06:15 20:27	05:56 20:52	06:06 20:54	06:32 20:27	07:01 19:41	07:29 18:53	07:03 17:13	07:34 17:00
12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:59	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:45 17:21	07:20 17:57	06:41 18:28	06:51 20:00	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00
14	07:44 17:23	07:19 17:59	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:08 20:52	06:35 20:23	07:04 19:36	07:32 18:48	07:07 17:10	07:37 17:01
15	07:44 17:24	07:18 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:36 20:22	07:04 19:35	07:34 18:47	07:08 17:10	07:37 17:01
16	07:44 17:25	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:38 17:01
17	07:43 17:26	07:16 18:02	06:34 18:32	06:46 20:03	06:09 20:33	05:56 20:54	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:55	06:11 20:50	06:38 20:18	07:07 19:30	07:37 18:42	07:11 17:07	07:39 17:02
19	07:42 17:28	07:13 18:04	06:31 18:34	06:43 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:07	07:40 17:02
20	07:42 17:29	07:12 18:05	06:29 18:35	06:41 20:06	06:07 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:07	06:28 18:36	06:40 20:07	06:06 20:37	05:57 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
22	07:41 17:31	07:09 18:08	06:26 18:38	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	07:16 17:05	07:42 17:03
23	07:40 17:33	07:08 18:09	06:25 18:39	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:34	07:06 18:10	06:23 18:40	06:36 20:10	06:04 20:39	05:57 20:56	06:16 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:04	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:41	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:08	07:14 19:18	06:44 17:33	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:17	06:45 17:31	07:20 17:03	07:44 17:06
27	07:37 17:37	07:02 18:13	06:18 18:43	06:31 20:13	06:02 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
28	07:37 17:38	07:00 18:14	06:17 18:44	06:30 20:14	06:01 20:42	05:59 20:56	06:19 20:42	06:48 20:03	07:17 19:13	06:47 17:29	07:22 17:02	07:44 17:07
29	07:36 17:40	07:00 19:45	06:15 19:45	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	06:48 17:27	07:23 17:01	07:45 17:08
30	07:35 17:41	07:00 19:46	06:13 19:46	06:28 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	06:50 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42	07:00 19:47	06:12 19:47	06:28 20:17	06:00 20:45	05:59 20:56	06:22 20:39	06:51 19:59	07:19 17:25	06:51 17:25	07:24 17:01	07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
Via Santa Margherita 4  
IT-09124 Cagliari  
+39 070 658297  
Giuseppe Frongia / direttore@iatprogetti.it  
Calculated:  
20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG11 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (39)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:52	07:20	06:52	07:25
	17:10	17:43	18:16	19:48	20:17	20:45	20:56	20:38	19:57	19:08	17:24	17:01
2	07:45	07:32	06:57	07:09	06:25	05:59	06:00	06:23	06:52	07:21	06:53	07:26
	17:11	17:44	18:17	19:49	20:18	20:46	20:56	20:37	19:55	19:07	17:23	17:01
3	07:45	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:21	06:54	07:27
	17:12	17:46	18:18	19:50	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:23	05:58	06:01	06:25	06:54	07:22	06:55	07:28
	17:13	17:47	18:19	19:50	20:20	20:48	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:21	05:58	06:02	06:26	06:55	07:23	06:56	07:29
	17:14	17:48	18:20	19:51	20:21	20:48	20:55	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:51	07:02	06:20	05:57	06:02	06:27	06:56	07:24	06:57	07:30
	17:15	17:49	18:21	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:53	20:23	20:49	20:55	20:32	19:48	18:59	17:17	17:00
8	07:45	07:26	06:48	06:59	06:18	05:57	06:04	06:29	06:58	07:26	07:00	07:32
	17:16	17:52	18:23	19:54	20:24	20:50	20:55	20:31	19:46	18:57	17:16	17:00
9	07:45	07:25	06:47	06:58	06:17	05:57	06:04	06:30	06:59	07:27	07:01	07:33
	17:17	17:53	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:28	07:02	07:33
	17:18	17:54	18:25	19:56	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:55	06:15	05:56	06:06	06:32	07:01	07:29	07:03	07:34
	17:19	17:55	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	17:12	17:00
13	07:45	07:20	06:41	06:51	06:13	05:56	06:07	06:34	07:03	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:32	07:07	07:37
	17:23	17:59	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:01
15	07:44	07:18	06:37	06:48	06:11	05:56	06:08	06:36	07:04	07:33	07:08	07:37
	17:24	18:00	18:30	20:01	20:31	20:53	20:52	20:22	19:35	18:47	17:10	17:01
16	07:44	07:17	06:36	06:47	06:10	05:56	06:09	06:37	07:05	07:35	07:09	07:38
	17:25	18:01	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:09	17:01
17	07:43	07:15	06:34	06:46	06:09	05:56	06:10	06:37	07:06	07:36	07:10	07:39
	17:26	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:11	06:38	07:07	07:37	07:11	07:39
	17:27	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:30	18:42	17:07	17:02
19	07:42	07:13	06:31	06:43	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:29	06:41	06:07	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:03
21	07:41	07:10	06:28	06:40	06:06	05:57	06:13	06:41	07:10	07:40	07:14	07:41
	17:30	18:07	18:36	20:07	20:37	20:55	20:48	20:13	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:16	07:42
	17:31	18:08	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:37	17:05	17:03
23	07:40	07:07	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:38	20:09	20:38	20:56	20:46	20:11	19:21	18:35	17:04	17:04
24	07:39	07:06	06:23	06:36	06:04	05:57	06:16	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:39	20:10	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:04
25	07:39	07:05	06:21	06:34	06:03	05:58	06:16	06:45	07:14	06:44	07:19	07:43
	17:35	18:11	18:41	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	06:45	07:20	07:43
	17:36	18:12	18:42	20:12	20:41	20:56	20:44	20:06	19:17	17:31	17:03	17:06
27	07:37	07:02	06:18	06:31	06:02	05:58	06:18	06:47	07:16	06:46	07:21	07:44
	17:37	18:13	18:43	20:13	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:36	07:00	06:17	06:30	06:01	05:59	06:19	06:48	07:17	06:47	07:22	07:44
	17:38	18:14	18:44	20:14	20:42	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:00	05:59	06:20	06:49	07:18	06:48	07:23	07:44
	17:40		19:45	20:15	20:43	20:56	20:41	20:02	19:12	17:27	17:01	17:08
30	07:35		07:13	06:28	06:00	05:59	06:21	06:50	07:19	06:50	07:24	07:45
	17:41		19:46	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		05:59		06:22	06:51		06:51		07:45
	17:42		19:47		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG12 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (40) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:51	07:20	06:52	07:25
	17:10	17:43	18:15	19:47	20:17	20:45	20:56	20:38	19:57	19:08	17:24	17:01
2	07:45	07:32	06:57	07:09	06:25	05:59	06:00	06:23	06:52	07:20	06:53	07:26
	17:11	17:44	18:17	19:48	20:18	20:46	20:56	20:37	19:55	19:07	17:23	17:01
3	07:45	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:21	06:54	07:27
	17:12	17:46	18:18	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:23	05:58	06:01	06:25	06:54	07:22	06:55	07:28
	17:13	17:47	18:19	19:50	20:20	20:47	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:21	05:57	06:02	06:26	06:55	07:23	06:56	07:29
	17:14	17:48	18:20	19:51	20:21	20:48	20:55	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:51	07:02	06:20	05:57	06:02	06:27	06:56	07:24	06:57	07:30
	17:15	17:49	18:21	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:53	20:23	20:49	20:55	20:32	19:48	18:59	17:17	17:00
8	07:45	07:26	06:48	06:59	06:18	05:57	06:04	06:29	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:16	17:00
9	07:45	07:25	06:47	06:58	06:17	05:56	06:04	06:30	06:59	07:27	07:01	07:33
	17:17	17:53	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:28	07:02	07:33
	17:18	17:54	18:25	19:56	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:54	06:15	05:56	06:06	06:32	07:01	07:29	07:03	07:34
	17:19	17:55	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	17:12	17:00
13	07:45	07:20	06:41	06:51	06:13	05:56	06:07	06:34	07:03	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:32	07:06	07:37
	17:23	17:59	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:01
15	07:44	07:18	06:37	06:48	06:11	05:56	06:08	06:36	07:04	07:33	07:08	07:37
	17:24	18:00	18:30	20:01	20:31	20:53	20:52	20:22	19:35	18:47	17:10	17:01
16	07:44	07:17	06:36	06:47	06:10	05:56	06:09	06:37	07:05	07:34	07:09	07:38
	17:25	18:01	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:09	17:01
17	07:43	07:15	06:34	06:45	06:09	05:56	06:10	06:37	07:06	07:36	07:10	07:39
	17:26	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
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19	07:42	07:13	06:31	06:43	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:29	06:41	06:07	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:02
21	07:41	07:10	06:28	06:40	06:06	05:57	06:13	06:41	07:10	07:40	07:14	07:41
	17:30	18:07	18:36	20:07	20:36	20:55	20:48	20:13	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:15	07:42
	17:31	18:08	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:37	17:05	17:03
23	07:40	07:07	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:38	20:09	20:38	20:56	20:46	20:11	19:21	18:35	17:04	17:04
24	07:39	07:06	06:23	06:36	06:04	05:57	06:16	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:39	20:10	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:04
25	07:39	07:05	06:21	06:34	06:03	05:57	06:16	06:45	07:14	07:44	07:19	07:43
	17:35	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	07:45	07:20	07:43
	17:36	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:03	17:06
27	07:37	07:02	06:18	06:31	06:02	05:58	06:18	06:47	07:16	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:36	07:00	06:17	06:30	06:01	05:59	06:19	06:48	07:17	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:00	05:59	06:20	06:49	07:18	07:48	07:23	07:44
	17:40		19:44	20:15	20:43	20:56	20:41	20:02	19:12	17:27	17:01	17:08
30	07:35		07:13	06:28	06:00	05:59	06:21	06:50	07:19	07:49	07:24	07:45
	17:41		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		05:59		06:22	06:51		06:51		07:45
	17:42		19:46		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG13 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (41) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Assumptions for shadow calculations

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:51	07:20	06:52	07:25
	17:10	17:43	18:15	19:47	20:17	20:45	20:56	20:38	19:57	19:08	17:24	17:01
2	07:45	07:32	06:57	07:09	06:25	05:59	06:00	06:23	06:52	07:20	06:53	07:26
	17:11	17:44	18:17	19:48	20:18	20:46	20:56	20:37	19:55	19:07	17:22	17:01
3	07:45	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:21	06:54	07:27
	17:12	17:46	18:18	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:23	05:58	06:01	06:25	06:54	07:22	06:55	07:28
	17:13	17:47	18:19	19:50	20:20	20:47	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:21	05:57	06:02	06:26	06:55	07:23	06:56	07:29
	17:14	17:48	18:20	19:51	20:21	20:48	20:55	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:51	07:02	06:20	05:57	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:21	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:53	20:23	20:49	20:55	20:32	19:47	18:59	17:17	17:00
8	07:45	07:26	06:48	06:59	06:18	05:57	06:04	06:29	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:16	17:00
9	07:45	07:25	06:47	06:58	06:17	05:56	06:04	06:30	06:59	07:27	07:01	07:33
	17:17	17:53	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:28	07:02	07:33
	17:18	17:54	18:25	19:56	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:54	06:15	05:56	06:05	06:32	07:01	07:29	07:03	07:34
	17:19	17:55	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	17:12	17:00
13	07:45	07:20	06:41	06:51	06:13	05:56	06:07	06:34	07:03	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:32	07:06	07:37
	17:22	17:59	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:01
15	07:44	07:18	06:37	06:48	06:11	05:56	06:08	06:36	07:04	07:33	07:08	07:37
	17:24	18:00	18:30	20:01	20:31	20:53	20:52	20:22	19:35	18:47	17:10	17:01
16	07:44	07:17	06:36	06:47	06:10	05:56	06:09	06:36	07:05	07:34	07:09	07:38
	17:25	18:01	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:09	17:01
17	07:43	07:15	06:34	06:45	06:09	05:56	06:10	06:37	07:06	07:36	07:10	07:39
	17:26	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:11	06:38	07:07	07:37	07:11	07:39
	17:27	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:30	18:42	17:07	17:02
19	07:42	07:13	06:31	06:43	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:29	06:41	06:06	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:02
21	07:41	07:10	06:28	06:40	06:06	05:56	06:13	06:41	07:10	07:40	07:14	07:41
	17:30	18:07	18:36	20:07	20:37	20:55	20:48	20:13	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:16	07:42
	17:31	18:08	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:37	17:05	17:03
23	07:40	07:07	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:38	20:09	20:38	20:56	20:46	20:11	19:21	18:35	17:04	17:04
24	07:39	07:06	06:23	06:35	06:03	05:57	06:15	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:39	20:10	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:04
25	07:39	07:05	06:21	06:34	06:03	05:57	06:16	06:45	07:14	07:44	07:19	07:43
	17:35	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	07:45	07:20	07:43
	17:36	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:03	17:06
27	07:37	07:02	06:18	06:31	06:02	05:58	06:18	06:47	07:16	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:36	07:00	06:17	06:30	06:01	05:58	06:19	06:48	07:17	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:00	05:59	06:20	06:49	07:18	07:48	07:23	07:44
	17:40		19:44	20:15	20:43	20:56	20:41	20:02	19:12	17:27	17:01	17:08
30	07:35		07:13	06:28	06:00	05:59	06:21	06:50	07:19	07:49	07:24	07:45
	17:41		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		05:59		06:22	06:51		06:51		07:45
	17:42		19:46		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG14 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (42) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:59	06:00	06:23	06:51	07:20	06:52	07:25
	17:10	17:43	18:15	19:48	20:17	20:45	20:56	20:38	19:57	19:08	17:24	17:01
2	07:45	07:32	06:57	07:09	06:25	05:59	06:00	06:23	06:52	07:21	06:53	07:26
	17:11	17:44	18:17	19:49	20:18	20:46	20:56	20:37	19:55	19:07	17:23	17:01
3	07:46	07:31	06:56	07:07	06:24	05:58	06:01	06:24	06:53	07:22	06:54	07:27
	17:12	17:46	18:18	19:50	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:23	05:58	06:01	06:25	06:54	07:22	06:55	07:28
	17:13	17:47	18:19	19:51	20:20	20:48	20:56	20:35	19:52	19:04	17:20	17:00
5	07:46	07:29	06:53	07:04	06:21	05:57	06:02	06:26	06:55	07:23	06:56	07:29
	17:14	17:48	18:20	19:52	20:21	20:48	20:56	20:34	19:51	19:02	17:19	17:00
6	07:46	07:28	06:51	07:02	06:20	05:57	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:21	19:53	20:22	20:49	20:55	20:33	19:49	19:00	17:18	17:00
7	07:46	07:27	06:50	07:01	06:19	05:57	06:03	06:28	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:54	20:23	20:49	20:55	20:32	19:48	18:59	17:17	17:00
8	07:46	07:26	06:48	06:59	06:18	05:57	06:04	06:29	06:58	07:26	07:00	07:32
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	17:17	17:53	18:24	19:56	20:25	20:51	20:54	20:29	19:44	18:56	17:15	17:00
10	07:45	07:24	06:45	06:56	06:16	05:56	06:05	06:31	07:00	07:28	07:02	07:34
	17:18	17:54	18:25	19:57	20:26	20:51	20:54	20:28	19:43	18:54	17:14	17:00
11	07:45	07:23	06:44	06:55	06:15	05:56	06:05	06:32	07:01	07:29	07:03	07:34
	17:19	17:55	18:26	19:58	20:27	20:52	20:54	20:27	19:41	18:53	17:13	17:00
12	07:45	07:22	06:42	06:53	06:14	05:56	06:06	06:33	07:02	07:30	07:04	07:35
	17:20	17:56	18:27	19:59	20:28	20:52	20:53	20:26	19:39	18:51	17:12	17:00
13	07:45	07:20	06:41	06:51	06:13	05:56	06:07	06:34	07:03	07:31	07:05	07:36
	17:21	17:57	18:28	20:00	20:29	20:53	20:53	20:24	19:38	18:50	17:11	17:00
14	07:44	07:19	06:39	06:50	06:12	05:56	06:08	06:35	07:04	07:32	07:07	07:37
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15	07:44	07:18	06:37	06:48	06:11	05:56	06:08	06:36	07:04	07:34	07:08	07:37
	17:24	18:00	18:30	20:02	20:31	20:54	20:52	20:22	19:35	18:47	17:10	17:01
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	17:26	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:44	17:08	17:01
18	07:43	07:14	06:33	06:44	06:08	05:56	06:11	06:38	07:07	07:37	07:11	07:39
	17:27	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:30	18:42	17:07	17:02
19	07:42	07:13	06:31	06:43	06:07	05:56	06:11	06:39	07:08	07:38	07:12	07:40
	17:28	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:41	17:07	17:02
20	07:42	07:12	06:29	06:41	06:06	05:56	06:12	06:40	07:09	07:39	07:13	07:41
	17:29	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:06	17:02
21	07:41	07:10	06:28	06:40	06:06	05:56	06:13	06:41	07:10	07:40	07:14	07:41
	17:30	18:07	18:36	20:07	20:37	20:55	20:48	20:13	19:25	18:38	17:05	17:03
22	07:41	07:09	06:26	06:38	06:05	05:57	06:14	06:42	07:11	07:41	07:16	07:42
	17:31	18:08	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:37	17:05	17:03
23	07:40	07:08	06:25	06:37	06:04	05:57	06:15	06:43	07:12	07:42	07:17	07:42
	17:33	18:09	18:39	20:09	20:38	20:56	20:46	20:11	19:21	18:35	17:04	17:04
24	07:39	07:06	06:23	06:36	06:03	05:57	06:15	06:44	07:13	07:43	07:18	07:43
	17:34	18:10	18:40	20:10	20:39	20:56	20:46	20:09	19:20	18:34	17:04	17:04
25	07:39	07:05	06:21	06:34	06:03	05:57	06:16	06:45	07:14	07:44	07:19	07:43
	17:35	18:11	18:41	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:03	17:05
26	07:38	07:03	06:20	06:33	06:02	05:58	06:17	06:46	07:15	06:45	07:20	07:44
	17:36	18:12	18:42	20:12	20:41	20:56	20:44	20:06	19:17	17:31	17:03	17:06
27	07:37	07:02	06:18	06:31	06:02	05:58	06:18	06:47	07:16	06:46	07:21	07:44
	17:37	18:13	18:43	20:13	20:42	20:56	20:43	20:05	19:15	17:30	17:02	17:06
28	07:37	07:00	06:17	06:30	06:01	05:58	06:19	06:48	07:17	06:47	07:22	07:44
	17:38	18:14	18:44	20:14	20:42	20:56	20:42	20:03	19:13	17:29	17:02	17:07
29	07:36		07:15	06:29	06:00	05:59	06:20	06:49	07:18	06:48	07:23	07:45
	17:40		19:45	20:15	20:43	20:56	20:41	20:02	19:12	17:27	17:01	17:08
30	07:35		07:13	06:28	06:00	05:59	06:21	06:50	07:19	06:50	07:24	07:45
	17:41		19:46	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:01	17:08
31	07:34		07:12		05:59		06:22	06:51		06:51		07:45
	17:42		19:47		20:45		20:39	19:59		17:25		17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

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+39 070 658297
Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
20/01/2023 16:32/3.4.415

SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG15 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (43)
Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains a time range (e.g., 07:45 08:12-08:35/23) and a numerical value. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG16 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)  
 Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June
1	07:45 15:24-16:28/64 17:10	07:33 15:31-16:50/79 17:43	06:59 08:00-08:45/45 18:15	07:10 18:15	06:26 20:18	05:59 20:45
2	07:45 15:24-16:29/65 17:11	07:32 15:31-16:50/79 17:44	06:57 08:00-08:44/44 18:17	07:09 19:49	06:25 20:18	05:59 20:46
3	07:46 15:25-16:30/65 17:12	07:31 15:32-16:50/78 17:46	06:56 08:01-08:43/42 18:18	07:07 19:50	06:24 20:19	05:58 20:47
4	07:46 15:25-16:31/66 17:13	07:30 15:33-16:50/77 17:47	06:54 08:01-08:41/40 18:19	07:05 19:51	06:23 20:20	05:58 20:48
5	07:46 15:25-16:31/66 17:14	07:29 15:33-16:50/77 17:48	06:53 08:02-08:41/39 18:20	07:04 19:52	06:21 20:21	05:57 20:48
6	07:46 15:25-16:32/67 17:14	07:28 15:34-16:50/76 17:49	06:51 08:03-08:39/36 18:21	07:02 19:53	06:20 20:22	05:57 20:49
7	07:46 15:25-16:33/68 17:15	07:27 08:20-08:28/8 17:50 15:35-16:50/75	06:50 08:04-08:36/32 18:22	07:01 19:54	06:19 20:23	05:57 20:49
8	07:46 15:26-16:34/68 17:16	07:26 08:15-08:32/17 17:51 15:35-16:49/74	06:48 08:06-08:35/29 18:23	06:59 19:55	06:18 20:24	05:57 20:50
9	07:45 15:26-16:35/69 17:17	07:25 08:12-08:35/23 17:53 15:36-16:49/73	06:47 08:07-08:32/25 18:24	06:58 19:56	06:17 20:25	05:56 20:51
10	07:45 15:25-16:35/70 17:18	07:24 08:10-08:38/28 17:54 15:37-16:49/72	06:45 08:10-08:29/19 18:25	06:56 19:57	06:16 20:26	05:56 20:51
11	07:45 15:26-16:36/70 17:19	07:23 08:09-08:40/31 17:55 15:38-16:49/71	06:44 08:14-08:24/10 18:26	06:55 19:58	06:15 20:27	05:56 20:52
12	07:45 15:26-16:37/71 17:20	07:22 08:07-08:41/34 17:56 15:40-16:49/69	06:42 18:27	06:53 19:59	06:14 20:28	05:56 20:52
13	07:45 15:26-16:37/71 17:21	07:20 08:06-08:43/37 17:57 15:41-16:48/67	06:41 18:28	06:51 20:00	06:13 20:29	05:56 20:53
14	07:44 15:26-16:38/72 17:22	07:19 08:04-08:43/39 17:59 15:42-16:47/65	06:39 18:29	06:50 20:01	06:12 20:30	05:56 20:53
15	07:44 15:27-16:39/72 17:24	07:18 08:04-08:44/40 18:00 15:44-16:46/62	06:37 18:30	06:48 20:02	06:11 20:31	05:56 20:54
16	07:44 15:26-16:40/74 17:25	07:17 08:03-08:45/42 18:01 15:45-16:46/61	06:36 18:31	06:47 20:03	06:10 20:32	05:56 20:54
17	07:43 15:27-16:41/74 17:26	07:16 08:02-08:45/43 18:02 15:46-16:44/58	06:34 18:32	06:45 20:04	06:09 20:33	05:56 20:54
18	07:43 15:26-16:41/75 17:27	07:14 08:01-08:46/45 18:03 15:47-16:43/56	06:33 18:33	06:44 20:05	06:08 20:34	05:56 20:55
19	07:42 15:27-16:43/76 17:28	07:13 08:01-08:47/46 18:04 15:49-16:42/53	06:31 18:34	06:43 20:06	06:07 20:35	05:56 20:55
20	07:42 15:27-16:43/76 17:29	07:12 08:00-08:47/47 18:05 15:50-16:40/50	06:29 18:35	06:41 20:07	06:06 20:36	05:56 20:55
21	07:41 15:27-16:43/76 17:30	07:10 08:00-08:47/47 18:07 15:52-16:38/46	06:28 18:36	06:40 20:08	06:06 20:37	05:56 20:55
22	07:41 15:28-16:45/77 17:31	07:09 08:00-08:48/48 18:08 15:55-16:37/42	06:26 18:37	06:38 20:09	06:05 20:37	05:57 20:56
23	07:40 15:27-16:45/78 17:33	07:08 07:59-08:47/48 18:09 15:57-16:33/36	06:25 18:39	06:37 20:10	06:04 20:38	05:57 20:56
24	07:39 15:27-16:46/79 17:34	07:06 07:59-08:47/48 18:10 16:00-16:30/30	06:23 18:40	06:36 20:11	06:03 20:39	05:57 20:56
25	07:39 15:28-16:47/79 17:35	07:05 07:59-08:46/47 18:11 16:03-16:24/21	06:21 18:41	06:34 20:12	06:03 20:40	05:57 20:56
26	07:38 15:28-16:47/79 17:36	07:03 07:59-08:46/47 18:12	06:20 18:42	06:33 20:13	06:02 20:41	05:58 20:56
27	07:37 15:28-16:48/80 17:37	07:02 08:00-08:46/46 18:13	06:18 18:43	06:31 20:14	06:02 20:42	05:58 20:56
28	07:37 15:29-16:48/79 17:38	07:00 07:59-08:45/46 18:14	06:17 18:44	06:30 20:15	06:01 20:42	05:58 20:56
29	07:36 15:29-16:48/79 17:40		07:15 19:45	06:29 20:16	06:00 20:43	05:59 20:56
30	07:35 15:30-16:49/79 17:41		07:13 19:46	06:28 20:17	06:00 20:44	05:59 20:56
31	07:34 15:30-16:50/80 17:42		07:12 19:47		05:59 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	2264	2404	361	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: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG16 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)  
 Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	July	August	September	October	November	December
1	06:00 20:56	06:23 20:38	06:51 19:57	07:20 19:08	06:52 07:40-08:07/27 17:24 15:07-16:19/72	07:25 15:08-16:18/70 17:01
2	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 07:42-08:05/23 17:23 15:06-16:19/73	07:26 15:08-16:18/70 17:01
3	06:01 20:56	06:24 20:36	06:53 19:54	07:22 08:49-09:05/16 19:05	06:54 07:45-08:01/16 17:21 15:05-16:19/74	07:27 15:09-16:18/69 17:00
4	06:01 20:56	06:25 20:35	06:54 19:52	07:22 08:46-09:08/22 19:04	06:55 07:50-07:56/6 17:20 15:04-16:19/75	07:28 15:10-16:18/68 17:00
5	06:02 20:56	06:26 20:34	06:55 19:51	07:23 08:43-09:11/28 19:02	06:56 15:04-16:20/76 17:19	07:29 15:11-16:18/67 17:00
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 08:41-09:12/31 19:00	06:57 15:03-16:20/77 17:18	07:30 15:11-16:18/67 17:00
7	06:03 20:55	06:28 20:32	06:57 19:48	07:25 08:39-09:14/35 18:59	06:59 15:02-16:20/78 17:17	07:31 15:12-16:18/66 17:00
8	06:04 20:55	06:29 20:31	06:58 19:46	07:26 08:38-09:15/37 18:57	07:00 15:02-16:20/78 17:16	07:32 15:13-16:19/66 17:00
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 08:36-09:16/40 18:56	07:01 15:02-16:21/79 17:15	07:33 15:14-16:19/65 17:00
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 08:35-09:16/41 18:54	07:02 15:02-16:21/79 17:14	07:34 15:14-16:19/65 17:00
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 08:34-09:17/43 18:53	07:03 15:01-16:20/79 17:13	07:34 15:14-16:18/64 17:00
12	06:06 20:53	06:33 20:26	07:02 19:39	07:30 08:33-09:17/44 18:51	07:04 15:01-16:20/79 17:12	07:35 15:15-16:19/64 17:00
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 08:32-09:18/46 18:50	07:05 15:01-16:20/79 17:11	07:36 15:16-16:19/63 17:00
14	06:08 20:52	06:35 20:23	07:04 19:36	07:32 08:32-09:18/46 18:48	07:07 15:02-16:21/79 17:10	07:37 15:17-16:20/63 17:01
15	06:08 20:52	06:36 20:22	07:04 19:35	07:34 08:31-09:18/47 18:47	07:08 15:01-16:20/79 17:10	07:37 15:17-16:19/62 17:01
16	06:09 20:51	06:36 20:20	07:05 19:33	07:35 08:32-09:19/47 18:45 16:39-16:50/11	07:09 15:01-16:20/79 17:09	07:38 15:18-16:20/62 17:01
17	06:10 20:51	06:37 20:19	07:06 19:31	07:36 08:31-09:19/48 18:44 16:34-16:59/25	07:10 15:01-16:20/79 17:08	07:39 15:19-16:20/61 17:01
18	06:11 20:50	06:38 20:18	07:07 19:30	07:37 08:31-09:19/48 18:42 16:30-17:03/33	07:11 15:01-16:20/79 17:07	07:39 15:19-16:20/61 17:02
19	06:11 20:49	06:39 20:16	07:08 19:28	07:38 08:31-09:19/48 18:41 16:27-17:06/39	07:12 15:02-16:20/78 17:07	07:40 15:20-16:21/61 17:02
20	06:12 20:49	06:40 20:15	07:09 19:26	07:39 08:31-09:18/47 18:39 16:25-17:08/43	07:13 15:03-16:20/77 17:06	07:41 15:20-16:21/61 17:02
21	06:13 20:48	06:41 20:13	07:10 19:25	07:40 08:30-09:18/48 18:38 16:22-17:10/48	07:14 15:03-16:19/76 17:05	07:41 15:21-16:22/61 17:03
22	06:14 20:47	06:42 20:12	07:11 19:23	07:41 08:31-09:17/46 18:37 16:20-17:11/51	07:16 15:03-16:19/76 17:05	07:42 15:21-16:22/61 17:03
23	06:15 20:46	06:43 20:11	07:12 19:21	07:42 08:31-09:16/45 18:35 16:18-17:12/54	07:17 15:03-16:19/76 17:04	07:42 15:22-16:23/61 17:04
24	06:15 20:46	06:44 20:09	07:13 19:20	07:43 08:31-09:16/45 18:34 16:17-17:13/56	07:18 15:03-16:18/75 17:04	07:43 15:22-16:23/61 17:04
25	06:16 20:45	06:45 20:08	07:14 19:18	06:44 07:32-08:16/44 17:32 15:16-16:15/59	07:19 15:05-16:19/74 17:03	07:43 15:23-16:24/61 17:05
26	06:17 20:44	06:46 20:06	07:15 19:17	06:45 07:33-08:15/42 17:31 15:15-16:15/60	07:20 15:05-16:19/74 17:03	07:44 15:23-16:24/61 17:06
27	06:18 20:43	06:47 20:05	07:16 19:15	06:46 07:34-08:14/40 17:30 15:13-16:16/63	07:21 15:06-16:18/72 17:02	07:44 15:23-16:24/61 17:06
28	06:19 20:42	06:48 20:03	07:17 19:13	06:47 07:34-08:13/39 17:29 15:11-16:17/66	07:22 15:06-16:18/72 17:02	07:44 15:23-16:25/62 17:07
29	06:20 20:41	06:49 20:02	07:18 19:12	06:48 07:35-08:11/36 17:27 15:10-16:17/67	07:23 15:07-16:18/71 17:01	07:45 15:24-16:26/62 17:08
30	06:21 20:40	06:50 20:00	07:19 19:10	06:50 07:36-08:10/34 17:26 15:08-16:17/69	07:24 15:07-16:18/71 17:01	07:45 15:24-16:27/63 17:08
31	06:22 20:39	06:51 19:59		06:51 07:39-08:09/30 17:25 15:08-16:19/71		07:45 15:24-16:27/63 17:09
Potential sun hours	455	425	374	347	301	292
Sum of minutes with flicker	0	0	0	1978	2357	1972

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

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+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:32/3.4.415

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14WTG: WTG17 - Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45) Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,40 5,05 5,88 7,00 8,45 9,88 10,82 10,03 8,08 6,09 5,07 4,27

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
319 183 190 436 759 530 340 319 409 721 2.333 1.038 7.577

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 16:01-16:36/35	07:33 06:59	07:10 06:26	05:59 06:00	06:23 06:52	07:20 06:52	07:25 15:51-16:20/29					
2	07:45 16:01-16:36/35	07:32 06:58	07:09 06:25	05:59 06:00	06:23 06:52	07:21 06:53	07:26 15:51-16:21/30					
3	07:46 16:02-16:36/34	07:31 06:56	07:07 06:24	05:58 06:01	06:24 06:53	07:22 06:54	07:27 15:51-16:22/31					
4	07:46 16:03-16:37/34	07:30 06:55	07:05 06:23	05:58 06:01	06:25 06:54	07:23 06:55	07:28 15:50-16:22/32					
5	07:46 16:04-16:37/33	07:29 06:53	07:04 06:21	05:57 06:02	06:26 06:55	07:23 06:56	07:29 15:50-16:23/33					
6	07:46 16:04-16:38/34	07:28 06:51	07:02 06:20	05:57 06:02	06:27 06:56	07:24 06:57	07:30 15:50-16:24/34					
7	07:46 16:05-16:38/33	07:27 06:50	07:01 06:19	05:57 06:03	06:28 06:57	07:25 06:59	07:31 15:51-16:24/33					
8	07:46 16:06-16:38/32	07:26 06:48	06:59 06:18	05:57 06:04	06:29 06:58	07:26 07:00	07:32 15:51-16:25/34					
9	07:45 16:07-16:39/32	07:25 06:47	06:58 06:17	05:56 06:04	06:30 06:59	07:27 07:01	07:33 15:51-16:26/35					
10	07:45 16:08-16:38/30	07:24 06:45	06:56 06:16	05:56 06:05	06:31 07:00	07:28 07:02	07:34 15:51-16:26/35					
11	07:45 16:09-16:38/29	07:23 06:44	06:55 06:15	05:56 06:06	06:32 07:01	07:29 07:03	07:34 15:51-16:26/35					
12	07:45 16:11-16:39/28	07:22 06:42	06:53 06:14	05:56 06:06	06:33 07:02	07:30 07:04	07:35 15:51-16:27/36					
13	07:45 16:11-16:38/27	07:21 06:41	06:51 06:13	05:56 06:07	06:34 07:03	07:31 07:05	07:36 15:52-16:27/35					
14	07:44 16:12-16:38/26	07:19 06:39	06:50 06:12	05:56 06:08	06:35 07:04	07:33 07:07	07:37 15:53-16:28/35					
15	07:44 16:14-16:38/24	07:18 06:37	06:48 06:11	05:56 06:08	06:36 07:05	07:34 07:08	07:37 15:52-16:28/36					
16	07:44 16:15-16:37/22	07:17 06:36	06:47 06:10	05:56 06:09	06:37 07:05	07:35 07:09	07:38 15:53-16:29/36					
17	07:43 16:17-16:37/20	07:16 06:34	06:46 06:09	05:56 06:10	06:37 07:06	07:36 07:10	07:39 15:54-16:29/35					
18	07:43 16:18-16:36/18	07:14 06:33	06:44 06:08	05:56 06:11	06:38 07:07	07:37 07:11	07:39 15:53-16:29/36					
19	07:42 16:21-16:35/14	07:13 06:31	06:43 06:07	05:56 06:11	06:39 07:08	07:38 07:12	07:40 15:54-16:30/36					
20	07:42 16:24-16:33/9	07:12 06:29	06:41 06:07	05:56 06:12	06:40 07:09	07:39 07:13	07:41 15:54-16:30/36					
21	07:41 17:30	07:10 06:28	06:40 06:06	05:57 06:13	06:41 07:10	07:40 07:14	07:41 15:55-16:31/36					
22	07:41 17:31	07:09 06:26	06:38 06:05	05:57 06:14	06:42 07:11	07:41 07:16	07:42 15:55-16:31/36					
23	07:40 17:33	07:08 06:25	06:37 06:04	05:57 06:15	06:43 07:12	07:42 07:17	07:42 15:56-16:32/36					
24	07:39 17:34	07:06 06:23	06:36 06:04	05:57 06:16	06:44 07:13	07:43 07:18	07:43 15:56-16:32/36					
25	07:39 17:35	07:05 06:21	06:34 06:03	05:57 06:16	06:45 07:14	07:44 07:19	07:43 15:57-16:33/36					
26	07:38 17:36	07:03 06:20	06:33 06:02	05:58 06:17	06:46 07:15	07:45 07:20	07:44 15:58-16:33/35					
27	07:37 17:37	07:02 06:18	06:31 06:02	05:58 06:18	06:47 07:16	07:46 07:21	07:44 15:58-16:33/35					
28	07:37 17:38	07:00 06:17	06:30 06:01	05:59 06:19	06:48 07:17	07:47 07:22	07:44 15:58-16:34/36					
29	07:36 17:40	07:00 06:17	06:30 06:01	05:59 06:20	06:49 07:18	07:48 07:23	07:45 15:59-16:35/36					
30	07:35 17:41	07:00 06:17	06:30 06:01	05:59 06:21	06:50 07:19	07:49 07:24	07:45 16:00-16:35/35					
31	07:34 17:42	07:00 06:17	06:30 06:01	05:59 06:22	06:51 07:20	07:50 07:25	07:45 16:00-16:35/35					
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	549	0	0	0	0	0	0	0	0	188	0	1074

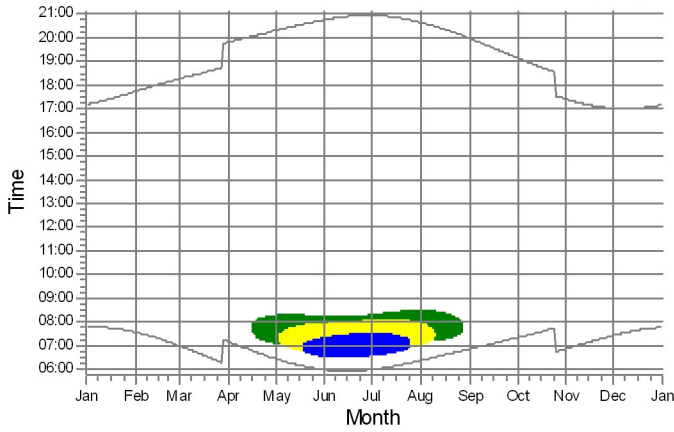
Table layout: For each day in each month the following matrix apply

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

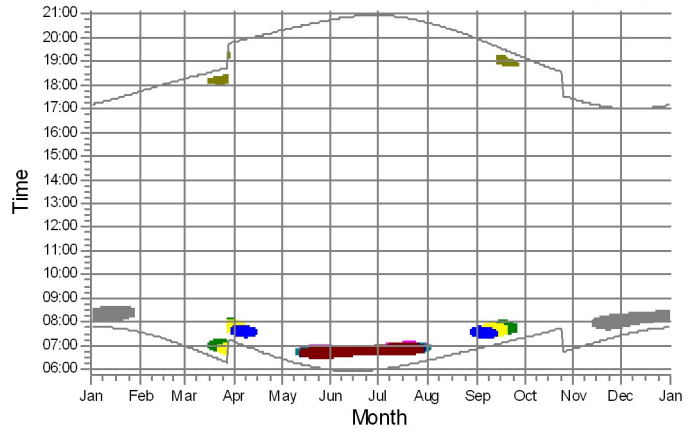
## SHADOW - Calendar per WTG, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14

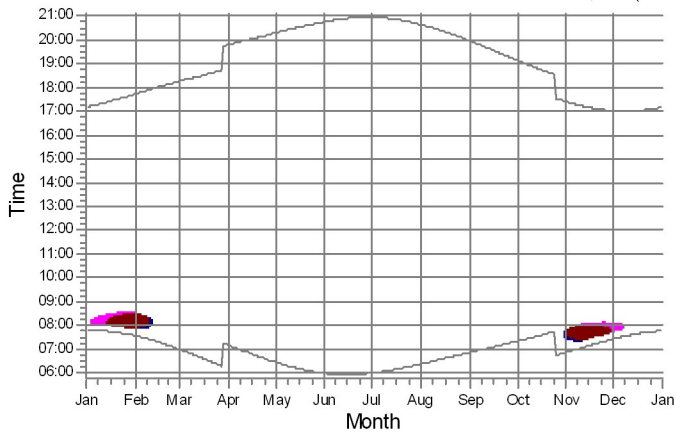
WTG01: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



