REGIONE SARDEGNA

PROVINCIA DEL SUD SARDEGNA

IMPIANTO EOLICO NEL COMUNE DI VILLAMASSARGIA

POTENZA MASSIMA DI IMMISSIONE DI 59,15 MW

COMPRENSIVA DI SISTEMA DI ACCUMULO INTEGRATO DA 15,75 MW

ORDINE INGEGNERI PROVINCIA CAGLIARI
N. 3453 Dott. Ing. Giuseppe Frongia

OGGETTO ***STUDIO DI IMPATTO AMBIENTALE***	***TITOLO*** ***ANALISI DEGLI EFFETTI DI SHADOW-FLICKERING***

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1 CRITERI GENERALI DI ANALISI E VALUTAZIONE

La Società Sorgenia Renewables S.r.l. ha in programma la realizzazione di un impianto eolico composto da n. 7 aerogeneratori nel comune di Villamassargia (SU) con annesso impianto di accumulo energetico (BESS).

Gli aerogeneratori in progetto avranno diametro del rotore fino a 170 m, una torre di altezza fino a 125 m e una potenza unitaria fino a 6,2 MW ciascuno per una potenza nominale complessiva di 43,4 MW ed una potenza in immissione di 59,15 MW, comprensiva di sistema di accumulo integrato da 15,75 MW.

Il presente elaborato, facente parte integrante dello Studio di impatto ambientale, esamina compiutamente il potenziale disturbo da ombreggiamento intermittente (*shadow flickering*) sui potenziali ricettori individuati nell'area interessata dal proposto impianto eolico, 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 (SR-VI-RA11_ Report dei 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 del fenomeno;

- 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 efficace 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 SR-VI-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 SR-VI-RA11 allegato alla documentazione progettuale.

Nel caso specifico, ai fini dei calcoli di esposizione all'ombra intermittente, sono stati individuati come ricettori n. 9 fabbricati, riferibili a strutture agrituristiche o a edifici aventi caratteristiche tipologiche assimilabili ad abitazioni, ubicati entro una distanza di 1000 m dalle postazioni eoliche.

Entro tali distanze è, infatti, ragionevole che si manifestino i più avertiti effetti di disturbo in rapporto al fattore di impatto in esame. La Tabella 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 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 / TIPOLOGIA
F013	Villamassargia	1472859	4345683	785	VI07	ente urbano
F014	Villamassargia	1472848	4345663	767	VI07	(agriturismo)
F015	Villamassargia	1472870	4345656	757	VI07	ente urbano
F016	Villamassargia	1472855	4345627	730	VI07	(agriturismo)
F017	Villamassargia	1472870	4345639	740	VI07	ente urbano
F027	Villamassargia	1472029	4344297	531	VI06	(agriturismo)
F030	Villamassargia	1471551	4344408	890	VI06	ente urbano
F111	Villamassargia	1467498	4344853	626	VI03	ente urbano
F112	Villamassargia	1467540	4345044	794	VI03	(agriturismo)

4 IPOTESI ALLA BASE DEL CALCOLO E SOGLIE DI RIFERIMENTO

4.1 Introduzione

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 la simulazione contempla l'effetto dell'orografia sulla propagazione dell'ombra, 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 ostacolino 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.

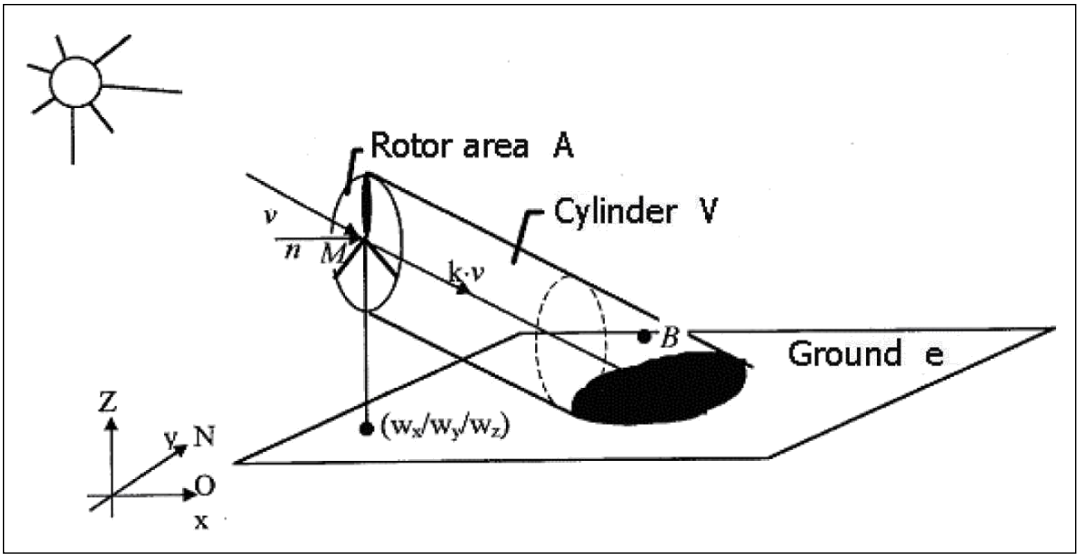


Figura 4.1: Rappresentazione schematica della proiezione dell'ombra del rotore.

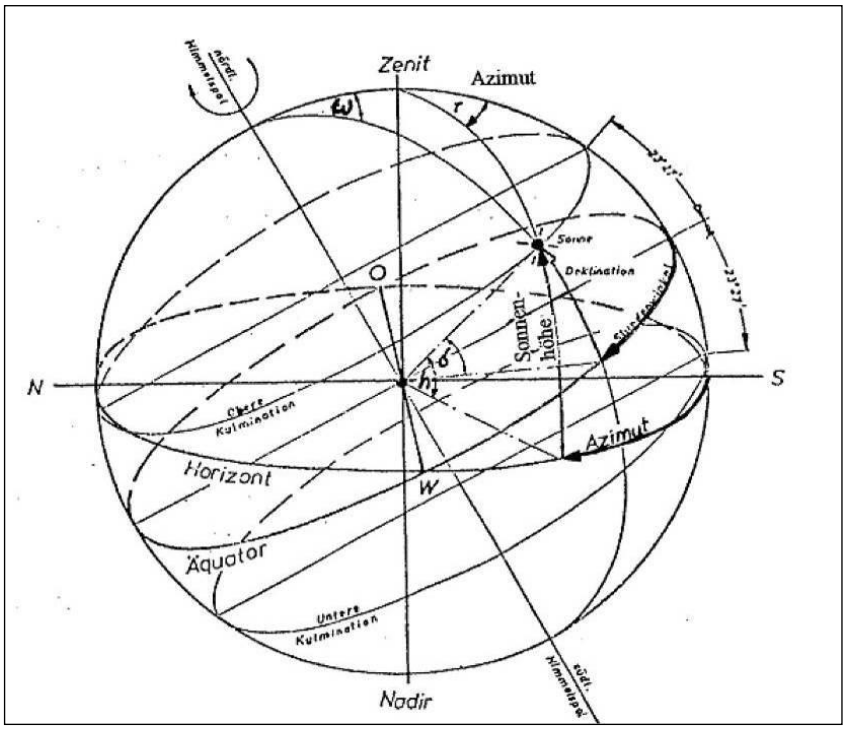


Figura 4.2: Schema dei moti terrestri e parametri di calcolo.

4.2 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.

4.3 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 (125 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 SR-VI-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 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 2.

Tabella 2 - Risultati dei calcoli di ombreggiamento intermittente presso i ricettori considerati

ID	RICETTORE	Cat. Catastale / tipologia	WTG SF	WTG Più prossimo	Dist. Min. WTG	h/anno SF Worst Case	h/giorno SF Worst Case	h/anno SF Real Case
1	F013	ente urbano (agriturismo)	VI07	VI07	785	38:04	0:47	**8:40**
2	F014	ente urbano (agriturismo)	VI07	VI07	767	44:24	0:50	**10:11**
3	F015	ente urbano (agriturismo)	VI07	VI07	757	45:15	0:50	**10:20**
4	F016	ente urbano	VI07	VI07	730	52:29	0:53	**12:05**
5	F017	ente urbano (agriturismo)	VI07	VI07	740	49:12	0:52	**11:16**
6	F027	sem-pascolo-pasc-arb	VI05	VI06	531	11:02	0:25	**4:06**
7	F030	ente urbano	VI05, VI06, VI07	VI06	890	84:04	0:46	**32:46**
8	F111	ente urbano	VI01, VI02, VI03	VI03	626	143:22	2:05	**34:35**
9	F112	ente urbano	VI01, VI03	VI03	794	26:17	0:50	**6:02**