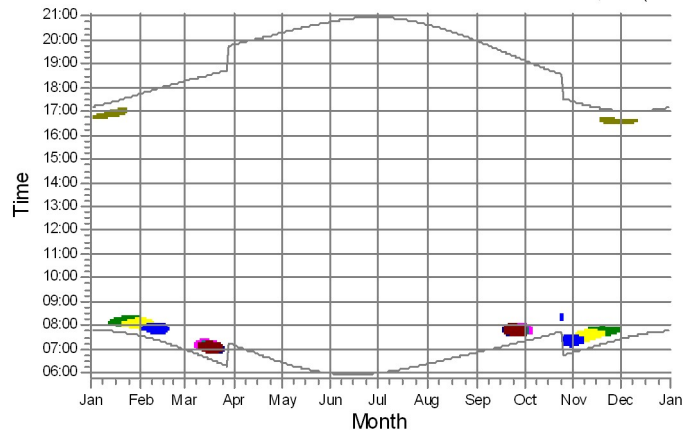
WTG02: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



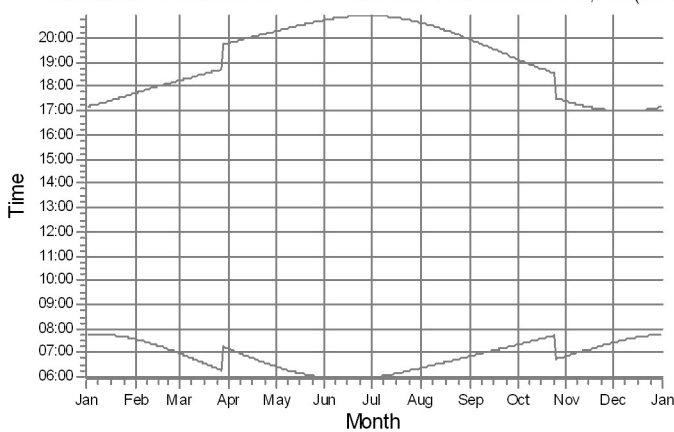
WTG03: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



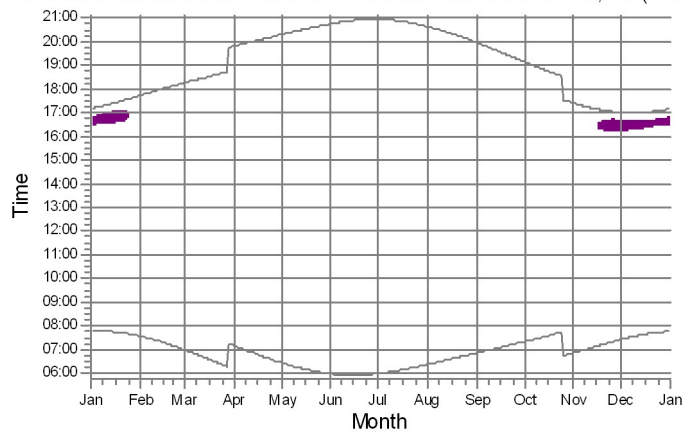
WTG04: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG05: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG06: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



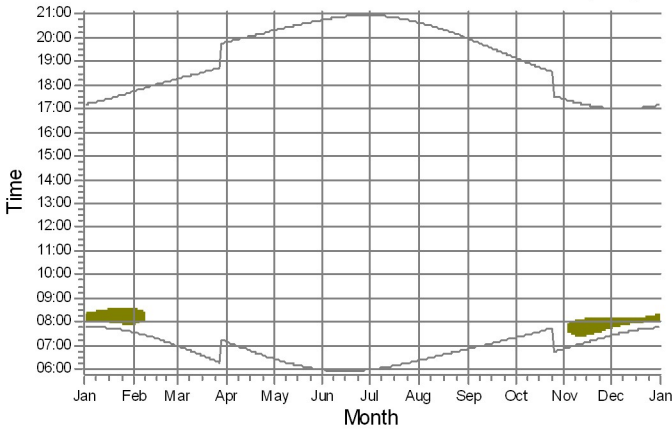
### Shadow receptors

 F024: A	 F042: A	 F064: A	 F086: A	 F098: D
 F027: A	 F063: A	 F083: A	 F088: A	 F106: A

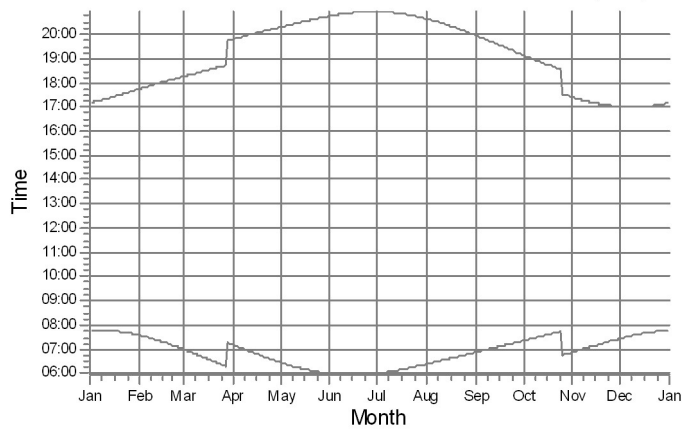
## SHADOW - Calendar per WTG, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14

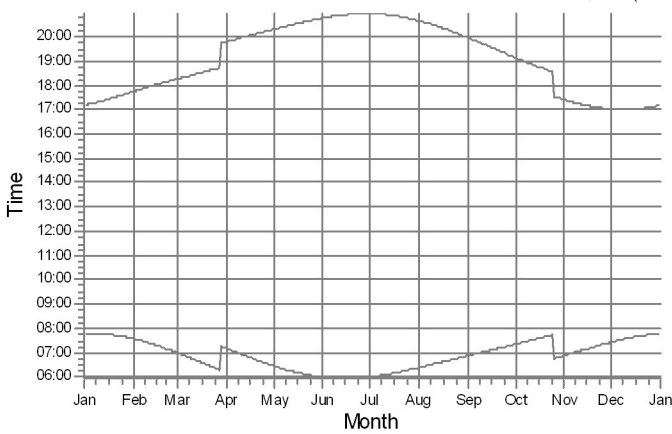
WTG07: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



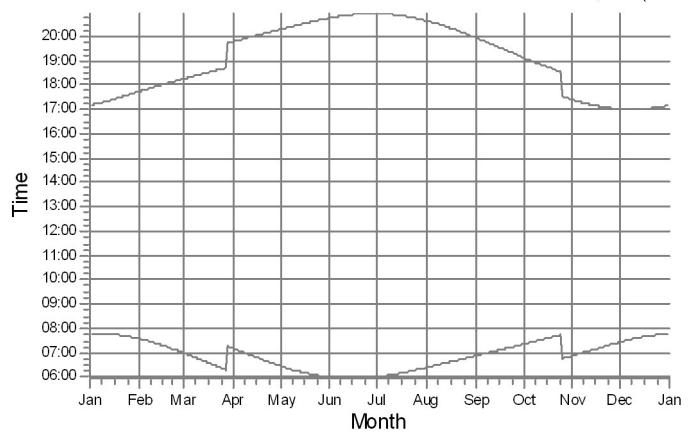
WTG08: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



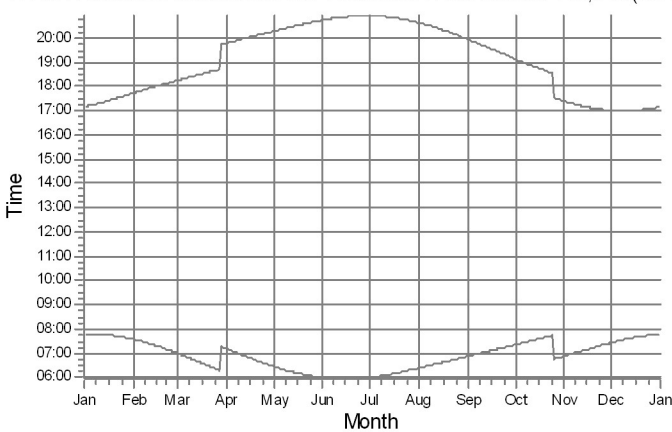
WTG09: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



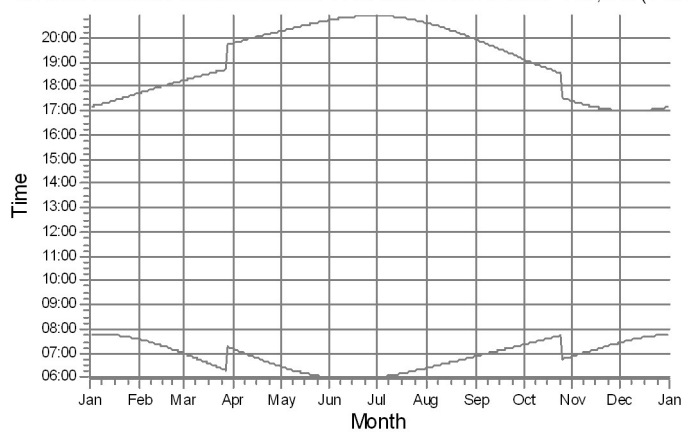
WTG10: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG11: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG12: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



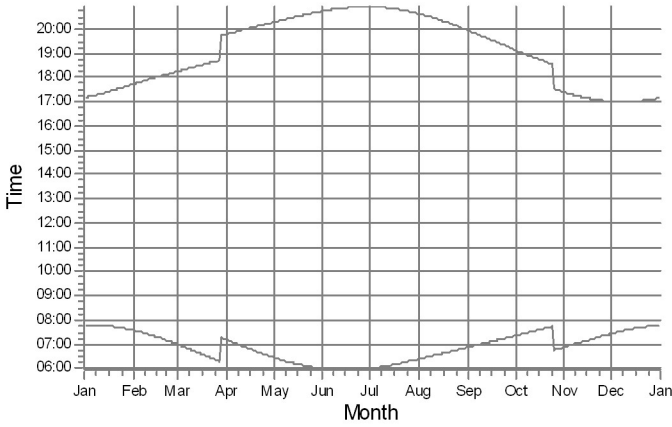
Shadow receptors

 F098: D

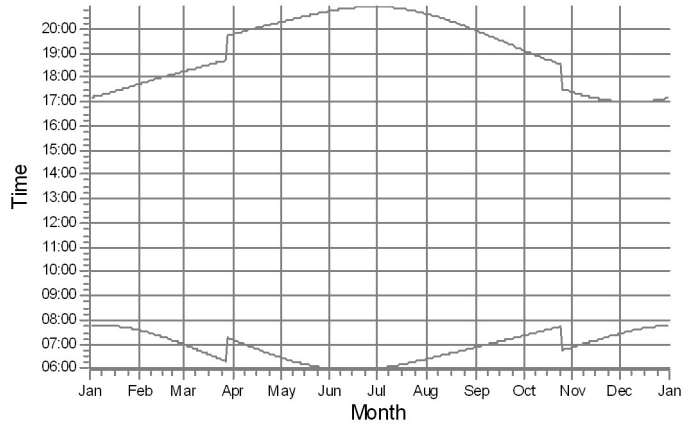
## SHADOW - Calendar per WTG, graphical

Calculation: Real\_case\_Progetto\_Layout\_2022\_10\_14

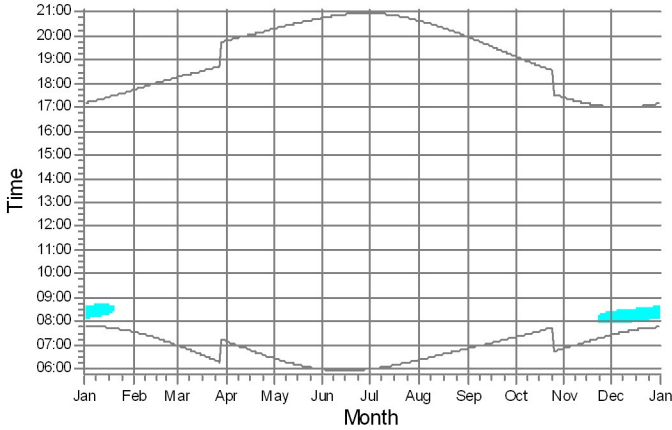
WTG13: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



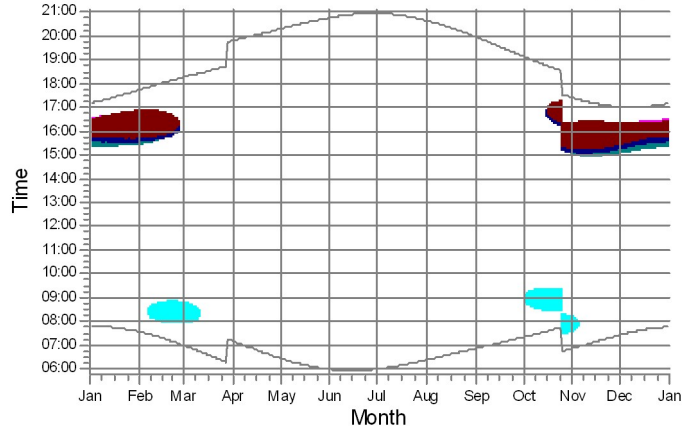
WTG14: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



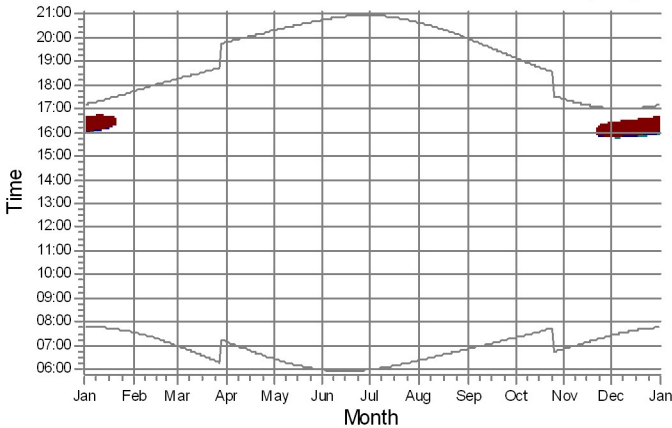
WTG15: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG16: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG17: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



Shadow receptors



## SHADOW - Main Result

Calculation: Progetto\_layout\_2022\_10\_14

### 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\_Progetto\_GRV\_Gergei

Obstacles used in calculation

Eye height for map: 1,5 m

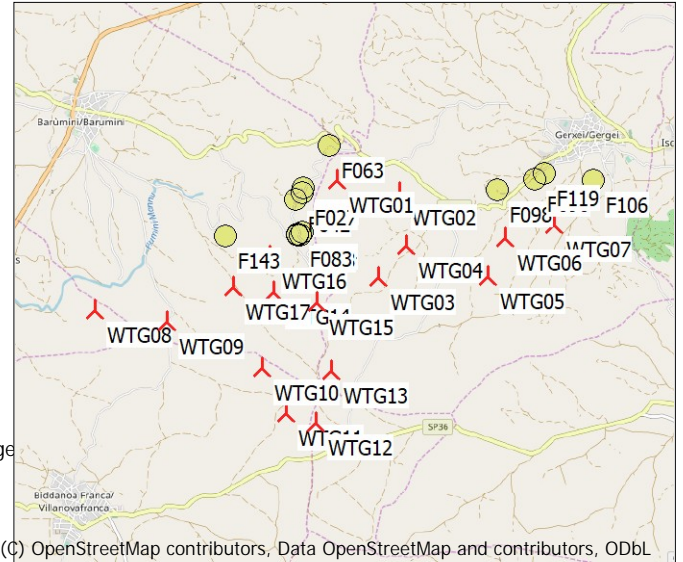
Grid resolution: 1,0 m

All coordinates are in

Italian Gauss-Boaga west-ROMA40 (IT-peninsular <±4m)

### 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
WTG01	1.504.501	4.393.663	290,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG02	1.505.538	4.393.459	317,6	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG03	1.505.187	4.392.070	259,1	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG04	1.505.638	4.392.596	290,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG05	1.506.986	4.392.084	320,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG06	1.507.289	4.392.726	342,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG07	1.508.097	4.392.953	327,7	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG08	1.500.496	4.391.537	239,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG09	1.501.689	4.391.351	240,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG10	1.503.256	4.390.595	300,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG11	1.503.656	4.389.846	334,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG12	1.504.149	4.389.686	340,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG13	1.504.401	4.390.546	300,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG14	1.503.456	4.391.840	289,4	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG15	1.504.162	4.391.658	260,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG16	1.503.391	4.392.418	270,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8
WTG17	1.502.774	4.391.909	279,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.6-170!!-6.600	6.600	170,0	115,0	2.041	8,8



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:125.000  
 ▲ New WTG      ● Shadow receptor

### 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]
F024	A	1.503.949	4.393.552	245,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F027	A	1.503.933	4.393.469	244,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F042	A	1.503.814	4.393.354	242,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F063	A	1.504.364	4.394.242	300,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F064	A	1.503.921	4.392.822	231,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F083	A	1.503.844	4.392.795	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F086	A	1.503.851	4.392.769	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F088	A	1.503.896	4.392.782	230,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F090	D	1.507.773	4.393.693	358,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F098	D	1.507.148	4.393.510	346,1	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F106	A	1.508.735	4.393.666	337,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F119	A	1.507.924	4.393.786	357,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F143	A	1.502.666	4.392.753	190,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6

## SHADOW - Main Result

Calculation: Progetto\_layout\_2022\_10\_14

### Calculation Results

Shadow receptor

No.	Name	Shadow, worst case		
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
F024	A	151:58	207	1:10
F027	A	113:51	166	1:08
F042	A	61:53	128	0:51
F063	A	29:04	76	0:30
F064	A	153:35	231	1:29
F083	A	164:55	214	1:34
F086	A	173:48	240	1:37
F088	A	162:43	237	1:32
F090	D	0:00	0	0:00
F098	D	40:05	123	0:38
F106	A	16:23	68	0:21
F119	A	0:00	0	0:00
F143	A	60:26	124	0:48

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

No.	Name	Worst case [h/year]
WTG01	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (29)	173:34
WTG02	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30)	85:12
WTG03	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (31)	27:48
WTG04	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (32)	38:04
WTG05	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (33)	0:00
WTG06	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (34)	16:23
WTG07	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (35)	30:57
WTG08	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (36)	0:00
WTG09	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (37)	0:00
WTG10	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (38)	0:00
WTG11	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (39)	0:00
WTG12	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (40)	0:00
WTG13	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (41)	0:00
WTG14	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (42)	0:00
WTG15	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (43)	19:33
WTG16	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)	188:56
WTG17	Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)	30:11

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F024 - A

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	08:04 (WTG04) 08:17 (WTG04)	06:59 18:15	07:10 19:48	07:52 (WTG02) 08:00 (WTG02)
2	07:45 17:11	07:32 17:44	08:06 (WTG04) 08:15 (WTG04)	06:57 18:17	07:09 19:49	06:25 20:17
3	07:46 17:12	07:31 17:45	06:56 18:18	06:24 19:50	07:08 (WTG01) 20:18	06:26 20:18
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:51	07:08 (WTG01) 20:19	06:25 20:19
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:52	07:06 (WTG01) 20:20	06:24 20:20
6	07:46 17:14	07:28 17:49	06:51 18:21	07:02 19:53	07:06 (WTG01) 20:21	06:23 20:21
7	07:46 17:15	07:27 17:50	06:50 18:22	07:01 19:54	07:06 (WTG01) 20:22	06:22 20:22
8	07:46 17:16	07:26 17:51	06:48 18:23	06:59 19:55	07:06 (WTG01) 20:23	06:21 20:23
9	07:45 17:17	07:25 17:53	06:47 18:24	06:58 19:56	07:05 (WTG01) 20:24	06:20 20:24
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:57	07:05 (WTG01) 20:25	06:19 20:25
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:58	07:05 (WTG01) 20:26	06:18 20:26
12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:59	07:05 (WTG01) 20:27	06:17 20:27
13	07:45 17:21	08:05 (WTG04) 17:57	06:41 18:28	06:51 19:59	07:05 (WTG01) 20:29	06:16 20:29
14	07:44 17:22	08:05 (WTG04) 17:59	06:39 18:29	06:50 20:00	07:04 (WTG01) 20:30	06:15 20:30
15	07:44 17:23	08:05 (WTG04) 18:00	06:37 18:30	06:48 20:01	07:05 (WTG01) 20:31	06:14 20:31
16	07:44 17:25	08:04 (WTG04) 18:01	06:36 18:31	06:47 20:02	07:05 (WTG01) 20:32	06:13 20:32
17	07:43 17:26	08:04 (WTG04) 18:02	06:34 18:32	06:45 20:03	07:05 (WTG01) 20:33	06:12 20:33
18	07:43 17:27	08:03 (WTG04) 18:03	06:33 18:33	06:44 20:04	07:05 (WTG01) 20:34	06:11 20:34
19	07:42 17:28	08:03 (WTG04) 18:04	06:31 18:34	06:43 20:05	07:05 (WTG01) 20:35	06:10 20:35
20	07:42 17:29	08:02 (WTG04) 18:05	06:29 18:35	06:41 20:06	07:05 (WTG01) 20:36	06:09 20:36
21	07:41 17:30	08:01 (WTG04) 18:07	06:28 18:36	06:40 20:07	07:05 (WTG01) 20:37	06:08 20:37
22	07:41 17:31	08:01 (WTG04) 18:08	06:26 18:37	06:38 20:08	07:05 (WTG01) 20:37	06:07 20:37
23	07:40 17:32	08:00 (WTG04) 18:09	06:25 18:38	06:37 20:09	07:05 (WTG01) 20:38	06:06 20:38
24	07:39 17:34	07:59 (WTG04) 18:10	06:23 18:39	06:35 20:10	07:05 (WTG01) 20:39	06:05 20:39
25	07:39 17:35	07:59 (WTG04) 18:11	06:21 18:40	06:34 20:11	07:05 (WTG01) 20:40	06:04 20:40
26	07:38 17:36	07:58 (WTG04) 18:12	06:20 18:42	06:33 20:12	07:05 (WTG01) 20:41	06:03 20:41
27	07:37 17:37	07:59 (WTG04) 18:13	06:18 18:43	06:31 20:13	07:05 (WTG01) 20:42	06:02 20:42
28	07:37 17:38	07:59 (WTG04) 18:14	06:17 18:44	06:30 20:14	07:05 (WTG01) 20:42	06:01 20:42
29	07:36 17:40	08:00 (WTG04) 18:19	07:15 19:45	07:47 (WTG02) 20:15	07:05 (WTG01) 20:43	06:00 20:43
30	07:35 17:41	08:01 (WTG04) 18:19	07:13 19:46	07:48 (WTG02) 20:16	07:05 (WTG01) 20:44	06:00 20:44
31	07:34 17:42	08:02 (WTG04) 18:18	07:12 19:47	07:50 (WTG02) 20:16	07:05 (WTG01) 20:45	06:00 20:45
Potential sun hours	301	299	370	397	445	448
Total, worst case	284	22	296	665	2077	1711

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F024 - A

### Assumptions for shadow calculations

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	06:00	07:18 (WTG01)	06:22	07:15 (WTG01)	06:51		07:20	06:52	07:25
	20:56	57 08:15 (WTG01)	20:38	70 08:25 (WTG01)	19:57		19:08	17:24	17:01
2	06:00	07:17 (WTG01)	06:23	07:16 (WTG01)	06:52		07:21	06:53	07:26
	20:56	58 08:15 (WTG01)	20:37	69 08:25 (WTG01)	19:55		19:07	17:22	17:01
3	06:01	07:18 (WTG01)	06:24	07:16 (WTG01)	06:53		07:21	06:54	07:27
	20:56	57 08:15 (WTG01)	20:36	69 08:25 (WTG01)	19:54		19:05	17:21	17:00
4	06:01	07:17 (WTG01)	06:25	07:16 (WTG01)	06:54		07:22	06:55	07:28
	20:56	58 08:15 (WTG01)	20:35	69 08:25 (WTG01)	19:52		19:04	17:20	17:00
5	06:02	07:18 (WTG01)	06:26	07:16 (WTG01)	06:55		07:23	06:56	07:29
	20:56	58 08:16 (WTG01)	20:34	69 08:25 (WTG01)	19:51		19:02	17:19	17:00
6	06:02	07:17 (WTG01)	06:27	07:16 (WTG01)	06:56		07:24	06:57	07:30
	20:55	59 08:16 (WTG01)	20:33	68 08:24 (WTG01)	19:49		19:00	17:18	17:00
7	06:03	07:17 (WTG01)	06:28	07:16 (WTG01)	06:57		07:25	06:59	07:31
	20:55	60 08:17 (WTG01)	20:32	67 08:23 (WTG01)	19:48		18:59	17:17	17:00
8	06:03	07:17 (WTG01)	06:29	07:16 (WTG01)	06:58		07:26	07:00	07:32
	20:55	60 08:17 (WTG01)	20:31	67 08:23 (WTG01)	19:46		18:57	17:16	3 07:42 (WTG04) 17:00
9	06:04	07:17 (WTG01)	06:30	07:17 (WTG01)	06:59		07:27	07:01	07:33
	20:54	61 08:18 (WTG01)	20:29	66 08:23 (WTG01)	19:44		18:56	17:15	11 07:47 (WTG04) 17:00
10	06:05	07:17 (WTG01)	06:31	07:17 (WTG01)	07:00		07:28	07:02	07:35 (WTG04) 07:34
	20:54	62 08:19 (WTG01)	20:28	65 08:22 (WTG01)	19:43		18:54	17:14	13 07:52 (WTG04) 17:00
11	06:05	07:17 (WTG01)	06:32	07:18 (WTG01)	07:01	07:46 (WTG02)	07:29	07:03	07:33 (WTG04) 07:34
	20:54	61 08:18 (WTG01)	20:27	64 08:22 (WTG01)	19:41	7 07:53 (WTG02)	18:53	17:13	16 07:49 (WTG04) 17:00
12	06:06	07:17 (WTG01)	06:33	07:18 (WTG01)	07:02	07:43 (WTG02)	07:30	07:04	07:32 (WTG04) 07:35
	20:53	62 08:19 (WTG01)	20:26	63 08:21 (WTG01)	19:39	13 07:56 (WTG02)	18:51	17:12	18 07:50 (WTG04) 17:00
13	06:07	07:17 (WTG01)	06:34	07:19 (WTG01)	07:03	07:39 (WTG02)	07:31	07:05	07:32 (WTG04) 07:36
	20:53	63 08:20 (WTG01)	20:24	62 08:21 (WTG01)	19:38	18 07:57 (WTG02)	18:50	17:11	19 07:51 (WTG04) 17:00
14	06:08	07:16 (WTG01)	06:35	07:19 (WTG01)	07:04	07:38 (WTG02)	07:32	07:07	07:32 (WTG04) 07:37
	20:52	64 08:20 (WTG01)	20:23	61 08:20 (WTG01)	19:36	20 07:58 (WTG02)	18:48	17:10	20 07:52 (WTG04) 17:00
15	06:08	07:16 (WTG01)	06:36	07:20 (WTG01)	07:04	07:37 (WTG02)	07:33	07:08	07:32 (WTG04) 07:37
	20:52	64 08:20 (WTG01)	20:22	59 08:19 (WTG01)	19:35	21 07:58 (WTG02)	18:47	17:10	20 07:52 (WTG04) 17:01
16	06:09	07:17 (WTG01)	06:36	07:20 (WTG01)	07:05	07:36 (WTG02)	07:35	07:09	07:31 (WTG04) 07:38
	20:51	64 08:21 (WTG01)	20:20	57 08:17 (WTG01)	19:33	23 07:59 (WTG02)	18:45	17:09	22 07:53 (WTG04) 17:01
17	06:10	07:17 (WTG01)	06:37	07:21 (WTG01)	07:06	07:35 (WTG02)	07:36	07:10	07:32 (WTG04) 07:39
	20:51	65 08:22 (WTG01)	20:19	55 08:16 (WTG01)	19:31	24 07:59 (WTG02)	18:44	17:08	21 07:53 (WTG04) 17:01
18	06:11	07:16 (WTG01)	06:38	07:22 (WTG01)	07:07	07:34 (WTG02)	07:37	07:11	07:33 (WTG04) 07:39
	20:50	65 08:21 (WTG01)	20:18	53 08:15 (WTG01)	19:30	25 07:59 (WTG02)	18:42	17:07	20 07:53 (WTG04) 17:02
19	06:11	07:16 (WTG01)	06:39	07:23 (WTG01)	07:08	07:34 (WTG02)	07:38	07:12	07:35 (WTG04) 07:40
	20:49	66 08:22 (WTG01)	20:16	51 08:14 (WTG01)	19:28	25 07:59 (WTG02)	18:41	17:07	19 07:54 (WTG04) 17:02
20	06:12	07:16 (WTG01)	06:40	07:24 (WTG01)	07:09	07:34 (WTG02)	07:39	07:13	07:36 (WTG04) 07:41
	20:49	67 08:23 (WTG01)	20:15	48 08:12 (WTG01)	19:26	24 07:58 (WTG02)	18:39	17:06	18 07:54 (WTG04) 17:02
21	06:13	07:16 (WTG01)	06:41	07:25 (WTG01)	07:10	07:34 (WTG02)	07:40	07:14	07:37 (WTG04) 07:41
	20:48	67 08:23 (WTG01)	20:13	46 08:11 (WTG01)	19:25	24 07:58 (WTG02)	18:38	17:05	16 07:53 (WTG04) 17:03
22	06:14	07:16 (WTG01)	06:42	07:27 (WTG01)	07:11	07:34 (WTG02)	07:41	07:16	07:38 (WTG04) 07:42
	20:47	68 08:24 (WTG01)	20:12	42 08:09 (WTG01)	19:23	23 07:57 (WTG02)	18:36	17:05	15 07:53 (WTG04) 17:03
23	06:15	07:15 (WTG01)	06:43	07:29 (WTG01)	07:12	07:35 (WTG02)	07:42	07:17	07:39 (WTG04) 07:42
	20:46	68 08:23 (WTG01)	20:11	38 08:07 (WTG01)	19:21	20 07:55 (WTG02)	18:35	17:04	14 07:53 (WTG04) 17:04
24	06:15	07:15 (WTG01)	06:44	07:31 (WTG01)	07:13	07:35 (WTG02)	07:43	07:18	07:40 (WTG04) 07:43
	20:46	69 08:24 (WTG01)	20:09	33 08:04 (WTG01)	19:20	18 07:53 (WTG02)	18:34	17:04	12 07:52 (WTG04) 17:04
25	06:16	07:16 (WTG01)	06:45	07:34 (WTG01)	07:14	07:36 (WTG02)	06:44	07:19	07:42 (WTG04) 07:43
	20:45	68 08:24 (WTG01)	20:08	27 08:01 (WTG01)	19:18	15 07:51 (WTG02)	17:32	17:03	11 07:53 (WTG04) 17:05
26	06:17	07:16 (WTG01)	06:46	07:37 (WTG01)	07:15	07:39 (WTG02)	06:45	07:20	07:43 (WTG04) 07:44
	20:44	68 08:24 (WTG01)	20:06	19 07:56 (WTG01)	19:16	9 07:48 (WTG02)	17:31	17:03	9 07:52 (WTG04) 17:06
27	06:18	07:16 (WTG01)	06:47		07:16		06:46	07:21	07:44 (WTG04) 07:44
	20:43	69 08:25 (WTG01)	20:05		19:15		17:30	17:02	7 07:51 (WTG04) 17:06
28	06:19	07:16 (WTG01)	06:48		07:17		06:47	07:22	07:45 (WTG04) 07:44
	20:42	69 08:25 (WTG01)	20:03		19:13		17:29	17:02	5 07:50 (WTG04) 17:07
29	06:20	07:15 (WTG01)	06:49		07:18		06:48	07:23	07:46 (WTG04) 07:45
	20:41	69 08:24 (WTG01)	20:02		19:12		17:27	17:01	3 07:49 (WTG04) 17:08
30	06:21	07:15 (WTG01)	06:50		07:19		06:50	07:24	07:45
	20:40	69 08:24 (WTG01)	20:00		19:10		17:26	17:01	17:08
31	06:22	07:15 (WTG01)	06:51				06:51		07:45
	20:39	70 08:25 (WTG01)	19:59				17:25		17:09
Potential sun hours	455		425		374		347	301	292
Total, worst case	1985		1457		309		312		

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F027 - A

### Assumptions for shadow calculations

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	07:45	07:33	07:53 (WTG04)	06:59	07:10	07:37 (WTG02)	06:26	05:59	06:47 (WTG01)
	17:10	17:43	21 08:14 (WTG04)	18:15	19:48	24 08:01 (WTG02)	20:17	20:46	66 07:53 (WTG01)
2	07:45	07:32	07:53 (WTG04)	06:57	07:09	07:38 (WTG02)	06:25	05:58	06:46 (WTG01)
	17:11	17:44	21 08:14 (WTG04)	18:17	19:49	22 08:00 (WTG02)	20:18	20:46	67 07:53 (WTG01)
3	07:46	07:31	07:54 (WTG04)	06:56	07:07	07:37 (WTG02)	06:24	05:58	06:46 (WTG01)
	17:12	17:45	20 08:14 (WTG04)	18:18	19:50	22 07:59 (WTG02)	20:19	20:47	67 07:53 (WTG01)
4	07:46	07:30	07:54 (WTG04)	06:54	07:05	07:39 (WTG02)	06:23	05:58	06:47 (WTG01)
	17:13	17:47	20 08:14 (WTG04)	18:19	19:51	19 07:58 (WTG02)	20:20	20:48	67 07:54 (WTG01)
5	07:46	07:29	07:55 (WTG04)	06:53	07:04	07:39 (WTG02)	06:21	05:57	06:47 (WTG01)
	17:14	17:48	18 08:13 (WTG04)	18:20	19:52	17 07:56 (WTG02)	20:21	20:48	67 07:54 (WTG01)
6	07:46	07:28	07:56 (WTG04)	06:51	07:02	07:40 (WTG02)	06:20	05:57	06:47 (WTG01)
	17:14	17:49	16 08:12 (WTG04)	18:21	19:53	14 07:54 (WTG02)	20:22	20:49	67 07:54 (WTG01)
7	07:46	07:27	07:58 (WTG04)	06:50	07:01	07:44 (WTG02)	06:19	05:57	06:47 (WTG01)
	17:15	17:50	13 08:11 (WTG04)	18:22	19:54	7 07:51 (WTG02)	20:23	20:49	67 07:54 (WTG01)
8	07:46	07:26	07:59 (WTG04)	06:48	06:59		06:18	05:57	06:47 (WTG01)
	17:16	17:51	9 08:08 (WTG04)	18:23	19:55		20:24	20:50	68 07:55 (WTG01)
9	07:45	07:25		06:47	06:58		06:17	05:56	06:47 (WTG01)
	17:17	17:53		18:24	19:56		20:25	20:51	68 07:55 (WTG01)
10	07:45	07:24		06:45	06:56		06:16	05:56	06:48 (WTG01)
	17:18	17:54		18:25	19:57		20:26	20:51	67 07:55 (WTG01)
11	07:45	07:23		06:44	06:54		06:15	05:56	06:47 (WTG01)
	17:19	17:55		18:26	19:58		20:27	20:52	68 07:55 (WTG01)
12	07:45	07:22		06:42	06:53		06:14	05:56	06:47 (WTG01)
	17:20	17:56		18:27	19:59		20:28	20:52	68 07:55 (WTG01)
13	07:45	07:20		06:41	06:51		06:13	05:56	06:47 (WTG01)
	17:21	17:57		18:28	19:59		20:29	20:53	68 07:55 (WTG01)
14	07:44	07:19		06:39	06:50		06:12	05:56	06:48 (WTG01)
	17:22	17:59		18:29	20:00		20:30	20:53	67 07:55 (WTG01)
15	07:44	07:18		06:37	06:48		06:11	05:56	06:48 (WTG01)
	17:23	18:00		18:30	20:01		20:31	20:54	67 07:55 (WTG01)
16	07:44	07:17		06:36	06:47		06:10	05:56	06:48 (WTG01)
	17:25	18:01		18:31	20:02		20:32	20:54	68 07:56 (WTG01)
17	07:43	07:16		06:34	06:45		06:09	05:56	06:49 (WTG01)
	17:26	18:02		18:32	20:03		20:33	20:54	68 07:57 (WTG01)
18	07:43	07:14		06:33	06:44		06:08	05:56	06:49 (WTG01)
	17:27	18:03		18:33	20:04		20:34	20:55	68 07:57 (WTG01)
19	07:42	07:13		06:31	06:43		06:07	05:56	06:49 (WTG01)
	17:28	18:04		18:34	20:05		20:35	20:55	68 07:57 (WTG01)
20	07:42	07:12		06:29	06:41		06:06	05:56	06:49 (WTG01)
	17:29	18:05		18:35	20:06		20:36	20:55	68 07:57 (WTG01)
21	07:41	07:10		06:28	06:40		06:06	05:56	06:49 (WTG01)
	17:30	18:07		18:36	20:07		20:37	20:55	68 07:57 (WTG01)
22	07:41	08:01 (WTG04)	07:09	06:26	06:38		06:05	05:57	06:49 (WTG01)
	17:31	4 08:05 (WTG04)	18:08	18:37	20:08		20:37	20:56	68 07:57 (WTG01)
23	07:40	08:00 (WTG04)	07:08	06:25	06:37	06:49 (WTG02)	06:04	05:57	06:50 (WTG01)
	17:32	7 08:07 (WTG04)	18:09	18:38	7 06:56 (WTG02)	20:09	20:38	20:56	68 07:58 (WTG01)
24	07:39	07:59 (WTG04)	07:06	06:23	06:45 (WTG02)	06:35	06:03	05:57	06:50 (WTG01)
	17:34	9 08:08 (WTG04)	18:10	18:39	13 06:58 (WTG02)	20:10	20:39	20:56	68 07:58 (WTG01)
25	07:39	07:59 (WTG04)	07:05	06:21	06:43 (WTG02)	06:34	06:03	05:57	06:50 (WTG01)
	17:35	11 08:10 (WTG04)	18:11	18:40	17 07:00 (WTG02)	20:11	20:40	20:56	68 07:58 (WTG01)
26	07:38	07:58 (WTG04)	07:03	06:20	06:41 (WTG02)	06:33	06:02	05:58	06:51 (WTG01)
	17:36	13 08:11 (WTG04)	18:12	18:42	20 07:01 (WTG02)	20:12	20:41	20:56	68 07:59 (WTG01)
27	07:37	07:57 (WTG04)	07:02	06:18	06:39 (WTG02)	06:31	06:02	05:58	06:51 (WTG01)
	17:37	15 08:12 (WTG04)	18:13	18:43	22 07:01 (WTG02)	20:13	20:42	20:56	68 07:59 (WTG01)
28	07:37	07:56 (WTG04)	07:00	06:17	06:39 (WTG02)	06:30	06:01	05:58	06:51 (WTG01)
	17:38	16 08:12 (WTG04)	18:14	18:44	23 07:02 (WTG02)	20:14	20:42	20:56	67 07:58 (WTG01)
29	07:36	07:55 (WTG04)		07:15	07:38 (WTG02)	06:29	06:00	05:59	06:51 (WTG01)
	17:40	18 08:13 (WTG04)		19:45	24 08:02 (WTG02)	20:15	20:43	20:56	68 07:59 (WTG01)
30	07:35	07:55 (WTG04)		07:13	07:37 (WTG02)	06:28	06:00	05:59	06:51 (WTG01)
	17:41	19 08:14 (WTG04)		19:46	24 08:01 (WTG02)	20:16	20:44	20:56	68 07:59 (WTG01)
31	07:34	07:54 (WTG04)		07:12	07:37 (WTG02)		05:59	06:46 (WTG01)	
	17:42	20 08:14 (WTG04)		19:47	25 08:02 (WTG02)		20:45	20:56	68 07:59 (WTG01)
Potential sun hours	301	299		370	397		445	448	2028
Total, worst case	132	138		175	125		1438		