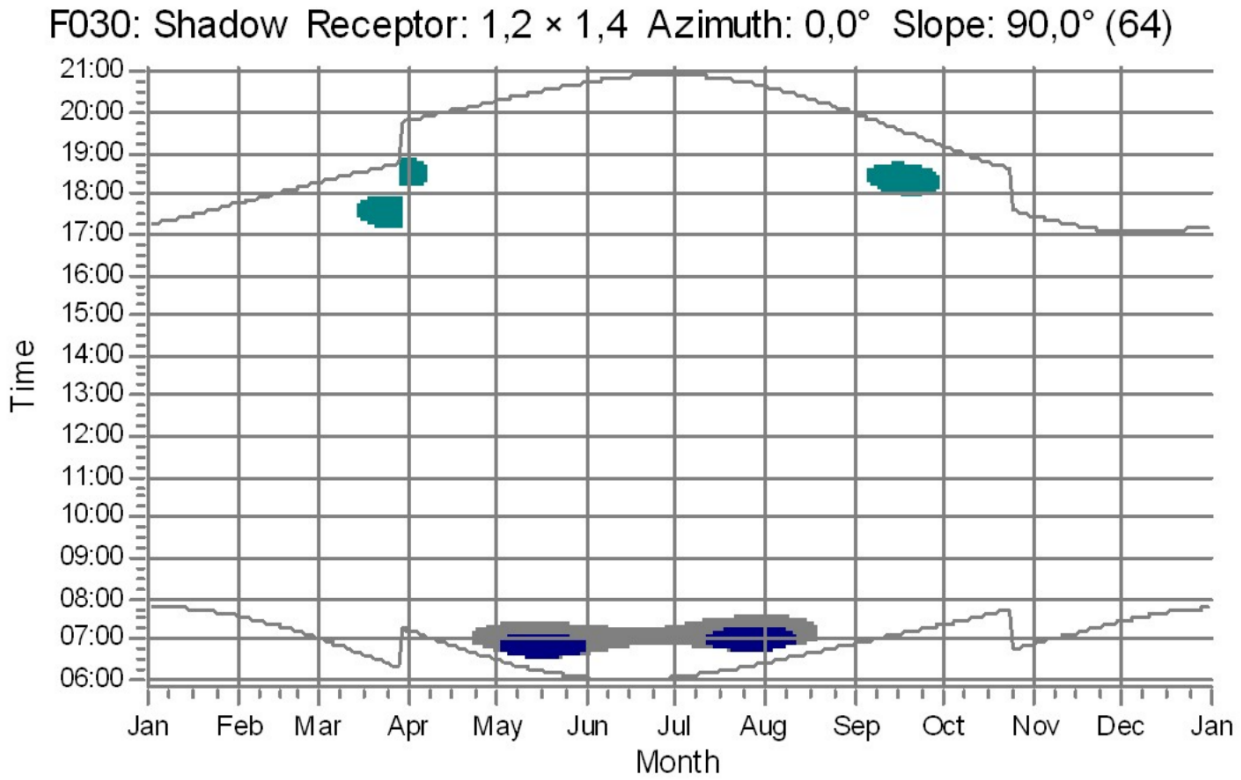
Come si può osservare dall'esame della Tabella 6.1, l'incidenza dell'ombreggiamento intermittente presso i ricettori considerati nello "**scenario reale**" è prevalentemente al disotto del valore guida di 30 h/anno (fabbricati F013, F014, F015, F016, F017, F027, F112) o appena superiore (F030, F111).

In riferimento ai fabbricati potenzialmente più esposti al potenziale ombreggiamento (F030 e F11), si riportano di seguito i calendari dell'ombra ai fini di una appropriata lettura del fenomeno (Figura 6.1 e Figura 6.2).

L'esame del calendario dell'ombra relativo al ricettore F030 (Figura 6.1) mostra come l'ombreggiamento si potrebbe manifestare prevalentemente nelle prime ore del mattino durante la stagione estiva e primaverile, ossia durante il periodo in cui le situazioni di calma di vento agli orari indicati sono estremamente più ricorrenti. È dunque piuttosto probabile che in quella fascia oraria gli aerogeneratori non siano ancora entrati in funzione e, pertanto, non si origini alcun effetto di *shadow-flickering*.

In riferimento al ricettore F111 (Figura 6.2) si nota come il potenziale ombreggiamento si verificherà durante la stagione invernale e sarà limitato a fasce orarie piuttosto ristrette. Peraltro, come si evince dall'esame della Figura 6.4, in prossimità del prospetto sud del fabbricato F111 sono presenti delle alberature in grado di esercitare un'efficace azione schermante rispetto al potenziale ombreggiamento esercitato dagli aerogeneratori VI0, VI02 e VI03, posizionati a sud-sudovest rispetto all'edificio (Figura 6.3).

In ragione di quanto precede, avuto riguardo della conservatività delle stime[1], del limitatissimo superamento della soglia guida e della saltuaria presenza di persone nei locali, è ragionevole affermare che l'effettivo potenziale disturbo da *shadow flickering* risulterà estremamente più contenuto di quello prospettato dal software di simulazione, tale da potersi ricondurre ai predetti "valori guida" e da non arrecare apprezzabili disturbi agli occupanti gli edifici più esposti.



[1] Si ricorda che la soglia di 30 h/anno fa riferimento alle ore di disturbo effettivo, il che presuppone che gli occupanti l'edificio siano effettivamente presenti nei locali interessati dal fenomeno e la circostanza che gli stessi siano svegli.

Figura 6.1 – Calendario dell'ombra relativo al ricettore F030

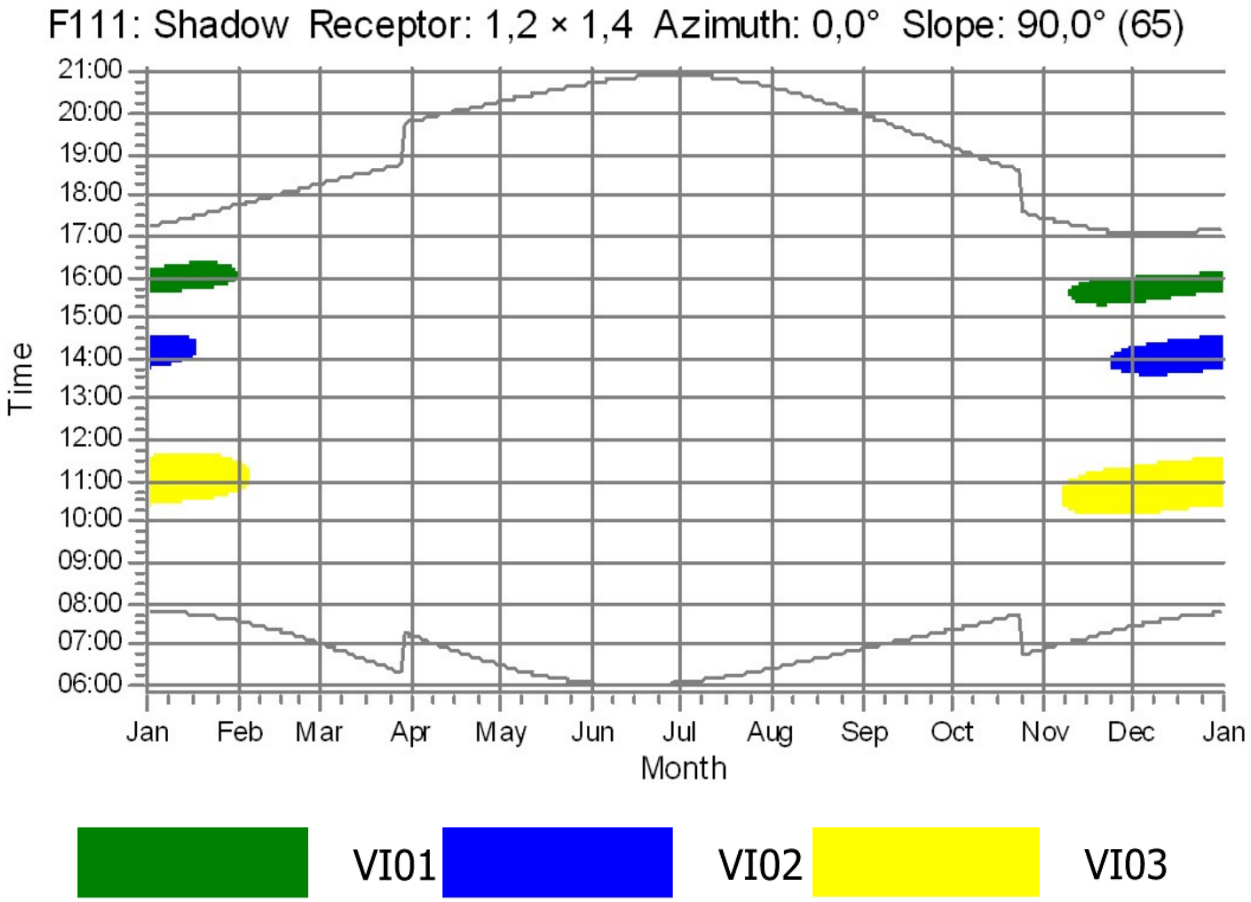


Figura 6.2 – Calendario dell'ombra relativo al ricettore F111

Figura 6.3 – Posizionamento del ricettore F111 rispetto agli aerogeneratori VI01-02-03, all'origine del potenziale fenomeno di ombreggiamento intermittente sul fabbricato

Figura 6.4 - Cortina arborea posizionata a ovest e a sud del ricettore F111. La barriera verde potrà esercitare un efficace effetto schermante sul potenziale ombreggiamento intermittente riferibile agli aerogeneratori VI01, VI02 e VI03 posizionato a est-nordest

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 al progetto.

Ai fini dei calcoli di esposizione all'ombra intermittente - avuto riguardo dei criteri enunciati dalla DGR 59/90 del 2020 - sono stati individuati come ricettori n. 9 fabbricati, ubicati entro una distanza di 1000 m dalle postazioni eoliche in progetto.

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.

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 Eliofania, 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 prevalentemente al disotto del valore guida di 30 h/anno (fabbricati F013, F014, F015, F016, F017, F027, F112) o appena superiore (~33 h/anno in F030 e ~35 h/anno in F111).

Considerata la conservatività delle stime in rapporto all'effettivo manifestarsi di un disturbo per gli occupanti gli edifici (effettivo funzionamento delle turbine negli orari prospettati dalla simulazione, aleatorietà circa la presenza di persone nei locali, 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", tale da potersi ricondurre ai predetti "valori guida" e da non arrecare apprezzabili disagi agli occupanti i fabbricati più esposti.

APPENDICE: REPORT DEI RISULTATI DEL CALCOLO MODELLISTICO

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Main Result

Calculation: Real_case_Progetto_2023_03_31

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

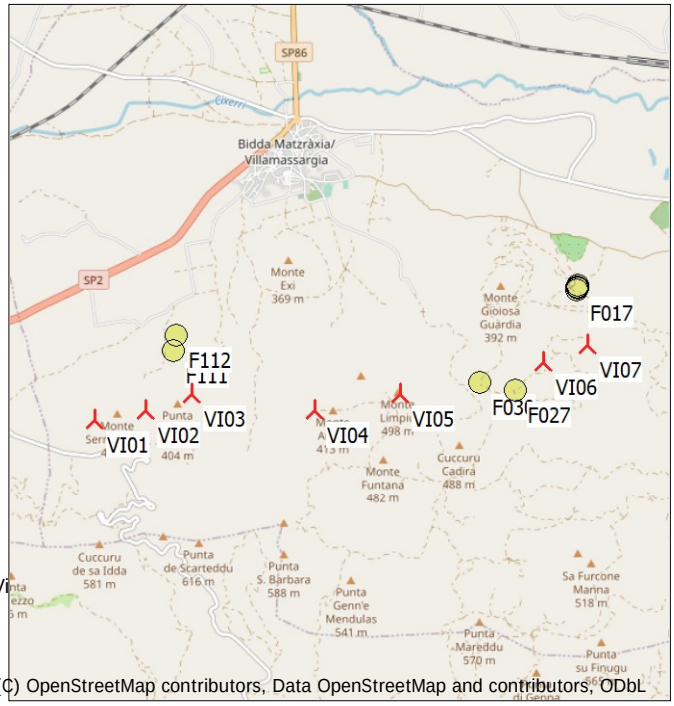
Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
227	250	261	300	427	403	363	323	320	335	398	489

W	WNW	NW	NNW	Sum
612	1.174	1.190	594	7.666

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_Sorgenia_VI
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)



Scale 1:100.000

New WTG Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
VI01	1.466.456	4.343.947	391,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI02	1.467.131	4.344.057	410,8	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI03	1.467.733	4.344.274	361,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI04	1.469.361	4.344.044	392,3	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI05	1.470.505	4.344.271	490,0	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI06	1.472.400	4.344.676	365,2	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8
VI07	1.472.978	4.344.907	402,5	Siemens Gamesa SG ...	Yes	Siemens Gamesa	SG 6.2-170-6.200	6.200	170,0	125,0	2.040	8,8

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
F013	Agritur	1.472.859	4.345.683	158,5	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F014	Agritur	1.472.848	4.345.663	160,3	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F015	Agritur	1.472.870	4.345.656	162,2	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F016		1.472.855	4.345.627	168,5	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F017	Agritur	1.472.870	4.345.639	166,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F027		1.472.029	4.344.297	370,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F030		1.471.551	4.344.408	375,2	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F111		1.467.498	4.344.853	195,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F112		1.467.540	4.345.044	177,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
F013	Agritur	8:40
F014	Agritur	10:11

To be continued on next page...

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Calculated:
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SHADOW - Main Result

Calculation: Real_case_Progetto_2023_03_31

...continued from previous page

Shadow, expected values

No.	Name	Shadow hours per year [h/year]
F015	Agritur	10:20
F016		12:05
F017	Agritur	11:16
F027		4:06
F030		32:46
F111		34:35
F112		6:02

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

No.	Name	Worst case [h/year]	Expected [h/year]
VI01	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (47)	42:16	10:00
VI02	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (49)	31:00	6:29
VI03	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (48)	81:27	20:30
VI04	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (51)	0:00	0:00
VI05	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (52)	32:40	11:51
VI06	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (50)	62:14	24:56
VI07	Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (53)	76:14	20:44

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.

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SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F013 - Agritur

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:45		11:29 (VI07)	07:34	07:00	07:12	06:28	06:02	06:02	06:25	06:53	07:21	06:53			07:25		11:19 (VI07)
	17:13	45	12:14 (VI07)	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:03	37	11:56 (VI07)
2	07:46		11:29 (VI07)	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54			07:26		11:19 (VI07)
	17:14	45	12:14 (VI07)	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25			17:03	38	11:57 (VI07)
3	07:46		11:30 (VI07)	07:32	06:57	07:09	06:26	06:01	06:03	06:27	06:55	07:23	06:55			07:27		11:18 (VI07)
	17:14	45	12:15 (VI07)	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	40	11:58 (VI07)
4	07:46		11:31 (VI07)	07:31	06:56	07:07	06:25	06:00	06:04	06:28	06:56	07:24	06:56			07:28		11:18 (VI07)
	17:15	44	12:15 (VI07)	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22			17:03	41	11:59 (VI07)
5	07:46		11:32 (VI07)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:29		11:18 (VI07)
	17:16	43	12:15 (VI07)	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21			17:03	42	12:00 (VI07)
6	07:46		11:32 (VI07)	07:29	06:53	07:04	06:23	06:00	06:05	06:29	06:58	07:26	06:58			07:30		11:18 (VI07)
	17:17	43	12:15 (VI07)	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20			17:03	43	12:01 (VI07)
7	07:46		11:33 (VI07)	07:28	06:51	07:02	06:21	06:00	06:06	06:30	06:59	07:27	06:59			07:31		11:19 (VI07)
	17:18	42	12:15 (VI07)	17:52	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:00	17:19			17:03	43	12:02 (VI07)
8	07:46		11:34 (VI07)	07:27	06:50	07:01	06:20	05:59	06:06	06:31	07:00	07:28	07:00			07:32		11:19 (VI07)
	17:19	41	12:15 (VI07)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	44	12:03 (VI07)
9	07:46		11:35 (VI07)	07:26	06:48	06:59	06:19	05:59	06:07	06:32	07:01	07:29	07:01			07:33		11:19 (VI07)
	17:20	40	12:15 (VI07)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17			17:03	45	12:04 (VI07)
10	07:46		11:35 (VI07)	07:25	06:47	06:58	06:18	05:59	06:07	06:33	07:02	07:30	07:03			07:34		11:20 (VI07)
	17:21	39	12:14 (VI07)	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16			17:03	44	12:04 (VI07)
11	07:45		11:37 (VI07)	07:24	06:45	06:56	06:17	05:59	06:08	06:34	07:02	07:31	07:04			07:35		11:19 (VI07)
	17:22	37	12:14 (VI07)	17:57	18:28	19:58	20:28	20:52	20:54	20:28	19:42	18:54	17:15			17:03	45	12:04 (VI07)
12	07:45		11:38 (VI07)	07:22	06:43	06:55	06:16	05:59	06:09	06:35	07:03	07:32	07:05			07:35		11:19 (VI07)
	17:23	36	12:14 (VI07)	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14			17:03	46	12:05 (VI07)
13	07:45		11:40 (VI07)	07:21	06:42	06:53	06:15	05:59	06:10	06:36	07:04	07:33	07:06			07:36		11:20 (VI07)
	17:24	34	12:14 (VI07)	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14			17:03	46	12:06 (VI07)
14	07:45		11:40 (VI07)	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:21 (VI07)
	17:25	32	12:12 (VI07)	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13			17:03	46	12:07 (VI07)
15	07:44		11:42 (VI07)	07:19	06:39	06:50	06:13	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:20 (VI07)
	17:26	30	12:12 (VI07)	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12			17:03	47	12:07 (VI07)
16	07:44		11:43 (VI07)	07:18	06:37	06:49	06:12	05:59	06:12	06:39	07:07	07:36	07:09			07:38		11:21 (VI07)
	17:27	27	12:10 (VI07)	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11			17:04	47	12:08 (VI07)
17	07:44		11:46 (VI07)	07:16	06:36	06:47	06:11	05:59	06:12	06:40	07:08	07:37	07:10			07:39		11:22 (VI07)
	17:28	23	12:09 (VI07)	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:45	17:10			17:04	46	12:08 (VI07)
18	07:43		11:48 (VI07)	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12			07:40		11:22 (VI07)
	17:29	19	12:07 (VI07)	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10			17:04	46	12:08 (VI07)
19	07:43		11:52 (VI07)	07:14	06:32	06:45	06:10	05:59	06:14	06:41	07:10	07:39	07:13			07:40		11:22 (VI07)
	17:30	12	12:04 (VI07)	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09			17:05	47	12:09 (VI07)
20	07:42			07:12	06:31	06:43	06:09	05:59	06:15	06:42	07:11	07:40	07:14			07:41		11:22 (VI07)
	17:32			18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08			17:05	47	12:09 (VI07)
21	07:42			07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15			07:41		11:23 (VI07)
	17:33			18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08			17:06	47	12:10 (VI07)
22	07:41			07:10	06:28	06:40	06:07	05:59	06:16	06:44	07:12	07:42	07:16			07:42		11:23 (VI07)
	17:34			18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:38	17:07			17:06	47	12:10 (VI07)
23	07:40			07:08	06:26	06:39	06:07	06:00	06:17	06:45	07:13	07:43	07:17		11:28 (VI07)	07:42		11:24 (VI07)
	17:35			18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	12	11:40 (VI07)	17:07	47	12:11 (VI07)
24	07:40			07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18		11:26 (VI07)	07:43		11:24 (VI07)
	17:36			18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	19	11:45 (VI07)	17:07	47	12:11 (VI07)
25	07:39			07:06	06:23	06:36	06:05	06:00	06:19	06:47	07:15	06:45	07:19		11:24 (VI07)	07:43		11:25 (VI07)
	17:37			18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:34	17:06	23	11:47 (VI07)	17:08	47	12:12 (VI07)
26	07:38			07:04	06:21	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20		11:22 (VI07)	07:44		11:26 (VI07)
	17:38			18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	27	11:49 (VI07)	17:08	46	12:12 (VI07)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21		11:21 (VI07)	07:44		11:26 (VI07)
	17:40			18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	30	11:51 (VI07)	17:09	47	12:13 (VI07)
28	07:37			07:01	06:18	06:32	06:04	06:01	06:21	06:50	07:18	06:48	07:22		11:20 (VI07)	07:44		11:26 (VI07)
	17:41			18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	32	11:52 (VI07)	17:10	47	12:13 (VI07)
29	07:36				07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:23		11:20 (VI07)	07:45		11:27 (VI07)
	17:42				19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	34	11:54 (VI07)	17:10	47	12:14 (VI07)
30	07:35				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:24		11:19 (VI07)	07:45		11:28 (VI07)
	17:43				19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	36	11:55 (VI07)	17:11	46	12:14 (VI07)
31	07:35				07:13		06:02		06:24	06:52		06:51				07:45		11:28 (VI07)
	17:44				19:48		20:45		20:40	20:00		17:27				17:12	46	12:14 (VI07)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		677												213			1394	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,57												0,57			0,57	
Total reduction		0,23												0,25			0,23	
Total, real		153												54			314	