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F027 - A

### Assumptions for shadow calculations

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	06:00	06:52 (WTG01)	06:22	07:06 (WTG01)	06:51		07:20	06:52	07:25
	20:56	68 08:00 (WTG01)	20:38	47 07:53 (WTG01)	19:57		19:08	17:24	17:01
2	06:00	06:52 (WTG01)	06:23	07:07 (WTG01)	06:52		07:21	06:53	07:26
	20:56	67 07:59 (WTG01)	20:37	44 07:51 (WTG01)	19:55		19:07	17:22	17:01
3	06:01	06:53 (WTG01)	06:24	07:09 (WTG01)	06:53		07:21	06:54	07:29 (WTG04)
	20:56	67 08:00 (WTG01)	20:36	41 07:50 (WTG01)	19:54		19:05	17:21	10 07:39 (WTG04)
4	06:01	06:52 (WTG01)	06:25	07:10 (WTG01)	06:54		07:22	06:55	07:27 (WTG04)
	20:56	68 08:00 (WTG01)	20:35	39 07:49 (WTG01)	19:52		19:04	17:20	13 07:40 (WTG04)
5	06:02	06:53 (WTG01)	06:26	07:12 (WTG01)	06:55	07:40 (WTG02)	07:23	06:56	07:26 (WTG04)
	20:56	67 08:00 (WTG01)	20:34	35 07:47 (WTG01)	19:51	7 07:47 (WTG02)	19:02	17:19	16 07:42 (WTG04)
6	06:02	06:53 (WTG01)	06:27	07:13 (WTG01)	06:56	07:36 (WTG02)	07:24	06:57	07:25 (WTG04)
	20:55	67 08:00 (WTG01)	20:33	31 07:44 (WTG01)	19:49	14 07:50 (WTG02)	19:00	17:18	18 07:43 (WTG04)
7	06:03	06:53 (WTG01)	06:28	07:16 (WTG01)	06:57	07:34 (WTG02)	07:25	06:59	07:24 (WTG04)
	20:55	67 08:00 (WTG01)	20:32	25 07:41 (WTG01)	19:48	17 07:51 (WTG02)	18:59	17:17	20 07:44 (WTG04)
8	06:03	06:53 (WTG01)	06:29	07:19 (WTG01)	06:58	07:19 (WTG02)	07:26	07:00	07:24 (WTG04)
	20:55	67 08:00 (WTG01)	20:31	19 07:38 (WTG01)	19:46	19 07:52 (WTG02)	18:57	17:16	20 07:44 (WTG04)
9	06:04	06:54 (WTG01)	06:30	07:28 (WTG01)	06:59	07:32 (WTG02)	07:27	07:01	07:24 (WTG04)
	20:54	66 08:00 (WTG01)	20:29	1 07:29 (WTG01)	19:44	21 07:53 (WTG02)	18:56	17:15	21 07:45 (WTG04)
10	06:05	06:54 (WTG01)	06:31		07:00	07:31 (WTG02)	07:28	07:02	07:24 (WTG04)
	20:54	67 08:01 (WTG01)	20:28		19:43	23 07:54 (WTG02)	18:54	17:14	21 07:45 (WTG04)
11	06:05	06:54 (WTG01)	06:32		07:01	07:30 (WTG02)	07:29	07:03	07:25 (WTG04)
	20:54	66 08:00 (WTG01)	20:27		19:41	24 07:54 (WTG02)	18:53	17:13	20 07:45 (WTG04)
12	06:06	06:55 (WTG01)	06:33		07:02	07:30 (WTG02)	07:30	07:04	07:26 (WTG04)
	20:53	66 08:01 (WTG01)	20:26		19:39	24 07:54 (WTG02)	18:51	17:12	19 07:45 (WTG04)
13	06:07	06:55 (WTG01)	06:34		07:03	07:28 (WTG02)	07:31	07:05	07:27 (WTG04)
	20:53	66 08:01 (WTG01)	20:24		19:38	25 07:53 (WTG02)	18:50	17:11	18 07:45 (WTG04)
14	06:08	06:55 (WTG01)	06:35		07:04	07:28 (WTG02)	07:32	07:07	07:29 (WTG04)
	20:52	65 08:00 (WTG01)	20:23		19:36	24 07:52 (WTG02)	18:48	17:10	16 07:45 (WTG04)
15	06:08	06:55 (WTG01)	06:36		07:04	07:28 (WTG02)	07:33	07:08	07:30 (WTG04)
	20:52	66 08:01 (WTG01)	20:22		19:35	24 07:52 (WTG02)	18:47	17:10	15 07:45 (WTG04)
16	06:09	06:56 (WTG01)	06:36		07:05	07:29 (WTG02)	07:35	07:09	07:31 (WTG04)
	20:51	65 08:01 (WTG01)	20:20		19:33	22 07:51 (WTG02)	18:45	17:09	13 07:44 (WTG04)
17	06:10	06:57 (WTG01)	06:37		07:06	07:29 (WTG02)	07:36	07:10	07:32 (WTG04)
	20:51	64 08:01 (WTG01)	20:19		19:31	21 07:50 (WTG02)	18:44	17:08	11 07:43 (WTG04)
18	06:11	06:56 (WTG01)	06:38		07:07	07:30 (WTG02)	07:37	07:11	07:33 (WTG04)
	20:50	64 08:00 (WTG01)	20:18		19:30	18 07:48 (WTG02)	18:42	17:07	9 07:42 (WTG04)
19	06:11	06:57 (WTG01)	06:39		07:08	07:31 (WTG02)	07:38	07:12	07:35 (WTG04)
	20:49	63 08:00 (WTG01)	20:16		19:28	15 07:46 (WTG02)	18:41	17:07	7 07:42 (WTG04)
20	06:12	06:58 (WTG01)	06:40		07:09	07:34 (WTG02)	07:39	07:13	07:36 (WTG04)
	20:49	62 08:00 (WTG01)	20:15		19:26	9 07:43 (WTG02)	18:39	17:06	4 07:40 (WTG04)
21	06:13	06:58 (WTG01)	06:41		07:10		07:40	07:14	07:41
	20:48	62 08:00 (WTG01)	20:13		19:25		18:38	17:05	17:03
22	06:14	06:59 (WTG01)	06:42		07:11		07:41	07:16	07:42
	20:47	61 08:00 (WTG01)	20:12		19:23		18:36	17:05	17:03
23	06:15	06:59 (WTG01)	06:43		07:12		07:42	07:17	07:42
	20:46	60 07:59 (WTG01)	20:11		19:21		18:35	17:04	17:04
24	06:15	06:59 (WTG01)	06:44		07:13		07:43	07:18	07:43
	20:46	59 07:58 (WTG01)	20:09		19:20		18:34	17:04	17:04
25	06:16	07:00 (WTG01)	06:45		07:14		06:44	07:19	07:43
	20:45	58 07:58 (WTG01)	20:08		19:18		17:32	17:03	17:05
26	06:17	07:01 (WTG01)	06:46		07:15		06:45	07:20	07:44
	20:44	57 07:58 (WTG01)	20:06		19:16		17:31	17:03	17:06
27	06:18	07:02 (WTG01)	06:47		07:16		06:46	07:21	07:44
	20:43	55 07:57 (WTG01)	20:05		19:15		17:30	17:02	17:06
28	06:19	07:03 (WTG01)	06:48		07:17		06:47	07:22	07:44
	20:42	54 07:57 (WTG01)	20:03		19:13		17:29	17:02	17:07
29	06:20	07:03 (WTG01)	06:49		07:18		06:48	07:23	07:45
	20:41	52 07:55 (WTG01)	20:02		19:12		17:27	17:01	17:08
30	06:21	07:04 (WTG01)	06:50		07:19		06:50	07:24	07:45
	20:40	50 07:54 (WTG01)	20:00		19:10		17:26	17:01	17:08
31	06:22	07:05 (WTG01)	06:51				06:51		07:45
	20:39	49 07:54 (WTG01)	19:59				17:25		17:09
Potential sun hours	455		425		374		347	301	292
Total, worst case	1935		282		307			271	

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F042 - A

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:48	07:30 (WTG02) 20:17	05:59 20:46
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	07:29 (WTG02) 20:18	05:58 20:46
3	07:46 17:12	07:31 17:45	06:56 18:18	07:07 19:50	07:27 (WTG02) 20:19	05:58 20:47
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:51	07:27 (WTG02) 20:20	05:58 20:48
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:52	07:26 (WTG02) 20:21	05:57 20:48
6	07:46 17:14	07:28 17:49	06:51 18:21	07:02 19:53	07:25 (WTG02) 20:22	05:57 20:49
7	07:46 17:15	07:27 17:50	06:50 18:22	07:01 19:54	07:25 (WTG02) 20:23	05:57 20:49
8	07:46 17:16	07:26 17:51	06:48 18:23	06:59 19:55	07:24 (WTG02) 20:24	05:57 20:50
9	07:45 17:17	07:25 17:53	06:47 18:24	06:58 19:56	07:25 (WTG02) 20:25	05:56 20:51
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:57	07:25 (WTG02) 20:26	05:56 20:51
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:58	07:26 (WTG02) 20:27	05:56 20:52
12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:59	07:27 (WTG02) 20:28	05:56 20:52
13	07:45 17:21	07:20 17:57	06:41 18:28	06:51 20:00	07:29 (WTG02) 20:29	05:56 20:53
14	07:44 17:22	07:19 17:59	06:39 18:29	06:50 20:01	07:32 (WTG02) 20:30	05:56 20:53
15	07:44 17:24	07:18 18:00	06:37 18:30	06:48 20:02	07:36 (WTG02) 20:31	05:56 20:54
16	07:44 17:25	07:17 18:01	06:36 18:31	06:47 20:03		05:56 20:54
17	07:43 17:26	07:16 18:02	06:34 18:32	06:45 20:03		05:56 20:54
18	07:43 17:27	07:14 18:03	06:33 18:33	06:44 20:04		05:56 20:55
19	07:42 17:28	07:13 18:04	06:31 18:34	06:43 20:05		05:56 20:55
20	07:42 17:29	07:12 18:05	06:29 18:35	06:41 20:06		05:56 20:55
21	07:41 17:30	07:10 18:07	06:28 18:36	06:40 20:07		05:56 20:55
22	07:41 17:31	07:09 18:08	06:26 18:37	06:38 20:08		05:57 20:56
23	07:40 17:32	07:08 18:09	06:25 18:38	06:37 20:09		05:57 20:56
24	07:39 17:34	07:06 18:10	06:23 18:39	06:35 20:10		05:57 20:56
25	07:39 17:35	07:05 18:11	06:21 18:41	06:34 20:11		05:57 20:56
26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:13		05:58 20:56
27	07:37 17:37	07:02 18:13	06:18 18:43	06:31 20:14		05:58 20:56
28	07:37 17:38	07:00 18:14	06:17 18:44	06:30 20:15		05:58 20:56
29	07:36 17:40		07:15 19:45	06:29 20:16		05:59 20:56
30	07:35 17:41		07:13 19:46	06:28 20:16		05:59 20:56
31	07:34 17:42		07:12 19:47	06:28 20:16		05:59 20:56
Potential sun hours	301	299	370	397	445	448
Total, worst case		216	11	255	370	1465

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F042 - A

### Assumptions for shadow calculations

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	06:00	06:38 (WTG01)	06:22	06:51	07:25 (WTG02)	07:20		06:52	07:13 (WTG04)	07:25	
	20:56	49 07:27 (WTG01)	20:38	19:57	18 07:43 (WTG02)	19:08		17:24	18 07:31 (WTG04)	17:01	
2	06:00	06:38 (WTG01)	06:23	06:52	07:24 (WTG02)	07:21		06:53	07:14 (WTG04)	07:26	
	20:56	49 07:27 (WTG01)	20:37	19:55	20 07:44 (WTG02)	19:07		17:22	17 07:31 (WTG04)	17:01	
3	06:01	06:39 (WTG01)	06:24	06:53	07:23 (WTG02)	07:21		06:54	07:15 (WTG04)	07:27	
	20:56	48 07:27 (WTG01)	20:36	19:54	22 07:45 (WTG02)	19:05		17:21	15 07:30 (WTG04)	17:00	
4	06:01	06:39 (WTG01)	06:25	06:54	07:22 (WTG02)	07:22		06:55	07:16 (WTG04)	07:28	
	20:56	48 07:27 (WTG01)	20:35	19:52	22 07:44 (WTG02)	19:04		17:20	13 07:29 (WTG04)	17:00	
5	06:02	06:40 (WTG01)	06:26	06:55	07:21 (WTG02)	07:23		06:56	07:18 (WTG04)	07:29	
	20:56	47 07:27 (WTG01)	20:34	19:51	23 07:44 (WTG02)	19:02		17:19	11 07:29 (WTG04)	17:00	
6	06:02	06:40 (WTG01)	06:27	06:56	07:21 (WTG02)	07:24		06:57	07:19 (WTG04)	07:30	
	20:55	46 07:26 (WTG01)	20:33	19:49	23 07:44 (WTG02)	19:00		17:18	9 07:28 (WTG04)	17:00	
7	06:03	06:40 (WTG01)	06:28	06:57	07:21 (WTG02)	07:25		06:59	07:20 (WTG04)	07:31	
	20:55	47 07:27 (WTG01)	20:32	19:48	22 07:43 (WTG02)	18:59		17:17	6 07:26 (WTG04)	17:00	
8	06:03	06:40 (WTG01)	06:29	06:58	07:21 (WTG02)	07:26		07:00		07:32	
	20:55	46 07:26 (WTG01)	20:31	19:46	21 07:42 (WTG02)	18:57		17:16		17:00	
9	06:04	06:41 (WTG01)	06:30	06:59	07:21 (WTG02)	07:27		07:01		07:33	
	20:54	45 07:26 (WTG01)	20:29	19:44	21 07:42 (WTG02)	18:56		17:15		17:00	
10	06:05	06:42 (WTG01)	06:31	07:00	07:22 (WTG02)	07:28		07:02		07:34	
	20:54	44 07:26 (WTG01)	20:28	19:43	18 07:40 (WTG02)	18:54		17:14		17:00	
11	06:05	06:42 (WTG01)	06:32	07:01	07:23 (WTG02)	07:29		07:03		07:34	
	20:54	43 07:25 (WTG01)	20:27	19:41	16 07:39 (WTG02)	18:53		17:13		17:00	
12	06:06	06:43 (WTG01)	06:33	07:02	07:25 (WTG02)	07:30		07:04		07:35	
	20:53	42 07:25 (WTG01)	20:26	19:39	12 07:37 (WTG02)	18:51		17:12		17:00	
13	06:07	06:44 (WTG01)	06:34	07:03	07:28 (WTG02)	07:31		07:05		07:36	
	20:53	41 07:25 (WTG01)	20:24	19:38	3 07:31 (WTG02)	18:50		17:11		17:00	
14	06:08	06:44 (WTG01)	06:35	07:04		07:32		07:07		07:37	
	20:52	40 07:24 (WTG01)	20:23	19:36		18:48		17:10		17:00	
15	06:08	06:45 (WTG01)	06:36	07:04		07:33		07:08		07:37	
	20:52	39 07:24 (WTG01)	20:22	19:35		18:47		17:10		17:01	
16	06:09	06:47 (WTG01)	06:36	07:05		07:35		07:09		07:38	
	20:51	36 07:23 (WTG01)	20:20	19:33		18:45		17:09		17:01	
17	06:10	06:48 (WTG01)	06:37	07:06		07:36		07:10		07:39	
	20:51	35 07:23 (WTG01)	20:19	19:31		18:44		17:08		17:01	
18	06:11	06:48 (WTG01)	06:38	07:07		07:37		07:11		07:39	
	20:50	33 07:21 (WTG01)	20:18	19:30		18:42		17:07		17:02	
19	06:11	06:50 (WTG01)	06:39	07:08		07:38		07:12		07:40	
	20:49	30 07:20 (WTG01)	20:16	19:28		18:41		17:07		17:02	
20	06:12	06:51 (WTG01)	06:40	07:09		07:39		07:13		07:41	
	20:49	28 07:19 (WTG01)	20:15	19:26		18:39		17:06		17:02	
21	06:13	06:53 (WTG01)	06:41	07:10		07:40		07:14		07:41	
	20:48	25 07:18 (WTG01)	20:13	19:25		18:38		17:05		17:03	
22	06:14	06:55 (WTG01)	06:42	07:11		07:41		07:16		07:42	
	20:47	21 07:16 (WTG01)	20:12	19:23		18:37		17:05		17:03	
23	06:15	06:57 (WTG01)	06:43	07:12		07:42		07:17		07:42	
	20:46	16 07:13 (WTG01)	20:11	19:21		18:35		17:04		17:04	
24	06:15	07:01 (WTG01)	06:44	07:13		07:43		07:18		07:43	
	20:46	8 07:09 (WTG01)	20:09	19:20		18:34	7 08:24 (WTG04)	17:04		17:04	
25	06:16		06:45	07:14		06:44	07:15 (WTG04)	07:19		07:43	
	20:45		20:08	19:18		17:32	12 07:27 (WTG04)	17:03		17:05	
26	06:17		06:46	07:15		06:45	07:14 (WTG04)	07:20		07:44	
	20:44		20:06	19:16		17:31	15 07:29 (WTG04)	17:03		17:06	
27	06:18		06:47	07:16		06:46	07:12 (WTG04)	07:21		07:44	
	20:43		20:05	19:15		17:30	18 07:30 (WTG04)	17:02		17:06	
28	06:19		06:48	07:17		06:47	07:11 (WTG04)	07:22		07:44	
	20:42		20:03	19:13		17:29	19 07:30 (WTG04)	17:02		17:07	
29	06:20		06:49	07:18		06:48	07:11 (WTG04)	07:23		07:45	
	20:41		20:02	4 07:37 (WTG02)	19:12	17:27	19 07:30 (WTG04)	17:01		17:08	
30	06:21		06:50	07:29 (WTG02)	07:19	06:50	07:10 (WTG04)	07:24		07:45	
	20:40		20:00	12 07:41 (WTG02)	19:10	17:26	20 07:30 (WTG04)	17:01		17:08	
31	06:22		06:51	07:27 (WTG02)		06:51	07:12 (WTG04)	07:45		07:45	
	20:39		19:59	15 07:42 (WTG02)		17:25	19 07:31 (WTG04)	17:09		17:09	
Potential sun hours	455		425		374		347		301		292
Total, worst case	906		31		241		129		89		

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:

Progetto\_GRV\_Gergei

Licensed user:

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 Via Santa Margherita 4  
 IT-09124 Cagliari  
 +39 070 658297  
 Giuseppe Frongia / direttore@iatprogetti.it  
 Calculated:  
 20/01/2023 16:13/3.4.415

## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F063 - A  
 Assumptions for shadow calculations

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	07:45 17:10	08:07 (WTG02) 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:46	06:00 20:56	06:22 20:38	06:51 19:57	07:20 19:08	06:52 17:24	07:25 17:01	07:48 (WTG02) 28 08:16 (WTG02)
2	07:45 17:11	08:07 (WTG02) 17:44	06:57 18:17	07:09 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00	07:49 (WTG02) 27 08:16 (WTG02)
3	07:46 17:12	08:07 (WTG02) 17:45	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00	07:50 (WTG02) 26 08:16 (WTG02)
4	07:46 17:13	08:07 (WTG02) 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00	07:51 (WTG02) 26 08:17 (WTG02)
5	07:46 17:13	08:07 (WTG02) 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00	07:52 (WTG02) 25 08:17 (WTG02)
6	07:46 17:14	08:07 (WTG02) 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00	07:53 (WTG02) 24 08:17 (WTG02)
7	07:46 17:15	08:07 (WTG02) 17:50	06:50 18:22	07:01 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:48	07:25 18:59	06:59 17:17	07:31 17:00	07:54 (WTG02) 24 08:18 (WTG02)
8	07:46 17:16	08:07 (WTG02) 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:57 20:50	06:03 20:55	06:29 20:31	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00	07:55 (WTG02) 23 08:18 (WTG02)
9	07:45 17:17	08:07 (WTG02) 17:53	06:47 18:24	06:58 19:55	06:17 20:25	05:56 20:51	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:01 17:15	07:33 17:00	07:56 (WTG02) 22 08:18 (WTG02)
10	07:45 17:18	08:06 (WTG02) 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:34 17:00	07:57 (WTG02) 22 08:19 (WTG02)
11	07:45 17:19	08:06 (WTG02) 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	07:03 17:13	07:34 17:00	07:57 (WTG02) 21 08:18 (WTG02)
12	07:45 17:20	08:06 (WTG02) 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00	07:58 (WTG02) 21 08:19 (WTG02)
13	07:45 17:21	08:05 (WTG02) 17:57	06:41 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00	07:59 (WTG02) 20 08:19 (WTG02)
14	07:44 17:22	08:05 (WTG02) 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:35 20:23	07:03 19:36	07:32 18:48	07:07 17:10	07:37 17:00	08:00 (WTG02) 20 08:20 (WTG02)
15	07:44 17:23	08:06 (WTG02) 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:54	06:08 20:52	06:35 20:22	07:04 19:35	07:33 18:47	07:08 17:09	07:38 17:00	08:00 (WTG02) 19 08:19 (WTG02)
16	07:44 17:25	08:06 (WTG02) 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:39 17:00	08:01 (WTG02) 19 08:20 (WTG02)
17	07:43 17:26	08:07 (WTG02) 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08	07:40 17:00	08:02 (WTG02) 19 08:21 (WTG02)
18	07:43 17:27	08:07 (WTG02) 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:55	06:10 20:50	06:38 20:18	07:07 19:30	07:37 18:42	07:11 17:07	07:41 17:00	08:02 (WTG02) 18 08:20 (WTG02)
19	07:42 17:28	08:08 (WTG02) 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:06	07:42 17:00	08:03 (WTG02) 18 08:21 (WTG02)
20	07:42 17:29	08:08 (WTG02) 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:43 17:00	08:03 (WTG02) 18 08:21 (WTG02)
21	07:41 17:30	08:09 (WTG02) 18:07	06:28 18:36	06:40 20:07	06:06 20:37	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:44 17:00	08:04 (WTG02) 18 08:22 (WTG02)
22	07:41 17:31	08:10 (WTG02) 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:16 17:05	07:45 17:00	08:04 (WTG02) 18 08:22 (WTG02)
23	07:40 17:32	08:11 (WTG02) 18:09	06:25 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:46 17:00	08:05 (WTG02) 18 08:23 (WTG02)
24	07:39 17:34	08:12 (WTG02) 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:47 17:00	08:05 (WTG02) 18 08:23 (WTG02)
25	07:39 17:35	08:14 (WTG02) 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:08	07:14 19:18	07:44 17:32	07:19 17:03	07:48 17:00	08:06 (WTG02) 18 08:24 (WTG02)
26	07:38 17:36	08:15 (WTG02) 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	07:45 17:31	07:20 17:03	07:49 17:00	08:06 (WTG02) 19 08:25 (WTG02)
27	07:37 17:37	08:17 (WTG02) 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:21 17:02	07:50 17:00	08:07 (WTG02) 19 08:25 (WTG02)
28	07:37 17:38	08:19 (WTG02) 18:14	06:17 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:17 19:13	07:47 17:29	07:22 17:02	07:51 17:00	08:07 (WTG02) 19 08:25 (WTG02)
29	07:36 17:39	08:20 (WTG02) 18:15	06:15 18:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	07:48 17:27	07:23 17:01	07:52 17:00	08:07 (WTG02) 20 08:26 (WTG02)
30	07:35 17:41	08:21 (WTG02) 18:16	06:13 18:45	06:27 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	07:49 17:26	07:24 17:01	07:53 17:00	08:07 (WTG02) 20 08:27 (WTG02)
31	07:34 17:42	08:22 (WTG02) 18:17	06:11 18:46	06:25 20:17	06:00 20:45	05:59 20:56	06:22 20:39	06:50 19:59	07:20 19:09	07:50 17:25	07:25 17:00	07:54 17:00	08:08 (WTG02) 20 08:27 (WTG02)
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292	647
Total, worst case	682										415		

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F064 - A  
 Assumptions for shadow calculations

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	07:45	15:42 (WTG16)	07:33	08:06 (WTG03)	06:59	07:10	06:26	05:59	06:35 (WTG02)							
	17:10	52	16:34 (WTG17)	17:43	80	16:46 (WTG16)	18:15	19:48	21	06:56 (WTG02)						
2	07:45	15:42 (WTG16)	07:32	08:08 (WTG03)	06:57	07:09	06:25	05:58	06:35 (WTG02)							
	17:11	52	16:34 (WTG17)	17:44	77	16:46 (WTG16)	18:17	19:49	20	06:55 (WTG02)						
3	07:46	15:42 (WTG16)	07:31	08:09 (WTG03)	06:56	07:07	06:24	05:58	06:36 (WTG02)							
	17:12	52	16:34 (WTG17)	17:45	72	16:45 (WTG16)	18:18	19:50	19	06:55 (WTG02)						
4	07:46	15:42 (WTG16)	07:30	08:12 (WTG03)	06:54	07:05	06:23	05:58	06:37 (WTG02)							
	17:13	52	16:34 (WTG17)	17:47	67	16:45 (WTG16)	18:19	19:51	18	06:55 (WTG02)						
5	07:46	08:07 (WTG03)	07:29	15:49 (WTG16)	06:53	07:04	06:21	05:57	06:37 (WTG02)							
	17:14	55	16:35 (WTG17)	17:48	56	16:45 (WTG16)	18:20	19:52	18	06:55 (WTG02)						
6	07:46	08:07 (WTG03)	07:28	15:50 (WTG16)	06:51	07:02	06:20	05:57	06:37 (WTG02)							
	17:14	57	16:35 (WTG17)	17:49	55	16:45 (WTG16)	18:21	19:53	17	06:54 (WTG02)						
7	07:46	08:07 (WTG03)	07:27	15:51 (WTG16)	06:50	07:01	06:19	05:57	06:38 (WTG02)							
	17:15	59	16:35 (WTG17)	17:50	53	16:44 (WTG16)	18:22	19:54	16	06:54 (WTG02)						
8	07:46	08:07 (WTG03)	07:26	15:51 (WTG16)	06:48	07:09 (WTG04)	06:59	06:18	05:57	06:39 (WTG02)						
	17:16	61	16:35 (WTG17)	17:51	52	16:43 (WTG16)	18:23	5	07:14 (WTG04)	19:55	20:24	15	06:54 (WTG02)			
9	07:45	08:07 (WTG03)	07:25	15:52 (WTG16)	06:47	07:05 (WTG04)	06:58	06:17	05:56	06:40 (WTG02)						
	17:17	64	16:36 (WTG17)	17:53	50	16:42 (WTG16)	18:24	12	07:17 (WTG04)	19:56	20:25	14	06:54 (WTG02)			
10	07:45	08:06 (WTG03)	07:24	15:53 (WTG16)	06:45	07:04 (WTG04)	06:56	06:16	05:56	06:41 (WTG02)						
	17:18	64	16:35 (WTG17)	17:54	49	16:42 (WTG16)	18:25	15	07:19 (WTG04)	19:56	20:26	12	06:53 (WTG02)			
11	07:45	08:06 (WTG03)	07:23	15:54 (WTG16)	06:44	07:02 (WTG04)	06:54	06:15	06:42 (WTG02)	05:56	06:41 (WTG02)					
	17:19	67	16:36 (WTG16)	17:55	47	16:41 (WTG16)	18:26	18	07:20 (WTG04)	19:57	20:27	4	06:46 (WTG02)	20:52	12	06:53 (WTG02)
12	07:45	08:06 (WTG03)	07:22	15:56 (WTG16)	06:42	07:01 (WTG04)	06:53	06:14	06:38 (WTG02)	05:56	06:41 (WTG02)					
	17:20	69	16:37 (WTG16)	17:56	44	16:40 (WTG16)	18:27	20	07:21 (WTG04)	19:58	20:28	11	06:49 (WTG02)	20:52	11	06:52 (WTG02)
13	07:45	08:05 (WTG03)	07:20	15:58 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13	06:36 (WTG02)	05:56	06:42 (WTG02)					
	17:21	70	16:37 (WTG16)	17:57	41	16:39 (WTG16)	18:28	22	07:21 (WTG04)	19:59	20:29	15	06:51 (WTG02)	20:53	10	06:52 (WTG02)
14	07:44	08:05 (WTG03)	07:19	15:58 (WTG16)	06:39	06:58 (WTG04)	06:50	06:12	06:35 (WTG02)	05:56	06:43 (WTG02)					
	17:22	73	16:38 (WTG16)	17:59	39	16:37 (WTG16)	18:29	23	07:21 (WTG04)	20:00	20:30	17	06:52 (WTG02)	20:53	8	06:51 (WTG02)
15	07:44	08:05 (WTG03)	07:18	16:01 (WTG16)	06:37	06:59 (WTG04)	06:48	06:11	06:35 (WTG02)	05:56	06:44 (WTG02)					
	17:24	75	16:39 (WTG16)	18:00	35	16:36 (WTG16)	18:30	22	07:21 (WTG04)	20:01	20:31	19	06:54 (WTG02)	20:54	7	06:51 (WTG02)
16	07:44	08:04 (WTG03)	07:17	16:03 (WTG16)	06:36	06:58 (WTG04)	06:47	06:10	06:34 (WTG02)	05:56	06:45 (WTG02)					
	17:25	77	16:40 (WTG16)	18:01	31	16:34 (WTG16)	18:31	22	07:20 (WTG04)	20:02	20:32	20	06:54 (WTG02)	20:54	6	06:51 (WTG02)
17	07:43	08:04 (WTG03)	07:16	16:05 (WTG16)	06:34	06:59 (WTG04)	06:45	06:09	06:33 (WTG02)	05:56	06:46 (WTG02)					
	17:26	79	16:41 (WTG16)	18:02	26	16:31 (WTG16)	18:32	21	07:20 (WTG04)	20:03	20:33	22	06:55 (WTG02)	20:54	5	06:51 (WTG02)
18	07:43	08:03 (WTG03)	07:14	16:09 (WTG16)	06:33	06:59 (WTG04)	06:44	06:08	06:33 (WTG02)	05:56	06:47 (WTG02)					
	17:27	81	16:41 (WTG16)	18:03	19	16:28 (WTG16)	18:33	20	07:19 (WTG04)	20:04	20:34	22	06:55 (WTG02)	20:55	3	06:50 (WTG02)
19	07:42	08:03 (WTG03)	07:13	16:15 (WTG16)	06:31	06:59 (WTG04)	06:43	06:07	06:32 (WTG02)	05:56	06:47 (WTG02)					
	17:28	82	16:42 (WTG16)	18:04	7	16:22 (WTG16)	18:34	18	07:17 (WTG04)	20:05	20:35	23	06:55 (WTG02)	20:55	3	06:50 (WTG02)
20	07:42	08:02 (WTG03)	07:12	16:22 (WTG16)	06:29	07:00 (WTG04)	06:41	06:06	06:33 (WTG02)	05:56	06:48 (WTG02)					
	17:29	84	16:42 (WTG16)	18:05	18:35	16	07:16 (WTG04)	20:06	20:36	23	06:56 (WTG02)	20:55	1	06:49 (WTG02)		
21	07:41	08:01 (WTG03)	07:10	16:28 (WTG16)	06:28	07:02 (WTG04)	06:40	06:06	06:32 (WTG02)	05:56	06:49 (WTG02)					
	17:30	85	16:42 (WTG16)	18:07	18:36	12	07:14 (WTG04)	20:07	20:37	24	06:56 (WTG02)	20:55				
22	07:41	08:01 (WTG03)	07:09	16:26 (WTG16)	06:26	07:05 (WTG04)	06:38	06:05	06:32 (WTG02)	05:57	06:48 (WTG02)					
	17:31	86	16:43 (WTG16)	18:08	18:37	4	07:09 (WTG04)	20:08	20:37	24	06:56 (WTG02)	20:56	1	06:49 (WTG02)		
23	07:40	08:00 (WTG03)	07:07	16:25 (WTG16)	06:25	06:37	20:09	20:38	24	06:56 (WTG02)	20:56	2	06:51 (WTG02)			
	17:32	87	16:43 (WTG16)	18:09	18:38	20:09	20:38	24	06:56 (WTG02)	20:56	2	06:51 (WTG02)				
24	07:39	08:00 (WTG03)	07:06	16:23 (WTG16)	06:23	06:35	20:10	20:39	24	06:56 (WTG02)	20:56	3	06:51 (WTG02)			
	17:34	88	16:44 (WTG16)	18:10	18:39	20:10	20:39	24	06:56 (WTG02)	20:56	3	06:51 (WTG02)				
25	07:39	08:01 (WTG03)	07:05	16:21 (WTG16)	06:21	06:34	20:11	20:40	24	06:56 (WTG02)	20:56	5	06:52 (WTG02)			
	17:35	89	16:45 (WTG16)	18:11	18:40	20:11	20:40	24	06:56 (WTG02)	20:56	5	06:52 (WTG02)				
26	07:38	08:01 (WTG03)	07:03	16:20 (WTG16)	06:20	06:33	20:12	20:41	24	06:57 (WTG02)	20:56	5	06:53 (WTG02)			
	17:36	89	16:45 (WTG16)	18:12	18:42	20:12	20:41	24	06:57 (WTG02)	20:56	5	06:53 (WTG02)				
27	07:37	08:02 (WTG03)	07:02	16:18 (WTG16)	06:18	06:31	20:13	20:42	23	06:56 (WTG02)	20:56	7	06:54 (WTG02)			
	17:37	87	16:45 (WTG16)	18:13	18:43	20:13	20:42	23	06:56 (WTG02)	20:56	7	06:54 (WTG02)				
28	07:37	08:02 (WTG03)	07:00	16:17 (WTG16)	06:17	06:30	20:14	20:42	22	06:56 (WTG02)	20:56	8	06:54 (WTG02)			
	17:38	86	16:45 (WTG16)	18:14	18:44	20:14	20:42	22	06:56 (WTG02)	20:56	8	06:54 (WTG02)				
29	07:36	08:02 (WTG03)	07:00	16:15 (WTG16)	06:15	06:29	20:15	20:43	23	06:56 (WTG02)	20:56	9	06:55 (WTG02)			
	17:40	86	16:45 (WTG16)	18:15	19:45	20:15	20:43	23	06:56 (WTG02)	20:56	9	06:55 (WTG02)				
30	07:35	08:04 (WTG03)	07:00	16:13 (WTG16)	06:13	06:28	20:16	20:44	22	06:56 (WTG02)	20:56	10	06:56 (WTG02)			
	17:41	84	16:46 (WTG16)	18:16	19:46	20:16	20:44	22	06:56 (WTG02)	20:56	10	06:56 (WTG02)				
31	07:34	08:05 (WTG03)	07:00	16:12 (WTG16)	06:12	06:27	20:17	20:45	21	06:55 (WTG02)	20:56					
	17:42	83	16:46 (WTG16)	18:17	19:47	20:17	20:45	21	06:55 (WTG02)	20:56						
Potential sun hours	301		299		370		397		445		448		286			
Total, worst case	2275		900		250		397		445		448		286			

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

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Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:13/3.4.415

## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F064 - A

### Assumptions for shadow calculations

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	06:00 20:56	06:46 (WTG02) 20:38	06:22 19:57	06:51 19:08	07:20 19:21	07:39 (WTG04) 17:24
2	06:00 20:56	06:45 (WTG02) 20:37	06:23 19:55	06:52 19:05	07:21 19:05	07:40 (WTG04) 17:22
3	06:01 20:56	06:45 (WTG02) 20:36	06:24 19:54	06:53 19:05	07:21 17:21	07:41 (WTG04) 17:21
4	06:01 20:56	06:44 (WTG02) 20:35	06:25 19:52	06:54 19:04	07:22 19:04	07:42 (WTG04) 17:20
5	06:02 20:56	06:44 (WTG02) 20:34	06:26 19:51	06:55 19:02	07:23 19:02	07:43 (WTG04) 17:19
6	06:02 20:55	06:44 (WTG02) 20:33	06:27 19:49	06:56 19:00	07:24 19:00	07:44 (WTG04) 17:18
7	06:03 20:55	06:44 (WTG02) 20:32	06:28 19:48	06:57 18:59	07:25 18:59	07:45 (WTG04) 17:17
8	06:03 20:55	06:43 (WTG02) 20:31	06:29 19:46	06:58 18:57	07:26 18:57	07:46 (WTG04) 17:16
9	06:04 20:54	06:43 (WTG02) 20:29	06:30 19:44	06:59 18:56	07:27 18:56	07:47 (WTG04) 17:15
10	06:05 20:54	06:43 (WTG02) 20:28	06:31 19:43	07:00 18:54	07:28 18:54	07:48 (WTG04) 17:14
11	06:05 20:54	06:42 (WTG02) 20:27	06:32 19:41	07:01 18:53	07:29 18:53	07:49 (WTG04) 17:13
12	06:06 20:53	06:42 (WTG02) 20:26	06:33 19:39	07:02 18:51	07:30 18:51	07:50 (WTG04) 17:12
13	06:07 20:53	06:43 (WTG02) 20:24	06:34 19:38	07:03 18:50	07:31 18:50	07:51 (WTG04) 17:11
14	06:08 20:52	06:43 (WTG02) 20:23	06:35 19:36	07:04 18:48	07:32 18:48	07:52 (WTG04) 17:10
15	06:08 20:52	06:42 (WTG02) 20:22	06:36 19:35	07:04 18:47	07:33 18:47	07:53 (WTG04) 17:09
16	06:09 20:51	06:42 (WTG02) 20:20	06:36 19:33	07:05 18:45	07:35 18:45	07:54 (WTG04) 17:08
17	06:10 20:51	06:42 (WTG02) 20:19	06:37 19:31	07:06 18:44	07:36 18:44	07:55 (WTG04) 17:07
18	06:11 20:50	06:42 (WTG02) 20:18	06:38 19:30	07:07 18:42	07:37 18:42	07:56 (WTG04) 17:06
19	06:11 20:49	06:42 (WTG02) 20:16	06:39 19:28	07:08 18:41	07:38 18:41	07:57 (WTG04) 17:05
20	06:12 20:49	06:42 (WTG02) 20:15	06:40 19:26	07:09 18:39	07:39 18:39	07:58 (WTG04) 17:04
21	06:13 20:48	06:42 (WTG02) 20:13	06:41 19:25	07:10 18:38	07:40 18:38	07:59 (WTG04) 17:03
22	06:14 20:47	06:43 (WTG02) 20:12	06:42 19:23	07:11 18:37	07:41 18:37	08:00 (WTG04) 17:02
23	06:15 20:46	06:43 (WTG02) 20:11	06:43 19:21	07:12 18:35	07:42 18:35	08:01 (WTG04) 17:01
24	06:15 20:46	06:43 (WTG02) 20:09	06:44 19:20	07:13 18:34	07:43 18:34	08:02 (WTG04) 17:00
25	06:16 20:45	06:43 (WTG02) 20:08	06:45 19:18	07:14 18:32	07:44 18:32	08:03 (WTG04) 16:59
26	06:17 20:44	06:44 (WTG02) 20:06	06:46 19:16	07:15 18:31	07:45 18:31	08:04 (WTG04) 16:58
27	06:18 20:43	06:44 (WTG02) 20:05	06:47 19:15	07:16 18:30	07:46 18:30	08:05 (WTG04) 16:57
28	06:19 20:42	06:45 (WTG02) 20:03	06:48 19:13	07:17 18:29	07:47 18:29	08:06 (WTG04) 16:56
29	06:20 20:41	06:45 (WTG02) 20:02	06:49 19:12	07:18 18:27	07:48 18:27	08:07 (WTG04) 16:55
30	06:21 20:40	06:46 (WTG02) 20:00	06:50 19:10	07:19 18:26	07:49 18:26	08:08 (WTG04) 16:54
31	06:22 20:39	06:48 (WTG02) 19:59	06:51 19:08	07:20 18:25	07:50 18:25	08:09 (WTG04) 16:53
Potential sun hours	455	425	374	347	301	292
Total, worst case	607	9	173	382	2256	1646