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F014 - Agritur

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:45		11:24 (VI07)	07:34	07:00	07:12	06:28	06:02	06:02	06:25	06:53	07:21	06:53			07:25		11:13 (VI07)
	17:13	48	12:12 (VI07)	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:03	42	11:55 (VI07)
2	07:46		11:24 (VI07)	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54			07:26		11:12 (VI07)
	17:14	48	12:12 (VI07)	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25			17:03	44	11:56 (VI07)
3	07:46		11:25 (VI07)	07:32	06:57	07:09	06:26	06:01	06:03	06:27	06:55	07:23	06:55			07:27		11:12 (VI07)
	17:14	47	12:12 (VI07)	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	45	11:57 (VI07)
4	07:46		11:25 (VI07)	07:31	06:56	07:07	06:25	06:00	06:04	06:28	06:56	07:24	06:56			07:28		11:12 (VI07)
	17:15	48	12:13 (VI07)	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22			17:03	45	11:57 (VI07)
5	07:46		11:26 (VI07)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:29		11:13 (VI07)
	17:16	47	12:13 (VI07)	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21			17:03	45	11:58 (VI07)
6	07:46		11:27 (VI07)	07:29	06:53	07:04	06:23	06:00	06:05	06:29	06:58	07:26	06:58			07:30		11:13 (VI07)
	17:17	46	12:13 (VI07)	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20			17:03	46	11:59 (VI07)
7	07:46		11:28 (VI07)	07:28	06:51	07:02	06:21	06:00	06:06	06:30	06:59	07:27	06:59			07:31		11:13 (VI07)
	17:18	45	12:13 (VI07)	17:52	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:00	17:19			17:03	47	12:00 (VI07)
8	07:46		11:28 (VI07)	07:27	06:50	07:01	06:20	05:59	06:06	06:31	07:00	07:28	07:00			07:32		11:13 (VI07)
	17:19	45	12:13 (VI07)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	48	12:01 (VI07)
9	07:46		11:29 (VI07)	07:26	06:48	06:59	06:19	05:59	06:07	06:32	07:01	07:29	07:01			07:33		11:14 (VI07)
	17:20	45	12:14 (VI07)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17			17:03	47	12:01 (VI07)
10	07:46		11:29 (VI07)	07:25	06:47	06:58	06:18	05:59	06:07	06:33	07:02	07:30	07:03			07:34		11:14 (VI07)
	17:21	44	12:13 (VI07)	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16			17:03	48	12:02 (VI07)
11	07:45		11:30 (VI07)	07:24	06:45	06:56	06:17	05:59	06:08	06:34	07:02	07:31	07:04			07:35		11:14 (VI07)
	17:22	43	12:13 (VI07)	17:57	18:28	19:58	20:28	20:52	20:54	20:28	19:42	18:54	17:15			17:03	48	12:02 (VI07)
12	07:45		11:32 (VI07)	07:22	06:43	06:55	06:16	05:59	06:09	06:35	07:03	07:32	07:05			07:35		11:14 (VI07)
	17:23	41	12:13 (VI07)	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14			17:03	49	12:03 (VI07)
13	07:45		11:33 (VI07)	07:21	06:42	06:53	06:15	05:59	06:10	06:36	07:04	07:33	07:06			07:36		11:15 (VI07)
	17:24	40	12:13 (VI07)	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14			17:03	49	12:04 (VI07)
14	07:45		11:33 (VI07)	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:16 (VI07)
	17:25	39	12:12 (VI07)	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13			17:03	48	12:04 (VI07)
15	07:44		11:35 (VI07)	07:19	06:39	06:50	06:13	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:15 (VI07)
	17:26	37	12:12 (VI07)	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12			17:03	49	12:04 (VI07)
16	07:44		11:35 (VI07)	07:18	06:37	06:49	06:12	05:59	06:12	06:39	07:07	07:36	07:09			07:38		11:16 (VI07)
	17:27	36	12:11 (VI07)	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11			17:04	49	12:05 (VI07)
17	07:44		11:37 (VI07)	07:16	06:36	06:47	06:11	05:59	06:12	06:40	07:08	07:37	07:10			07:39		11:17 (VI07)
	17:28	33	12:10 (VI07)	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:45	17:10			17:04	49	12:06 (VI07)
18	07:43		11:38 (VI07)	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12			07:40		11:17 (VI07)
	17:29	31	12:09 (VI07)	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10			17:04	49	12:06 (VI07)
19	07:43		11:41 (VI07)	07:14	06:32	06:45	06:10	05:59	06:14	06:41	07:10	07:39	07:13			07:40		11:17 (VI07)
	17:30	27	12:08 (VI07)	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09			17:05	50	12:07 (VI07)
20	07:42		11:42 (VI07)	07:12	06:31	06:43	06:09	05:59	06:15	06:42	07:11	07:40	07:14		11:25 (VI07)	07:41		11:17 (VI07)
	17:32	24	12:06 (VI07)	18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08	9	11:34 (VI07)	17:05	50	12:07 (VI07)
21	07:42		11:46 (VI07)	07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15		11:21 (VI07)	07:41		11:18 (VI07)
	17:33	18	12:04 (VI07)	18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08	18	11:39 (VI07)	17:06	50	12:08 (VI07)
22	07:41		11:50 (VI07)	07:10	06:28	06:40	06:07	05:59	06:16	06:44	07:12	07:42	07:16		11:18 (VI07)	07:42		11:18 (VI07)
	17:34	9	11:59 (VI07)	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:38	17:07	24	11:42 (VI07)	17:06	50	12:08 (VI07)
23	07:40			07:08	06:26	06:39	06:07	06:00	06:17	06:45	07:13	07:43	07:17		11:17 (VI07)	07:42		11:19 (VI07)
	17:35			18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	27	11:44 (VI07)	17:07	50	12:09 (VI07)
24	07:40			07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18		11:16 (VI07)	07:43		11:19 (VI07)
	17:36			18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	31	11:47 (VI07)	17:07	50	12:09 (VI07)
25	07:39			07:06	06:23	06:36	06:05	06:00	06:19	06:47	07:15	06:45	07:19		11:15 (VI07)	07:43		11:21 (VI07)
	17:37			18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:34	17:06	33	11:48 (VI07)	17:08	49	12:10 (VI07)
26	07:38			07:04	06:21	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20		11:15 (VI07)	07:44		11:21 (VI07)
	17:38			18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	35	11:50 (VI07)	17:08	49	12:10 (VI07)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21		11:14 (VI07)	07:44		11:21 (VI07)
	17:40			18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	37	11:51 (VI07)	17:09	49	12:10 (VI07)
28	07:37			07:01	06:18	06:32	06:04	06:01	06:21	06:50	07:18	06:48	07:22		11:13 (VI07)	07:44		11:21 (VI07)
	17:41			18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	39	11:52 (VI07)	17:10	49	12:10 (VI07)
29	07:36				07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:23		11:13 (VI07)	07:45		11:22 (VI07)
	17:42				19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	40	11:53 (VI07)	17:10	49	12:11 (VI07)
30	07:35				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:24		11:13 (VI07)	07:45		11:23 (VI07)
	17:43				19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	41	11:54 (VI07)	17:11	48	12:11 (VI07)
31	07:35				07:13		06:02		06:24	06:52		06:51				07:45		11:23 (VI07)
	17:44				19:48		20:45		20:40	20:00		17:27				17:12	49	12:12 (VI07)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		841												334			1489	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,57												0,57			0,57	
Total reduction		0,23												0,25			0,23	
Total, real		190												84			337	

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F015 - Agritur

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:45		11:30 (VI07)	07:34	07:00	07:12	06:28	06:02	06:02	06:25	06:53	07:21	06:53			07:25		11:18 (VI07)
	17:13	48	12:18 (VI07)	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:03	44	12:02 (VI07)
2	07:46		11:30 (VI07)	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54			07:26		11:18 (VI07)
	17:14	49	12:19 (VI07)	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25			17:03	44	12:02 (VI07)
3	07:46		11:31 (VI07)	07:32	06:57	07:09	06:26	06:01	06:03	06:27	06:55	07:23	06:55			07:27		11:18 (VI07)
	17:14	48	12:19 (VI07)	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	45	12:03 (VI07)
4	07:46		11:31 (VI07)	07:31	06:56	07:07	06:25	06:00	06:04	06:28	06:56	07:24	06:56			07:28		11:18 (VI07)
	17:15	48	12:19 (VI07)	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22			17:03	46	12:04 (VI07)
5	07:46		11:32 (VI07)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:29		11:19 (VI07)
	17:16	47	12:19 (VI07)	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21			17:03	46	12:05 (VI07)
6	07:46		11:33 (VI07)	07:29	06:53	07:04	06:23	06:00	06:05	06:29	06:58	07:26	06:58			07:30		11:19 (VI07)
	17:17	47	12:20 (VI07)	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20			17:03	47	12:06 (VI07)
7	07:46		11:33 (VI07)	07:28	06:51	07:02	06:21	06:00	06:06	06:30	06:59	07:27	06:59			07:31		11:19 (VI07)
	17:18	47	12:20 (VI07)	17:52	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:00	17:19			17:03	47	12:06 (VI07)
8	07:46		11:34 (VI07)	07:27	06:50	07:01	06:20	05:59	06:06	06:31	07:00	07:28	07:00			07:32		11:19 (VI07)
	17:19	46	12:20 (VI07)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	48	12:07 (VI07)
9	07:46		11:35 (VI07)	07:26	06:48	06:59	06:19	05:59	06:07	06:32	07:01	07:29	07:01			07:33		11:20 (VI07)
	17:20	45	12:20 (VI07)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17			17:03	48	12:08 (VI07)
10	07:46		11:35 (VI07)	07:25	06:47	06:58	06:18	05:59	06:07	06:33	07:02	07:30	07:03			07:34		11:20 (VI07)
	17:21	44	12:19 (VI07)	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16			17:03	49	12:09 (VI07)
11	07:45		11:36 (VI07)	07:24	06:45	06:56	06:17	05:59	06:08	06:34	07:02	07:31	07:04			07:35		11:20 (VI07)
	17:22	44	12:20 (VI07)	17:57	18:28	19:58	20:28	20:52	20:54	20:28	19:42	18:54	17:15			17:03	49	12:09 (VI07)
12	07:45		11:38 (VI07)	07:22	06:43	06:55	06:16	05:59	06:09	06:35	07:03	07:32	07:05			07:35		11:20 (VI07)
	17:23	42	12:20 (VI07)	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14			17:03	49	12:09 (VI07)
13	07:45		11:39 (VI07)	07:21	06:42	06:53	06:15	05:59	06:10	06:36	07:04	07:33	07:06			07:36		11:21 (VI07)
	17:24	41	12:20 (VI07)	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14			17:03	49	12:10 (VI07)
14	07:45		11:39 (VI07)	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:21 (VI07)
	17:25	40	12:19 (VI07)	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13			17:03	50	12:11 (VI07)
15	07:44		11:41 (VI07)	07:19	06:39	06:50	06:13	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:21 (VI07)
	17:26	38	12:19 (VI07)	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12			17:03	50	12:11 (VI07)
16	07:44		11:41 (VI07)	07:18	06:37	06:49	06:12	05:59	06:12	06:39	07:07	07:36	07:09			07:38		11:22 (VI07)
	17:27	36	12:17 (VI07)	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11			17:04	50	12:12 (VI07)
17	07:44		11:43 (VI07)	07:16	06:36	06:47	06:11	05:59	06:12	06:40	07:08	07:37	07:10			07:39		11:23 (VI07)
	17:28	34	12:17 (VI07)	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:45	17:10			17:04	49	12:12 (VI07)
18	07:43		11:44 (VI07)	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12			07:40		11:22 (VI07)
	17:29	31	12:15 (VI07)	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10			17:04	50	12:12 (VI07)
19	07:43		11:46 (VI07)	07:14	06:32	06:45	06:10	05:59	06:14	06:41	07:10	07:39	07:13			07:40		11:23 (VI07)
	17:30	29	12:15 (VI07)	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09			17:05	50	12:13 (VI07)
20	07:42		11:48 (VI07)	07:12	06:31	06:43	06:09	05:59	06:15	06:42	07:11	07:40	07:14		11:30 (VI07)	07:41		11:23 (VI07)
	17:32	25	12:13 (VI07)	18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08	12	11:42 (VI07)	17:05	50	12:13 (VI07)
21	07:42		11:51 (VI07)	07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15		11:26 (VI07)	07:41		11:24 (VI07)
	17:33	20	12:11 (VI07)	18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08	20	11:46 (VI07)	17:06	50	12:14 (VI07)
22	07:41		11:55 (VI07)	07:10	06:28	06:40	06:07	05:59	06:16	06:44	07:12	07:42	07:16		11:24 (VI07)	07:42		11:24 (VI07)
	17:34	12	12:07 (VI07)	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:38	17:07	25	11:49 (VI07)	17:06	50	12:14 (VI07)
23	07:40			07:08	06:26	06:39	06:07	06:00	06:17	06:45	07:13	07:43	07:17		11:23 (VI07)	07:42		11:25 (VI07)
	17:35			18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	28	11:51 (VI07)	17:07	50	12:15 (VI07)
24	07:40			07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18		11:22 (VI07)	07:43		11:25 (VI07)
	17:36			18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	31	11:53 (VI07)	17:07	50	12:15 (VI07)
25	07:39			07:06	06:23	06:36	06:05	06:00	06:19	06:47	07:15	06:45	07:19		11:21 (VI07)	07:43		11:26 (VI07)
	17:37			18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:34	17:06	34	11:55 (VI07)	17:08	50	12:16 (VI07)
26	07:38			07:04	06:21	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20		11:20 (VI07)	07:44		11:27 (VI07)
	17:38			18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	36	11:56 (VI07)	17:08	49	12:16 (VI07)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21		11:20 (VI07)	07:44		11:27 (VI07)
	17:40			18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	38	11:58 (VI07)	17:09	50	12:17 (VI07)
28	07:37			07:01	06:18	06:32	06:04	06:01	06:21	06:50	07:18	06:48	07:22		11:19 (VI07)	07:44		11:27 (VI07)
	17:41			18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	40	11:59 (VI07)	17:10	50	12:17 (VI07)
29	07:36				07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:23		11:19 (VI07)	07:45		11:28 (VI07)
	17:42				19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	41	12:00 (VI07)	17:10	50	12:18 (VI07)
30	07:35				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:24		11:19 (VI07)	07:45		11:29 (VI07)
	17:43				19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	42	12:01 (VI07)	17:11	49	12:18 (VI07)
31	07:35				07:13		06:02		06:24	06:52		06:51				07:45		11:29 (VI07)
	17:44				19:48		20:45		20:40	20:00		17:27				17:12	49	12:18 (VI07)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		861												347			1507	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,57												0,57			0,57	
Total reduction		0,23												0,25			0,23	
Total, real		194												87			340	

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F016 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (61)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:45		11:23 (VI07)	07:34	07:00	07:12	06:28	06:02	06:02	06:25	06:53	07:21	06:53			07:25		11:11 (VI07)
	17:13	51	12:14 (VI07)	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:03	47	11:58 (VI07)
2	07:46		11:23 (VI07)	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54			07:26		11:11 (VI07)
	17:14	52	12:15 (VI07)	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25			17:03	48	11:59 (VI07)
3	07:46		11:24 (VI07)	07:32	06:57	07:09	06:26	06:01	06:03	06:27	06:55	07:23	06:55			07:27		11:11 (VI07)
	17:14	51	12:15 (VI07)	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	49	12:00 (VI07)
4	07:46		11:24 (VI07)	07:31	06:56	07:07	06:25	06:00	06:04	06:28	06:56	07:24	06:56			07:28		11:11 (VI07)
	17:15	51	12:15 (VI07)	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22			17:03	50	12:01 (VI07)
5	07:46		11:25 (VI07)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:29		11:11 (VI07)
	17:16	51	12:16 (VI07)	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21			17:03	50	12:01 (VI07)
6	07:46		11:25 (VI07)	07:29	06:53	07:04	06:23	06:00	06:05	06:29	06:58	07:26	06:58			07:30		11:11 (VI07)
	17:17	51	12:16 (VI07)	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20			17:03	51	12:02 (VI07)
7	07:46		11:26 (VI07)	07:28	06:51	07:02	06:21	06:00	06:06	06:30	06:59	07:27	06:59			07:31		11:12 (VI07)
	17:18	50	12:16 (VI07)	17:52	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:00	17:19			17:03	51	12:03 (VI07)
8	07:46		11:27 (VI07)	07:27	06:50	07:01	06:20	05:59	06:06	06:31	07:00	07:28	07:00			07:32		11:12 (VI07)
	17:19	50	12:17 (VI07)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	51	12:03 (VI07)
9	07:46		11:28 (VI07)	07:26	06:48	06:59	06:19	05:59	06:07	06:32	07:01	07:29	07:01			07:33		11:13 (VI07)
	17:20	49	12:17 (VI07)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17			17:03	51	12:04 (VI07)
10	07:46		11:28 (VI07)	07:25	06:47	06:58	06:18	05:59	06:07	06:33	07:02	07:30	07:03			07:34		11:13 (VI07)
	17:21	48	12:16 (VI07)	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16			17:03	52	12:05 (VI07)
11	07:45		11:28 (VI07)	07:24	06:45	06:56	06:17	05:59	06:08	06:34	07:02	07:31	07:04			07:35		11:13 (VI07)
	17:22	48	12:16 (VI07)	17:57	18:28	19:58	20:28	20:52	20:54	20:28	19:42	18:54	17:15			17:03	51	12:04 (VI07)
12	07:45		11:29 (VI07)	07:22	06:43	06:55	06:16	05:59	06:09	06:35	07:03	07:32	07:05			07:35		11:13 (VI07)
	17:23	48	12:17 (VI07)	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14			17:03	52	12:05 (VI07)
13	07:45		11:31 (VI07)	07:21	06:42	06:53	06:15	05:59	06:10	06:36	07:04	07:33	07:06			07:36		11:14 (VI07)
	17:24	46	12:17 (VI07)	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14			17:03	52	12:06 (VI07)
14	07:45		11:31 (VI07)	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:15 (VI07)
	17:25	45	12:16 (VI07)	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13			17:03	52	12:07 (VI07)
15	07:44		11:32 (VI07)	07:19	06:39	06:50	06:13	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:14 (VI07)
	17:26	44	12:16 (VI07)	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12			17:03	53	12:07 (VI07)
16	07:44		11:32 (VI07)	07:18	06:37	06:49	06:12	05:59	06:12	06:39	07:07	07:36	07:09			07:38		11:15 (VI07)
	17:27	43	12:15 (VI07)	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11			17:04	52	12:07 (VI07)
17	07:44		11:34 (VI07)	07:16	06:36	06:47	06:11	05:59	06:12	06:40	07:08	07:37	07:10		11:24 (VI07)	07:39		11:16 (VI07)
	17:28	41	12:15 (VI07)	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:45	17:10	12	11:36 (VI07)	17:04	52	12:08 (VI07)
18	07:43		11:34 (VI07)	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12		11:20 (VI07)	07:40		11:16 (VI07)
	17:29	40	12:14 (VI07)	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10	20	11:40 (VI07)	17:04	52	12:08 (VI07)
19	07:43		11:36 (VI07)	07:14	06:32	06:45	06:10	05:59	06:14	06:41	07:10	07:39	07:13		11:17 (VI07)	07:40		11:17 (VI07)
	17:30	38	12:14 (VI07)	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09	26	11:43 (VI07)	17:05	52	12:09 (VI07)
20	07:42		11:37 (VI07)	07:12	06:31	06:43	06:09	05:59	06:15	06:42	07:11	07:40	07:14		11:16 (VI07)	07:41		11:16 (VI07)
	17:32	36	12:13 (VI07)	18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08	29	11:45 (VI07)	17:05	53	12:09 (VI07)
21	07:42		11:39 (VI07)	07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15		11:14 (VI07)	07:41		11:17 (VI07)
	17:33	33	12:12 (VI07)	18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08	33	11:47 (VI07)	17:06	53	12:10 (VI07)
22	07:41		11:41 (VI07)	07:10	06:28	06:40	06:07	05:59	06:16	06:44	07:12	07:42	07:16		11:13 (VI07)	07:42		11:17 (VI07)
	17:34	29	12:10 (VI07)	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:38	17:07	36	11:49 (VI07)	17:06	53	12:10 (VI07)
23	07:40		11:42 (VI07)	07:08	06:26	06:39	06:07	06:00	06:17	06:45	07:13	07:43	07:17		11:12 (VI07)	07:42		11:18 (VI07)
	17:35	26	12:08 (VI07)	18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	38	11:50 (VI07)	17:07	53	12:11 (VI07)
24	07:40		11:46 (VI07)	07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18		11:13 (VI07)	07:43		11:19 (VI07)
	17:36	20	12:06 (VI07)	18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	39	11:52 (VI07)	17:07	52	12:11 (VI07)
25	07:39		11:50 (VI07)	07:06	06:23	06:36	06:05	06:00	06:19	06:47	07:15	06:45	07:19		11:12 (VI07)	07:43		11:20 (VI07)
	17:37	12	12:02 (VI07)	18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:34	17:06	41	11:53 (VI07)	17:08	52	12:12 (VI07)
26	07:38			07:04	06:21	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20		11:11 (VI07)	07:44		11:20 (VI07)
	17:38			18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	43	11:54 (VI07)	17:08	52	12:12 (VI07)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21		11:11 (VI07)	07:44		11:20 (VI07)
	17:40			18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	44	11:55 (VI07)	17:09	52	12:12 (VI07)
28	07:37			07:01	06:18	06:32	06:04	06:01	06:21	06:50	07:18	06:48	07:22		11:11 (VI07)	07:44		11:20 (VI07)
	17:41			18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	45	11:56 (VI07)	17:10	52	12:12 (VI07)
29	07:36				07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:23		11:11 (VI07)	07:45		11:21 (VI07)
	17:42				19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	46	11:57 (VI07)	17:10	53	12:14 (VI07)
30	07:35				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:24		11:11 (VI07)	07:45		11:22 (VI07)
	17:43				19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	47	11:58 (VI07)	17:11	52	12:14 (VI07)
31	07:35				07:13		06:02		06:24	06:52		06:51				07:45		11:22 (VI07)
	17:44				19:48		20:45		20:40	20:00		17:27				17:12	52	12:14 (VI07)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		1053												499			1597	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,57												0,57			0,57	
Total reduction		0,23												0,25			0,23	
Total, real		238												126			361	