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F083 - A  
Assumptions for shadow calculations

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   07:45	15:24 (WTG16)	07:33	07:56 (WTG03)	06:59	07:10	06:26	05:59
17:10 65	16:29 (WTG17)	17:43	92 16:37 (WTG16)	18:15	19:48	20:17	18 06:54 (WTG02)
2   07:45	15:24 (WTG16)	07:32	07:56 (WTG03)	06:57	07:09	06:25	05:59 06:36 (WTG02)
17:11 65	16:29 (WTG17)	17:44	92 16:37 (WTG16)	18:17	19:49	20:18	20:46 17 06:53 (WTG02)
3   07:46	15:25 (WTG16)	07:31	07:57 (WTG03)	06:56	07:07	06:24	05:58 06:37 (WTG02)
17:12 64	16:29 (WTG17)	17:45	90 16:37 (WTG16)	18:18	19:50	20:19	20:47 16 06:53 (WTG02)
4   07:46	15:25 (WTG16)	07:30	07:58 (WTG03)	06:54	07:05	06:23	05:58 06:38 (WTG02)
17:13 65	16:30 (WTG17)	17:47	86 16:36 (WTG16)	18:19	19:51	20:20	20:48 15 06:53 (WTG02)
5   07:46	15:25 (WTG16)	07:29	07:59 (WTG03)	06:53	07:04	06:21	05:57 06:39 (WTG02)
17:14 65	16:30 (WTG17)	17:48	85 16:36 (WTG16)	18:20	19:52	20:21	20:48 14 06:53 (WTG02)
6   07:46	15:25 (WTG16)	07:28	08:00 (WTG03)	06:51	07:02	06:20	05:57 06:39 (WTG02)
17:14 65	16:30 (WTG17)	17:49	82 16:36 (WTG16)	18:21	19:53	20:22	20:49 12 06:51 (WTG02)
7   07:46	15:25 (WTG16)	07:27	08:02 (WTG03)	06:50	07:01	06:19	05:57 06:40 (WTG02)
17:15 65	16:30 (WTG17)	17:50	78 16:36 (WTG16)	18:22	19:54	20:23	20:49 11 06:51 (WTG02)
8   07:46	15:26 (WTG16)	07:26	08:03 (WTG03)	06:48	06:59	06:18	05:57 06:41 (WTG02)
17:16 64	16:30 (WTG17)	17:51	72 16:34 (WTG16)	18:23	19:55	20:24	20:50 10 06:51 (WTG02)
9   07:45	15:26 (WTG16)	07:25	08:06 (WTG03)	06:47	06:58	06:17	05:56 06:42 (WTG02)
17:17 64	16:30 (WTG17)	17:53	65 16:34 (WTG16)	18:24	19:56	20:25	20:51 8 06:50 (WTG02)
10   07:45	15:25 (WTG16)	07:24	15:37 (WTG16)	06:45	06:56	06:16	05:56 06:44 (WTG02)
17:18 64	16:29 (WTG17)	17:54	56 16:33 (WTG16)	18:25	19:57	20:26	20:51 5 06:49 (WTG02)
11   07:45	15:26 (WTG16)	07:23	15:38 (WTG16)	06:44	06:54	06:15	05:56 06:46 (WTG02)
17:19 63	16:29 (WTG17)	17:55	55 16:33 (WTG16)	18:26	19:58	20:27	8 06:47 (WTG02) 20:52 2 06:48 (WTG02)
12   07:45	15:26 (WTG16)	07:22	15:40 (WTG16)	06:42	07:01 (WTG04)	06:53	06:14 05:56
17:20 63	16:29 (WTG17)	17:56	52 16:32 (WTG16)	18:27	19:58	20:28	12 06:49 (WTG02) 20:52
13   07:45	15:26 (WTG16)	07:20	15:41 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13 06:36 (WTG02) 05:56
17:21 63	16:29 (WTG17)	17:57	50 16:31 (WTG16)	18:28	19:59	20:29	14 06:50 (WTG02) 20:53
14   07:44	15:26 (WTG16)	07:19	15:42 (WTG16)	06:39	06:57 (WTG04)	06:50	06:12 06:34 (WTG02) 05:56
17:22 64	16:30 (WTG16)	17:59	47 16:29 (WTG16)	18:29	19 07:16 (WTG04)	20:00	17 06:51 (WTG02) 20:53
15   07:44	15:27 (WTG16)	07:18	15:44 (WTG16)	06:37	06:56 (WTG04)	06:48	06:11 06:35 (WTG02) 05:56
17:24 64	16:31 (WTG16)	18:00	44 16:28 (WTG16)	18:30	21 07:17 (WTG04)	20:01	18 06:53 (WTG02) 20:54
16   07:44	08:04 (WTG03)	07:17	15:46 (WTG16)	06:36	06:55 (WTG04)	06:47	06:10 06:34 (WTG02) 05:56
17:25 67	16:31 (WTG16)	18:01	41 16:27 (WTG16)	18:31	21 07:16 (WTG04)	20:02	20 06:54 (WTG02) 20:54
17   07:43	08:04 (WTG03)	07:16	15:47 (WTG16)	06:34	06:55 (WTG04)	06:45	06:09 06:33 (WTG02) 05:56
17:26 71	16:32 (WTG16)	18:02	37 16:24 (WTG16)	18:32	22 07:17 (WTG04)	20:03	21 06:54 (WTG02) 20:54
18   07:43	08:03 (WTG03)	07:14	15:50 (WTG16)	06:33	06:55 (WTG04)	06:44	06:08 06:33 (WTG02) 05:56
17:27 75	16:32 (WTG16)	18:03	32 16:22 (WTG16)	18:33	21 07:16 (WTG04)	20:04	20:34 21 06:54 (WTG02) 20:55
19   07:42	08:03 (WTG03)	07:13	15:53 (WTG16)	06:31	06:54 (WTG04)	06:43	06:07 06:32 (WTG02) 05:56
17:28 77	16:33 (WTG16)	18:04	27 16:20 (WTG16)	18:34	21 07:15 (WTG04)	20:05	22 06:54 (WTG02) 20:55
20   07:42	08:02 (WTG03)	07:12	15:57 (WTG16)	06:29	06:55 (WTG04)	06:41	06:06 06:33 (WTG02) 05:56
17:29 80	16:34 (WTG16)	18:05	19 16:16 (WTG16)	18:35	20 07:15 (WTG04)	20:06	22 06:55 (WTG02) 20:55
21   07:41	08:01 (WTG03)	07:10	06:28	06:55 (WTG04)	06:40	06:06	06:32 (WTG02) 05:56
17:30 82	16:34 (WTG16)	18:07	18:36	18 07:13 (WTG04)	20:07	20:37	23 06:55 (WTG02) 20:55
22   07:41	08:01 (WTG03)	07:09	06:26	06:56 (WTG04)	06:38	06:05	06:32 (WTG02) 05:57
17:31 84	16:35 (WTG16)	18:08	18:37	15 07:11 (WTG04)	20:08	20:37	23 06:55 (WTG02) 20:56
23   07:40	08:00 (WTG03)	07:08	06:25	06:59 (WTG04)	06:37	06:04	06:32 (WTG02) 05:57
17:32 86	16:35 (WTG16)	18:09	18:38	10 07:09 (WTG04)	20:09	20:38	23 06:55 (WTG02) 20:56
24   07:39	07:59 (WTG03)	07:06	06:23	06:35	06:03	06:33 (WTG02)	05:57
17:34 88	16:35 (WTG16)	18:10	18:39	20:10	20:39	22 06:55 (WTG02)	20:56
25   07:39	07:59 (WTG03)	07:05	06:21	06:34	06:03	06:32 (WTG02)	05:57
17:35 89	16:36 (WTG16)	18:11	18:41	20:11	20:40	23 06:55 (WTG02)	20:56
26   07:38	07:58 (WTG03)	07:03	06:20	06:33	06:02	06:33 (WTG02)	05:58
17:36 91	16:36 (WTG16)	18:12	18:42	20:12	20:41	22 06:55 (WTG02)	20:56
27   07:37	07:57 (WTG03)	07:02	06:18	06:31	06:02	06:33 (WTG02)	05:58
17:37 92	16:36 (WTG16)	18:13	18:43	20:13	20:42	22 06:55 (WTG02)	20:56
28   07:37	07:56 (WTG03)	07:00	06:17	06:30	06:01	06:34 (WTG02)	05:58
17:38 92	16:36 (WTG16)	18:14	18:44	20:14	20:42	21 06:55 (WTG02)	20:56
29   07:36	07:55 (WTG03)		07:15	06:29	06:00	06:34 (WTG02)	05:59
17:40 93	16:36 (WTG16)		19:45	20:15	20:43	20 06:54 (WTG02)	20:56
30   07:35	07:55 (WTG03)		07:13	06:28	06:00	06:35 (WTG02)	05:59
17:41 94	16:37 (WTG16)		19:46	20:16	20:44	20 06:55 (WTG02)	20:56
31   07:34	07:56 (WTG03)		07:12		05:59		
17:42 93	16:37 (WTG16)		19:47		20:45	19 06:54 (WTG02)	
Potential sun hours	301	299	370	397	445	448	128
Total, worst case	2317	1202	229	397	445	413	

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F083 - A  
 Assumptions for shadow calculations

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	06:00		06:23		06:51		07:20		06:52		07:25
	20:56		20:38	10	06:59 (WTG02)		19:57		19:08	15	07:39 (WTG04)
2	06:00	06:48 (WTG02)	06:23		06:52 (WTG02)		19:57		17:24	56	16:03 (WTG16)
	20:56	5	20:37	4	06:56 (WTG02)		19:55		17:22	66	16:04 (WTG16)
3	06:01	06:48 (WTG02)	06:24		06:53		19:55		17:22	66	16:04 (WTG16)
	20:56	7	20:36		19:54		19:05	7	17:21	73	16:04 (WTG16)
4	06:01	06:47 (WTG02)	06:25		06:54		19:05		17:21	73	16:04 (WTG16)
	20:56	8	20:35		19:52		19:04		17:20	78	16:04 (WTG16)
5	06:02	06:46 (WTG02)	06:26		06:55		19:04		17:19	82	16:06 (WTG16)
	20:56	11	20:34		19:51		19:02		17:19	82	16:06 (WTG16)
6	06:02	06:45 (WTG02)	06:27		06:56		19:02		17:19	82	16:06 (WTG16)
	20:55	12	20:33		19:49		19:00		17:18	85	16:06 (WTG16)
7	06:03	06:45 (WTG02)	06:28		06:57		19:00		17:18	85	16:06 (WTG16)
	20:55	14	20:32		19:48		18:59		17:17	87	16:06 (WTG16)
8	06:03	06:44 (WTG02)	06:29		06:58		18:59		17:17	87	16:06 (WTG16)
	20:55	15	20:31		19:46		18:57		17:16	90	16:07 (WTG16)
9	06:04	06:44 (WTG02)	06:30		06:59		18:57		17:16	90	16:07 (WTG16)
	20:54	16	20:29		19:44		18:56		17:15	92	16:08 (WTG16)
10	06:05	06:44 (WTG02)	06:31		07:00		18:56		17:15	92	16:08 (WTG16)
	20:54	17	20:28		19:43		18:54		17:14	92	16:08 (WTG16)
11	06:05	06:43 (WTG02)	06:32		07:01		18:54		17:14	92	16:08 (WTG16)
	20:54	18	20:27		19:41		18:53		17:13	93	16:08 (WTG16)
12	06:06	06:43 (WTG02)	06:33		07:02		18:53		17:13	93	16:08 (WTG16)
	20:53	19	20:26		19:39		18:51		17:12	94	16:08 (WTG16)
13	06:07	06:43 (WTG02)	06:34		07:03		18:51		17:12	94	16:08 (WTG16)
	20:53	20	20:24		19:38		18:50		17:11	93	16:08 (WTG16)
14	06:08	06:42 (WTG02)	06:35		07:04		18:50		17:11	93	16:08 (WTG16)
	20:52	20	20:23		19:36		18:48		17:10	92	16:09 (WTG16)
15	06:08	06:42 (WTG02)	06:36		07:04		18:48		17:10	92	16:09 (WTG16)
	20:52	21	20:22		19:35		18:47		17:10	92	16:09 (WTG16)
16	06:09	06:42 (WTG02)	06:36		07:05		18:47		17:10	92	16:09 (WTG16)
	20:51	22	20:20		19:33		18:45		17:09	91	16:09 (WTG16)
17	06:10	06:43 (WTG02)	06:37		07:06		18:45		17:09	91	16:09 (WTG16)
	20:51	21	20:19		19:31		18:44		17:08	89	16:09 (WTG16)
18	06:11	06:42 (WTG02)	06:38		07:07		18:44		17:08	89	16:09 (WTG16)
	20:50	22	20:18		19:30		18:42		17:07	88	16:09 (WTG16)
19	06:11	06:42 (WTG02)	06:39		07:08		18:42		17:07	88	16:09 (WTG16)
	20:49	22	20:16		19:28		18:41		17:07	86	16:10 (WTG16)
20	06:12	06:42 (WTG02)	06:40		07:09		18:41		17:07	86	16:10 (WTG16)
	20:49	23	20:15		19:26	8	18:39		17:06	84	16:10 (WTG16)
21	06:13	06:42 (WTG02)	06:41		07:10		18:39		17:06	84	16:10 (WTG16)
	20:48	23	20:13		19:25	14	18:38		17:05	82	16:10 (WTG16)
22	06:14	06:43 (WTG02)	06:42		07:11		18:38		17:05	82	16:10 (WTG16)
	20:47	22	20:12		19:23	17	18:37		17:05	80	16:10 (WTG16)
23	06:15	06:42 (WTG02)	06:43		07:12		18:37		17:05	80	16:10 (WTG16)
	20:46	23	20:11		19:21	19	18:35		17:04	77	16:09 (WTG16)
24	06:15	06:42 (WTG02)	06:44		07:13		18:35		17:04	77	16:09 (WTG16)
	20:46	23	20:09		19:20	20	18:34		17:04	75	16:09 (WTG16)
25	06:16	06:43 (WTG02)	06:45		07:14		18:34		17:04	75	16:09 (WTG16)
	20:45	22	20:08		19:18	21	18:32		17:03	71	16:10 (WTG16)
26	06:17	06:43 (WTG02)	06:46		07:15		18:32		17:03	71	16:10 (WTG16)
	20:44	22	20:06		19:16	21	18:31		17:03	68	16:10 (WTG16)
27	06:18	06:44 (WTG02)	06:47		07:16		18:31		17:03	68	16:10 (WTG16)
	20:43	20	20:05		19:15	22	18:30		17:02	64	16:10 (WTG16)
28	06:19	06:45 (WTG02)	06:48		07:17		18:30		17:02	64	16:10 (WTG16)
	20:42	19	20:03		19:13	21	18:29		17:02	64	16:10 (WTG16)
29	06:20	06:44 (WTG02)	06:49		07:18		18:29		17:02	64	16:10 (WTG16)
	20:41	18	20:02		19:12	20	18:27		17:01	63	16:10 (WTG16)
30	06:21	06:45 (WTG02)	06:50		07:19		18:27		17:01	63	16:10 (WTG16)
	20:40	17	20:00		19:10	17	18:26		17:01	63	16:10 (WTG16)
31	06:22	06:47 (WTG02)	06:51		07:20		18:26		17:01	63	16:10 (WTG16)
	20:39	13	19:59		19:59		17:25		16:02 (WTG16)		
Potential sun hours	455		425		374		347		301		292
Total, worst case	535		425	14	200		347	456	2410		1991

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F086 - A  
 Assumptions for shadow calculations

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	07:45	15:37 (WTG16)	07:33	07:54 (WTG03)	06:59	07:10	06:26	05:59	06:32 (WTG02)		
	17:10	56 16:33 (WTG17)	17:43	95 16:45 (WTG16)	18:15	19:48	20:17	20:45	21 06:53 (WTG02)		
2	07:45	15:37 (WTG16)	07:32	07:54 (WTG03)	06:57	07:09	06:25	05:59	06:32 (WTG02)		
	17:11	56 16:33 (WTG17)	17:44	95 16:45 (WTG16)	18:17	19:49	20:18	20:46	20 06:52 (WTG02)		
3	07:46	15:37 (WTG16)	07:31	07:54 (WTG03)	06:56	07:07	06:24	05:58	06:32 (WTG02)		
	17:12	57 16:34 (WTG17)	17:45	95 16:45 (WTG16)	18:18	19:50	20:19	20:47	21 06:53 (WTG02)		
4	07:46	15:37 (WTG16)	07:30	07:55 (WTG03)	06:54	07:05	06:23	05:58	06:33 (WTG02)		
	17:13	57 16:34 (WTG17)	17:47	93 16:45 (WTG16)	18:19	19:51	20:20	20:48	20 06:53 (WTG02)		
5	07:46	15:37 (WTG16)	07:29	07:55 (WTG03)	06:53	07:04	06:21	05:57	06:34 (WTG02)		
	17:14	57 16:34 (WTG17)	17:48	92 16:45 (WTG16)	18:20	19:52	20:21	20:48	19 06:53 (WTG02)		
6	07:46	15:37 (WTG16)	07:28	07:56 (WTG03)	06:51	07:02	06:20	05:57	06:34 (WTG02)		
	17:14	58 16:35 (WTG17)	17:49	91 16:45 (WTG16)	18:21	19:53	20:22	20:49	18 06:52 (WTG02)		
7	07:46	15:37 (WTG16)	07:27	07:57 (WTG03)	06:50	07:01	06:19	05:57	06:34 (WTG02)		
	17:15	58 16:35 (WTG17)	17:50	88 16:45 (WTG16)	18:22	19:54	20:23	20:49	18 06:52 (WTG02)		
8	07:46	15:37 (WTG16)	07:26	07:57 (WTG03)	06:48	06:59	06:18	05:57	06:35 (WTG02)		
	17:16	58 16:35 (WTG17)	17:51	86 16:44 (WTG16)	18:23	19:55	20:24	20:50	17 06:52 (WTG02)		
9	07:45	15:37 (WTG16)	07:25	07:59 (WTG03)	06:47	06:58	06:17	05:56	06:36 (WTG02)		
	17:17	59 16:36 (WTG17)	17:53	82 16:44 (WTG16)	18:24	19:56	20:25	20:51	16 06:52 (WTG02)		
10	07:45	15:36 (WTG16)	07:24	08:01 (WTG03)	06:45	06:56	06:16	05:56	06:36 (WTG02)		
	17:18	59 16:35 (WTG17)	17:54	77 16:44 (WTG16)	18:25	19:57	20:26	20:51	16 06:52 (WTG02)		
11	07:45	15:37 (WTG16)	07:23	08:05 (WTG03)	06:44	06:54	06:15	05:56	06:37 (WTG02)		
	17:19	58 16:35 (WTG17)	17:55	68 16:43 (WTG16)	18:26	19:57	20:27	20:52	15 06:52 (WTG02)		
12	07:45	15:37 (WTG16)	07:22	15:42 (WTG16)	06:42	07:02 (WTG04)	06:53	06:14	05:56	06:37 (WTG02)	
	17:20	58 16:35 (WTG17)	17:56	61 16:43 (WTG16)	18:27	7 07:09 (WTG04)	19:58	20:28	20:52	14 06:51 (WTG02)	
13	07:45	15:36 (WTG16)	07:20	15:43 (WTG16)	06:41	06:59 (WTG04)	06:51	06:13	06:40 (WTG02)	05:56	06:37 (WTG02)
	17:21	59 16:35 (WTG17)	17:57	60 16:43 (WTG16)	18:28	12 07:11 (WTG04)	19:59	20:29	2 06:42 (WTG02)	20:53	14 06:51 (WTG02)
14	07:44	15:36 (WTG16)	07:19	15:43 (WTG16)	06:39	06:57 (WTG04)	06:50	06:12	06:36 (WTG02)	05:56	06:38 (WTG02)
	17:22	59 16:35 (WTG17)	17:59	58 16:41 (WTG16)	18:29	15 07:12 (WTG04)	20:00	20:30	9 06:45 (WTG02)	20:53	13 06:51 (WTG02)
15	07:44	15:37 (WTG16)	07:18	15:44 (WTG16)	06:37	06:56 (WTG04)	06:48	06:11	06:35 (WTG02)	05:56	06:38 (WTG02)
	17:24	58 16:35 (WTG17)	18:00	57 16:41 (WTG16)	18:30	18 07:14 (WTG04)	20:01	20:31	13 06:48 (WTG02)	20:54	12 06:50 (WTG02)
16	07:44	15:36 (WTG16)	07:17	15:45 (WTG16)	06:36	06:54 (WTG04)	06:47	06:10	06:34 (WTG02)	05:56	06:40 (WTG02)
	17:25	59 16:35 (WTG17)	18:01	55 16:40 (WTG16)	18:31	20 07:14 (WTG04)	20:02	20:32	15 06:49 (WTG02)	20:54	11 06:51 (WTG02)
17	07:43	15:36 (WTG16)	07:16	15:46 (WTG16)	06:34	06:53 (WTG04)	06:45	06:09	06:32 (WTG02)	05:56	06:40 (WTG02)
	17:26	61 16:37 (WTG16)	18:02	52 16:38 (WTG16)	18:32	22 07:15 (WTG04)	20:03	20:33	18 06:50 (WTG02)	20:54	11 06:51 (WTG02)
18	07:43	15:36 (WTG16)	07:14	15:47 (WTG16)	06:33	06:52 (WTG04)	06:44	06:08	06:32 (WTG02)	05:56	06:40 (WTG02)
	17:27	61 16:37 (WTG16)	18:03	51 16:38 (WTG16)	18:33	22 07:14 (WTG04)	20:04	20:34	18 06:50 (WTG02)	20:55	11 06:51 (WTG02)
19	07:42	08:03 (WTG03)	07:13	15:49 (WTG16)	06:31	06:52 (WTG04)	06:43	06:07	06:31 (WTG02)	05:56	06:41 (WTG02)
	17:28	66 16:38 (WTG16)	18:04	48 16:37 (WTG16)	18:34	21 07:13 (WTG04)	20:05	20:35	20 06:51 (WTG02)	20:55	10 06:51 (WTG02)
20	07:42	08:02 (WTG03)	07:12	15:50 (WTG16)	06:29	06:52 (WTG04)	06:41	06:06	06:31 (WTG02)	05:56	06:41 (WTG02)
	17:29	71 16:39 (WTG16)	18:05	45 16:35 (WTG16)	18:35	22 07:14 (WTG04)	20:06	20:36	21 06:52 (WTG02)	20:55	10 06:51 (WTG02)
21	07:41	08:01 (WTG03)	07:10	15:52 (WTG16)	06:28	06:52 (WTG04)	06:40	06:06	06:31 (WTG02)	05:56	06:41 (WTG02)
	17:30	74 16:39 (WTG16)	18:07	41 16:33 (WTG16)	18:36	20 07:12 (WTG04)	20:07	20:37	21 06:52 (WTG02)	20:55	10 06:51 (WTG02)
22	07:41	08:01 (WTG03)	07:09	15:55 (WTG16)	06:26	06:52 (WTG04)	06:38	06:05	06:30 (WTG02)	05:57	06:41 (WTG02)
	17:31	77 16:40 (WTG16)	18:08	37 16:32 (WTG16)	18:37	19 07:11 (WTG04)	20:08	20:37	22 06:52 (WTG02)	20:56	10 06:51 (WTG02)
23	07:40	08:00 (WTG03)	07:08	15:57 (WTG16)	06:25	06:54 (WTG04)	06:37	06:04	06:30 (WTG02)	05:57	06:42 (WTG02)
	17:32	80 16:40 (WTG16)	18:09	32 16:29 (WTG16)	18:38	16 07:10 (WTG04)	20:09	20:38	22 06:52 (WTG02)	20:56	10 06:52 (WTG02)
24	07:39	07:59 (WTG03)	07:06	16:00 (WTG16)	06:23	06:55 (WTG04)	06:35	06:03	06:30 (WTG02)	05:57	06:41 (WTG02)
	17:34	82 16:41 (WTG16)	18:10	26 16:26 (WTG16)	18:39	13 07:08 (WTG04)	20:10	20:39	23 06:53 (WTG02)	20:56	11 06:52 (WTG02)
25	07:39	07:59 (WTG03)	07:05	16:03 (WTG16)	06:21	06:58 (WTG04)	06:34	06:03	06:30 (WTG02)	05:57	06:41 (WTG02)
	17:35	84 16:42 (WTG16)	18:11	19 16:22 (WTG16)	18:41	7 07:05 (WTG04)	20:11	20:40	23 06:53 (WTG02)	20:56	11 06:52 (WTG02)
26	07:38	07:58 (WTG03)	07:03		06:20		06:33	06:02	06:30 (WTG02)	05:58	06:42 (WTG02)
	17:36	86 16:42 (WTG16)	18:12		18:42		20:12	20:41	23 06:53 (WTG02)	20:56	11 06:53 (WTG02)
27	07:37	07:57 (WTG03)	07:02		06:18		06:31	06:02	06:30 (WTG02)	05:58	06:41 (WTG02)
	17:37	89 16:43 (WTG16)	18:13		18:43		20:13	20:42	23 06:53 (WTG02)	20:56	12 06:53 (WTG02)
28	07:37	07:56 (WTG03)	07:00		06:17		06:30	06:01	06:31 (WTG02)	05:58	06:41 (WTG02)
	17:38	91 16:43 (WTG16)	18:14		18:44		20:14	20:42	22 06:53 (WTG02)	20:56	13 06:54 (WTG02)
29	07:36	07:55 (WTG03)			07:15		06:29	06:00	06:31 (WTG02)	05:59	06:41 (WTG02)
	17:40	92 16:43 (WTG16)			19:45		20:15	20:43	22 06:53 (WTG02)	20:56	14 06:55 (WTG02)
30	07:35	07:55 (WTG03)			07:13		06:28	06:00	06:31 (WTG02)	05:59	06:41 (WTG02)
	17:41	93 16:44 (WTG16)			19:46		20:16	20:44	22 06:53 (WTG02)	20:56	14 06:55 (WTG02)
31	07:34	07:54 (WTG03)			07:12			05:59	06:31 (WTG02)		
	17:42	95 16:44 (WTG16)			19:47			20:45	22 06:53 (WTG02)		
Potential sun hours	301		299		370		397	445		448	423
Total, worst case	2128		1604		234		397	445		361	423

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F086 - A

### Assumptions for shadow calculations

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	06:00	06:41 (WTG02)	06:23	06:51	07:20	07:39 (WTG04)	06:52	07:31 (WTG03)	07:25	15:19 (WTG16)	
	20:56	15 06:56 (WTG02)	20:38	19:57	19:08	10 07:49 (WTG04)	17:24	77 16:13 (WTG16)	17:01	58 16:17 (WTG17)	
2	06:00	06:41 (WTG02)	06:23	06:52	07:21		06:53	07:29 (WTG03)	07:26	15:19 (WTG16)	
	20:56	15 06:56 (WTG02)	20:37	19:55	19:07		17:22	82 16:14 (WTG16)	17:01	59 16:18 (WTG17)	
3	06:01	06:41 (WTG02)	06:24	06:53	07:21		06:54	07:27 (WTG03)	07:27	15:20 (WTG16)	
	20:56	16 06:57 (WTG02)	20:36	19:54	19:05		17:21	86 16:14 (WTG16)	17:00	59 16:19 (WTG17)	
4	06:01	06:40 (WTG02)	06:25	06:54	07:22		06:55	07:26 (WTG03)	07:28	15:21 (WTG16)	
	20:56	17 06:57 (WTG02)	20:35	19:52	19:04		17:20	89 16:14 (WTG16)	17:00	58 16:19 (WTG17)	
5	06:02	06:41 (WTG02)	06:26	06:55	07:23		06:56	07:26 (WTG03)	07:29	15:22 (WTG16)	
	20:56	17 06:58 (WTG02)	20:34	19:51	19:02		17:19	91 16:15 (WTG16)	17:00	58 16:20 (WTG17)	
6	06:02	06:40 (WTG02)	06:27	06:56	07:24		06:57	07:25 (WTG03)	07:30	15:23 (WTG16)	
	20:55	18 06:58 (WTG02)	20:33	19:49	19:00		17:18	92 16:15 (WTG16)	17:00	58 16:21 (WTG17)	
7	06:03	06:40 (WTG02)	06:28	06:57	07:25		06:59	07:24 (WTG03)	07:31	15:24 (WTG16)	
	20:55	19 06:59 (WTG02)	20:32	19:48	18:59		17:17	94 16:15 (WTG16)	17:00	57 16:21 (WTG17)	
8	06:03	06:39 (WTG02)	06:29	06:58	07:26		07:00	07:24 (WTG03)	07:32	15:25 (WTG16)	
	20:55	20 06:59 (WTG02)	20:31	19:46	18:57		17:16	95 16:15 (WTG16)	17:00	57 16:22 (WTG17)	
9	06:04	06:40 (WTG02)	06:30	06:59	07:27		07:01	07:25 (WTG03)	07:33	15:26 (WTG16)	
	20:54	20 07:00 (WTG02)	20:29	19:44	18:56		17:15	95 16:16 (WTG16)	17:00	57 16:23 (WTG17)	
10	06:05	06:40 (WTG02)	06:31	07:00	07:28		07:02	07:24 (WTG03)	07:34	15:27 (WTG16)	
	20:54	20 07:00 (WTG02)	20:28	19:43	18:54		17:14	97 16:16 (WTG16)	17:00	56 16:23 (WTG17)	
11	06:05	06:39 (WTG02)	06:32	07:01	07:29		07:03	07:25 (WTG03)	07:34	15:27 (WTG16)	
	20:54	21 07:00 (WTG02)	20:27	19:41	18:53		17:13	95 16:15 (WTG16)	17:00	56 16:23 (WTG17)	
12	06:06	06:39 (WTG02)	06:33	07:02	07:30		07:04	07:26 (WTG03)	07:35	15:28 (WTG16)	
	20:53	22 07:01 (WTG02)	20:26	19:39	18:51		17:12	93 16:15 (WTG16)	17:00	56 16:24 (WTG17)	
13	06:07	06:40 (WTG02)	06:34	07:03	07:31		07:05	07:27 (WTG03)	07:36	15:29 (WTG16)	
	20:53	22 07:02 (WTG02)	20:24	19:38	18:50		17:11	92 16:15 (WTG16)	17:00	56 16:25 (WTG17)	
14	06:08	06:39 (WTG02)	06:35	07:04	07:32		07:07	07:29 (WTG03)	07:37	15:30 (WTG16)	
	20:52	22 07:01 (WTG02)	20:23	19:36	18:48		17:10	91 16:16 (WTG16)	17:00	55 16:25 (WTG17)	
15	06:08	06:39 (WTG02)	06:36	07:04	07:33		07:08	07:30 (WTG03)	07:37	15:30 (WTG16)	
	20:52	23 07:02 (WTG02)	20:22	19:35	18:47		17:10	89 16:16 (WTG16)	17:01	55 16:25 (WTG17)	
16	06:09	06:39 (WTG02)	06:36	07:05	07:35	16:39 (WTG16)	07:09	07:31 (WTG03)	07:38	15:31 (WTG16)	
	20:51	23 07:02 (WTG02)	20:20	19:33	18:45	11 16:50 (WTG16)	17:09	86 16:15 (WTG16)	17:01	55 16:26 (WTG17)	
17	06:10	06:40 (WTG02)	06:37	07:06	07:36	16:34 (WTG16)	07:10	07:32 (WTG03)	07:39	15:32 (WTG16)	
	20:51	23 07:03 (WTG02)	20:19	19:31	18:44	22 16:56 (WTG16)	17:08	84 16:15 (WTG16)	17:01	55 16:27 (WTG17)	
18	06:11	06:39 (WTG02)	06:38	07:07	07:37	16:30 (WTG16)	07:11	07:33 (WTG03)	07:39	15:32 (WTG16)	
	20:50	23 07:02 (WTG02)	20:18	19:30	18:42	29 16:59 (WTG16)	17:07	82 16:15 (WTG16)	17:02	55 16:27 (WTG17)	
19	06:11	06:39 (WTG02)	06:39	07:08	07:38	16:27 (WTG16)	07:12	07:35 (WTG03)	07:40	15:34 (WTG16)	
	20:49	23 07:02 (WTG02)	20:16	19:28	18:41	34 17:01 (WTG16)	17:07	80 16:15 (WTG16)	17:02	54 16:28 (WTG17)	
20	06:12	06:40 (WTG02)	06:40	07:09	07:39	16:25 (WTG16)	07:13	07:36 (WTG03)	07:41	15:34 (WTG16)	
	20:49	23 07:03 (WTG02)	20:15	19:26	18:39	38 17:03 (WTG16)	17:06	77 16:15 (WTG16)	17:02	54 16:28 (WTG17)	
21	06:13	06:40 (WTG02)	06:41	07:10	07:40	16:22 (WTG16)	07:14	07:37 (WTG03)	07:41	15:35 (WTG16)	
	20:48	23 07:03 (WTG02)	20:13	19:25	18:38	42 17:04 (WTG16)	17:05	74 16:15 (WTG16)	17:03	53 16:28 (WTG17)	
22	06:14	06:41 (WTG02)	06:42	07:11	07:41	16:20 (WTG16)	07:16	07:38 (WTG03)	07:42	15:35 (WTG16)	
	20:47	22 07:03 (WTG02)	20:12	19:23	18:37	46 17:06 (WTG16)	17:05	71 16:15 (WTG16)	17:03	53 16:28 (WTG17)	
23	06:15	06:40 (WTG02)	06:43	07:12	07:42	16:18 (WTG16)	07:17	07:39 (WTG03)	07:42	15:36 (WTG16)	
	20:46	22 07:02 (WTG02)	20:11	19:21	18:35	49 17:07 (WTG16)	17:04	67 16:14 (WTG16)	17:04	53 16:29 (WTG17)	
24	06:15	06:41 (WTG02)	06:44	07:13	07:43	16:17 (WTG16)	07:18	15:13 (WTG16)	07:43	15:36 (WTG16)	
	20:46	21 07:02 (WTG02)	20:09	19:20	18:34	51 17:08 (WTG16)	17:04	61 16:14 (WTG16)	17:04	54 16:30 (WTG17)	
25	06:16	06:42 (WTG02)	06:45	07:14	07:44	15:16 (WTG16)	07:19	15:14 (WTG16)	07:43	15:36 (WTG16)	
	20:45	19 07:01 (WTG02)	20:08	19:18	17:32	53 16:09 (WTG16)	17:03	61 16:15 (WTG16)	17:05	55 16:31 (WTG17)	
26	06:17	06:42 (WTG02)	06:46	07:15	07:45	15:15 (WTG16)	07:20	15:15 (WTG16)	07:44	15:36 (WTG16)	
	20:44	19 07:01 (WTG02)	20:06	19:16	17:31	55 16:10 (WTG16)	17:03	59 16:14 (WTG16)	17:06	55 16:31 (WTG17)	
27	06:18	06:43 (WTG02)	06:47	07:16	07:46	15:13 (WTG16)	07:21	15:16 (WTG16)	07:44	15:36 (WTG16)	
	20:43	17 07:00 (WTG02)	20:05	19:15	17:30	58 16:11 (WTG16)	17:02	58 16:14 (WTG17)	17:06	55 16:31 (WTG17)	
28	06:19	06:45 (WTG02)	06:48	07:17	07:47	15:12 (WTG16)	07:22	15:16 (WTG16)	07:44	15:36 (WTG16)	
	20:42	14 06:59 (WTG02)	20:03	19:13	17:29	59 16:11 (WTG16)	17:02	59 16:15 (WTG17)	17:07	55 16:31 (WTG17)	
29	06:20	06:45 (WTG02)	06:49	07:18	07:48	15:11 (WTG16)	07:23	15:17 (WTG16)	07:45	15:37 (WTG16)	
	20:41	12 06:57 (WTG02)	20:02	19:12	17:27	61 16:12 (WTG16)	17:01	59 16:16 (WTG17)	17:08	55 16:32 (WTG17)	
30	06:21	06:47 (WTG02)	06:50	07:19	07:50	15:10 (WTG16)	07:24	15:18 (WTG16)	07:45	15:37 (WTG16)	
	20:40	8 06:55 (WTG02)	20:00	19:10	17:26	62 16:12 (WTG16)	17:01	58 16:16 (WTG17)	17:08	56 16:33 (WTG17)	
31	06:22		06:51		06:51						
	20:39		19:59		17:25	70 16:13 (WTG16)			17:09	56 16:33 (WTG17)	
Potential sun hours	455		425	374	227	347	301	2394	292	1728	
Total, worst case	579					750					

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F088 - A  
Assumptions for shadow calculations

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	07:45 17:10	15:50 (WTG16)	07:33 17:43	07:58 (WTG03) 18:15	06:59 19:48	05:59 20:45
2	07:45 17:11	15:50 (WTG16)	07:32 17:44	07:58 (WTG03) 18:17	06:57 19:49	05:58 20:46
3	07:46 17:12	15:49 (WTG16)	07:31 17:45	07:59 (WTG03) 18:18	06:56 19:50	05:58 20:47
4	07:46 17:13	15:49 (WTG16)	07:30 17:47	08:00 (WTG03) 18:19	06:54 19:51	05:58 20:48
5	07:46 17:14	15:49 (WTG16)	07:29 17:48	08:01 (WTG03) 18:20	06:53 19:52	05:57 20:48
6	07:46 17:14	15:49 (WTG16)	07:28 17:49	08:02 (WTG03) 18:21	06:51 19:53	05:57 20:49
7	07:46 17:15	15:49 (WTG16)	07:27 17:50	08:04 (WTG03) 18:22	06:50 19:54	05:57 20:49
8	07:46 17:16	15:49 (WTG16)	07:26 17:51	08:05 (WTG03) 18:23	06:48 19:55	05:57 20:50
9	07:45 17:17	15:49 (WTG16)	07:25 17:53	15:48 (WTG16) 18:24	06:47 19:56	05:56 20:51
10	07:45 17:18	15:48 (WTG16)	07:24 17:54	15:49 (WTG16) 18:25	06:45 19:56	05:56 20:51
11	07:45 17:19	15:48 (WTG16)	07:23 17:55	15:50 (WTG16) 18:26	06:44 19:57	05:56 20:52
12	07:45 17:20	15:48 (WTG16)	07:22 17:56	15:51 (WTG16) 18:27	06:42 19:58	05:56 20:52
13	07:45 17:21	15:47 (WTG16)	07:20 17:57	15:52 (WTG16) 18:28	06:41 19:59	05:56 20:53
14	07:44 17:22	08:05 (WTG03)	07:19 17:59	15:52 (WTG16) 18:29	06:57 (WTG04) 20:00	06:12 20:30
15	07:44 17:24	08:05 (WTG03)	07:18 18:00	15:53 (WTG16) 18:30	06:56 (WTG04) 20:01	06:11 20:31
16	07:44 17:25	08:04 (WTG03)	07:17 18:01	15:55 (WTG16) 18:31	06:55 (WTG04) 20:02	06:10 20:32
17	07:43 17:26	08:04 (WTG03)	07:16 18:02	15:55 (WTG16) 18:32	06:55 (WTG04) 20:03	06:09 20:33
18	07:43 17:27	08:03 (WTG03)	07:14 18:03	15:57 (WTG16) 18:33	06:54 (WTG04) 20:04	06:08 20:34
19	07:42 17:28	08:03 (WTG03)	07:13 18:04	15:58 (WTG16) 18:34	06:54 (WTG04) 20:05	06:07 20:35
20	07:42 17:29	08:02 (WTG03)	07:12 18:05	15:59 (WTG16) 18:35	06:54 (WTG04) 20:06	06:06 20:36
21	07:41 17:30	08:01 (WTG03)	07:10 18:07	16:02 (WTG16) 18:36	06:54 (WTG04) 20:07	06:06 20:37
22	07:41 17:31	08:01 (WTG03)	07:09 18:08	16:04 (WTG16) 18:37	06:55 (WTG04) 20:08	06:05 20:37
23	07:40 17:32	08:00 (WTG03)	07:07 18:09	16:06 (WTG16) 18:38	06:56 (WTG04) 20:09	06:04 20:38
24	07:39 17:34	07:59 (WTG03)	07:06 18:10	16:10 (WTG16) 18:39	06:58 (WTG04) 20:10	06:03 20:39
25	07:39 17:35	07:59 (WTG03)	07:05 18:11	16:16 (WTG16) 18:40	07:08 (WTG04) 20:11	06:30 (WTG02) 20:40
26	07:38 17:36	07:58 (WTG03)	07:03 18:12	16:24 (WTG16) 18:42	06:34 20:12	06:03 (WTG02) 20:41
27	07:37 17:37	07:57 (WTG03)	07:02 18:13	16:18 18:43	06:33 20:13	06:02 (WTG02) 20:42
28	07:37 17:38	07:56 (WTG03)	07:00 18:14	16:18 18:44	06:31 20:14	06:02 (WTG02) 20:42
29	07:36 17:40	07:56 (WTG03)	06:59 19:45	16:18 19:45	06:29 20:15	06:00 (WTG02) 20:43
30	07:35 17:41	07:57 (WTG03)	06:58 19:46	16:18 19:46	06:28 20:16	06:00 (WTG02) 20:44
31	07:34 17:42	07:57 (WTG03)	06:57 19:47	16:18 19:47	06:28 20:16	06:00 (WTG02) 20:44
Potential sun hours	301	299	370	397	445	448
Total, worst case	2028	1428	245	397	445	508