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F017 - Agritur

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:45		11:28 (VI07)	07:34	07:00	07:12	06:28	06:02	06:02	06:25	06:53	07:21	06:53			07:25		11:17 (VI07)
	17:13	51	12:19 (VI07)	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:03	45	12:02 (VI07)
2	07:46		11:29 (VI07)	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54			07:26		11:16 (VI07)
	17:14	50	12:19 (VI07)	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25			17:03	47	12:03 (VI07)
3	07:46		11:29 (VI07)	07:32	06:57	07:09	06:26	06:01	06:03	06:27	06:55	07:23	06:55			07:27		11:17 (VI07)
	17:14	50	12:19 (VI07)	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	47	12:04 (VI07)
4	07:46		11:30 (VI07)	07:31	06:56	07:07	06:25	06:00	06:04	06:28	06:56	07:24	06:56			07:28		11:17 (VI07)
	17:15	50	12:20 (VI07)	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22			17:03	48	12:05 (VI07)
5	07:46		11:30 (VI07)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:29		11:17 (VI07)
	17:16	50	12:20 (VI07)	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21			17:03	48	12:05 (VI07)
6	07:46		11:31 (VI07)	07:29	06:53	07:04	06:23	06:00	06:05	06:29	06:58	07:26	06:58			07:30		11:17 (VI07)
	17:17	49	12:20 (VI07)	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20			17:03	49	12:06 (VI07)
7	07:46		11:32 (VI07)	07:28	06:51	07:02	06:21	06:00	06:06	06:30	06:59	07:27	06:59			07:31		11:17 (VI07)
	17:18	48	12:20 (VI07)	17:52	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:00	17:19			17:03	50	12:07 (VI07)
8	07:46		11:33 (VI07)	07:27	06:50	07:01	06:20	05:59	06:06	06:31	07:00	07:28	07:00			07:32		11:18 (VI07)
	17:19	48	12:21 (VI07)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	50	12:08 (VI07)
9	07:46		11:33 (VI07)	07:26	06:48	06:59	06:19	05:59	06:07	06:32	07:01	07:29	07:01			07:33		11:18 (VI07)
	17:20	48	12:21 (VI07)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17			17:03	50	12:08 (VI07)
10	07:46		11:33 (VI07)	07:25	06:47	06:58	06:18	05:59	06:07	06:33	07:02	07:30	07:03			07:34		11:19 (VI07)
	17:21	47	12:20 (VI07)	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16			17:03	50	12:09 (VI07)
11	07:45		11:34 (VI07)	07:24	06:45	06:56	06:17	05:59	06:08	06:34	07:02	07:31	07:04			07:35		11:18 (VI07)
	17:22	46	12:20 (VI07)	17:57	18:28	19:58	20:28	20:52	20:54	20:28	19:42	18:54	17:15			17:03	51	12:09 (VI07)
12	07:45		11:36 (VI07)	07:22	06:43	06:55	06:16	05:59	06:09	06:35	07:03	07:32	07:05			07:35		11:19 (VI07)
	17:23	45	12:21 (VI07)	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14			17:03	51	12:10 (VI07)
13	07:45		11:37 (VI07)	07:21	06:42	06:53	06:15	05:59	06:10	06:36	07:04	07:33	07:06			07:36		11:19 (VI07)
	17:24	44	12:21 (VI07)	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14			17:03	51	12:10 (VI07)
14	07:45		11:37 (VI07)	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:20 (VI07)
	17:25	43	12:20 (VI07)	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13			17:03	51	12:11 (VI07)
15	07:44		11:38 (VI07)	07:19	06:39	06:50	06:13	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:20 (VI07)
	17:26	42	12:20 (VI07)	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12			17:03	51	12:11 (VI07)
16	07:44		11:39 (VI07)	07:18	06:37	06:49	06:12	05:59	06:12	06:39	07:07	07:36	07:09			07:38		11:21 (VI07)
	17:27	40	12:19 (VI07)	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11			17:04	51	12:12 (VI07)
17	07:44		11:40 (VI07)	07:16	06:36	06:47	06:11	05:59	06:12	06:40	07:08	07:37	07:10			07:39		11:21 (VI07)
	17:28	39	12:19 (VI07)	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:45	17:10			17:04	52	12:13 (VI07)
18	07:43		11:41 (VI07)	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12		11:32 (VI07)	07:40		11:21 (VI07)
	17:29	36	12:17 (VI07)	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10	6	11:38 (VI07)	17:04	52	12:13 (VI07)
19	07:43		11:43 (VI07)	07:14	06:32	06:45	06:10	05:59	06:14	06:41	07:10	07:39	07:13		11:27 (VI07)	07:40		11:22 (VI07)
	17:30	34	12:17 (VI07)	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09	17	11:44 (VI07)	17:05	52	12:14 (VI07)
20	07:42		11:44 (VI07)	07:12	06:31	06:43	06:09	05:59	06:15	06:42	07:11	07:40	07:14		11:24 (VI07)	07:41		11:22 (VI07)
	17:32	31	12:15 (VI07)	18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08	23	11:47 (VI07)	17:05	51	12:13 (VI07)
21	07:42		11:47 (VI07)	07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15		11:22 (VI07)	07:41		11:23 (VI07)
	17:33	27	12:14 (VI07)	18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08	27	11:49 (VI07)	17:06	51	12:14 (VI07)
22	07:41		11:49 (VI07)	07:10	06:28	06:40	06:07	05:59	06:16	06:44	07:12	07:42	07:16		11:20 (VI07)	07:42		11:23 (VI07)
	17:34	23	12:12 (VI07)	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:38	17:07	31	11:51 (VI07)	17:06	51	12:14 (VI07)
23	07:40		11:52 (VI07)	07:08	06:26	06:39	06:07	06:00	06:17	06:45	07:13	07:43	07:17		11:19 (VI07)	07:42		11:24 (VI07)
	17:35	17	12:09 (VI07)	18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	34	11:53 (VI07)	17:07	51	12:15 (VI07)
24	07:40		11:58 (VI07)	07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18		11:19 (VI07)	07:43		11:24 (VI07)
	17:36	6	12:04 (VI07)	18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	36	11:55 (VI07)	17:07	52	12:16 (VI07)
25	07:39			07:06	06:23	06:36	06:05	06:00	06:19	06:47	07:15	06:45	07:19		11:19 (VI07)	07:43		11:25 (VI07)
	17:37			18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:34	17:06	38	11:57 (VI07)	17:08	52	12:17 (VI07)
26	07:38			07:04	06:21	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20		11:18 (VI07)	07:44		11:25 (VI07)
	17:38			18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	40	11:58 (VI07)	17:08	52	12:17 (VI07)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21		11:17 (VI07)	07:44		11:25 (VI07)
	17:40			18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	42	11:59 (VI07)	17:09	52	12:17 (VI07)
28	07:37			07:01	06:18	06:32	06:04	06:01	06:21	06:50	07:18	06:48	07:22		11:17 (VI07)	07:44		11:26 (VI07)
	17:41			18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	43	12:00 (VI07)	17:10	51	12:17 (VI07)
29	07:36				07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:23		11:17 (VI07)	07:45		11:27 (VI07)
	17:42				19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	44	12:01 (VI07)	17:10	51	12:18 (VI07)
30	07:35				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:24		11:17 (VI07)	07:45		11:27 (VI07)
	17:43				19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	45	12:02 (VI07)	17:11	51	12:18 (VI07)
31	07:35				07:13		06:02		06:24	06:52		06:51				07:45		11:28 (VI07)
	17:44				19:48		20:45		20:40	20:00		17:27				17:12	51	12:19 (VI07)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		964												426			1562	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,57												0,57			0,57	
Total reduction		0,23												0,25			0,23	
Total, real		217												107			352	

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

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

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:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F027 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (63)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March			April			May	June	July	August	September			October	November	December
1	07:45	07:34	07:00			07:12		18:46 (VI05)	06:29	06:02	06:03	06:25	06:53			07:21	06:53	07:25
	17:13	17:45	18:17			19:49	25	19:11 (VI05)	20:18	20:46	20:56	20:39	19:58			19:10	17:26	17:03
2	07:46	07:33	06:59			07:10		18:45 (VI05)	06:27	06:01	06:03	06:26	06:54		18:52 (VI05)	07:22	06:54	07:26
	17:14	17:47	18:18			19:50	25	19:10 (VI05)	20:19	20:46	20:56	20:38	19:56	3	18:55 (VI05)	19:08	17:25	17:03
3	07:46	07:32	06:57			07:09		18:45 (VI05)	06:26	06:01	06:04	06:27	06:55		18:47 (VI05)	07:23	06:55	07:27
	17:15	17:48	18:19			19:51	25	19:10 (VI05)	20:20	20:47	20:56	20:37	19:55	12	18:59 (VI05)	19:07	17:24	17:03
4	07:46	07:31	06:56			07:07		18:45 (VI05)	06:25	06:01	06:04	06:28	06:56		18:45 (VI05)	07:24	06:56	07:28
	17:15	17:49	18:21			19:52	24	19:09 (VI05)	20:21	20:48	20:56	20:36	19:53	16	19:01 (VI05)	19:05	17:22	17:03
5	07:46	07:30	06:54			07:06		18:46 (VI05)	06:24	06:00	06:05	06:29	06:57		18:43 (VI05)	07:25	06:57	07:29
	17:16	17:50	18:22			19:53	23	19:09 (VI05)	20:22	20:48	20:56	20:35	19:52	20	19:03 (VI05)	19:04	17:21	17:03
6	07:46	07:29	06:53			07:04		18:46 (VI05)	06:23	06:00	06:05	06:30	06:58		18:42 (VI05)	07:26	06:58	07:30
	17:17	17:51	18:23			19:54	21	19:07 (VI05)	20:23	20:49	20:55	20:33	19:50	21	19:03 (VI05)	19:02	17:20	17:03
7	07:46	07:28	06:51			07:03		18:47 (VI05)	06:22	06:00	06:06	06:30	06:59		18:41 (VI05)	07:27	06:59	07:31
	17:18	17:53	18:24			19:55	20	19:07 (VI05)	20:24	20:50	20:55	20:32	19:49	23	19:04 (VI05)	19:01	17:19	17:03
8	07:46	07:27	06:50			07:01		18:48 (VI05)	06:20	05:59	06:06	06:31	07:00		18:40 (VI05)	07:28	07:00	07:32
	17:19	17:54	18:25			19:56	16	19:04 (VI05)	20:25	20:50	20:55	20:31	19:47	24	19:04 (VI05)	18:59	17:18	17:03
9	07:46	07:26	06:48			06:59		18:49 (VI05)	06:19	05:59	06:07	06:32	07:01		18:39 (VI05)	07:29	07:01	07:33
	17:20	17:55	18:26			19:57	13	19:02 (VI05)	20:26	20:51	20:55	20:30	19:45	25	19:04 (VI05)	18:57	17:17	17:03
10	07:46	07:25	06:47			06:58		18:54 (VI05)	06:18	05:59	06:08	06:33	07:02		18:38 (VI05)	07:30	07:03	07:34
	17:21	17:56	18:27			19:58	3	18:57 (VI05)	20:27	20:51	20:54	20:29	19:44	25	19:03 (VI05)	18:56	17:16	17:03
11	07:45	07:24	06:45			06:56			06:17	05:59	06:08	06:34	07:03		18:38 (VI05)	07:31	07:04	07:35
	17:22	17:57	18:28			19:59			20:28	20:52	20:54	20:28	19:42	25	19:03 (VI05)	18:54	17:15	17:03
12	07:45	07:22	06:43			06:55			06:16	05:59	06:09	06:35	07:03		18:38 (VI05)	07:32	07:05	07:35
	17:23	17:58	18:29			19:59			20:29	20:52	20:53	20:26	19:41	25	19:03 (VI05)	18:53	17:15	17:03
13	07:45	07:21	06:42			06:53			06:15	05:59	06:10	06:36	07:04		18:38 (VI05)	07:33	07:06	07:36
	17:24	18:00	18:30			20:00			20:30	20:53	20:53	20:25	19:39	24	19:02 (VI05)	18:51	17:14	17:03
14	07:45	07:20	06:40			06:52			06:14	05:59	06:10	06:37	07:05		18:38 (VI05)	07:34	07:07	07:37
	17:25	18:01	18:31			20:01			20:31	20:53	20:52	20:24	19:37	23	19:01 (VI05)	18:50	17:13	17:03
15	07:44	07:19	06:39			06:50			06:13	05:59	06:11	06:38	07:06		18:39 (VI05)	07:35	07:08	07:38
	17:26	18:02	18:32			20:02			20:32	20:54	20:52	20:22	19:36	21	19:00 (VI05)	18:48	17:12	17:03
16	07:44	07:18	06:37			06:49			06:12	05:59	06:12	06:39	07:07		18:40 (VI05)	07:36	07:09	07:38
	17:27	18:03	18:33			20:03			20:32	20:54	20:51	20:21	19:34	19	18:59 (VI05)	18:47	17:11	17:04
17	07:44	07:16	06:36			06:47			06:12	05:59	06:12	06:40	07:08		18:41 (VI05)	07:37	07:10	07:39
	17:28	18:04	18:34			20:04			20:33	20:54	20:51	20:20	19:33	16	18:57 (VI05)	18:46	17:10	17:04
18	07:43	07:15	06:34			06:46			06:11	05:59	06:13	06:41	07:09		18:42 (VI05)	07:38	07:12	07:40
	17:29	18:05	18:35			20:05			20:34	20:55	20:50	20:18	19:31	11	18:53 (VI05)	18:44	17:10	17:04
19	07:43	07:14	06:33			06:45			06:10	05:59	06:14	06:41	07:10			07:39	07:13	07:40
	17:31	18:06	18:36			20:06			20:35	20:55	20:50	20:17	19:29			18:43	17:09	17:05
20	07:42	07:13	06:31			06:43			06:09	05:59	06:15	06:42	07:11			07:40	07:14	07:41
	17:32	18:07	18:37			20:07			20:36	20:55	20:49	20:16	19:28			18:41	17:08	17:05
21	07:42	07:11	06:29			06:42			06:08	05:59	06:16	06:43	07:12			07:41	07:15	07:41
	17:33	18:09	18:38			20:08			20:37	20:55	20:48	20:14	19:26			18:40	17:08	17:06
22	07:41	07:10	06:28			06:40			06:08	06:00	06:16	06:44	07:13			07:42	07:16	07:42
	17:34	18:10	18:39			20:09			20:38	20:56	20:48	20:13	19:24			18:39	17:07	17:06
23	07:40	07:08	06:26			06:39			06:07	06:00	06:17	06:45	07:13			07:43	07:17	07:42
	17:35	18:11	18:40			20:10			20:39	20:56	20:47	20:11	19:23			18:37	17:07	17:07
24	07:40	07:07	06:25			06:38			06:06	06:00	06:18	06:46	07:14			07:44	07:18	07:43
	17:36	18:12	18:41			20:11			20:39	20:56	20:46	20:10	19:21			18:36	17:06	17:07
25	07:39	07:06	06:23		17:56 (VI05)	06:36			06:05	06:00	06:19	06:47	07:15			06:45	07:19	07:43
	17:37	18:13	18:42	9	18:05 (VI05)	20:12			20:40	20:56	20:45	20:09	19:20			17:35	17:06	17:08
26	07:38	07:04	06:21		17:52 (VI05)	06:35			06:05	06:01	06:20	06:48	07:16			06:46	07:20	07:44
	17:38	18:14	18:43	15	18:07 (VI05)	20:13			20:41	20:56	20:44	20:07	19:18			17:33	17:05	17:08
27	07:38	07:03	06:20		17:51 (VI05)	06:34			06:04	06:01	06:21	06:49	07:17			06:47	07:21	07:44
	17:40	18:15	18:44	18	18:09 (VI05)	20:14			20:42	20:56	20:43	20:06	19:16			17:32	17:05	17:09
28	07:37	07:01	06:18		17:49 (VI05)	06:32			06:04	06:01	06:21	06:50	07:18			06:48	07:22	07:44
	17:41	18:16	18:45	21	18:10 (VI05)	20:15			20:43	20:56	20:43	20:04	19:15			17:31	17:04	17:10
29	07:36		07:17		18:48 (VI05)	06:31			06:03	06:02	06:22	06:51	07:19			06:49	07:23	07:45
	17:42		19:46	23	19:11 (VI05)	20:16			20:43	20:56	20:42	20:03	19:13			17:29	17:04	17:10
30	07:35		07:15		18:47 (VI05)	06:30			06:03	06:02	06:23	06:52	07:20			06:50	07:24	07:45
	17:43		19:47	24	19:11 (VI05)	20:17			20:44	20:56	20:41	20:01	19:12			17:28	17:04	17:11
31	07:35		07:13		18:46 (VI05)				06:02		06:24	06:53				06:51		07:45
	17:44		19:48	24	19:10 (VI05)				20:45		20:40	20:00				17:27		17:12
Potential sun hours	302	300	370			396			444	446	454	425	374			347	302	293
Total, worst case				134			195							333				
Sun reduction				0,49			0,53							0,65				
Oper. time red.				0,88			0,88							0,88				
Wind dir. red.				0,73			0,73							0,73				
Total reduction				0,31			0,34							0,41				
Total, real				42			66							138				