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F088 - A

### Assumptions for shadow calculations

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	06:00 20:56	06:40 (WTG02) 06:57 (WTG02)	06:23 20:38	06:51 19:57	07:20 19:08	07:39 (WTG04) 17:24
2	06:00 20:56	06:39 (WTG02) 06:57 (WTG02)	06:23 20:37	06:52 19:55	07:21 19:07	07:40 (WTG04) 17:22
3	06:01 20:56	06:40 (WTG02) 06:58 (WTG02)	06:24 20:36	06:53 19:54	07:21 19:05	07:51 (WTG04) 17:22
4	06:01 20:56	06:39 (WTG02) 06:58 (WTG02)	06:25 20:35	06:54 19:52	07:22 19:04	06:52 17:21
5	06:02 20:56	06:40 (WTG02) 06:59 (WTG02)	06:26 20:34	06:55 19:51	07:23 19:02	06:54 17:21
6	06:02 20:55	06:39 (WTG02) 06:59 (WTG02)	06:27 20:33	06:56 19:49	07:24 19:00	06:53 17:19
7	06:03 20:55	06:39 (WTG02) 07:00 (WTG02)	06:28 20:32	06:57 19:48	07:25 18:59	06:59 17:17
8	06:03 20:55	06:39 (WTG02) 07:00 (WTG02)	06:29 20:31	06:58 19:46	07:26 18:57	07:00 17:16
9	06:04 20:54	06:39 (WTG02) 07:01 (WTG02)	06:30 20:29	06:59 19:44	07:27 18:56	07:01 17:15
10	06:05 20:54	06:39 (WTG02) 07:01 (WTG02)	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14
11	06:05 20:54	06:39 (WTG02) 07:01 (WTG02)	06:32 20:27	07:01 19:41	07:29 18:53	07:03 17:13
12	06:06 20:53	06:39 (WTG02) 07:02 (WTG02)	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12
13	06:07 20:53	06:39 (WTG02) 07:02 (WTG02)	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11
14	06:08 20:52	06:38 (WTG02) 07:02 (WTG02)	06:35 20:23	07:04 19:36	07:32 18:48	07:07 17:10
15	06:08 20:52	06:39 (WTG02) 07:02 (WTG02)	06:36 20:22	07:04 19:35	07:33 18:47	07:08 17:09
16	06:09 20:51	06:39 (WTG02) 07:03 (WTG02)	06:36 20:20	07:05 19:33	07:35 18:45	07:09 17:09
17	06:10 20:51	06:40 (WTG02) 07:03 (WTG02)	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08
18	06:11 20:50	06:39 (WTG02) 07:02 (WTG02)	06:38 20:18	07:07 19:30	07:37 18:42	16:45 (WTG16) 17:08
19	06:11 20:49	06:39 (WTG02) 07:03 (WTG02)	06:39 20:16	07:08 19:28	07:38 18:41	16:59 (WTG16) 17:07
20	06:12 20:49	06:40 (WTG02) 07:03 (WTG02)	06:40 20:15	07:09 19:26	07:39 18:39	16:03 (WTG16) 17:07
21	06:13 20:48	06:40 (WTG02) 07:03 (WTG02)	06:41 20:13	07:10 19:25	07:40 18:38	16:37 (WTG16) 17:07
22	06:14 20:47	06:41 (WTG02) 07:03 (WTG02)	06:42 20:12	07:11 19:23	07:41 18:37	16:08 (WTG16) 17:05
23	06:15 20:46	06:40 (WTG02) 07:02 (WTG02)	06:43 20:11	07:12 19:21	07:42 18:35	16:32 (WTG16) 17:04
24	06:15 20:46	06:41 (WTG02) 07:01 (WTG02)	06:44 20:09	07:13 19:20	07:43 18:34	16:26 (WTG16) 17:04
25	06:16 20:45	06:42 (WTG02) 07:01 (WTG02)	06:45 20:08	07:14 19:18	07:44 18:32	17:13 (WTG16) 17:03
26	06:17 20:44	06:43 (WTG02) 07:00 (WTG02)	06:46 20:06	07:15 19:16	07:45 18:31	15:25 (WTG16) 17:03
27	06:18 20:43	06:44 (WTG02) 07:00 (WTG02)	06:47 20:05	07:16 19:15	07:46 18:30	16:15 (WTG16) 17:02
28	06:19 20:42	06:45 (WTG02) 06:59 (WTG02)	06:48 20:03	07:17 19:13	07:47 18:29	16:16 (WTG16) 17:02
29	06:20 20:41	06:46 (WTG02) 06:56 (WTG02)	06:49 20:02	07:18 19:12	07:48 18:27	15:20 (WTG16) 17:01
30	06:21 20:40	06:50 (WTG02) 06:50 (WTG02)	06:50 20:00	07:19 19:10	07:49 18:26	16:17 (WTG16) 17:01
31	06:22 20:39	06:51 (WTG02) 19:59	06:51 19:59	07:20 19:09	07:50 18:25	15:20 (WTG16) 17:01
Potential sun hours	455	425	374	347	301	292
Total, worst case	592		225	678	2293	1409

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F090 - D  
Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00
3	07:45 17:12	07:31 17:45	06:56 18:17	07:07 19:49	06:24 20:19	05:58 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:45 17:12	07:30 17:46	06:54 18:19	07:05 19:50	06:22 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:45 17:13	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:45 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:45 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:58 17:17	07:31 17:00
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:56 20:50	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:17 20:25	05:56 20:50	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:55	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:33 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:52	07:03 17:13	07:34 17:00
12	07:45 17:20	07:21 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:25	07:01 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:00
16	07:43 17:24	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:09	07:38 17:01
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:32 18:33	06:44 20:04	06:08 20:34	05:56 20:54	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:28	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:41	07:12 17:06	07:40 17:02
20	07:42 17:29	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	06:39 20:07	06:05 20:36	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
22	07:40 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:56 20:55	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03
23	07:40 17:32	07:07 18:09	06:24 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:33	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:07	07:14 19:18	07:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	07:45 17:31	07:20 17:02	07:43 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:16 19:13	07:47 17:28	07:22 17:02	07:44 17:07
29	07:36 17:39		07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:48 20:01	07:17 19:11	07:48 17:27	07:23 17:01	07:44 17:07
30	07:35 17:41		07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:49 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42		07:12 19:46		05:59 20:45		06:21 20:39	06:50 19:58		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Total, worst case												

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F098 - D

### Assumptions for shadow calculations

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	07:45 17:10	08:07 (WTG07) 16:45 (WTG04)	07:33 17:43	07:58 (WTG07) 08:30 (WTG07)	06:59 18:15	07:10 19:47
2	07:45 17:11	08:07 (WTG07) 08:16 (WTG07)	07:32 17:44	07:59 (WTG07) 08:29 (WTG07)	06:57 18:16	07:08 19:48
3	07:45 17:12	08:07 (WTG07) 16:46 (WTG04)	07:31 17:45	08:01 (WTG07) 08:28 (WTG07)	06:56 18:17	07:07 19:49
4	07:45 17:12	08:07 (WTG07) 16:47 (WTG04)	07:30 17:47	08:02 (WTG07) 08:27 (WTG07)	06:54 18:19	07:05 19:50
5	07:46 17:13	08:07 (WTG07) 16:48 (WTG04)	07:29 17:48	08:04 (WTG07) 08:25 (WTG07)	06:53 18:20	07:04 19:51
6	07:46 17:14	08:07 (WTG07) 16:49 (WTG04)	07:28 17:49	08:06 (WTG07) 08:24 (WTG07)	06:51 18:21	07:02 19:52
7	07:45 17:15	08:07 (WTG07) 16:50 (WTG04)	07:27 17:50	08:08 (WTG07) 08:20 (WTG07)	06:50 18:22	07:01 19:53
8	07:45 17:16	08:07 (WTG07) 16:51 (WTG04)	07:26 17:51		06:48 18:23	06:59 19:54
9	07:45 17:17	08:06 (WTG07) 16:52 (WTG04)	07:25 17:52		06:47 18:24	06:57 19:55
10	07:45 17:18	08:06 (WTG07) 16:53 (WTG04)	07:24 17:54		06:45 18:25	06:56 19:56
11	07:45 17:19	08:06 (WTG07) 16:54 (WTG04)	07:23 17:55		06:44 18:26	06:54 19:57
12	07:45 17:20	08:06 (WTG07) 16:56 (WTG04)	07:22 17:56		06:42 18:27	06:53 19:58
13	07:44 17:21	08:05 (WTG07) 16:56 (WTG04)	07:20 17:57		06:40 18:28	06:51 19:59
14	07:44 17:22	08:05 (WTG07) 16:58 (WTG04)	07:19 17:58		06:39 18:29	06:50 20:00
15	07:44 17:23	08:05 (WTG07) 16:59 (WTG04)	07:18 18:00		06:37 18:30	06:48 20:01
16	07:43 17:24	08:04 (WTG07) 17:00 (WTG04)	07:17 18:01		06:36 18:31	06:47 20:02
17	07:43 17:26	08:04 (WTG07) 17:01 (WTG04)	07:15 18:02		06:34 18:32	06:45 20:03
18	07:43 17:27	08:03 (WTG07) 17:02 (WTG04)	07:14 18:03	2	18:09 (WTG02) 18:11 (WTG02)	06:09 20:33
19	07:42 17:28	08:03 (WTG07) 17:04 (WTG04)	07:13 18:04	5	18:08 (WTG02) 18:13 (WTG02)	06:08 20:34
20	07:42 17:29	08:02 (WTG07) 17:05 (WTG04)	07:11 18:05	8	18:06 (WTG02) 18:15 (WTG02)	06:07 20:35
21	07:41 17:30	08:01 (WTG07) 17:05 (WTG04)	07:10 18:06	9	18:14 (WTG02) 18:06 (WTG02)	20:05 20:36
22	07:41 17:31	08:01 (WTG07) 17:07 (WTG04)	07:09 18:08	11	18:05 (WTG02) 18:16 (WTG02)	06:40 20:37
23	07:40 17:32	08:00 (WTG07) 17:07 (WTG04)	07:07 18:09	13	18:05 (WTG02) 18:18 (WTG02)	06:06 20:38
24	07:39 17:33	07:59 (WTG07) 08:30 (WTG07)	07:06 18:10	14	18:05 (WTG02) 18:19 (WTG02)	06:35 20:39
25	07:39 17:35	07:59 (WTG07) 08:31 (WTG07)	07:05 18:11	15	18:05 (WTG02) 18:19 (WTG02)	06:34 20:40
26	07:38 17:36	07:58 (WTG07) 08:31 (WTG07)	07:03 18:12	14	18:06 (WTG02) 18:21 (WTG02)	06:33 20:41
27	07:37 17:37	07:57 (WTG07) 08:31 (WTG07)	07:02 18:13	15	18:06 (WTG02) 18:21 (WTG02)	06:31 20:42
28	07:36 17:38	07:56 (WTG07) 08:31 (WTG07)	07:00 18:14	15	18:08 (WTG02) 18:23 (WTG02)	06:30 20:42
29	07:36 17:39	07:55 (WTG07) 08:30 (WTG07)		10	19:10 (WTG02) 19:20 (WTG02)	06:29 20:43
30	07:35 17:41	07:56 (WTG07) 08:30 (WTG07)				06:27 20:44
31	07:34 17:42	07:57 (WTG07) 08:30 (WTG07)				05:59 20:45
Potential sun hours	301	299	370	397	445	448
Total, worst case	842	165	142			

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F098 - D

### Assumptions for shadow calculations

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	06:00 20:56	06:22 20:38	06:51 19:57		07:19 19:08	06:52 17:23		07:25 17:01
2	06:00 20:56	06:23 20:37	06:52 19:55		07:20 19:07	06:53 17:22		07:26 17:00
3	06:00 20:56	06:24 20:36	06:53 19:54		07:21 19:05	06:54 17:21		07:27 17:00
4	06:01 20:56	06:25 20:35	06:54 19:52		07:22 19:03	06:55 17:20	13	07:37 (WTG07) 07:50 (WTG07)
5	06:02 20:55	06:26 20:34	06:55 19:51		07:23 19:02	06:56 17:19	19	07:35 (WTG07) 07:54 (WTG07)
6	06:02 20:55	06:27 20:33	06:56 19:49		07:24 19:00	06:57 17:18	23	07:33 (WTG07) 07:56 (WTG07)
7	06:03 20:55	06:28 20:32	06:57 19:47		07:25 18:59	06:58 17:17	25	07:32 (WTG07) 07:57 (WTG07)
8	06:03 20:55	06:29 20:30	06:58 19:46		07:26 18:57	07:00 17:16	28	07:30 (WTG07) 07:58 (WTG07)
9	06:04 20:54	06:30 20:29	06:59 19:44		07:27 18:56	07:01 17:15	30	07:29 (WTG07) 07:59 (WTG07)
10	06:05 20:54	06:31 20:28	07:00 19:43		07:28 18:54	07:02 17:14	32	07:29 (WTG07) 08:01 (WTG07)
11	06:05 20:54	06:32 20:27	07:01 19:41		07:29 18:52	07:03 17:13	33	07:28 (WTG07) 08:01 (WTG07)
12	06:06 20:53	06:33 20:26	07:02 19:39		07:30 18:51	07:04 17:12	34	07:28 (WTG07) 08:02 (WTG07)
13	06:07 20:53	06:33 20:24	07:02 19:38		07:31 18:49	07:05 17:11	35	07:27 (WTG07) 08:02 (WTG07)
14	06:07 20:52	06:34 20:23	07:03 19:36	8	07:32 19:09 (WTG02)	07:06 17:10	35	07:28 (WTG07) 08:03 (WTG07)
15	06:08 20:52	06:35 20:22	07:04 19:34	14	07:33 19:12 (WTG02)	07:08 17:09	34	07:30 (WTG07) 08:04 (WTG07)
16	06:09 20:51	06:36 20:20	07:05 19:33	15	07:34 19:11 (WTG02)	07:09 17:09	33	07:31 (WTG07) 08:04 (WTG07)
17	06:10 20:50	06:37 20:19	07:06 19:31	15	07:35 19:09 (WTG02)	07:10 17:08	32	07:32 (WTG07) 08:04 (WTG07)
18	06:10 20:50	06:38 20:18	07:07 19:29	15	07:36 19:08 (WTG02)	07:11 17:07	31	07:33 (WTG07) 08:04 (WTG07)
19	06:11 20:49	06:39 20:16	07:08 19:28	14	07:38 19:06 (WTG02)	07:12 17:06	37	07:34 (WTG07) 16:41 (WTG04)
20	06:12 20:49	06:40 20:15	07:09 19:26	14	07:39 19:05 (WTG02)	07:13 17:06	38	07:36 (WTG07) 16:42 (WTG04)
21	06:13 20:48	06:41 20:13	07:10 19:25	12	07:40 19:03 (WTG02)	07:14 17:05	38	07:37 (WTG07) 16:41 (WTG04)
22	06:14 20:47	06:42 20:12	07:11 19:23	11	07:41 19:01 (WTG02)	07:15 17:04	38	07:38 (WTG07) 16:41 (WTG04)
23	06:14 20:46	06:43 20:10	07:12 19:21	9	07:42 18:59 (WTG02)	07:17 17:04	36	07:39 (WTG07) 16:40 (WTG04)
24	06:15 20:46	06:44 20:09	07:13 19:20	7	07:43 18:57 (WTG02)	07:18 17:03	35	07:40 (WTG07) 16:39 (WTG04)
25	06:16 20:45	06:45 20:08	07:14 19:18	6	07:44 18:56 (WTG02)	07:19 17:03	33	07:41 (WTG07) 16:38 (WTG04)
26	06:17 20:44	06:46 20:06	07:15 19:16	3	07:45 18:55 (WTG02)	07:20 17:02	32	07:43 (WTG07) 16:39 (WTG04)
27	06:18 20:43	06:47 20:05	07:16 19:15	1	07:46 18:52 (WTG02)	07:21 17:02	30	07:44 (WTG07) 16:38 (WTG04)
28	06:19 20:42	06:48 20:03	07:17 19:13		07:47 17:28	07:22 17:02	29	07:45 (WTG07) 16:38 (WTG04)
29	06:20 20:41	06:49 20:02	07:18 19:11		07:48 17:27	07:23 17:01	27	07:46 (WTG07) 16:37 (WTG04)
30	06:21 20:40	06:49 20:00	07:18 19:10		07:49 17:26	07:24 17:01	26	07:47 (WTG07) 16:37 (WTG04)
31	06:21 20:39	06:50 19:58			06:51 17:25			07:45 17:09
Potential sun hours	455	425	374		347	301		292
Total, worst case			144			836		276

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
Via Santa Margherita 4  
IT-09124 Cagliari  
+39 070 658297  
Giuseppe Frongia / direttore@iatprogetti.it  
Calculated:  
20/01/2023 16:13/3.4.415

### SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F106 - A  
Assumptions for shadow calculations

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	07:45 17:10	16:33 (WTG06) 17:43	07:33 18:15	06:59 19:47	07:10 20:17	06:26 20:45	05:59 20:56	05:59 20:38	06:22 19:57	06:51 19:08	07:19 17:23	06:52 17:23												
2	07:45 17:11	16:33 (WTG06) 17:44	07:32 18:16	06:57 19:48	07:08 20:18	06:25 20:46	05:58 20:56	06:00 20:37	06:23 19:55	06:52 19:07	07:20 17:22	06:53 17:22												
3	07:45 17:12	16:33 (WTG06) 17:45	07:31 18:17	06:56 19:49	07:07 20:19	06:24 20:47	05:58 20:56	06:00 20:36	06:24 19:54	06:53 19:05	07:21 17:21	06:54 17:21												
4	07:45 17:12	16:33 (WTG06) 17:46	07:30 18:18	06:54 19:50	07:05 20:20	06:22 20:47	05:57 20:56	06:01 20:35	06:25 19:52	06:54 19:03	07:22 17:20	06:55 17:20												
5	07:45 17:13	16:34 (WTG06) 17:48	07:29 18:20	06:53 19:51	07:04 20:21	06:21 20:48	05:57 20:55	06:01 20:34	06:26 19:51	06:55 19:02	07:23 17:19	06:56 17:19												
6	07:45 17:14	16:34 (WTG06) 17:49	07:28 18:21	06:51 19:52	07:02 20:22	06:20 20:49	05:57 20:55	06:02 20:33	06:27 19:49	06:56 19:00	07:24 17:18	06:57 17:18												
7	07:45 17:15	16:35 (WTG06) 17:50	07:27 18:22	06:50 19:53	07:00 20:23	06:19 20:49	05:57 20:55	06:03 20:32	06:28 19:47	06:57 18:59	07:25 17:17	06:58 17:17												
8	07:45 17:16	16:35 (WTG06) 17:51	07:26 18:23	06:48 19:54	06:59 20:24	06:18 20:50	05:56 20:55	06:03 20:30	06:29 19:46	06:58 18:57	07:26 17:16	07:00 17:16												
9	07:45 17:17	16:35 (WTG06) 17:52	07:25 18:24	06:47 19:55	06:57 20:25	06:17 20:50	05:56 20:54	06:04 20:29	06:30 19:44	06:59 18:55	07:27 17:15	07:01 17:15												
10	07:45 17:18	16:35 (WTG06) 17:54	07:24 18:25	06:45 19:56	06:56 20:26	06:16 20:51	05:56 20:54	06:05 20:28	06:31 19:00	07:00 18:54	07:28 17:14	07:02 17:14												
11	07:45 17:19	16:36 (WTG06) 17:55	07:23 18:26	06:44 19:57	06:54 20:27	06:15 20:51	05:56 20:53	06:05 20:27	06:32 19:41	07:01 18:52	07:29 17:13	07:03 17:13												
12	07:45 17:20	16:37 (WTG06) 17:56	07:21 18:27	06:42 19:58	06:53 20:28	06:13 20:52	05:56 20:53	06:06 20:25	06:32 19:39	07:01 18:51	07:30 17:12	07:04 17:12												
13	07:44 17:21	16:37 (WTG06) 17:57	07:20 18:28	06:40 19:59	06:51 20:29	06:12 20:52	05:56 20:53	06:07 20:24	06:33 19:38	07:02 18:49	07:31 17:11	07:05 17:11												
14	07:44 17:22	16:38 (WTG06) 17:58	07:19 18:29	06:39 20:00	06:50 20:30	06:12 20:53	05:56 20:52	06:07 20:23	06:34 19:36	07:03 18:48	07:32 17:10	07:06 17:10												
15	07:44 17:23	16:38 (WTG06) 17:59	07:18 18:30	06:37 20:01	06:48 20:31	06:11 20:53	05:56 20:52	06:08 20:22	06:35 19:34	07:04 18:46	07:33 17:09	07:07 17:09												
16	07:43 17:24	16:39 (WTG06) 18:01	07:17 18:31	06:36 20:02	06:47 20:32	06:10 20:54	05:56 20:51	06:09 20:20	06:36 19:33	07:05 18:45	07:34 17:09	07:09 17:09												
17	07:43 17:25	16:40 (WTG06) 18:02	07:15 18:32	06:34 20:03	06:45 20:33	06:09 20:54	05:56 20:50	06:10 20:19	06:37 19:31	07:06 18:43	07:35 17:08	07:10 17:08												
18	07:43 17:27	16:40 (WTG06) 18:03	07:14 18:33	06:32 20:04	06:44 20:34	06:08 20:54	05:56 20:50	06:10 20:17	06:38 19:29	07:07 18:42	07:36 17:07	07:11 17:07												
19	07:42 17:28	16:41 (WTG06) 18:04	07:13 18:34	06:31 20:05	06:42 20:35	06:07 20:55	05:56 20:49	06:11 20:16	06:39 19:28	07:08 18:40	07:37 17:06	07:12 17:06												
20	07:42 17:29	16:42 (WTG06) 18:05	07:11 18:35	06:29 20:06	06:41 20:35	06:06 20:55	05:56 20:48	06:12 20:15	06:40 19:26	07:09 18:39	07:38 17:06	07:13 17:06												
21	07:41 17:30	16:43 (WTG06) 18:06	07:10 18:36	06:28 20:07	06:39 20:36	06:05 20:55	05:56 20:48	06:13 20:13	06:41 19:24	07:10 18:38	07:40 17:05	07:14 17:05												
22	07:40 17:31	16:45 (WTG06) 18:07	07:09 18:37	06:26 20:08	06:38 20:37	06:05 20:55	05:56 20:47	06:14 20:12	06:42 19:23	07:11 18:36	07:41 17:04	07:15 17:04												
23	07:40 17:32	16:47 (WTG06) 18:09	07:07 18:38	06:24 20:09	06:37 20:38	06:04 20:56	05:57 20:46	06:14 20:10	06:43 19:21	07:12 18:35	07:42 17:04	07:16 17:04												
24	07:39 17:33	16:49 (WTG06) 18:10	07:06 18:39	06:23 20:10	06:35 20:39	06:03 20:56	05:57 20:45	06:15 20:09	06:44 19:20	07:13 18:34	07:43 17:03	07:18 17:03												
25	07:39 17:35	16:55 (WTG06) 18:11	07:04 18:40	06:21 20:11	06:34 20:40	06:03 20:56	05:57 20:45	06:16 20:07	06:45 19:18	07:14 17:32	07:44 17:03	07:19 17:03												
26	07:38 17:36	16:55 (WTG06) 18:12	07:03 18:41	06:20 20:12	06:33 20:41	06:02 20:56	05:57 20:44	06:17 20:06	06:46 19:16	07:15 17:31	07:45 17:02	07:20 17:02												
27	07:37 17:37	16:55 (WTG06) 18:13	07:02 18:42	06:18 20:13	06:31 20:41	06:01 20:56	05:58 20:43	06:18 20:04	06:47 19:15	07:16 17:30	07:46 17:02	07:21 17:02												
28	07:36 17:38	16:55 (WTG06) 18:14	07:00 18:43	06:16 20:14	06:30 20:42	06:01 20:56	05:58 20:42	06:19 20:03	06:47 19:13	07:16 17:28	07:47 17:02	07:22 17:02												
29	07:36 17:39	16:55 (WTG06) 18:15	07:00 18:44	06:16 20:15	06:30 20:43	06:01 20:56	05:58 20:41	06:19 20:01	06:47 19:11	07:16 17:27	07:47 17:01	07:23 17:01												
30	07:35 17:40	16:55 (WTG06) 18:16	07:00 18:45	06:16 20:16	06:30 20:44	06:01 20:56	05:58 20:40	06:19 20:00	06:47 19:10	07:16 17:26	07:48 17:01	07:24 17:01												
31	07:34 17:42	16:55 (WTG06) 18:17	07:00 18:46	06:16 20:17	06:30 20:45	06:01 20:56	05:58 20:39	06:19 19:58	06:47 19:58	07:16 17:25	07:49 17:01	07:25 17:01												
Potential sun hours	301		299		397		445		448		455		425		374		347		301		229		362	
Total, worst case		392																						

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: Progetto\_layout\_2022\_10\_14Shadow receptor: F119 - A

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00
3	07:45 17:12	07:31 17:45	06:56 18:17	07:07 19:49	06:24 20:19	05:58 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:45 17:12	07:30 17:46	06:54 18:19	07:05 19:50	06:22 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:45 17:13	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:45 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:45 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:58 17:17	07:31 17:00
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:56 20:50	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:17 20:25	05:56 20:50	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:55	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:33 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:52	07:03 17:13	07:34 17:00
12	07:45 17:20	07:21 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:25	07:01 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:00
16	07:43 17:24	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:09	07:38 17:01
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:32 18:33	06:44 20:04	06:08 20:34	05:56 20:54	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:28	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:41	07:12 17:06	07:40 17:02
20	07:42 17:29	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	06:39 20:07	06:05 20:36	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:24	07:40 18:38	07:14 17:05	07:41 17:03
22	07:40 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:05 20:37	05:56 20:55	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03
23	07:40 17:32	07:07 18:09	06:24 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:33	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:07	07:14 19:18	07:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	07:45 17:31	07:20 17:02	07:43 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:16 19:13	07:47 17:28	07:22 17:02	07:44 17:07
29	07:36 17:39		07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:48 20:01	07:17 19:11	07:48 17:27	07:23 17:01	07:44 17:07
30	07:35 17:41		07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:49 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42		07:12 19:46		05:59 20:45		06:21 20:39	06:50 19:58		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Total, worst case												

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F143 - A

### Assumptions for shadow calculations

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	07:45 17:10	08:12 (WTG15) 08:35 (WTG15)	07:33 17:43	06:59 18:16	08:00 (WTG16) 08:45 (WTG16)	07:10 19:48	06:26 20:18	05:59 20:46
2	07:45 17:11	08:12 (WTG15) 08:35 (WTG15)	07:32 17:44	06:58 18:17	08:00 (WTG16) 08:44 (WTG16)	07:09 19:49	06:25 20:19	05:59 20:46
3	07:46 17:12	08:13 (WTG15) 08:36 (WTG15)	07:31 17:46	06:56 18:18	08:01 (WTG16) 08:43 (WTG16)	07:07 19:50	06:24 20:20	05:58 20:47
4	07:46 17:13	08:13 (WTG15) 08:36 (WTG15)	07:30 17:47	06:55 18:19	08:01 (WTG16) 08:41 (WTG16)	07:05 19:51	06:23 20:21	05:58 20:48
5	07:46 17:14	08:14 (WTG15) 08:36 (WTG15)	07:29 17:48	06:53 18:20	08:02 (WTG16) 08:41 (WTG16)	07:04 19:52	06:21 20:22	05:57 20:48
6	07:46 17:15	08:14 (WTG15) 08:37 (WTG15)	07:28 17:49	06:52 18:21	08:03 (WTG16) 08:39 (WTG16)	07:02 19:53	06:20 20:23	05:57 20:49
7	07:46 17:15	08:15 (WTG15) 08:37 (WTG15)	07:27 17:50	06:50 18:22	08:04 (WTG16) 08:36 (WTG16)	07:01 19:54	06:19 20:23	05:57 20:50
8	07:46 17:16	08:16 (WTG15) 08:38 (WTG15)	07:26 17:52	06:48 18:23	08:06 (WTG16) 08:35 (WTG16)	06:59 19:55	06:18 20:24	05:57 20:50
9	07:45 17:17	08:17 (WTG15) 08:38 (WTG15)	07:25 17:53	06:47 18:24	08:07 (WTG16) 08:32 (WTG16)	06:58 19:56	06:17 20:25	05:56 20:51
10	07:45 17:18	08:16 (WTG15) 08:38 (WTG15)	07:24 17:54	06:45 18:25	08:10 (WTG16) 08:29 (WTG16)	06:56 19:57	06:16 20:26	05:56 20:51
11	07:45 17:19	08:17 (WTG15) 08:38 (WTG15)	07:23 17:55	06:44 18:26	08:14 (WTG16) 08:24 (WTG16)	06:55 19:58	06:15 20:27	05:56 20:52
12	07:45 17:20	08:18 (WTG15) 08:38 (WTG15)	07:22 17:56	06:42 18:27	08:07 (WTG16) 08:41 (WTG16)	06:53 19:59	06:14 20:28	05:56 20:52
13	07:45 17:21	08:19 (WTG15) 08:37 (WTG15)	07:21 17:57	06:41 18:28	08:06 (WTG16) 08:43 (WTG16)	06:51 20:00	06:13 20:29	05:56 20:53
14	07:44 17:23	08:20 (WTG15) 08:38 (WTG15)	07:19 17:59	06:39 18:29	08:04 (WTG16) 08:43 (WTG16)	06:50 20:01	06:12 20:30	05:56 20:53
15	07:44 17:24	08:21 (WTG15) 08:38 (WTG15)	07:18 18:00	06:37 18:30	08:04 (WTG16) 08:44 (WTG16)	06:48 20:02	06:11 20:31	05:56 20:54
16	07:44 17:25	08:22 (WTG15) 08:37 (WTG15)	07:17 18:01	06:36 18:31	08:03 (WTG16) 08:45 (WTG16)	06:47 20:03	06:10 20:32	05:56 20:54
17	07:43 17:26	08:24 (WTG15) 08:36 (WTG15)	07:16 18:02	06:34 18:32	08:02 (WTG16) 08:45 (WTG16)	06:46 20:04	06:09 20:33	05:56 20:54
18	07:43 17:27	08:25 (WTG15) 08:35 (WTG15)	07:14 18:03	06:33 18:33	08:01 (WTG16) 08:46 (WTG16)	06:44 20:05	06:08 20:34	05:56 20:55
19	07:42 17:28	08:29 (WTG15) 08:33 (WTG15)	07:13 18:04	06:31 18:34	08:01 (WTG16) 08:47 (WTG16)	06:43 20:06	06:07 20:35	05:56 20:55
20	07:42 17:29	08:33 (WTG15)	07:12 18:05	06:29 18:36	08:00 (WTG16) 08:47 (WTG16)	06:41 20:07	06:06 20:36	05:56 20:55
21	07:41 17:30		07:10 18:07	06:28 18:37	08:00 (WTG16) 08:47 (WTG16)	06:40 20:08	06:06 20:37	05:56 20:55
22	07:41 17:31		07:09 18:08	06:26 18:38	08:00 (WTG16) 08:48 (WTG16)	06:38 20:09	06:05 20:38	05:57 20:56
23	07:40 17:33		07:08 18:09	06:25 18:39	07:59 (WTG16) 08:47 (WTG16)	06:37 20:10	06:04 20:38	05:57 20:56
24	07:39 17:34		07:06 18:10	06:23 18:40	07:59 (WTG16) 08:47 (WTG16)	06:36 20:11	06:04 20:39	05:57 20:56
25	07:39 17:35		07:05 18:11	06:21 18:41	07:59 (WTG16) 08:46 (WTG16)	06:34 20:12	06:03 20:40	05:57 20:56
26	07:38 17:36		07:03 18:12	06:20 18:42	07:59 (WTG16) 08:46 (WTG16)	06:33 20:13	06:02 20:41	05:58 20:56
27	07:37 17:37		07:02 18:13	06:18 18:43	08:00 (WTG16) 08:46 (WTG16)	06:31 20:14	06:02 20:42	05:58 20:56
28	07:37 17:38		07:00 18:14	06:17 18:44	08:46 (WTG16) 08:45 (WTG16)	06:30 20:15	06:01 20:43	05:58 20:56
29	07:36 17:40			06:15 19:45		06:29 20:16	06:00 20:43	05:59 20:56
30	07:35 17:41			07:13 19:46		06:28 20:17	06:00 20:44	05:59 20:56
31	07:34 17:42			07:12 19:47			05:59 20:45	
Potential sun hours	301	299	370	397	445	448		
Total, worst case	359	857	361					

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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## SHADOW - Calendar

Calculation: Progetto\_layout\_2022\_10\_14Shadow receptor: F143 - A

### Assumptions for shadow calculations

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

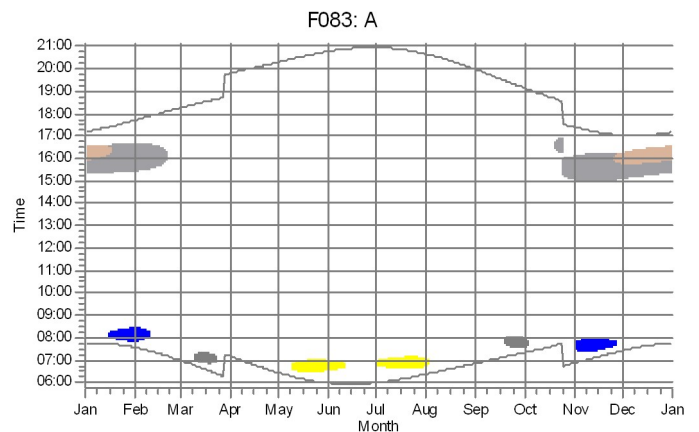
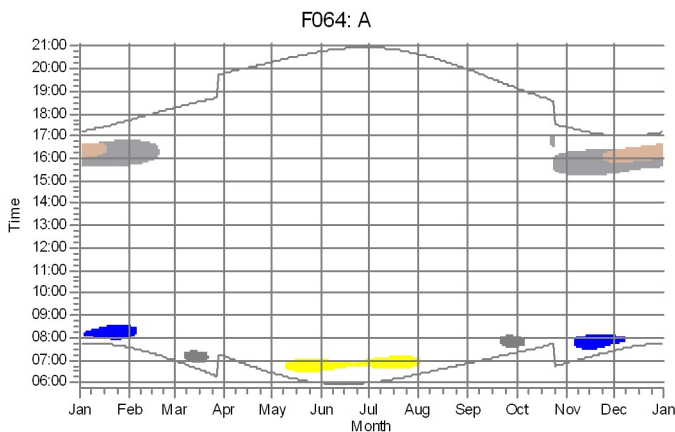
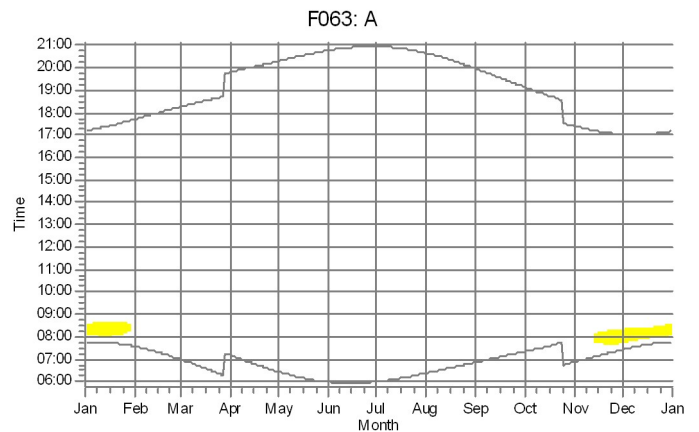
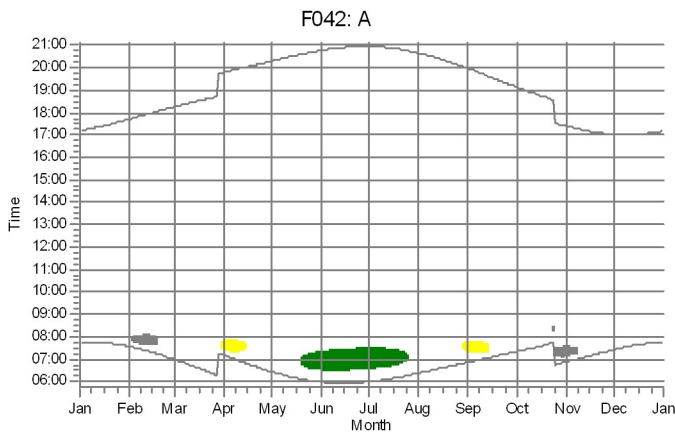
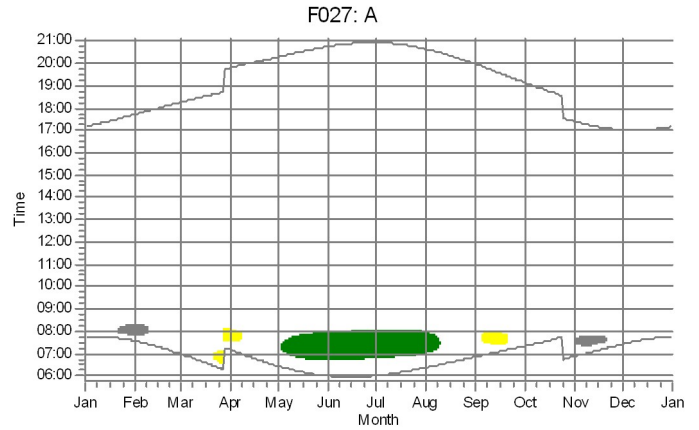
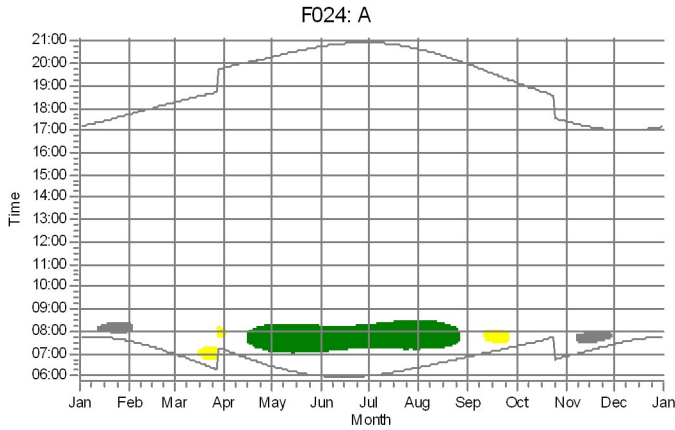
The WTG is always operating

	July	August	September	October		November		December			
1	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08		06:52 17:24	27	07:40 (WTG16) 08:07 (WTG16)	07:25 17:01	21	07:59 (WTG15) 08:20 (WTG15)
2	06:00 20:56	06:23 20:37	06:52 19:56	07:21 19:07		06:53 17:23	23	07:42 (WTG16) 08:05 (WTG16)	07:26 17:01	21	08:00 (WTG15) 08:21 (WTG15)
3	06:01 20:56	06:24 20:36	06:53 19:54	07:22 19:05	16	08:49 (WTG16) 09:05 (WTG16)	16	06:54 08:01 (WTG16)	07:27 17:00	21	08:00 (WTG15) 08:21 (WTG15)
4	06:01 20:56	06:25 20:35	06:54 19:52	07:23 19:04	22	08:46 (WTG16) 09:08 (WTG16)	6	06:55 07:50 (WTG16)	07:28 17:00	22	08:00 (WTG15) 08:22 (WTG15)
5	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	28	08:43 (WTG16) 09:11 (WTG16)		06:56 17:19	07:29 17:00	22	08:00 (WTG15) 08:22 (WTG15)
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	31	08:41 (WTG16) 09:12 (WTG16)		06:58 17:18	07:30 17:00	23	08:00 (WTG15) 08:23 (WTG15)
7	06:03 20:55	06:28 20:32	06:57 19:48	07:25 18:59	35	08:39 (WTG16) 09:14 (WTG16)		06:59 17:17	07:31 17:00	23	08:01 (WTG15) 08:24 (WTG15)
8	06:04 20:55	06:29 20:31	06:58 19:46	07:26 18:57	37	08:38 (WTG16) 09:15 (WTG16)		07:00 17:16	07:32 17:00	23	08:01 (WTG15) 08:24 (WTG15)
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	40	08:36 (WTG16) 09:16 (WTG16)		07:01 17:15	07:33 17:00	23	08:02 (WTG15) 08:25 (WTG15)
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	41	08:35 (WTG16) 09:16 (WTG16)		07:02 17:14	07:34 17:00	23	08:02 (WTG15) 08:25 (WTG15)
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	43	08:34 (WTG16) 09:17 (WTG16)		07:03 17:13	07:34 17:00	23	08:02 (WTG15) 08:25 (WTG15)
12	06:06 20:53	06:33 20:26	07:02 19:40	07:30 18:51	44	08:33 (WTG16) 09:17 (WTG16)		07:04 17:12	07:35 17:00	23	08:03 (WTG15) 08:26 (WTG15)
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	46	08:32 (WTG16) 09:18 (WTG16)		07:05 17:11	07:36 17:00	23	08:03 (WTG15) 08:26 (WTG15)
14	06:08 20:52	06:35 20:23	07:04 19:36	07:33 18:48	46	08:32 (WTG16) 09:18 (WTG16)		07:07 17:10	07:37 17:01	23	08:04 (WTG15) 08:27 (WTG15)
15	06:08 20:52	06:36 20:22	07:05 19:35	07:34 18:47	47	08:31 (WTG16) 09:18 (WTG16)		07:08 17:10	07:37 17:01	23	08:04 (WTG15) 08:27 (WTG15)
16	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	47	08:32 (WTG16) 09:19 (WTG16)		07:09 17:09	07:38 17:01	22	08:05 (WTG15) 08:27 (WTG15)
17	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	48	08:31 (WTG16) 09:19 (WTG16)		07:10 17:08	07:39 17:01	22	08:06 (WTG15) 08:28 (WTG15)
18	06:11 20:50	06:38 20:18	07:07 19:30	07:37 18:42	48	08:31 (WTG16) 09:19 (WTG16)		07:11 17:07	07:40 17:02	23	08:05 (WTG15) 08:28 (WTG15)
19	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	48	08:31 (WTG16) 09:19 (WTG16)		07:12 17:07	07:40 17:02	23	08:06 (WTG15) 08:29 (WTG15)
20	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	47	08:31 (WTG16) 09:18 (WTG16)		07:13 17:06	07:41 17:02	23	08:06 (WTG15) 08:29 (WTG15)
21	06:13 20:48	06:41 20:14	07:10 19:25	07:40 18:38	48	08:30 (WTG16) 09:18 (WTG16)		07:15 17:05	07:41 17:03	23	08:07 (WTG15) 08:30 (WTG15)
22	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	46	08:31 (WTG16) 09:17 (WTG16)		07:16 17:05	07:42 17:03	23	08:07 (WTG15) 08:30 (WTG15)
23	06:15 20:47	06:43 20:11	07:12 19:21	07:42 18:35	45	08:31 (WTG16) 09:16 (WTG16)	3	07:17 17:04	07:42 17:04	23	08:08 (WTG15) 08:31 (WTG15)
24	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	45	08:31 (WTG16) 09:16 (WTG16)	10	07:18 17:04	07:43 17:04	23	08:08 (WTG15) 08:31 (WTG15)
25	06:16 20:45	06:45 20:08	07:14 19:18	07:44 17:33	44	07:32 (WTG16) 08:16 (WTG16)	12	07:19 17:03	07:43 17:05	23	08:09 (WTG15) 08:32 (WTG15)
26	06:17 20:44	06:46 20:06	07:15 19:17	07:45 17:31	42	07:33 (WTG16) 08:15 (WTG16)	15	07:20 17:03	07:44 17:06	23	08:09 (WTG15) 08:32 (WTG15)
27	06:18 20:43	06:47 20:05	07:16 19:15	07:46 17:30	40	07:34 (WTG16) 08:14 (WTG16)	17	07:21 17:02	07:44 17:06	22	08:10 (WTG15) 08:32 (WTG15)
28	06:19 20:42	06:48 20:03	07:17 19:13	07:47 17:29	39	07:34 (WTG16) 08:13 (WTG16)	18	07:22 17:02	07:44 17:07	23	08:11 (WTG15) 08:34 (WTG15)
29	06:20 20:41	06:49 20:02	07:18 19:12	07:49 17:27	36	07:35 (WTG16) 08:11 (WTG16)	19	07:23 17:01	07:45 17:08	23	08:11 (WTG15) 08:34 (WTG15)
30	06:21 20:40	06:50 20:00	07:19 19:10	07:50 17:26	34	07:36 (WTG16) 08:10 (WTG16)	19	07:24 17:01	07:45 17:08	23	08:11 (WTG15) 08:34 (WTG15)
31	06:22 20:39	06:51 19:59		07:51 17:25	30	07:39 (WTG16) 08:09 (WTG16)			07:45 17:09	22	08:12 (WTG15) 08:34 (WTG15)
Potential sun hours	455	425	374	347		301			292		701
Total, worst case					1163		185				701

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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SHADOW - Calendar, graphical  
 Calculation: Progetto\_layout\_2022\_10\_14

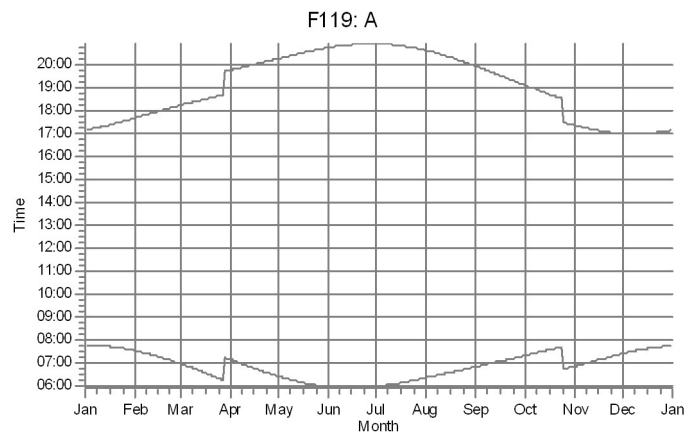
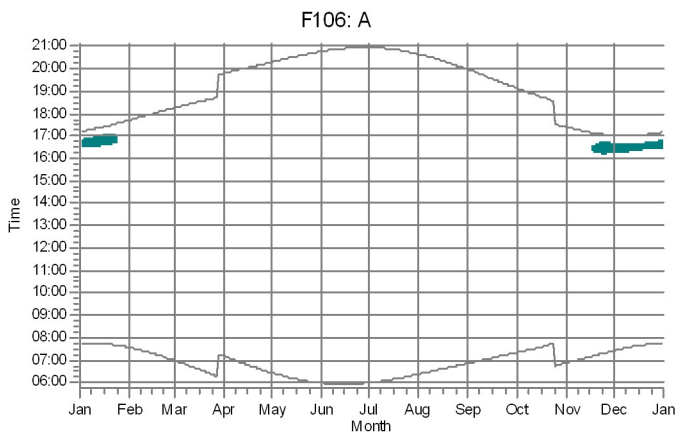
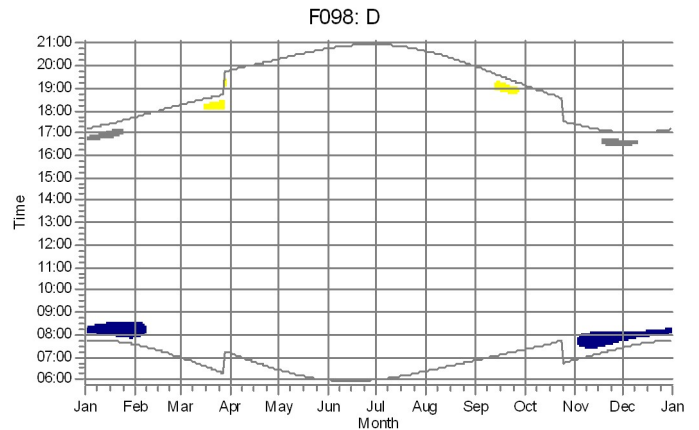
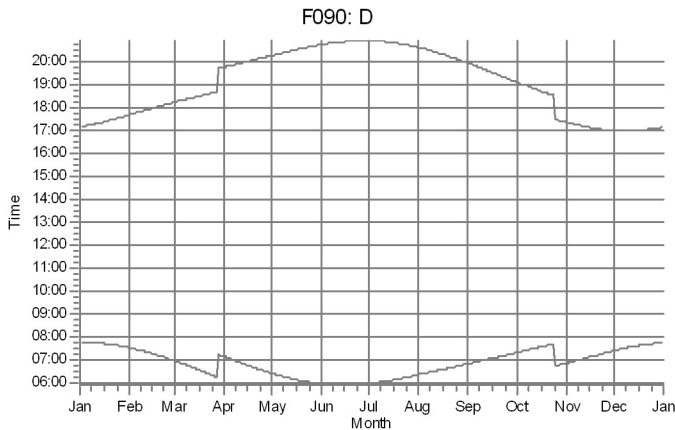
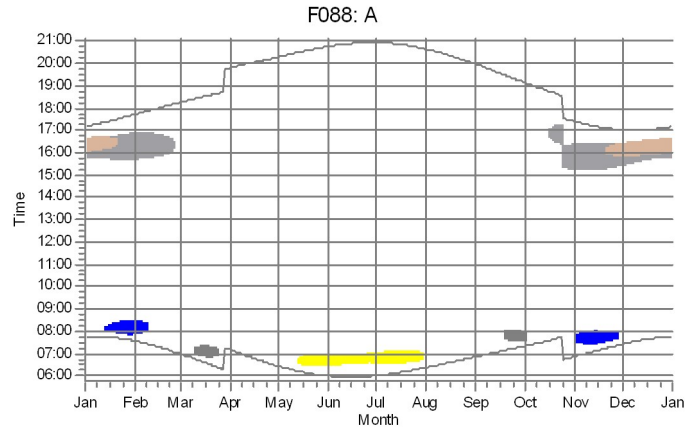
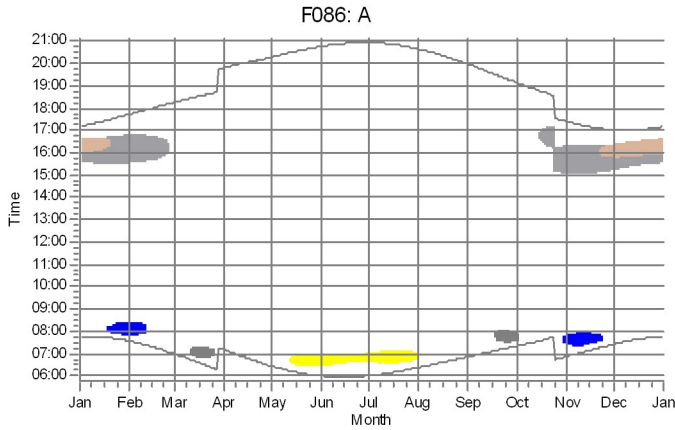


WTGs

- WTG01: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (29)
- WTG02: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (30)
- WTG03: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (31)

- WTG04: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (32)
- WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)
- WTG17: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45)

SHADOW - Calendar, graphical  
 Calculation: Progetto\_layout\_2022\_10\_14

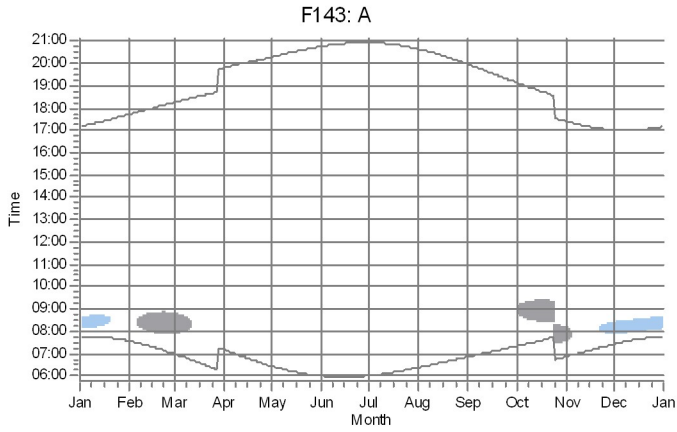


- WTGs
- WTG02: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (30)
  - WTG03: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (31)
  - WTG04: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (32)
  - WTG06: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (34)

- WTG07: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (35)
- WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)
- WTG17: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45)

## SHADOW - Calendar, graphical

Calculation: Progetto\_layout\_2022\_10\_14



### WTGs

WTG15: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (43)

WTG16: Siemens Gamesa SG 6.6-170!! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (44)

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.

Via Santa Margherita 4

IT-09124 Cagliari

+39 070 658297

Giuseppe Frongia / direttore@iatprogetti.it

Calculated:

20/01/2023 16:13/3.4.415

### SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG01 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (29)

#### Assumptions for shadow calculations

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	07:45	07:33	06:59	07:10	06:26 07:09-08:13/64	05:59 06:35-08:11/96	06:00 06:38-08:15/97	06:22 07:06-08:25/79	06:51	07:20	06:52	07:25
2	07:45	07:32	06:57	07:09	06:25 07:09-08:13/64	05:58 06:34-08:10/96	06:00 06:38-08:15/97	06:23 07:07-08:25/78	06:52	07:20	06:53	07:26
3	07:46	07:31	06:56	07:07	06:24 07:08-08:14/66	05:58 06:34-08:11/97	06:01 06:39-08:15/96	06:24 07:09-08:25/76	06:53	07:21	06:54	07:27
4	07:46	07:30	06:54	07:05	06:23 07:08-08:14/66	05:58 06:34-08:11/97	06:01 06:39-08:15/96	06:25 07:10-08:25/75	06:54	07:22	06:55	07:28
5	07:46	07:29	06:53	07:04	06:21 07:06-08:13/67	05:57 06:34-08:11/97	06:02 06:40-08:16/96	06:26 07:12-08:25/73	06:55	07:23	06:56	07:29
6	07:46	07:28	06:51	07:02	06:20 07:05-08:14/69	05:57 06:33-08:10/97	06:02 06:40-08:16/96	06:27 07:13-08:24/71	06:56	07:24	06:57	07:30
7	07:46	07:27	06:50	07:01	06:19 07:03-08:14/71	05:57 06:34-08:10/96	06:03 06:40-08:17/97	06:28 07:16-08:23/67	06:57	07:25	06:59	07:31
8	07:46	07:26	06:48	06:59	06:18 07:01-08:14/73	05:57 06:34-08:10/96	06:03 06:40-08:17/97	06:29 07:16-08:23/67	06:58	07:26	07:00	07:32
9	07:45	07:25	06:47	06:58	06:17 06:59-08:14/75	05:56 06:34-08:10/96	06:04 06:41-08:18/97	06:30 07:17-08:23/66	06:59	07:27	07:01	07:33
10	07:45	07:24	06:45	06:56	06:16 06:58-08:14/76	05:56 06:34-08:11/97	06:05 06:42-08:19/97	06:31 07:17-08:22/65	07:00	07:28	07:02	07:34
11	07:45	07:23	06:44	06:54	06:15 06:56-08:14/78	05:56 06:34-08:10/96	06:05 06:42-08:18/96	06:32 07:18-08:22/64	07:01	07:29	07:03	07:34
12	07:45	07:22	06:42	06:53	06:14 06:55-08:14/79	05:56 06:33-08:10/97	06:06 06:43-08:19/96	06:33 07:18-08:21/63	07:02	07:30	07:04	07:35
13	07:45	07:20	06:41	06:51	06:13 06:54-08:14/80	05:56 06:33-08:10/97	06:07 06:44-08:20/96	06:34 07:19-08:21/62	07:03	07:31	07:05	07:36
14	07:44	07:19	06:39	06:50	06:12 06:53-08:14/81	05:56 06:33-08:10/97	06:07 06:44-08:20/96	06:35 07:19-08:20/61	07:03	07:32	07:07	07:37
15	07:44	07:18	06:37	06:48	06:11 06:53-08:15/82	05:56 06:33-08:10/97	06:08 06:45-08:20/95	06:36 07:20-08:19/59	07:04	07:33	07:08	07:37
16	07:44	07:17	06:36	06:47	06:10 06:52-08:14/82	05:56 06:33-08:10/97	06:09 06:47-08:21/94	06:36 07:20-08:17/57	07:05	07:35	07:09	07:38
17	07:43	07:15	06:34	06:45	06:09 06:51-08:14/83	05:56 06:34-08:11/97	06:10 06:48-08:22/94	06:37 07:21-08:16/55	07:06	07:36	07:10	07:39
18	07:43	07:14	06:33	06:44	06:08 06:50-08:14/84	05:56 06:34-08:11/97	06:10 06:48-08:21/93	06:38 07:22-08:15/53	07:07	07:37	07:11	07:39
19	07:42	07:13	06:31	06:42	06:07 06:49-08:13/84	05:56 06:35-08:11/96	06:11 06:50-08:22/92	06:39 07:23-08:14/51	07:08	07:38	07:12	07:40
20	07:42	07:12	06:29	06:41	06:06 06:49-08:13/84	05:56 06:35-08:11/96	06:12 06:51-08:23/92	06:40 07:24-08:12/48	07:09	07:39	07:13	07:41
21	07:41	07:10	06:28	06:40	06:06 06:46-08:13/87	05:56 06:35-08:11/96	06:13 06:53-08:23/90	06:41 07:25-08:11/46	07:10	07:40	07:14	07:41
22	07:41	07:09	06:26	06:38	06:05 06:44-08:13/89	05:57 06:35-08:11/96	06:14 06:55-08:24/89	06:42 07:27-08:09/42	07:11	07:41	07:16	07:42
23	07:40	07:07	06:25	06:37	06:04 06:42-08:12/90	05:57 06:36-08:12/96	06:15 06:57-08:23/86	06:43 07:29-08:07/38	07:12	07:42	07:17	07:42
24	07:39	07:06	06:23	06:35	06:03 06:41-08:13/92	05:57 06:35-08:12/97	06:15 06:59-08:24/85	06:44 07:31-08:04/33	07:13	07:43	07:18	07:43
25	07:39	07:05	06:21	06:34	06:03 06:39-08:12/93	05:57 06:35-08:12/97	06:16 07:00-08:24/84	06:45 07:34-08:01/27	07:14	07:44	07:19	07:43
26	07:38	07:03	06:20	06:33	06:02 06:39-08:13/94	05:58 06:36-08:13/97	06:17 07:01-08:24/83	06:46 07:37-07:56/19	07:15	07:45	07:20	07:44
27	07:37	07:02	06:18	06:31	06:01 06:38-08:12/94	05:58 06:36-08:13/97	06:18 07:02-08:25/83	06:47	07:16	07:46	07:21	07:44
28	07:37	07:00	06:17	06:30	06:01 06:37-08:12/95	05:58 06:36-08:13/97	06:19 07:03-08:25/82	06:48	07:17	07:47	07:22	07:44
29	07:36	07:15	06:15	06:29	06:00 06:36-08:12/96	05:59 06:37-08:14/97	06:20 07:03-08:24/81	06:49	07:18	07:48	07:23	07:45
30	07:35	07:13	06:13	06:27	06:00 06:36-08:12/96	05:59 06:37-08:14/97	06:21 07:04-08:24/80	06:50	07:19	07:49	07:24	07:45
31	07:34	07:12	06:11	06:25	05:59 06:35-08:11/96	05:59 06:35-08:11/96	06:22 07:05-08:25/80	06:51	07:20	07:50	07:25	07:46
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	0	0	0	657	2530	2899	2833	1495	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: Progetto\_layout\_2022\_10\_14WTG: WTG02 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30)  
Assumptions for shadow calculations

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	07:45 08:07-08:28/21 17:10	07:33 17:43 06:59 18:15		07:10 07:30-08:01/31 19:47	06:26 20:17	05:59 06:31-06:56/25 20:45
2	07:45 08:07-08:29/22 17:11	07:32 17:44 06:57 18:16		07:08 07:29-08:00/31 19:48	06:25 20:18	05:58 06:31-06:55/24 20:46
3	07:45 08:07-08:29/22 17:12	07:31 17:45 06:56 18:18		07:07 07:27-07:59/32 19:49	06:24 20:19	05:58 06:32-06:55/23 20:47
4	07:46 08:07-08:30/23 17:13	07:30 17:47 06:54 18:19		07:05 07:27-07:58/31 19:50	06:22 20:20	05:58 06:32-06:55/23 20:48
5	07:46 08:07-08:30/23 17:13	07:29 17:48 06:53 18:20		07:04 07:26-07:56/30 19:51	06:21 20:21	05:57 06:33-06:55/22 20:48
6	07:46 08:07-08:31/24 17:14	07:28 17:49 06:51 18:21		07:02 07:25-07:54/29 19:52	06:20 20:22	05:57 06:33-06:54/21 20:49
7	07:46 08:07-08:32/25 17:15	07:27 17:50 06:50 18:22		07:01 07:25-07:51/26 19:53	06:19 20:23	05:57 06:33-06:54/21 20:49
8	07:45 08:07-08:33/26 17:16	07:26 17:51 06:48 18:23		06:59 07:24-07:47/23 19:54	06:18 20:24	05:57 06:34-06:54/20 20:50
9	07:45 08:07-08:33/26 17:17	07:25 17:53 06:47 18:24		06:57 07:25-07:47/22 19:55	06:17 20:25	05:56 06:35-06:54/19 20:51
10	07:45 08:06-08:33/27 17:18	07:24 17:54 06:45 18:25		06:56 07:25-07:45/20 19:56	06:16 20:26	05:56 06:35-06:53/18 20:51
11	07:45 08:06-08:34/28 17:19	07:23 17:55 06:44 18:26		06:54 07:26-07:44/18 19:57	06:15 06:39-06:47/8 20:27	05:56 06:36-06:53/17 20:52
12	07:45 08:06-08:34/28 17:20	07:22 17:56 06:42 18:27		06:53 07:27-07:42/15 19:58	06:14 06:37-06:49/12 20:28	05:56 06:35-06:52/17 20:52
13	07:45 08:05-08:34/29 17:21	07:20 17:57 06:41 18:28		06:51 07:29-07:41/12 19:59	06:13 06:36-06:51/15 20:29	05:56 06:36-06:52/16 20:53
14	07:44 08:05-08:35/30 17:22	07:19 17:58 06:39 18:29		06:50 07:32-07:36/4 20:00	06:12 06:34-06:52/18 20:30	05:56 06:36-06:52/16 20:53
15	07:44 08:06-08:36/30 17:23	07:18 18:00 06:37 18:30		06:48 20:01	06:11 06:35-06:54/19 20:31	05:56 06:37-06:52/15 20:53
16	07:44 08:06-08:35/29 17:25	07:17 18:01 06:36 18:31		06:47 20:02	06:10 06:34-06:54/20 20:32	05:56 06:38-06:53/15 20:54
17	07:43 08:07-08:36/29 17:26	07:15 18:02 06:34 18:32	18:09-18:11/2 06:59-07:04/5	06:45 20:03	06:09 06:32-06:55/23 20:33	05:56 06:38-06:53/15 20:54
18	07:43 08:07-08:35/28 17:27	07:14 18:03 06:33 18:33	18:08-18:13/5 06:55-07:08/13	06:44 20:04	06:08 06:32-06:55/23 20:34	05:56 06:38-06:53/15 20:55
19	07:42 08:08-08:36/28 17:28	07:13 18:04 06:31 18:34	18:06-18:14/8 06:52-07:09/17	06:42 20:05	06:07 06:31-06:55/24 20:35	05:56 06:39-06:53/14 20:55
20	07:42 08:08-08:35/27 17:29	07:12 18:05 06:29 18:35	18:06-18:15/9 06:51-07:11/20	06:41 20:06	06:06 06:31-06:56/25 20:36	05:56 06:39-06:53/14 20:55
21	07:41 08:09-08:35/26 17:30	07:10 18:06 06:28 18:36	18:05-18:16/11 06:49-07:11/22	06:40 20:07	06:06 06:31-06:56/25 20:37	05:56 06:39-06:53/14 20:55
22	07:41 08:10-08:35/25 17:31	07:09 18:08 06:26 18:37	18:05-18:16/11 06:48-07:11/23	06:38 20:08	06:05 06:30-06:56/26 20:37	05:57 06:39-06:53/14 20:56
23	07:40 08:11-08:35/24 17:32	07:07 18:09 06:25 18:38	18:05-18:18/13 06:48-07:12/24	06:37 20:09	06:04 06:30-06:56/26 20:38	05:57 06:40-06:54/14 20:56
24	07:39 08:12-08:34/22 17:34	07:06 18:10 06:23 18:39	18:05-18:19/14 06:45-07:11/26	06:35 20:10	06:03 06:30-06:56/26 20:39	05:57 06:40-06:54/14 20:56
25	07:39 08:14-08:34/20 17:35	07:05 18:11 06:21 18:40	18:05-18:19/14 06:43-07:12/29	06:34 20:11	06:03 06:30-06:56/26 20:40	05:57 06:39-06:54/15 20:56
26	07:38 08:15-08:32/17 17:36	07:03 18:12 06:20 18:41	18:06-18:21/15 06:41-07:11/30	06:33 20:12	06:02 06:30-06:57/27 20:41	05:58 06:40-06:55/15 20:56
27	07:37 08:17-08:31/14 17:37	07:02 18:13 06:18 18:42	18:06-18:21/15 06:39-07:10/31	06:31 20:13	06:01 06:30-06:56/26 20:42	05:58 06:40-06:55/15 20:56
28	07:36 08:19-08:28/9 17:38	07:00 18:14 06:16 18:43	18:08-18:23/15 06:39-07:09/30	06:30 20:14	06:01 06:30-06:56/26 20:42	05:58 06:39-06:55/16 20:56
29	07:36 17:39	07:15 19:10-19:20/10 19:44 07:38-08:08/30		06:29 20:15	06:00 06:30-06:56/26 20:43	05:59 06:40-06:56/16 20:56
30	07:35 17:41	07:13 19:45 07:37-08:06/29		06:27 20:16	06:00 06:31-06:56/25 20:44	05:59 06:39-06:56/17 20:56
31	07:34 17:42	07:12 19:46 07:33-08:04/31			05:59 06:31-06:55/24 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	682	0	502	324	470	520

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
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## SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG02 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (30)

### Assumptions for shadow calculations

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	06:00 06:40-06:57/17 20:56	06:22 06:49-06:59/10 20:38	06:51 07:25-07:43/18 19:57	07:19 19:08	06:52 17:24	07:25 07:48-08:16/28 17:01
2	06:00 06:39-06:57/18 20:56	06:23 06:52-06:56/4 20:37	06:52 07:24-07:44/20 19:55	07:20 19:07	06:53 17:22	07:26 07:49-08:16/27 17:00
3	06:01 06:40-06:58/18 20:56	06:24 20:36	06:53 07:23-07:45/22 19:54	07:21 19:05	06:54 17:21	07:27 07:50-08:16/26 17:00
4	06:01 06:39-06:59/20 20:56	06:25 20:35	06:54 07:22-07:44/22 19:52	07:22 19:03	06:55 17:20	07:28 07:51-08:17/26 17:00
5	06:02 06:40-07:00/20 20:56	06:26 20:34	06:55 07:21-07:47/26 19:51	07:23 19:02	06:56 17:19	07:29 07:52-08:17/25 17:00
6	06:02 06:39-07:00/21 20:55	06:27 20:33	06:56 07:21-07:50/29 19:49	07:24 19:00	06:57 17:18	07:30 07:53-08:17/24 17:00
7	06:03 06:39-07:01/22 20:55	06:28 20:32	06:57 07:21-07:51/30 19:47	07:25 18:59	06:59 17:17	07:31 07:54-08:18/24 17:00
8	06:03 06:39-07:01/22 20:55	06:29 20:30	06:58 07:21-07:52/31 19:46	07:26 18:57	07:00 17:16	07:32 07:55-08:18/23 17:00
9	06:04 06:39-07:02/23 20:54	06:30 20:29	06:59 07:21-07:53/32 19:44	07:27 18:56	07:01 17:15	07:33 07:56-08:18/22 17:00
10	06:05 06:39-07:03/24 20:54	06:31 20:28	07:00 07:22-07:54/32 19:43	07:28 18:54	07:02 17:14	07:33 07:57-08:19/22 17:00
11	06:05 06:39-07:03/24 20:54	06:32 20:27	07:01 07:23-07:54/31 19:41	07:29 18:53	07:03 17:13	07:34 07:57-08:18/21 17:00
12	06:06 06:39-07:03/24 20:53	06:33 20:26	07:02 07:25-07:56/31 19:39	07:30 18:51	07:04 17:12	07:35 07:58-08:19/21 17:00
13	06:07 06:39-07:04/25 20:53	06:34 20:24	07:03 07:28-07:57/29 19:38	07:31 18:49	07:05 17:11	07:36 07:59-08:19/20 17:00
14	06:07 06:38-07:04/26 20:52	06:35 20:23	07:03 19:01-19:09/8 19:36	07:32 18:48	07:07 07:52-08:01/9 17:10	07:37 08:00-08:20/20 17:00
15	06:08 06:39-07:05/26 20:52	06:35 20:22	07:04 18:58-19:12/14 19:34	07:33 18:46	07:08 07:50-08:04/14 17:09	07:37 08:00-08:19/19 17:01
16	06:09 06:39-07:05/26 20:51	06:36 20:20	07:05 18:56-19:11/15 19:33	07:34 18:45	07:09 07:48-08:05/17 17:09	07:38 08:01-08:20/19 17:01
17	06:10 06:40-07:06/26 20:51	06:37 20:19	07:06 18:54-19:09/15 19:31	07:35 18:44	07:10 07:47-08:07/20 17:08	07:39 08:02-08:21/19 17:01
18	06:10 06:39-07:05/26 20:50	06:38 20:18	07:07 18:53-19:08/15 19:30	07:37 18:42	07:11 07:46-08:08/22 17:07	07:39 08:02-08:20/18 17:02
19	06:11 06:39-07:06/27 20:49	06:39 20:16	07:08 18:52-19:06/14 19:28	07:38 18:41	07:12 07:46-08:10/24 17:06	07:40 08:03-08:21/18 17:02
20	06:12 06:40-07:06/26 20:49	06:40 20:15	07:09 18:51-19:05/14 19:26	07:39 18:39	07:13 07:45-08:10/25 17:06	07:41 08:03-08:21/18 17:02
21	06:13 06:40-07:06/26 20:48	06:41 20:13	07:10 18:51-19:03/12 19:25	07:40 18:38	07:14 07:45-08:11/26 17:05	07:41 08:04-08:22/18 17:03
22	06:14 06:41-07:06/25 20:47	06:42 20:12	07:11 18:50-19:01/11 19:23	07:41 18:36	07:16 07:44-08:11/27 17:05	07:42 08:04-08:22/18 17:03
23	06:14 06:40-07:06/26 20:46	06:43 20:11	07:12 18:50-18:59/9 19:21	07:42 18:35	07:17 07:44-08:12/28 17:04	07:42 08:05-08:23/18 17:04
24	06:15 06:41-07:06/25 20:46	06:44 20:09	07:13 18:50-18:57/7 19:20	07:43 18:34	07:18 07:44-08:12/28 17:03	07:43 08:05-08:23/18 17:04
25	06:16 06:42-07:05/23 20:45	06:45 20:08	07:14 18:50-18:56/6 19:18	06:44 17:32	07:19 07:45-08:14/29 17:03	07:43 08:06-08:24/18 17:05
26	06:17 06:42-07:05/23 20:44	06:46 20:06	07:15 18:51-18:54/3 19:16	06:45 17:31	07:20 07:45-08:14/29 17:02	07:43 08:06-08:24/18 17:05
27	06:18 06:43-07:05/22 20:43	06:47 20:05	07:16 18:52-18:53/1 19:15	06:46 17:30	07:21 07:45-08:15/30 17:02	07:44 08:06-08:25/19 17:06
28	06:19 06:45-07:04/19 20:42	06:48 20:03	07:17 19:13	06:47 17:28	07:22 07:45-08:15/30 17:02	07:44 08:06-08:25/19 17:07
29	06:20 06:44-07:03/19 20:41	06:49 07:33-07:37/4 20:02	07:18 19:12	06:48 17:27	07:23 07:46-08:15/29 17:01	07:44 08:07-08:27/20 17:08
30	06:21 06:45-07:02/17 20:40	06:50 07:29-07:41/12 20:00	07:19 19:10	06:50 17:26	07:24 07:47-08:15/28 17:01	07:45 08:07-08:27/20 17:08
31	06:22 06:47-07:01/14 20:39	06:50 07:27-07:42/15 19:59		06:51 17:25		07:45 08:07-08:27/20 17:09
Potential sun hours	455	425	374	347	301	292
Sum of minutes with flicker	700	45	807	0	415	647

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: Progetto\_Layout\_2022\_10\_14WTG: WTG03 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (31)
Assumptions for shadow calculations

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

Table with columns for months (January to December) and rows for days (1 to 31). Each cell contains start and end times for shadow flicker. Summary rows at the bottom show 'Potential sun hours' and 'Sum of minutes with flicker' for each month.

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

Matrix with 2 rows and 3 columns: 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.

## SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG04 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (32)

### Assumptions for shadow calculations

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	07:45 16:44-16:45/1 17:10	07:33 07:53-08:17/24 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45
2	07:45 17:11	07:32 07:53-08:15/22 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46
3	07:45 16:45-16:46/1 17:12	07:31 07:51-07:52/1 17:45 07:54-08:14/20	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47
4	07:46 16:45-16:47/2 17:13	07:30 07:50-08:14/24 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:47
5	07:46 16:46-16:48/2 17:13	07:29 07:49-08:13/24 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48
6	07:46 16:46-16:49/3 17:14	07:28 07:48-08:12/24 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49
7	07:46 16:47-16:50/3 17:15	07:27 07:47-08:11/24 17:50	06:50 18:22	07:01 19:53	06:19 20:23	05:57 20:49
8	07:45 16:47-16:51/4 17:16	07:26 07:45-08:08/23 17:51	06:48 07:09-07:14/5 18:23	06:59 19:54	06:18 20:24	05:57 20:50
9	07:45 16:47-16:52/5 17:17	07:25 07:44-08:01/17 17:53	06:47 07:05-07:17/12 18:24	06:57 19:55	06:17 20:25	05:56 20:51
10	07:45 16:48-16:53/5 17:18	07:24 07:43-08:01/18 17:54	06:45 07:04-07:19/15 18:25	06:56 19:56	06:16 20:26	05:56 20:51
11	07:45 16:48-16:54/6 17:19	07:23 07:42-08:02/20 17:55	06:44 07:02-07:20/18 18:26	06:54 19:57	06:15 20:27	05:56 20:52
12	07:45 16:49-16:56/7 17:20	07:22 07:41-08:02/21 17:56	06:42 07:01-07:21/20 18:27	06:53 19:58	06:14 20:28	05:56 20:52
13	07:45 16:49-16:56/7 17:21	07:20 07:42-08:02/20 17:57	06:41 06:59-07:21/22 18:28	06:51 19:59	06:13 20:29	05:56 20:53
14	07:44 16:50-16:58/8 17:22	07:19 07:42-08:00/18 17:58	06:39 06:57-07:21/24 18:29	06:50 20:00	06:12 20:30	05:56 20:53
15	07:44 16:51-16:59/8 17:23	07:18 07:43-08:00/17 18:00	06:37 06:56-07:21/25 18:30	06:48 20:01	06:11 20:31	05:56 20:53
16	07:44 16:51-17:00/9 17:25	07:17 07:44-07:59/15 18:01	06:36 06:54-07:20/26 18:31	06:47 20:02	06:10 20:32	05:56 20:54
17	07:43 16:52-17:01/9 17:26	07:15 07:45-07:56/11 18:02	06:34 06:53-07:20/27 18:32	06:45 20:03	06:09 20:33	05:56 20:54
18	07:43 16:53-17:02/9 17:27	07:14 07:49-07:53/4 18:03	06:33 06:52-07:19/27 18:33	06:44 20:04	06:08 20:34	05:56 20:55
19	07:42 16:54-17:04/10 17:28	07:13 18:04	06:31 06:52-07:17/25 18:34	06:42 20:05	06:07 20:35	05:56 20:55
20	07:42 16:55-17:05/10 17:29	07:11 18:05	06:29 06:52-07:16/24 18:35	06:41 20:06	06:06 20:36	05:56 20:55
21	07:41 16:56-17:05/9 17:30	07:10 18:06	06:28 06:52-07:14/22 18:36	06:40 20:07	06:06 20:36	05:56 20:55
22	07:41 16:59-17:07/8 17:31	07:09 18:08	06:26 06:52-07:12/20 18:37	06:38 20:08	06:05 20:37	05:57 20:56
23	07:40 17:01-17:07/6 17:32	07:07 18:09	06:25 06:54-07:11/17 18:38	06:37 20:09	06:04 20:38	05:57 20:56
24	07:39 07:59-08:19/20 17:34	07:06 18:10	06:23 06:55-07:08/13 18:39	06:35 20:10	06:03 20:39	05:57 20:56
25	07:39 07:59-08:20/21 17:35	07:05 18:11	06:21 06:58-07:05/7 18:40	06:34 20:11	06:03 20:40	05:57 20:56
26	07:38 07:58-08:20/22 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56
27	07:37 07:57-08:19/22 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:58 20:56
28	07:36 07:56-08:19/23 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56
29	07:36 07:55-08:19/24 17:39		07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56
30	07:35 07:55-08:19/24 17:41		07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56
31	07:34 07:54-08:18/24 17:42		07:12 19:46		05:59 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	440	347	349	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: Progetto\_layout\_2022\_10\_14WTG: WTG04 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (32)

### Assumptions for shadow calculations

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	06:00 20:56	06:22 20:38	06:51 19:57	07:19 19:08	07:39-08:00/21 17:24	06:52 17:01	07:13-07:31/18 17:01	07:25 16:30-16:36/6
2	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	07:40-07:59/19 17:22	06:53 17:00	07:14-07:31/17 17:00	07:26 16:31-16:36/5
3	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	07:41-07:58/17 17:21	06:54 17:00	07:15-07:39/24 17:00	07:27 16:31-16:36/5
4	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	07:42-07:56/14 19:03	06:55 17:20	07:16-07:40/24 17:00	07:28 16:31-16:35/4
5	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	07:43-07:53/10 19:02	06:56 17:19	07:18-07:42/24 17:00	07:29 16:32-16:35/3
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	07:44-07:43/24 17:18	06:57 17:18	07:19-07:43/24 17:00	07:30 16:32-16:35/3
7	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	07:45-07:44/24 17:17	06:59 17:17	07:20-07:44/24 17:00	07:31 16:33-16:35/2
8	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:46-07:44/20 17:16	07:00 17:16	07:21-07:44/20 17:00	07:32 16:33-16:35/2
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:47-07:47/23 17:15	07:01 17:15	07:22-07:47/23 17:00	07:33 16:34-16:35/1
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:48-07:48/24 17:14	07:02 17:14	07:23-07:48/24 17:00	07:33 16:34-16:35/1
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:53	07:49-07:49/24 17:13	07:03 17:13	07:24-07:49/24 17:00	07:34 17:00
12	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:50-07:50/24 17:12	07:04 17:12	07:25-07:50/24 17:00	07:35 17:00
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:49	07:51-07:51/24 17:11	07:05 17:11	07:26-07:51/24 17:00	07:36 17:00
14	06:07 20:52	06:35 20:23	07:03 19:36	07:32 18:48	07:52-07:52/23 17:10	07:06 17:10	07:27-07:52/23 17:00	07:37 17:00
15	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:53-07:52/22 17:09	07:08 17:09	07:28-07:52/22 17:01	07:37 17:01
16	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:54-07:53/22 17:09	07:09 17:09	07:29-07:53/22 17:01	07:38 17:01
17	06:10 20:51	06:37 20:19	07:06 19:31	07:35 18:44	07:55-07:53/21 17:08	07:10 17:08	07:30-07:53/21 17:01	07:39 17:01
18	06:10 20:50	06:38 20:18	07:07 19:30	07:36 18:42	07:56-07:53/20 17:07	07:11 17:07	07:31-07:53/20 17:02	07:39 17:02
19	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:57-07:54/19 17:06	07:12 17:06	07:32-07:54/19 17:02	07:40 17:02
20	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:58-07:54/18 17:05	07:13 17:05	07:33-07:54/18 17:02	07:41 17:03
21	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:59-07:53/16 17:04	07:14 17:04	07:34-07:53/16 17:03	07:41 17:03
22	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:59-07:53/15 17:03	07:15 17:03	07:35-07:53/15 17:03	07:42 17:03
23	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:59-07:53/14 17:02	07:17 17:02	07:36-07:53/14 17:04	07:42 17:04
24	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:59-07:53/13 17:01	07:18 17:01	07:37-07:53/13 17:05	07:43 17:05
25	06:16 20:45	06:45 20:08	07:14 19:18	07:44 18:32	07:59-07:53/12 17:00	07:19 17:00	07:38-07:53/12 17:05	07:43 17:05
26	06:17 20:44	06:46 20:06	07:15 19:16	07:45 18:31	07:59-07:53/11 17:00	07:20 17:00	07:39-07:53/11 17:06	07:43 17:06
27	06:18 20:43	06:47 20:05	07:16 19:15	07:46 18:30	07:59-07:53/10 17:00	07:21 17:00	07:40-07:53/10 17:06	07:44 17:06
28	06:19 20:42	06:48 20:03	07:17 19:13	07:47 18:28	07:59-07:53/9 17:00	07:22 17:00	07:41-07:53/9 17:07	07:44 17:07
29	06:20 20:41	06:49 20:02	07:18 19:12	07:48 18:27	07:59-07:53/8 17:00	07:23 17:00	07:42-07:53/8 17:08	07:44 17:08
30	06:21 20:40	06:50 20:00	07:18 19:10	07:49 18:26	07:59-07:53/7 17:00	07:24 17:00	07:43-07:53/7 17:09	07:45 17:08
31	06:22 20:39	06:50 19:58		07:50 18:25	07:59-07:53/6 17:00	07:25 17:00	07:44-07:53/6 17:09	07:45 17:09
Potential sun hours	455	425	374	347	301	292		
Sum of minutes with flicker	0	0	277	210	629	32		

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: Progetto\_layout\_2022\_10\_14WTG: WTG05 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (33)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 19:17	05:59 20:45	06:00 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:16	07:08 19:48	06:25 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:00
3	07:45 17:12	07:31 17:45	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:45 17:13	07:30 17:47	06:54 18:19	07:05 19:50	06:22 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:45 17:13	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:45 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:45 17:15	07:27 17:50	06:50 18:22	07:01 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:58 17:17	07:31 17:00
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:18 20:24	05:56 20:50	06:03 20:55	06:29 20:30	06:58 19:46	07:26 18:57	07:00 17:16	07:32 17:00
9	07:45 17:17	07:25 17:53	06:47 18:24	06:57 19:55	06:17 20:25	05:56 20:50	06:04 20:54	06:30 20:29	06:59 19:44	07:27 18:56	07:01 17:15	07:33 17:00
10	07:45 17:18	07:24 17:54	06:45 18:25	06:56 19:56	06:16 20:26	05:56 20:51	06:05 20:54	06:31 20:28	07:00 19:43	07:28 18:54	07:02 17:14	07:33 17:00
11	07:45 17:19	07:23 17:55	06:44 18:26	06:54 19:57	06:15 20:27	05:56 20:52	06:05 20:54	06:32 20:27	07:01 19:41	07:29 18:52	07:03 17:13	07:34 17:00
12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:25	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:13 20:29	05:56 20:52	06:07 20:53	06:34 20:24	07:03 19:38	07:32 18:49	07:06 17:11	07:37 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:01
16	07:43 17:24	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:09	07:38 17:01
17	07:43 17:26	07:15 18:02	06:34 18:32	06:45 20:03	06:09 20:33	05:56 20:54	06:10 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:54	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:28	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:06	07:40 17:02
20	07:42 17:29	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	06:40 20:07	06:06 20:36	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
22	07:40 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:57 20:55	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:05	07:42 17:03
23	07:40 17:32	07:07 18:09	06:24 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:34	07:06 18:10	06:23 18:39	06:35 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:03	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:40	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:08	07:14 19:18	06:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:41	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:16	06:45 17:31	07:20 17:02	07:43 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:01 20:42	05:58 20:56	06:19 20:42	06:48 20:03	07:17 19:13	06:47 17:28	07:22 17:02	07:44 17:07
29	07:36 17:39		07:15 19:44	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:01	07:17 19:11	06:48 17:27	07:23 17:01	07:44 17:07
30	07:35 17:41		07:13 19:45	06:27 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:49 20:00	07:18 19:10	06:49 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42		07:12 19:46		05:59 20:45		06:21 20:39	06:50 19:58		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG06 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (34)

### Assumptions for shadow calculations

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	07:45 16:33-16:45/12 17:10	07:33 06:59 17:43 18:15	07:10 06:26 19:47 20:17	05:59 06:00 20:45 20:56	06:00 06:22 20:38 19:57	06:51 07:19 19:08 17:23	06:52 07:25 16:18-16:36/18 17:01					
2	07:45 16:33-16:45/12 17:11	07:32 06:57 17:44 18:16	07:08 06:25 19:48 20:18	05:58 06:00 20:46 20:56	06:23 06:52 20:37 19:55	07:20 06:53 19:07 17:22	07:26 16:18-16:36/18 17:00					
3	07:45 16:33-16:46/13 17:12	07:31 06:56 17:45 18:17	07:07 06:24 19:49 20:19	05:58 06:01 20:47 20:56	06:24 06:36 20:36 19:54	07:21 06:54 19:05 17:21	07:27 16:19-16:36/17 17:00					
4	07:45 16:33-16:47/14 17:12	07:30 06:54 17:47 18:19	07:05 06:22 19:50 20:20	05:58 06:01 20:47 20:56	06:25 06:54 20:35 19:52	07:22 06:55 19:03 17:20	07:28 16:19-16:35/16 17:00					
5	07:45 16:34-16:48/14 17:13	07:29 06:53 17:48 18:20	07:04 06:21 19:51 20:21	05:57 06:02 20:48 20:55	06:26 06:55 20:34 19:51	07:23 06:56 19:02 17:19	07:29 16:20-16:35/15 17:00					
6	07:45 16:34-16:49/15 17:14	07:28 06:51 17:49 18:21	07:02 06:20 19:52 20:22	05:57 06:02 20:49 20:55	06:27 06:56 20:33 19:49	07:24 06:57 19:00 17:18	07:30 16:20-16:35/15 17:00					
7	07:45 16:35-16:50/15 17:15	07:27 06:50 17:50 18:22	07:01 06:19 19:53 20:23	05:57 06:03 20:49 20:55	06:28 06:57 20:32 19:47	07:25 06:58 18:59 17:17	07:31 16:21-16:35/14 17:00					
8	07:45 16:35-16:51/16 17:16	07:26 06:48 17:51 18:23	06:59 06:18 19:54 20:24	05:56 06:03 20:50 20:55	06:29 06:58 20:30 19:46	07:26 07:00 18:57 17:16	07:32 16:21-16:35/14 17:00					
9	07:45 16:35-16:52/17 17:17	07:25 06:47 17:52 18:24	06:57 06:17 19:55 20:25	05:56 06:04 20:50 20:54	06:30 06:59 20:29 19:44	07:27 07:01 18:56 17:15	07:33 16:22-16:35/13 17:00					
10	07:45 16:35-16:53/18 17:18	07:24 06:45 17:54 18:25	06:56 06:16 19:56 20:26	05:56 06:05 20:51 20:54	06:31 07:00 20:28 19:43	07:28 07:02 18:54 17:14	07:33 16:22-16:34/12 17:00					
11	07:45 16:36-16:54/18 17:19	07:23 06:44 17:55 18:26	06:54 06:15 19:57 20:27	05:56 06:05 20:52 20:54	06:32 07:01 20:27 19:41	07:29 07:03 18:52 17:13	07:34 16:23-16:35/12 17:00					
12	07:45 16:37-16:56/19 17:20	07:22 06:42 17:56 18:27	06:53 06:14 19:58 20:28	05:56 06:06 20:52 20:53	06:33 07:02 20:25 19:39	07:30 07:04 18:51 17:12	07:35 16:23-16:35/12 17:00					
13	07:44 16:37-16:56/19 17:21	07:20 06:40 17:57 18:28	06:51 06:13 19:59 20:29	05:56 06:07 20:52 20:53	06:33 07:02 20:24 19:38	07:31 07:05 18:49 17:11	07:36 16:24-16:35/11 17:00					
14	07:44 16:38-16:57/19 17:22	07:19 06:39 17:58 18:29	06:50 06:12 20:00 20:30	05:56 06:07 20:53 20:52	06:34 07:03 20:23 19:36	07:32 07:06 18:48 17:10	07:37 16:24-16:35/11 17:00					
15	07:44 16:38-16:58/20 17:23	07:18 06:37 18:00 18:30	06:48 06:11 20:01 20:31	05:56 06:08 20:52 20:52	06:35 07:04 20:22 19:34	07:33 07:08 18:46 17:09	07:37 16:25-16:35/10 17:01					
16	07:43 16:39-17:00/21 17:24	07:17 06:36 18:01 18:31	06:47 06:10 20:02 20:32	05:56 06:09 20:54 20:51	06:36 07:05 20:20 19:33	07:34 07:09 18:45 17:09	07:38 16:26-16:36/10 17:01					
17	07:43 16:40-17:01/21 17:26	07:15 06:34 18:02 18:32	06:45 06:09 20:03 20:33	05:56 06:10 20:54 20:50	06:37 07:06 20:19 19:31	07:35 07:10 18:43 17:08	07:39 16:26-16:35/9 17:01					
18	07:43 16:40-17:01/21 17:27	07:14 06:32 18:03 18:33	06:44 06:08 20:04 20:34	05:56 06:10 20:54 20:50	06:38 07:07 20:18 19:29	07:36 07:11 16:23-16:29/6 18:42 17:07	07:39 16:27-16:36/9 17:01					
19	07:42 16:41-17:01/20 17:28	07:13 06:31 18:04 18:34	06:42 06:07 20:05 20:35	05:56 06:11 20:55 20:49	06:39 07:08 20:16 19:28	07:37 07:12 16:21-16:32/11 18:41 17:06	07:40 16:28-16:37/9 17:02					
20	07:42 16:42-17:01/19 17:29	07:11 06:29 18:05 18:35	06:41 06:06 20:06 20:36	05:56 06:12 20:55 20:49	06:40 07:09 20:15 19:26	07:39 07:13 16:20-16:35/15 18:39 17:06	07:41 16:28-16:37/9 17:02					
21	07:41 16:43-17:00/17 17:30	07:10 06:28 18:06 18:36	06:40 06:05 20:07 20:36	05:56 06:13 20:55 20:48	06:41 07:10 20:13 19:25	07:40 07:14 16:19-16:36/17 18:38 17:05	07:41 16:29-16:38/9 17:03					
22	07:40 16:45-17:00/15 17:31	07:09 06:26 18:08 18:37	06:38 06:05 20:08 20:37	05:56 06:14 20:55 20:47	06:42 07:11 20:12 19:23	07:41 07:15 16:18-16:37/19 18:36 17:04	07:42 16:29-16:38/9 17:03					
23	07:40 16:47-16:58/11 17:32	07:07 06:24 18:09 18:38	06:37 06:04 20:09 20:38	05:57 06:14 20:56 20:46	06:43 07:12 20:10 19:21	07:42 07:17 16:18-16:38/20 18:35 17:04	07:42 16:30-16:39/9 17:04					
24	07:39 16:49-16:55/6 17:33	07:06 06:23 18:10 18:39	06:35 06:03 20:10 20:39	05:57 06:15 20:56 20:46	06:44 07:13 20:09 19:20	07:43 07:18 16:17-16:38/21 18:34 17:03	07:43 16:30-16:39/9 17:04					
25	07:39 17:35 07:38	07:05 06:21 18:11 18:40	06:34 06:03 20:11 20:40	05:57 06:16 20:56 20:45	06:45 07:14 20:08 19:18	07:44 07:19 16:17-16:38/21 17:32 17:03	07:43 16:30-16:39/9 17:05					
26	07:38 17:36 07:37	07:03 06:20 18:12 18:41	06:33 06:02 20:12 20:41	05:58 06:17 20:56 20:44	06:46 07:15 20:06 19:16	07:45 07:20 16:18-16:39/21 17:31 17:02	07:43 16:31-16:40/9 17:05					
27	07:37 17:37 07:36	07:02 06:18 18:13 18:42	06:31 06:01 20:13 20:41	05:58 06:18 20:56 20:43	06:47 07:16 20:05 19:15	07:46 07:21 16:18-16:38/20 17:30 17:02	07:44 16:31-16:41/10 17:06					
28	07:36 17:38 07:36	07:00 06:16 18:14 18:43	06:30 06:01 20:14 20:42	05:58 06:19 20:56 20:42	06:48 07:17 20:03 19:13	07:47 07:22 16:18-16:38/20 17:28 17:02	07:44 16:31-16:41/10 17:07					
29	07:36 17:39 07:35	07:00 06:16 19:44 19:13	06:30 06:01 20:15 20:43	05:59 06:20 20:56 20:41	06:49 07:18 20:01 19:11	07:48 07:23 16:18-16:37/19 17:27 17:01	07:44 16:31-16:42/11 17:07					
30	07:35 17:41 07:34	07:00 06:16 19:45 19:14	06:30 06:01 20:16 20:44	05:59 06:21 20:56 20:40	06:49 07:18 20:00 19:10	07:49 07:24 16:18-16:37/19 17:26 17:01	07:45 16:32-16:43/11 17:08					
31	07:34 17:42 07:33	07:00 06:16 19:46 19:15	06:30 06:01 20:17 20:45	05:59 06:22 20:56 20:41	06:50 07:19 20:39 19:58	07:50 07:25 16:18-16:37/19 17:25 17:01	07:45 16:32-16:44/12 17:09					
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	392	0	0	0	0	0	0	0	0	0	229	362

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	Last time (hh:mm) with flicker First time (hh:mm) with flicker/Minutes with flicker
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## SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG07 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (35)  
Assumptions for shadow calculations

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	07:45 08:07-08:15/8 17:10	07:33 07:58-08:30/32 17:43	06:59   07:10 18:15   19:47	06:26   05:59 20:17   20:45	06:00   06:22 20:38   19:57	06:51   07:19 19:08   17:23	06:52   07:26 17:23   17:01					
2	07:45 08:07-08:16/9 17:11	07:32 07:59-08:29/30 17:44	06:57   07:08 18:16   19:48	06:25   05:58 20:18   20:46	06:00   06:24 20:37   20:56	06:53   07:21 19:07   17:22	06:54   07:28 17:22   17:00					
3	07:45 08:07-08:17/10 17:12	07:31 08:01-08:28/27 17:45	06:56   07:07 18:17   19:49	06:24   05:58 20:19   20:47	06:00   06:25 20:36   20:56	06:54   07:22 19:05   17:21	06:55   07:37-07:50/13 17:20   17:00					
4	07:45 08:07-08:18/11 17:12	07:30 08:02-08:27/25 17:46	06:54   07:05 18:19   19:50	06:22   05:58 20:20   20:47	06:01   06:25 20:35   20:56	06:54   07:22 19:03   17:20	06:55   07:35-07:54/19 17:20   17:00					
5	07:45 08:07-08:19/12 17:13	07:29 08:04-08:25/21 17:48	06:53   07:04 18:20   19:51	06:21   05:57 20:21   20:48	06:02   06:26 20:34   20:55	06:55   07:23 19:51   19:02	06:56   07:35-07:54/19 17:19   17:00					
6	07:45 08:07-08:20/13 17:14	07:28 08:06-08:24/18 17:49	06:51   07:02 18:21   19:52	06:20   05:57 20:22   20:49	06:02   06:27 20:33   20:55	06:56   07:24 19:00   17:18	06:57   07:37-07:56/23 17:17   17:00					
7	07:45 08:07-08:21/14 17:15	07:27 08:08-08:20/12 17:50	06:50   07:00 18:22   19:53	06:19   05:57 20:23   20:49	06:03   06:28 20:32   20:56	06:57   07:25 18:59   17:17	06:58   07:32-07:57/25 17:17   17:00					
8	07:45 08:07-08:22/15 17:16	07:26 08:09-08:21/11 17:51	06:48   06:59 18:23   19:54	06:18   05:56 20:24   20:50	06:04   06:29 20:30   20:54	06:58   07:26 18:57   17:16	07:00   07:30-07:58/28 17:16   17:00					
9	07:45 08:06-08:22/16 17:17	07:25 08:10-08:22/10 17:52	06:47   06:57 18:24   19:55	06:17   05:56 20:25   20:50	06:05   06:30 20:29   20:54	06:59   07:27 18:55   17:15	07:01   07:29-07:59/30 17:15   17:00					
10	07:45 08:06-08:23/17 17:18	07:24 08:11-08:23/9 17:54	06:45   06:56 18:25   19:56	06:16   05:56 20:26   20:51	06:05   06:31 20:28   20:54	07:00   07:28 18:54   17:14	07:02   07:29-08:01/32 17:14   17:00					
11	07:45 08:06-08:24/18 17:19	07:23 08:12-08:24/8 17:55	06:44   06:55 18:26   19:57	06:15   05:56 20:27   20:52	06:05   06:32 20:27   20:53	07:01   07:29 18:52   17:13	07:03   07:28-08:01/33 17:13   17:00					
12	07:45 08:06-08:25/19 17:20	07:22 08:13-08:25/7 17:56	06:42   06:53 18:27   19:58	06:14   05:56 20:28   20:52	06:06   06:33 20:25   20:53	07:01   07:30 18:51   17:12	07:04   07:28-08:02/34 17:12   17:00					
13	07:44 08:05-08:25/20 17:21	07:21 08:14-08:26/6 17:57	06:40   06:51 18:28   19:59	06:13   05:56 20:29   20:52	06:07   06:34 20:24   20:53	07:02   07:31 18:49   17:11	07:05   07:27-08:02/35 17:11   17:00					
14	07:44 08:05-08:26/21 17:22	07:20 08:15-08:27/5 17:58	06:39   06:50 18:29   20:00	06:12   05:56 20:30   20:53	06:07   06:34 20:23   20:52	07:03   07:32 18:48   17:10	07:06   07:28-08:03/35 17:10   17:00					
15	07:44 08:05-08:27/22 17:23	07:19 08:16-08:28/4 17:59	06:37   06:48 18:30   20:01	06:11   05:56 20:31   20:53	06:08   06:35 20:22   20:52	07:04   07:33 18:46   17:09	07:08   07:30-08:04/34 17:09   17:00					
16	07:43 08:04-08:27/23 17:24	07:18 08:17-08:29/3 18:01	06:36   06:47 18:31   20:02	06:10   05:56 20:32   20:54	06:09   06:36 20:20   20:51	07:05   07:34 18:45   17:09	07:09   07:31-08:04/33 17:09   17:00					
17	07:43 08:04-08:28/24 17:25	07:17 08:18-08:30/2 18:02	06:34   06:45 18:32   20:03	06:09   05:56 20:33   20:54	06:10   06:37 20:19   20:50	07:06   07:35 18:43   17:08	07:10   07:32-08:04/32 17:08   17:00					
18	07:43 08:03-08:29/26 17:27	07:16 08:19-08:31/1 18:04	06:32   06:44 18:33   20:04	06:08   05:56 20:34   20:54	06:10   06:38 20:17   20:50	07:07   07:36 18:42   17:07	07:11   07:33-08:04/31 17:07   17:00					
19	07:42 08:03-08:30/27 17:28	07:15 08:20-08:32/0 18:04	06:31   06:42 18:34   20:05	06:07   05:56 20:35   20:55	06:11   06:39 20:16   20:49	07:08   07:37 18:41   17:06	07:12   07:34-08:05/31 17:06   17:00					
20	07:42 08:02-08:30/28 17:29	07:14 08:21-08:33/9 18:05	06:29   06:41 18:35   20:06	06:06   05:56 20:36   20:55	06:12   06:40 20:15   20:48	07:09   07:39 18:39   17:03	07:13   07:36-08:06/30 17:03   17:00					
21	07:41 08:01-08:30/29 17:30	07:13 08:22-08:34/0 18:06	06:28   06:39 18:36   20:07	06:05   05:56 20:36   20:55	06:13   06:41 20:13   20:48	07:10   07:40 18:38   17:04	07:14   07:37-08:06/29 17:04   17:00					
22	07:40 08:01-08:31/30 17:31	07:12 08:23-08:35/1 18:07	06:26   06:38 18:37   20:08	06:05   05:56 20:37   20:55	06:14   06:42 20:12   20:47	07:11   07:41 18:36   17:04	07:15   07:38-08:06/28 17:04   17:00					
23	07:40 08:00-08:31/31 17:32	07:11 08:24-08:36/2 18:09	06:24   06:37 18:38   20:09	06:04   05:57 20:38   20:56	06:14   06:43 20:10   20:46	07:12   07:42 18:35   17:04	07:16   07:39-08:06/27 17:04   17:00					
24	07:39 07:59-08:30/31 17:33	07:10 08:25-08:37/3 18:10	06:23   06:35 18:39   20:10	06:03   05:57 20:39   20:56	06:15   06:44 20:09   20:45	07:13   07:43 18:34   17:03	07:18   07:40-08:06/26 17:04   17:00					
25	07:39 07:59-08:31/32 17:35	07:09 08:26-08:38/4 18:11	06:21   06:34 18:40   20:11	06:03   05:57 20:40   20:56	06:16   06:45 20:07   20:45	07:14   07:44 18:32   17:03	06:44   07:41-08:06/25 17:03   17:00					
26	07:38 07:58-08:31/33 17:36	07:08 08:27-08:39/5 18:12	06:20   06:33 18:41   20:12	06:02   05:58 20:41   20:56	06:17   06:46 20:06   20:44	07:15   07:45 17:31   17:02	06:45   07:43-08:06/23 17:02   17:00					
27	07:37 07:57-08:31/34 17:37	07:07 08:28-08:40/6 18:13	06:18   06:31 18:42   20:13	06:01   05:58 20:42   20:56	06:18   06:47 20:04   20:43	07:16   07:46 19:15   17:02	06:46   07:44-08:06/22 17:02   17:00					
28	07:36 07:56-08:31/35 17:38	07:06 08:29-08:41/7 18:14	06:16   06:30 18:43   20:14	06:01   05:58 20:42   20:56	06:19   06:48 20:03   20:42	07:16   07:47 19:13   17:02	06:47   07:45-08:06/21 17:02   17:00					
29	07:36 07:55-08:30/35 17:39	07:05 08:30-08:42/8 18:15	06:15   06:29 19:44   20:15	06:00   05:59 20:43   20:56	06:20   06:41 20:01   20:41	07:17   07:48 19:11   17:02	06:48   07:46-08:06/20 17:02   17:00					
30	07:35 07:56-08:30/34 17:41	07:04 08:31-08:43/9 18:16	06:14   06:27 19:45   20:16	06:00   05:59 20:44   20:56	06:20   06:40 20:00   20:40	07:18   07:49 19:10   17:03	06:49   07:24 17:26   17:01	07:24   07:47-08:06/19 17:01   17:00				
31	07:34 07:57-08:30/33 17:42	07:03 08:32-08:44/0 18:17	06:13   06:26 19:46   20:17	06:00   05:59 20:45   20:57	06:21   06:41 20:39   20:58	07:19   07:50 19:11   17:04	06:51   07:25 17:25   17:02	07:25   07:48-08:06/18 17:02   17:00				
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	710	665	0	0	0	0	0	0	0	0	738	244

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: Progetto\_layout\_2022\_10\_14WTG: WTG08 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (36)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:16	07:10 19:48	06:26 20:18	05:59 20:46	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:09	06:52 17:24	07:25 17:01
2	07:46 17:11	07:32 17:44	06:58 18:17	07:09 19:49	06:25 20:19	05:59 20:46	06:00 20:56	06:24 20:37	06:53 19:56	07:21 19:07	06:53 17:23	07:26 17:01
3	07:46 17:12	07:31 17:46	06:56 18:18	07:07 19:50	06:24 20:20	05:58 20:47	06:01 20:56	06:25 20:36	06:53 19:54	07:22 19:05	06:54 17:22	07:27 17:01
4	07:46 17:13	07:30 17:47	06:55 18:19	07:06 19:51	06:23 20:21	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:23 19:04	06:55 17:20	07:28 17:00
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:52	06:22 20:22	05:58 20:48	06:02 20:56	06:26 20:34	06:55 19:51	07:24 19:02	06:56 17:19	07:29 17:00
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8	07:46 17:17	07:26 17:52	06:49 18:23	06:59 19:55	06:18 20:25	05:57 20:50	06:04 20:55	06:29 20:31	06:58 19:46	07:27 18:57	07:00 17:16	07:32 17:00
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12	07:45 17:21	07:22 17:56	06:42 18:27	06:53 19:59	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:40	07:31 18:51	07:04 17:12	07:35 17:00
13	07:45 17:22	07:21 17:58	06:41 18:28	06:52 20:00	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:32 18:50	07:06 17:11	07:36 17:00
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22	07:41 17:32	07:09 18:08	06:26 18:38	06:38 20:09	06:05 20:38	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	07:16 17:05	07:42 17:04
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31	07:34 17:42	07:00 18:15	06:12 18:47	06:26 20:18	06:00 20:45	06:00 20:56	06:22 20:39	06:51 19:59	07:20 19:09	06:51 17:25	07:25 17:01	07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG09 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (37)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:16	07:10 19:48	06:26 20:18	05:59 20:46	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08	06:52 17:24	07:25 17:01
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23	07:40 17:33	07:08 18:09	06:25 18:39	06:37 20:10	06:04 20:38	05:57 20:56	06:15 20:47	06:43 20:11	07:12 19:22	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:34	07:06 18:10	06:23 18:40	06:36 20:11	06:04 20:39	05:57 20:56	06:16 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:04	07:43 17:05
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26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:13	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:17	06:45 17:31	07:20 17:03	07:44 17:06
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Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG10 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (38)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:16	07:10 19:48	06:26 20:17	05:59 20:45	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 17:23	07:26 17:01
3	07:46 17:12	07:31 17:46	06:56 18:18	07:07 19:50	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:22 19:05	06:54 17:21	07:27 17:00
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13	07:45 17:21	07:20 17:57	06:41 18:28	06:51 20:00	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00
14	07:44 17:23	07:19 17:59	06:39 18:29	06:50 20:00	06:12 20:30	05:56 20:53	06:08 20:52	06:35 20:23	07:04 19:36	07:32 18:48	07:07 17:10	07:37 17:01
15	07:44 17:24	07:18 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:36 20:22	07:04 19:35	07:34 18:47	07:08 17:10	07:37 17:01
16	07:44 17:25	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:38 17:01
17	07:43 17:26	07:16 18:02	06:34 18:32	06:46 20:03	06:09 20:33	05:56 20:54	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08	07:39 17:01
18	07:43 17:27	07:14 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:55	06:11 20:50	06:38 20:18	07:07 19:30	07:37 18:42	07:11 17:07	07:39 17:02
19	07:42 17:28	07:13 18:04	06:31 18:34	06:43 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:07	07:40 17:02
20	07:42 17:29	07:12 18:05	06:29 18:35	06:41 20:06	06:07 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:07	06:28 18:36	06:40 20:07	06:06 20:37	05:57 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
22	07:41 17:31	07:09 18:08	06:26 18:38	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	07:16 17:05	07:42 17:03
23	07:40 17:33	07:08 18:09	06:25 18:39	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
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26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:17	06:45 17:31	07:20 17:03	07:44 17:06
27	07:37 17:37	07:02 18:13	06:18 18:43	06:31 20:13	06:02 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
28	07:37 17:38	07:00 18:14	06:17 18:44	06:30 20:14	06:01 20:42	05:59 20:56	06:19 20:42	06:48 20:03	07:17 19:13	06:47 17:29	07:22 17:02	07:44 17:07
29	07:36 17:40		07:15 19:45	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	06:48 17:27	07:23 17:01	07:45 17:08
30	07:35 17:41		07:13 19:46	06:28 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	06:50 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42		07:12 19:47		05:59 20:45		06:22 20:39	06:51 19:59		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG11 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (39)

#### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:16	07:10 19:48	06:26 20:17	05:59 20:45	06:00 20:56	06:23 20:38	06:52 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 17:23	07:26 17:01
3	07:45 17:12	07:31 17:46	06:56 18:18	07:07 19:50	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:58 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:46 17:15	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
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13	07:45 17:21	07:20 17:57	06:41 18:28	06:51 19:59	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00
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15	07:44 17:24	07:18 18:00	06:37 18:30	06:48 20:01	06:11 20:31	05:56 20:53	06:08 20:52	06:36 20:22	07:04 19:35	07:33 18:47	07:08 17:10	07:37 17:01
16	07:44 17:25	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:38 17:01
17	07:43 17:26	07:15 18:02	06:34 18:32	06:46 20:03	06:09 20:33	05:56 20:54	06:10 20:51	06:37 20:19	07:06 19:31	07:36 18:44	07:10 17:08	07:39 17:01
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22	07:41 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	07:16 17:05	07:42 17:03
23	07:40 17:33	07:07 18:09	06:25 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
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28	07:36 17:38	07:00 18:14	06:17 18:44	06:30 20:14	06:01 20:42	05:59 20:56	06:19 20:42	06:48 20:03	07:17 19:13	06:47 17:29	07:22 17:02	07:44 17:07
29	07:36 17:40		07:15 19:45	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	06:48 17:27	07:23 17:01	07:44 17:08
30	07:35 17:41		07:13 19:46	06:28 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	06:50 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42		07:12 19:47		05:59 20:45		06:22 20:39	06:51 19:59		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG12 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (40)

#### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	06:00 20:56	06:23 20:38	06:51 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:48	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:23	07:26 17:01
3	07:45 17:12	07:31 17:46	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00
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27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:02 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
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Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG13 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (41)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:59 20:45	06:00 20:56	06:23 20:38	06:51 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:48	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:07	06:53 17:22	07:26 17:01
3	07:45 17:12	07:31 17:46	06:56 18:18	07:07 19:49	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:50	06:23 20:20	05:58 20:47	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:51	06:21 20:21	05:57 20:48	06:02 20:55	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
6	07:46 17:14	07:28 17:49	06:51 18:21	07:02 19:52	06:20 20:22	05:57 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:18	07:30 17:00
7	07:46 17:15	07:27 17:50	06:50 18:22	07:01 19:53	06:19 20:23	05:57 20:49	06:03 20:55	06:28 20:32	06:57 19:47	07:25 18:59	06:59 17:17	07:31 17:00
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12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:58	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00
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22	07:41 17:31	07:09 18:08	06:26 18:37	06:38 20:08	06:05 20:37	05:57 20:56	06:14 20:47	06:42 20:12	07:11 19:23	07:41 18:37	07:16 17:05	07:42 17:03
23	07:40 17:33	07:07 18:09	06:25 18:38	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
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31	07:34 17:42		07:12 19:46		05:59 20:45		06:22 20:39	06:51 19:59		06:51 17:25		07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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: Progetto\_layout\_2022\_10\_14WTG: WTG14 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (42)

### Assumptions for shadow calculations

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	07:45 17:10	07:33 17:43	06:59 18:15	07:10 19:48	06:26 19:17	05:59 20:45	06:00 20:56	06:23 20:38	06:51 19:57	07:20 19:08	06:52 17:24	07:25 17:01
2	07:45 17:11	07:32 17:44	06:57 18:17	07:09 19:49	06:25 20:18	05:59 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 17:23	07:26 17:01
3	07:46 17:12	07:31 17:46	06:56 18:18	07:07 19:50	06:24 20:19	05:58 20:47	06:01 20:56	06:24 20:36	06:53 19:54	07:22 19:05	06:54 17:21	07:27 17:00
4	07:46 17:13	07:30 17:47	06:54 18:19	07:05 19:51	06:23 20:20	05:58 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:04	06:55 17:20	07:28 17:00
5	07:46 17:14	07:29 17:48	06:53 18:20	07:04 19:52	06:21 20:21	05:57 20:48	06:02 20:56	06:26 20:34	06:55 19:51	07:23 19:02	06:56 17:19	07:29 17:00
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12	07:45 17:20	07:22 17:56	06:42 18:27	06:53 19:59	06:14 20:28	05:56 20:52	06:06 20:53	06:33 20:26	07:02 19:39	07:30 18:51	07:04 17:12	07:35 17:00
13	07:45 17:21	07:20 17:57	06:41 18:28	06:51 20:00	06:13 20:29	05:56 20:53	06:07 20:53	06:34 20:24	07:03 19:38	07:31 18:50	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:59	06:39 18:29	06:50 20:01	06:12 20:30	05:56 20:53	06:08 20:52	06:35 20:23	07:04 19:36	07:32 18:48	07:07 17:10	07:37 17:01
15	07:44 17:24	07:18 18:00	06:37 18:30	06:48 20:02	06:11 20:31	05:56 20:54	06:08 20:52	06:36 20:22	07:04 19:35	07:34 18:47	07:08 17:10	07:37 17:01
16	07:44 17:25	07:17 18:01	06:36 18:31	06:47 20:02	06:10 20:32	05:56 20:54	06:09 20:51	06:37 20:20	07:05 19:33	07:35 18:45	07:09 17:09	07:38 17:01
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18	07:43 17:27	07:14 18:03	06:33 18:33	06:44 20:04	06:08 20:34	05:56 20:55	06:11 20:50	06:38 20:18	07:07 19:30	07:37 18:42	07:11 17:07	07:39 17:02
19	07:42 17:28	07:13 18:04	06:31 18:34	06:43 20:05	06:07 20:35	05:56 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 18:41	07:12 17:07	07:40 17:02
20	07:42 17:29	07:12 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:12 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:06	07:41 17:02
21	07:41 17:30	07:10 18:07	06:28 18:36	06:40 20:07	06:06 20:37	05:56 20:55	06:13 20:48	06:41 20:13	07:10 19:25	07:40 18:38	07:14 17:05	07:41 17:03
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23	07:40 17:33	07:08 18:09	06:25 18:39	06:37 20:09	06:04 20:38	05:57 20:56	06:15 20:46	06:43 20:11	07:12 19:21	07:42 18:35	07:17 17:04	07:42 17:04
24	07:39 17:34	07:06 18:10	06:23 18:40	06:36 20:10	06:03 20:39	05:57 20:56	06:15 20:46	06:44 20:09	07:13 19:20	07:43 18:34	07:18 17:04	07:43 17:04
25	07:39 17:35	07:05 18:11	06:21 18:41	06:34 20:11	06:03 20:40	05:57 20:56	06:16 20:45	06:45 20:08	07:14 19:18	06:44 17:32	07:19 17:03	07:43 17:05
26	07:38 17:36	07:03 18:12	06:20 18:42	06:33 20:12	06:02 20:41	05:58 20:56	06:17 20:44	06:46 20:06	07:15 19:17	06:45 17:31	07:20 17:03	07:44 17:06
27	07:37 17:37	07:02 18:13	06:18 18:43	06:31 20:13	06:02 20:42	05:58 20:56	06:18 20:43	06:47 20:05	07:16 19:15	06:46 17:30	07:21 17:02	07:44 17:06
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29	07:36 17:40	07:00 18:15	06:16 18:45	06:29 20:15	06:00 20:43	05:59 20:56	06:20 20:41	06:49 20:02	07:18 19:12	06:48 17:27	07:23 17:01	07:45 17:08
30	07:35 17:41	07:00 18:16	06:15 18:46	06:28 20:16	06:00 20:44	05:59 20:56	06:21 20:40	06:50 20:00	07:19 19:10	06:50 17:26	07:24 17:01	07:45 17:08
31	07:34 17:42	07:00 18:17	06:14 18:47	06:27 20:17	06:00 20:45	05:59 20:56	06:22 20:39	06:51 19:59	07:20 19:09	06:51 17:25	07:25 17:01	07:45 17:09
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
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

Project:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
Via Santa Margherita 4  
IT-09124 Cagliari  
+39 070 658297  
Giuseppe Frongia / direttore@iatprogetti.it  
Calculated:  
20/01/2023 16:13/3.4.415

### SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG15 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (43)  
Assumptions for shadow calculations

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	07:45 08:12-08:35/23 17:10	07:33 06:59 17:43 18:15	07:10 06:26 19:47 20:17	05:59 06:00 20:45 20:56	06:23 06:51 19:57 19:08	07:20 06:52 17:24 17:01	07:25 07:59-08:20/21 17:01					
2	07:45 08:12-08:35/23 17:11	07:32 06:57 17:44 18:17	07:09 06:25 19:48 20:18	05:59 06:00 20:46 20:56	06:23 06:52 19:57 19:07	07:20 06:53 17:22 17:01	08:00-08:21/21 17:01					
3	07:46 08:13-08:36/23 17:12	07:31 06:56 17:45 18:18	07:07 06:24 19:49 20:19	05:58 06:01 20:47 20:56	06:24 06:53 19:54 19:05	07:21 06:54 17:21 17:00	08:00-08:21/21 17:00					
4	07:46 08:13-08:36/23 17:13	07:30 06:54 17:47 18:19	07:05 06:23 19:50 20:20	05:58 06:01 20:48 20:56	06:25 06:54 19:52 19:04	07:22 06:55 17:20 17:00	08:00-08:22/22 17:00					
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6	07:46 08:14-08:37/23 17:14	07:28 06:51 17:49 18:21	07:02 06:20 19:52 20:22	05:57 06:02 20:49 20:55	06:27 06:56 20:33 19:49	07:24 06:57 19:00 17:18	08:00-08:23/23 17:00					
7	07:46 08:15-08:37/22 17:15	07:27 06:50 17:50 18:22	07:01 06:19 19:53 20:23	05:57 06:03 20:49 20:55	06:28 06:57 20:32 19:48	07:25 06:59 18:59 17:17	08:01-08:24/23 17:00					
8	07:45 08:16-08:38/22 17:16	07:26 06:48 17:51 18:23	06:59 06:18 19:54 20:24	05:57 06:04 20:50 20:55	06:29 06:58 20:31 19:46	07:26 07:00 18:57 17:16	08:01-08:24/23 17:00					
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18	07:43 08:25-08:35/10 17:27	07:14 06:33 18:03 18:33	06:44 06:08 20:04 20:34	05:56 06:11 20:50 20:50	06:38 07:07 20:18 19:30	07:37 07:11 18:42 17:07	08:05-08:28/23 17:02					
19	07:42 08:29-08:33/4 17:28	07:13 06:31 18:04 18:34	06:43 06:07 20:05 20:35	05:56 06:11 20:49 20:16	06:39 07:08 20:16 19:28	07:38 07:12 18:41 17:07	08:06-08:29/23 17:02					
20	07:42 17:29 17:30	07:12 06:29 18:05 18:35	06:41 06:06 20:06 20:36	05:56 06:12 20:49 20:15	06:40 07:09 20:15 19:26	07:39 07:13 18:39 17:06	08:06-08:29/23 17:02					
21	07:41 17:30 17:31	07:10 06:28 18:07 18:36	06:40 06:06 20:07 20:37	05:56 06:13 20:48 20:13	06:41 07:10 20:13 19:25	07:40 07:14 18:38 17:05	08:07-08:30/23 17:03					
22	07:41 17:31 17:32	07:09 06:26 18:08 18:37	06:38 06:05 20:08 20:37	05:57 06:14 20:47 20:12	06:42 07:11 20:12 19:23	07:41 07:16 18:37 17:05	08:07-08:30/23 17:03					
23	07:40 17:33 17:34	07:07 06:25 18:09 18:38	06:37 06:04 20:09 20:38	05:57 06:15 20:46 20:11	06:43 07:12 20:11 19:21	07:42 07:17 18:35 17:04	08:08-08:31/23 17:04					
24	07:39 17:34 17:35	07:06 06:23 18:10 18:39	06:35 06:03 20:10 20:39	05:57 06:15 20:56 20:46	06:44 07:13 20:09 19:20	07:43 07:18 18:34 17:04	08:03-08:13/10 17:04					
25	07:39 17:35 17:36	07:05 06:21 18:11 18:40	06:34 06:03 20:11 20:40	05:57 06:16 20:56 20:45	06:45 07:14 20:08 19:18	07:44 07:19 17:32 17:03	08:02-08:14/12 17:05					
26	07:38 17:36 17:37	07:03 06:20 18:12 18:41	06:33 06:02 20:12 20:41	05:58 06:17 20:56 20:44	06:46 07:15 20:06 19:16	07:45 07:20 17:31 17:03	08:01-08:16/15 17:06					
27	07:37 17:37 17:38	07:02 06:18 18:13 18:42	06:31 06:02 20:13 20:42	05:58 06:18 20:56 20:43	06:47 07:16 20:05 19:15	07:46 07:21 17:30 17:02	08:00-08:17/17 17:06					
28	07:36 17:38 17:39	07:00 06:17 18:14 18:43	06:30 06:01 20:14 20:42	05:58 06:19 20:56 20:42	06:48 07:17 20:03 19:13	07:47 07:22 17:29 17:02	08:00-08:18/18 17:07					
29	07:36 17:40 17:41	07:15 06:29 19:44 20:15	06:00 06:00 20:15 20:43	05:59 06:20 20:56 20:41	06:49 07:18 20:02 19:12	07:48 07:23 17:27 17:01	08:00-08:19/19 17:08					
30	07:35 17:41 17:42	07:13 06:28 19:45 20:16	06:00 06:00 20:16 20:44	05:59 06:21 20:56 20:40	06:50 07:19 20:00 19:10	07:49 07:24 17:26 17:01	08:00-08:19/19 17:08					
31	07:34 17:42	07:12 06:27 19:46 20:17	05:59 06:00 20:45 20:14	06:22 06:51 20:39 19:59	06:51 07:20 19:59 19:10	07:25 07:00 17:25 17:00	08:12-08:34/22 17:09					
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	359	0	0	0	0	0	0	0	0	0	113	701

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: Progetto\_layout\_2022\_10\_14WTG: WTG16 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)

### Assumptions for shadow calculations

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	07:45 15:24-16:28/64 17:10	07:33 15:31-16:50/79 17:43	06:59 08:00-08:45/45 18:15	07:10 19:48	06:26 20:18	05:59 20:45
2	07:45 15:24-16:29/65 17:11	07:32 15:31-16:50/79 17:44	06:57 08:00-08:44/44 18:17	07:09 19:49	06:25 20:18	05:59 20:46
3	07:46 15:25-16:30/65 17:12	07:31 15:32-16:50/78 17:46	06:56 08:01-08:43/42 18:18	07:07 19:50	06:24 20:19	05:58 20:47
4	07:46 15:25-16:31/66 17:13	07:30 15:33-16:50/77 17:47	06:54 08:01-08:41/40 18:19	07:05 19:51	06:23 20:20	05:58 20:48
5	07:46 15:25-16:31/66 17:14	07:29 15:33-16:50/77 17:48	06:53 08:02-08:41/39 18:20	07:04 19:52	06:21 20:21	05:57 20:48
6	07:46 15:25-16:32/67 17:14	07:28 15:34-16:50/76 17:49	06:51 08:03-08:39/36 18:21	07:02 19:53	06:20 20:22	05:57 20:49
7	07:46 15:25-16:33/68 17:15	07:27 08:20-08:28/8 17:50 15:35-16:50/75	06:50 08:04-08:36/32 18:22	07:01 19:54	06:19 20:23	05:57 20:49
8	07:46 15:26-16:34/68 17:16	07:26 08:15-08:32/17 17:51 15:35-16:49/74	06:48 08:06-08:35/29 18:23	06:59 19:55	06:18 20:24	05:57 20:50
9	07:45 15:26-16:35/69 17:17	07:25 08:12-08:35/23 17:53 15:36-16:49/73	06:47 08:07-08:32/25 18:24	06:58 19:56	06:17 20:25	05:56 20:51
10	07:45 15:25-16:35/70 17:18	07:24 08:10-08:38/28 17:54 15:37-16:49/72	06:45 08:10-08:29/19 18:25	06:56 19:57	06:16 20:26	05:56 20:51
11	07:45 15:26-16:36/70 17:19	07:23 08:09-08:40/31 17:55 15:38-16:49/71	06:44 08:14-08:24/10 18:26	06:55 19:58	06:15 20:27	05:56 20:52
12	07:45 15:26-16:37/71 17:20	07:22 08:07-08:41/34 17:56 15:40-16:49/69	06:42 18:27	06:53 19:59	06:14 20:28	05:56 20:52
13	07:45 15:26-16:37/71 17:21	07:20 08:06-08:43/37 17:57 15:41-16:48/67	06:41 18:28	06:51 20:00	06:13 20:29	05:56 20:53
14	07:44 15:26-16:38/72 17:22	07:19 08:04-08:43/39 17:59 15:42-16:47/65	06:39 18:29	06:50 20:01	06:12 20:30	05:56 20:53
15	07:44 15:27-16:39/72 17:24	07:18 08:04-08:44/40 18:00 15:44-16:46/62	06:37 18:30	06:48 20:02	06:11 20:31	05:56 20:54
16	07:44 15:26-16:40/74 17:25	07:17 08:03-08:45/42 18:01 15:45-16:46/61	06:36 18:31	06:47 20:03	06:10 20:32	05:56 20:54
17	07:43 15:27-16:41/74 17:26	07:16 08:02-08:45/43 18:02 15:46-16:44/58	06:34 18:32	06:45 20:04	06:09 20:33	05:56 20:54
18	07:43 15:26-16:41/75 17:27	07:14 08:01-08:46/45 18:03 15:47-16:43/56	06:33 18:33	06:44 20:05	06:08 20:34	05:56 20:55
19	07:42 15:27-16:43/76 17:28	07:13 08:01-08:47/46 18:04 15:49-16:42/53	06:31 18:34	06:43 20:06	06:07 20:35	05:56 20:55
20	07:42 15:27-16:43/76 17:29	07:12 08:00-08:47/47 18:05 15:50-16:40/50	06:29 18:35	06:41 20:07	06:06 20:36	05:56 20:55
21	07:41 15:27-16:43/76 17:30	07:10 08:00-08:47/47 18:07 15:52-16:38/46	06:28 18:36	06:40 20:08	06:06 20:37	05:56 20:55
22	07:41 15:28-16:45/77 17:31	07:09 08:00-08:48/48 18:08 15:55-16:37/42	06:26 18:37	06:38 20:09	06:05 20:37	05:57 20:56
23	07:40 15:27-16:45/78 17:33	07:08 07:59-08:47/48 18:09 15:57-16:33/36	06:25 18:39	06:37 20:10	06:04 20:38	05:57 20:56
24	07:39 15:27-16:46/79 17:34	07:06 07:59-08:47/48 18:10 16:00-16:30/30	06:23 18:40	06:36 20:11	06:03 20:39	05:57 20:56
25	07:39 15:28-16:47/79 17:35	07:05 07:59-08:46/47 18:11 16:03-16:24/21	06:21 18:41	06:34 20:12	06:03 20:40	05:57 20:56
26	07:38 15:28-16:47/79 17:36	07:03 07:59-08:46/47 18:12	06:20 18:42	06:33 20:13	06:02 20:41	05:58 20:56
27	07:37 15:28-16:48/80 17:37	07:02 08:00-08:46/46 18:13	06:18 18:43	06:31 20:14	06:02 20:42	05:58 20:56
28	07:37 15:29-16:48/79 17:38	07:00 07:59-08:45/46 18:14	06:17 18:44	06:30 20:15	06:01 20:42	05:58 20:56
29	07:36 15:29-16:48/79 17:40			07:15 19:45	06:00 20:43	05:59 20:56
30	07:35 15:30-16:49/79 17:41			07:13 19:46	06:00 20:44	05:59 20:56
31	07:34 15:30-16:50/80 17:42			07:12 19:47	05:59 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	2264	2404	361	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: Progetto\_layout\_2022\_10\_14WTG: WTG16 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)

### Assumptions for shadow calculations

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	06:00 20:56	06:23 20:38	06:51 19:57	07:20 19:08	06:52 07:40-08:07/27 17:24 15:07-16:19/72	07:25 15:08-16:18/70 17:01
2	06:00 20:56	06:23 20:37	06:52 19:55	07:21 19:07	06:53 07:42-08:05/23 17:23 15:06-16:19/73	07:26 15:08-16:18/70 17:01
3	06:01 20:56	06:24 20:36	06:53 19:54	07:22 08:49-09:05/16 19:05	06:54 07:45-08:01/16 17:21 15:05-16:19/74	07:27 15:09-16:18/69 17:00
4	06:01 20:56	06:25 20:35	06:54 19:52	07:22 08:46-09:08/22 19:04	06:55 07:50-07:56/6 17:20 15:04-16:19/75	07:28 15:10-16:18/68 17:00
5	06:02 20:56	06:26 20:34	06:55 19:51	07:23 08:43-09:11/28 19:02	06:56 15:04-16:20/76 17:19	07:29 15:11-16:18/67 17:00
6	06:02 20:55	06:27 20:33	06:56 19:49	07:24 08:41-09:12/31 19:00	06:57 15:03-16:20/77 17:18	07:30 15:11-16:18/67 17:00
7	06:03 20:55	06:28 20:32	06:57 19:48	07:25 08:39-09:14/35 18:59	06:59 15:02-16:20/78 17:17	07:31 15:12-16:18/66 17:00
8	06:04 20:55	06:29 20:31	06:58 19:46	07:26 08:38-09:15/37 18:57	07:00 15:02-16:20/78 17:16	07:32 15:13-16:19/66 17:00
9	06:04 20:54	06:30 20:29	06:59 19:44	07:27 08:36-09:16/40 18:56	07:01 15:02-16:21/79 17:15	07:33 15:14-16:19/65 17:00
10	06:05 20:54	06:31 20:28	07:00 19:43	07:28 08:35-09:16/41 18:54	07:02 15:02-16:21/79 17:14	07:34 15:14-16:19/65 17:00
11	06:05 20:54	06:32 20:27	07:01 19:41	07:29 08:34-09:17/43 18:53	07:03 15:01-16:20/79 17:13	07:34 15:14-16:18/64 17:00
12	06:06 20:53	06:33 20:26	07:02 19:39	07:30 08:33-09:17/44 18:51	07:04 15:01-16:20/79 17:12	07:35 15:15-16:19/64 17:00
13	06:07 20:53	06:34 20:24	07:03 19:38	07:31 08:32-09:18/46 18:50	07:05 15:01-16:20/79 17:11	07:36 15:16-16:19/63 17:00
14	06:08 20:52	06:35 20:23	07:04 19:36	07:32 08:32-09:18/46 18:48	07:07 15:02-16:21/79 17:10	07:37 15:17-16:20/63 17:01
15	06:08 20:52	06:36 20:22	07:04 19:35	07:34 08:31-09:18/47 18:47	07:08 15:01-16:20/79 17:10	07:37 15:17-16:19/62 17:01
16	06:09 20:51	06:36 20:20	07:05 19:33	07:35 08:32-09:19/47 18:45 16:39-16:50/11	07:09 15:01-16:20/79 17:09	07:38 15:18-16:20/62 17:01
17	06:10 20:51	06:37 20:19	07:06 19:31	07:36 08:31-09:19/48 18:44 16:34-16:59/25	07:10 15:01-16:20/79 17:08	07:39 15:19-16:20/61 17:01
18	06:11 20:50	06:38 20:18	07:07 19:30	07:37 08:31-09:19/48 18:42 16:30-17:03/33	07:11 15:01-16:20/79 17:07	07:39 15:19-16:20/61 17:02
19	06:11 20:49	06:39 20:16	07:08 19:28	07:38 08:31-09:19/48 18:41 16:27-17:06/39	07:12 15:02-16:20/78 17:07	07:40 15:20-16:21/61 17:02
20	06:12 20:49	06:40 20:15	07:09 19:26	07:39 08:31-09:18/47 18:39 16:25-17:08/43	07:13 15:03-16:20/77 17:06	07:41 15:20-16:21/61 17:02
21	06:13 20:48	06:41 20:13	07:10 19:25	07:40 08:30-09:18/48 18:38 16:22-17:10/48	07:14 15:03-16:19/76 17:05	07:41 15:21-16:22/61 17:03
22	06:14 20:47	06:42 20:12	07:11 19:23	07:41 08:31-09:17/46 18:37 16:20-17:11/51	07:16 15:03-16:19/76 17:05	07:42 15:21-16:22/61 17:03
23	06:15 20:46	06:43 20:11	07:12 19:21	07:42 08:31-09:16/45 18:35 16:18-17:12/54	07:17 15:03-16:19/76 17:04	07:42 15:22-16:23/61 17:04
24	06:15 20:46	06:44 20:09	07:13 19:20	07:43 08:31-09:16/45 18:34 16:17-17:13/56	07:18 15:03-16:18/75 17:04	07:43 15:22-16:23/61 17:04
25	06:16 20:45	06:45 20:08	07:14 19:18	06:44 07:32-08:16/44 17:32 15:16-16:15/59	07:19 15:05-16:19/74 17:03	07:43 15:23-16:24/61 17:05
26	06:17 20:44	06:46 20:06	07:15 19:17	06:45 07:33-08:15/42 17:31 15:15-16:15/60	07:20 15:05-16:19/74 17:03	07:44 15:23-16:24/61 17:06
27	06:18 20:43	06:47 20:05	07:16 19:15	06:46 07:34-08:14/40 17:30 15:13-16:16/63	07:21 15:06-16:18/72 17:02	07:44 15:23-16:24/61 17:06
28	06:19 20:42	06:48 20:03	07:17 19:13	06:47 07:34-08:13/39 17:29 15:11-16:17/66	07:22 15:06-16:18/72 17:02	07:44 15:23-16:25/62 17:07
29	06:20 20:41	06:49 20:02	07:18 19:12	06:48 07:35-08:11/36 17:27 15:10-16:17/67	07:23 15:07-16:18/71 17:01	07:45 15:24-16:26/62 17:08
30	06:21 20:40	06:50 20:00	07:19 19:10	06:50 07:36-08:10/34 17:26 15:08-16:17/69	07:24 15:07-16:18/71 17:01	07:45 15:24-16:27/63 17:08
31	06:22 20:39	06:51 19:59		06:51 07:39-08:09/30 17:25 15:08-16:19/71		07:45 15:24-16:27/63 17:09
Potential sun hours	455	425	374	347	301	292
Sum of minutes with flicker	0	0	0	1978	2357	1972

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:

Progetto\_GRV\_Gergei

Licensed user:

I.A.T. Consulenza e progetti S.r.l.  
Via Santa Margherita 4  
IT-09124 Cagliari  
+39 070 658297  
Giuseppe Frongia / direttore@iatprogetti.it  
Calculated:  
20/01/2023 16:13/3.4.415

### SHADOW - Calendar per WTG

Calculation: Progetto\_layout\_2022\_10\_14WTG: WTG17 - Siemens Gamesa SG 6.6-170!! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)  
Assumptions for shadow calculations

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	07:45 16:01-16:36/35	07:33 06:59	07:10 06:26	05:59 06:00	06:23 06:52	07:20 06:52	07:25 15:51-16:20/29					
2	07:45 16:01-16:36/35	07:32 06:58	07:09 06:25	05:59 06:00	06:23 06:52	07:21 06:53	17:01					
3	07:46 16:02-16:36/34	07:31 06:56	07:07 06:24	05:58 06:01	06:24 06:53	07:22 06:54	07:27 15:51-16:22/31					
4	07:46 16:03-16:37/34	07:30 06:55	07:05 06:23	05:58 06:01	06:25 06:54	07:23 06:55	07:28 15:50-16:22/32					
5	07:46 16:04-16:37/33	07:29 06:53	07:04 06:21	05:57 06:02	06:26 06:55	07:23 06:56	07:29 15:50-16:23/33					
6	07:46 16:04-16:38/34	07:28 06:51	07:02 06:20	05:57 06:02	06:27 06:56	07:24 06:57	07:30 15:50-16:24/34					
7	07:46 16:05-16:38/33	07:27 06:50	07:01 06:19	05:57 06:03	06:28 06:57	07:25 06:59	07:31 15:51-16:24/33					
8	07:46 16:06-16:38/32	07:26 06:48	06:59 06:18	05:57 06:04	06:29 06:58	07:26 07:00	07:32 15:51-16:25/34					
9	07:45 16:07-16:39/32	07:25 06:47	06:58 06:17	05:56 06:04	06:30 06:59	07:27 07:01	07:33 15:51-16:26/35					
10	07:45 16:08-16:38/30	07:24 06:45	06:56 06:16	05:56 06:05	06:31 07:00	07:28 07:02	07:34 15:51-16:26/35					
11	07:45 16:09-16:38/29	07:23 06:44	06:55 06:15	05:56 06:06	06:32 07:01	07:29 07:03	07:34 15:51-16:26/35					
12	07:45 16:11-16:39/28	07:22 06:42	06:53 06:14	05:56 06:06	06:33 07:02	07:30 07:04	07:35 15:51-16:27/36					
13	07:45 16:11-16:38/27	07:21 06:41	06:51 06:13	05:56 06:07	06:34 07:03	07:31 07:05	07:36 15:52-16:27/35					
14	07:44 16:12-16:38/26	07:19 06:39	06:50 06:12	05:56 06:08	06:35 07:04	07:33 07:07	07:37 15:53-16:28/35					
15	07:44 16:14-16:38/24	07:18 06:37	06:48 06:11	05:56 06:08	06:36 07:05	07:34 07:08	07:37 15:52-16:28/36					
16	07:44 16:15-16:37/22	07:17 06:36	06:47 06:10	05:56 06:09	06:37 07:05	07:35 07:09	07:38 15:53-16:29/36					
17	07:43 16:17-16:37/20	07:16 06:34	06:46 06:09	05:56 06:10	06:37 07:06	07:36 07:10	07:39 15:54-16:29/35					
18	07:43 16:18-16:36/18	07:14 06:33	06:44 06:08	05:56 06:11	06:38 07:07	07:37 07:11	07:39 15:53-16:29/36					
19	07:42 16:21-16:35/14	07:13 06:31	06:43 06:07	05:56 06:11	06:39 07:08	07:38 07:12	07:40 15:54-16:30/36					
20	07:42 16:24-16:33/9	07:12 06:29	06:41 06:07	05:56 06:12	06:40 07:09	07:39 07:13	07:41 15:54-16:30/36					
21	07:41 17:30	07:10 06:28	06:40 06:06	05:57 06:13	06:41 07:10	07:40 07:14	07:41 15:55-16:31/36					
22	07:41 17:31	07:09 06:26	06:38 06:05	05:57 06:14	06:42 07:11	07:41 07:16	07:42 15:55-16:31/36					
23	07:40 17:33	07:08 06:25	06:37 06:04	05:57 06:15	06:43 07:12	07:42 07:17	07:42 15:56-16:32/36					
24	07:39 17:34	07:06 06:23	06:36 06:04	05:57 06:16	06:44 07:13	07:43 07:18	07:43 15:56-16:32/36					
25	07:39 17:35	07:05 06:21	06:34 06:03	05:57 06:16	06:45 07:14	07:44 07:19	07:43 15:57-16:33/36					
26	07:38 17:36	07:03 06:20	06:33 06:02	05:58 06:17	06:46 07:15	07:45 07:20	07:44 15:58-16:33/35					
27	07:37 17:37	07:02 06:18	06:31 06:02	05:58 06:18	06:47 07:16	07:46 07:21	07:44 15:58-16:33/35					
28	07:37 17:38	07:00 06:17	06:30 06:01	05:59 06:19	06:48 07:17	07:47 07:22	07:44 15:58-16:34/36					
29	07:36 17:40	07:00 06:17	06:30 06:01	05:59 06:20	06:49 07:18	07:49 07:23	07:45 15:59-16:35/36					
30	07:35 17:41	07:00 06:17	06:30 06:01	05:59 06:21	06:50 07:19	07:50 07:24	07:45 16:00-16:35/35					
31	07:34 17:42	07:00 06:17	06:30 06:01	05:59 06:22	06:51 07:20	07:51 07:25	07:45 16:00-16:35/35					
Potential sun hours	301	299	370	397	445	448	455	425	374	347	301	292
Sum of minutes with flicker	549	0	0	0	0	0	0	0	0	0	188	1074

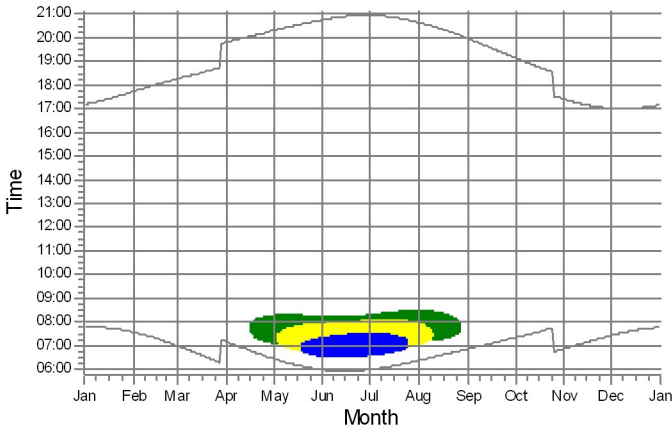
Table layout: For each day in each month the following matrix apply

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

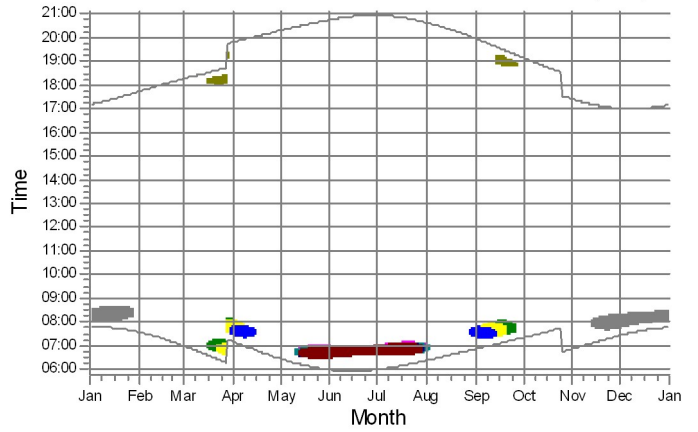
## SHADOW - Calendar per WTG, graphical

Calculation: Progetto\_layout\_2022\_10\_14

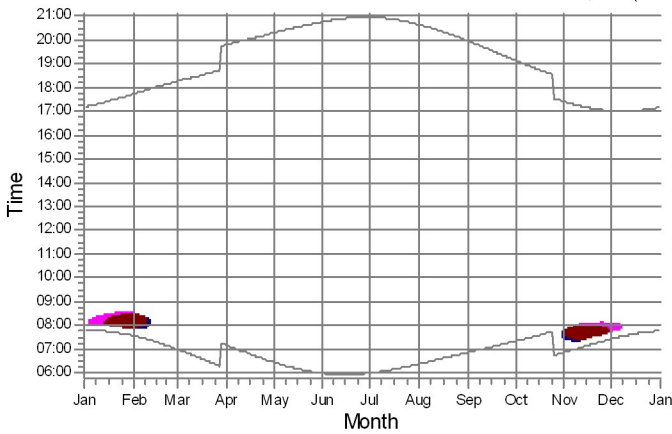
WTG01: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



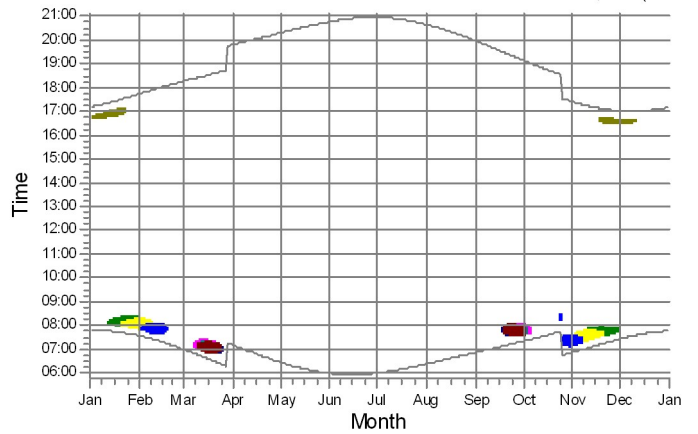
WTG02: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



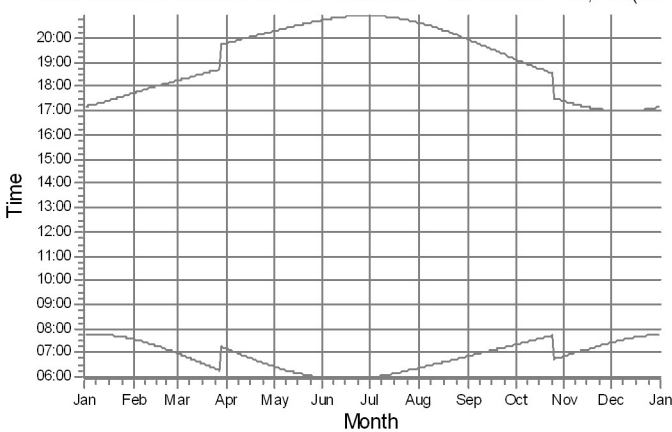
WTG03: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



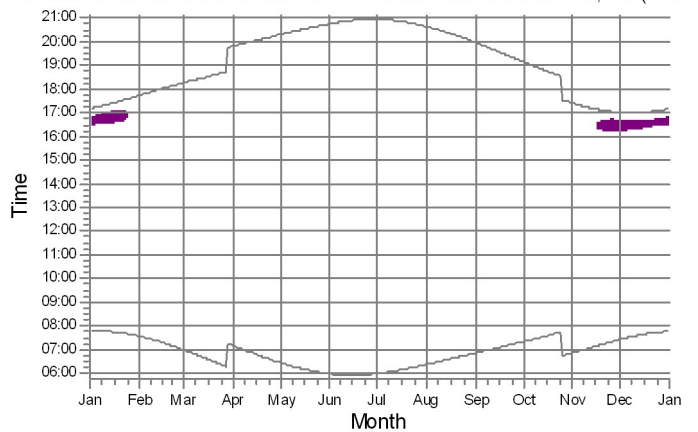
WTG04: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG05: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG06: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



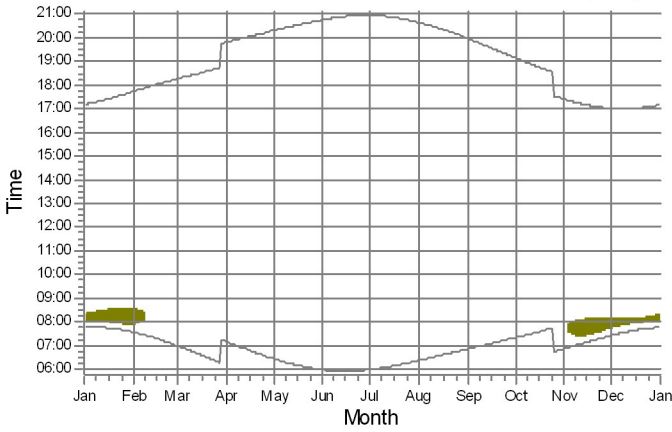
### Shadow receptors

 F024: A	 F042: A	 F064: A	 F086: A	 F098: D
 F027: A	 F063: A	 F083: A	 F088: A	 F106: A

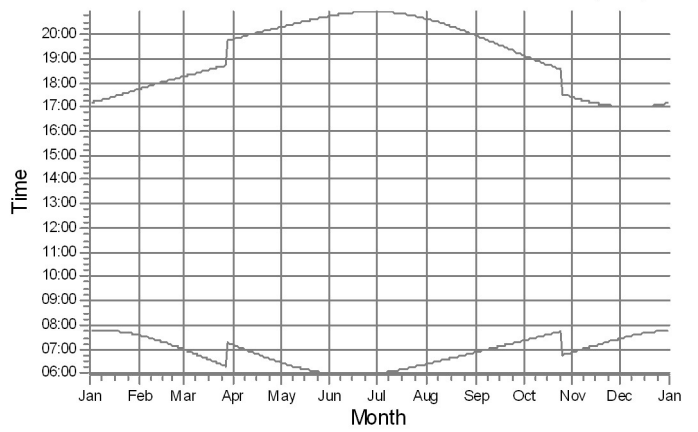
## SHADOW - Calendar per WTG, graphical

Calculation: Progetto\_layout\_2022\_10\_14

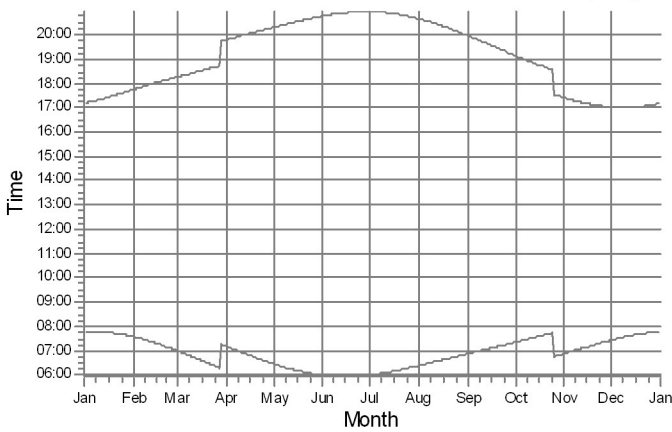
WTG07: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



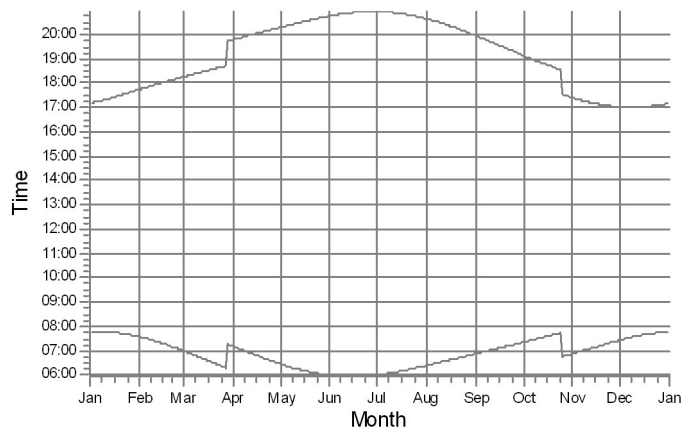
WTG08: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



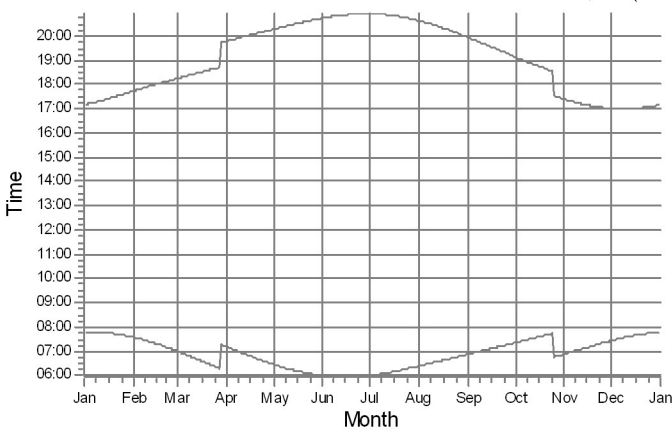
WTG09: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



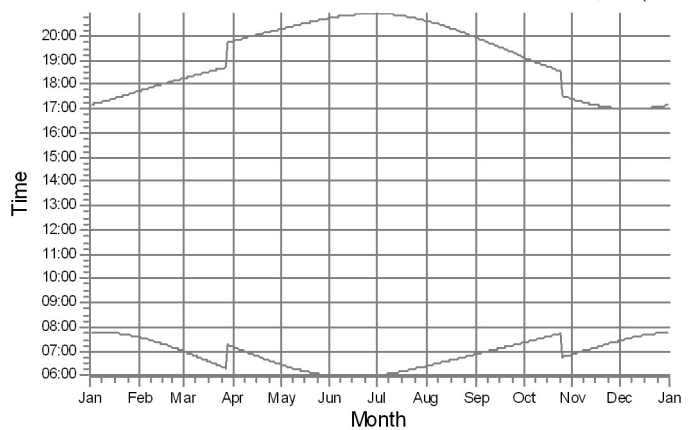
WTG10: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG11: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG12: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



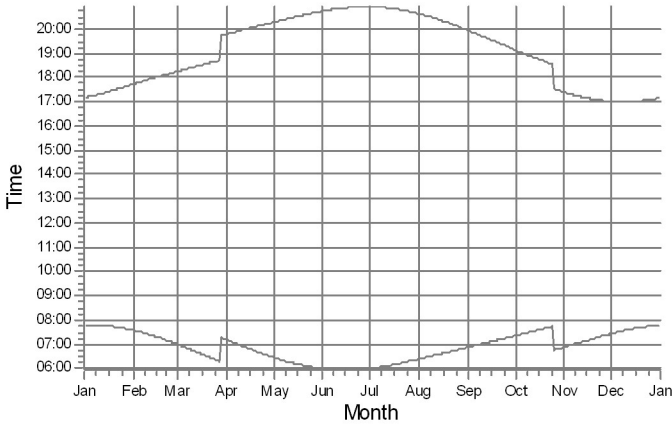
Shadow receptors

 F098: D

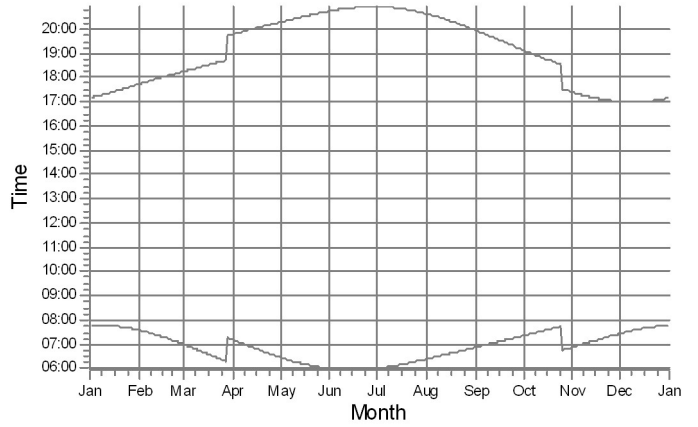
## SHADOW - Calendar per WTG, graphical

Calculation: Progetto\_layout\_2022\_10\_14

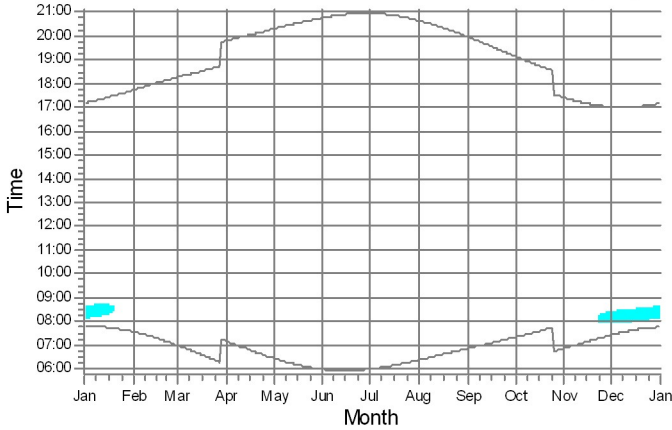
WTG13: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



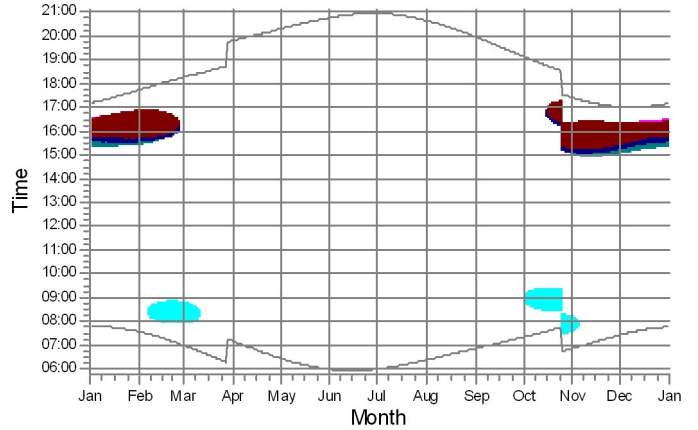
WTG14: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



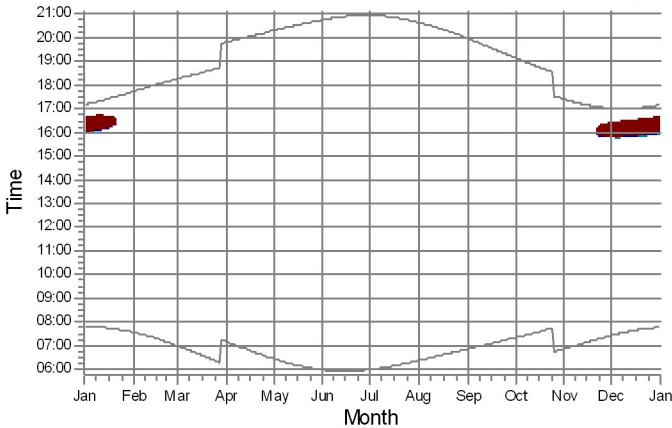
WTG15: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG16: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



WTG17: Siemens Gamesa SG 6.6-170!!6600 170.0 !O! hub: 115,0 m (TOT:



Shadow receptors