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F030 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (64)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March			April			May			June		
1	07:46	07:34	07:00			07:12		18:16 (VI05)	06:29		06:47 (VI06)	06:02		06:42 (VI06)
	17:13	17:46	18:17			19:49	30	18:46 (VI05)	20:18	30	07:17 (VI06)	20:46	33	07:15 (VI06)
2	07:46	07:33	06:59			07:10		18:16 (VI05)	06:27		06:46 (VI06)	06:01		06:43 (VI06)
	17:14	17:47	18:18			19:50	29	18:45 (VI05)	20:19	32	07:18 (VI06)	20:46	32	07:15 (VI06)
3	07:46	07:32	06:57			07:09		18:18 (VI05)	06:26		06:45 (VI06)	06:01		06:44 (VI06)
	17:15	17:48	18:19			19:51	26	18:44 (VI05)	20:20	34	07:19 (VI06)	20:47	31	07:15 (VI06)
4	07:46	07:31	06:56			07:07		18:19 (VI05)	06:25		06:44 (VI06)	06:01		06:44 (VI06)
	17:15	17:49	18:21			19:52	22	18:41 (VI05)	20:21	36	07:20 (VI06)	20:48	30	07:14 (VI06)
5	07:46	07:30	06:54			07:06		18:21 (VI05)	06:24		06:43 (VI06)	06:00		06:45 (VI06)
	17:16	17:50	18:22			19:53	18	18:39 (VI05)	20:22	37	07:20 (VI06)	20:48	29	07:14 (VI06)
6	07:46	07:29	06:53			07:04		18:24 (VI05)	06:23		06:42 (VI06)	06:00		06:46 (VI06)
	17:17	17:51	18:23			19:54	11	18:35 (VI05)	20:23	39	07:21 (VI06)	20:49	28	07:14 (VI06)
7	07:46	07:28	06:51			07:03			06:22		06:41 (VI06)	06:00		06:47 (VI06)
	17:18	17:53	18:24			19:55			20:24	40	07:21 (VI06)	20:50	27	07:14 (VI06)
8	07:46	07:27	06:50			07:01			06:20		06:40 (VI06)	05:59		06:48 (VI06)
	17:19	17:54	18:25			19:56			20:25	41	07:21 (VI06)	20:50	25	07:13 (VI06)
9	07:46	07:26	06:48			06:59			06:19		06:39 (VI06)	05:59		06:48 (VI06)
	17:20	17:55	18:26			19:57			20:26	42	07:21 (VI06)	20:51	24	07:12 (VI06)
10	07:46	07:25	06:47			06:58			06:18		06:38 (VI06)	05:59		06:49 (VI06)
	17:21	17:56	18:27			19:58			20:27	44	07:22 (VI06)	20:51	23	07:12 (VI06)
11	07:45	07:24	06:45			06:56			06:17		06:37 (VI06)	05:59		06:50 (VI06)
	17:22	17:57	18:28			19:59			20:28	45	07:22 (VI06)	20:52	22	07:12 (VI06)
12	07:45	07:22	06:44			06:55			06:16		06:36 (VI06)	05:59		06:51 (VI06)
	17:23	17:58	18:29			20:00			20:29	46	07:22 (VI06)	20:52	20	07:11 (VI06)
13	07:45	07:21	06:42			06:53			06:15		06:35 (VI06)	05:59		06:51 (VI06)
	17:24	18:00	18:30			20:01			20:30	46	07:21 (VI06)	20:53	20	07:11 (VI06)
14	07:45	07:20	06:40			06:52			06:14		06:35 (VI06)	05:59		06:52 (VI06)
	17:25	18:01	18:31			20:01			20:31	46	07:21 (VI06)	20:53	19	07:11 (VI06)
15	07:44	07:19	06:39		17:31 (VI05)	06:50			06:13		06:35 (VI06)	05:59		06:53 (VI06)
	17:26	18:02	18:32	10	17:41 (VI05)	20:02			20:32	46	07:21 (VI06)	20:54	18	07:11 (VI06)
16	07:44	07:18	06:37		17:26 (VI05)	06:49			06:12		06:35 (VI06)	05:59		06:53 (VI06)
	17:27	18:03	18:33	18	17:44 (VI05)	20:03			20:32	46	07:21 (VI06)	20:54	17	07:10 (VI06)
17	07:44	07:16	06:36		17:24 (VI05)	06:48			06:12		06:35 (VI06)	05:59		06:54 (VI06)
	17:28	18:04	18:34	23	17:47 (VI05)	20:04			20:33	45	07:20 (VI06)	20:54	16	07:10 (VI06)
18	07:43	07:15	06:34		17:22 (VI05)	06:46			06:11		06:35 (VI06)	05:59		06:54 (VI06)
	17:29	18:05	18:35	26	17:48 (VI05)	20:05			20:34	45	07:20 (VI06)	20:55	16	07:10 (VI06)
19	07:43	07:14	06:33		17:21 (VI05)	06:45			06:10		06:36 (VI06)	05:59		06:55 (VI06)
	17:31	18:06	18:36	28	17:49 (VI05)	20:06			20:35	45	07:21 (VI06)	20:55	16	07:11 (VI06)
20	07:42	07:13	06:31		17:19 (VI05)	06:43			06:09		06:36 (VI06)	05:59		06:56 (VI06)
	17:32	18:07	18:37	31	17:50 (VI05)	20:07			20:36	44	07:20 (VI06)	20:55	15	07:11 (VI06)
21	07:42	07:11	06:29		17:17 (VI05)	06:42			06:08		06:36 (VI06)	05:59		06:56 (VI06)
	17:33	18:09	18:38	33	17:50 (VI05)	20:08			20:37	43	07:19 (VI06)	20:56	15	07:11 (VI06)
22	07:41	07:10	06:28		17:17 (VI05)	06:40			06:08		06:37 (VI06)	06:00		06:56 (VI06)
	17:34	18:10	18:39	34	17:51 (VI05)	20:09			20:38	43	07:20 (VI06)	20:56	15	07:11 (VI06)
23	07:40	07:08	06:26		17:16 (VI05)	06:39			06:07		06:38 (VI06)	06:00		06:56 (VI06)
	17:35	18:11	18:40	35	17:51 (VI05)	20:10			20:39	41	07:19 (VI06)	20:56	15	07:11 (VI06)
24	07:40	07:07	06:25		17:16 (VI05)	06:38		06:57 (VI06)	06:06		06:38 (VI06)	06:00		06:56 (VI06)
	17:36	18:12	18:41	35	17:51 (VI05)	20:11	7	07:04 (VI06)	20:39	41	07:19 (VI06)	20:56	16	07:12 (VI06)
25	07:39	07:06	06:23		17:15 (VI05)	06:36		06:55 (VI06)	06:05		06:39 (VI06)	06:00		06:56 (VI06)
	17:37	18:13	18:42	36	17:51 (VI05)	20:12	14	07:09 (VI06)	20:40	40	07:19 (VI06)	20:56	16	07:12 (VI06)
26	07:39	07:04	06:21		17:14 (VI05)	06:35		06:53 (VI06)	06:05		06:39 (VI06)	06:01		06:55 (VI06)
	17:38	18:14	18:43	36	17:50 (VI05)	20:13	18	07:11 (VI06)	20:41	39	07:18 (VI06)	20:56	17	07:12 (VI06)
27	07:38	07:03	06:20		17:15 (VI05)	06:34		06:52 (VI06)	06:04		06:40 (VI06)	06:01		06:56 (VI06)
	17:40	18:15	18:44	35	17:50 (VI05)	20:14	21	07:13 (VI06)	20:42	38	07:18 (VI06)	20:56	17	07:13 (VI06)
28	07:37	07:01	06:18		17:14 (VI05)	06:32		06:51 (VI06)	06:04		06:40 (VI06)	06:01		06:55 (VI06)
	17:41	18:16	18:45	35	17:49 (VI05)	20:15	24	07:15 (VI06)	20:43	37	07:17 (VI06)	20:56	19	07:14 (VI06)
29	07:36		07:17		18:15 (VI05)	06:31		06:50 (VI06)	06:03		06:41 (VI06)	06:02		06:55 (VI06)
	17:42		19:46	34	18:49 (VI05)	20:16	26	07:16 (VI06)	20:43	36	07:17 (VI06)	20:56	19	07:14 (VI06)
30	07:35		07:15		18:15 (VI05)	06:30		06:49 (VI06)	06:03		06:41 (VI06)	06:02		06:55 (VI06)
	17:43		19:47	33	18:48 (VI05)	20:17	28	07:17 (VI06)	20:44	35	07:16 (VI06)	20:56	20	07:15 (VI06)
31	07:35		07:13		18:16 (VI05)				06:02		06:42 (VI06)			
	17:44		19:48	32	18:48 (VI05)				20:45	34	07:16 (VI06)			
Potential sun hours	302	300	370			396			444			446		
Total, worst case				514			274			1256			630	
Sun reduction				0,49			0,53			0,59			0,66	
Oper. time red.				0,88			0,88			0,88			0,88	
Wind dir. red.				0,71			0,70			0,68			0,69	
Total reduction				0,31			0,32			0,35			0,40	
Total, real				158			89			444			251	

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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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F030 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (64)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	July		August		September		October	November	December
1	06:03		06:54 (VI06)	06:25		06:46 (VI06)	06:53		07:21	06:53	07:25
	20:56	22	07:16 (VI06)	20:39	45	07:31 (VI06)	19:58		19:10	17:26	17:03
2	06:03		06:54 (VI06)	06:26		06:47 (VI06)	06:54		07:22	06:54	07:26
	20:56	23	07:17 (VI06)	20:38	44	07:31 (VI06)	19:57		19:08	17:25	17:03
3	06:04		06:54 (VI06)	06:27		06:48 (VI06)	06:55		07:23	06:55	07:27
	20:56	23	07:17 (VI06)	20:37	43	07:31 (VI06)	19:55		19:07	17:24	17:03
4	06:04		06:54 (VI06)	06:28		06:49 (VI06)	06:56		07:24	06:56	07:28
	20:56	24	07:18 (VI06)	20:36	42	07:31 (VI06)	19:53		19:05	17:22	17:03
5	06:05		06:53 (VI06)	06:29		06:50 (VI06)	06:57		07:25	06:57	07:29
	20:56	26	07:19 (VI06)	20:35	41	07:31 (VI06)	19:52		19:04	17:21	17:03
6	06:05		06:53 (VI06)	06:30		06:51 (VI06)	06:58		18:20 (VI05)	07:26	06:58	07:30
	20:55	27	07:20 (VI06)	20:33	40	07:31 (VI06)	19:50	11	18:31 (VI05)	19:02	17:20	17:03
7	06:06		06:53 (VI06)	06:30		06:52 (VI06)	06:59		18:17 (VI05)	07:27	06:59	07:31
	20:55	28	07:21 (VI06)	20:32	38	07:30 (VI06)	19:49	17	18:34 (VI05)	19:01	17:19	17:03
8	06:06		06:52 (VI06)	06:31		06:53 (VI06)	07:00		18:14 (VI05)	07:28	07:00	07:32
	20:55	29	07:21 (VI06)	20:31	37	07:30 (VI06)	19:47	22	18:36 (VI05)	18:59	17:18	17:03
9	06:07		06:52 (VI06)	06:32		06:53 (VI06)	07:01		18:12 (VI05)	07:29	07:02	07:33
	20:55	30	07:22 (VI06)	20:30	35	07:28 (VI06)	19:46	26	18:38 (VI05)	18:57	17:17	17:03
10	06:08		06:51 (VI06)	06:33		06:54 (VI06)	07:02		18:10 (VI05)	07:30	07:03	07:34
	20:54	31	07:22 (VI06)	20:29	34	07:28 (VI06)	19:44	28	18:38 (VI05)	18:56	17:16	17:03
11	06:08		06:51 (VI06)	06:34		06:55 (VI06)	07:03		18:08 (VI05)	07:31	07:04	07:35
	20:54	32	07:23 (VI06)	20:28	32	07:27 (VI06)	19:42	30	18:38 (VI05)	18:54	17:15	17:03
12	06:09		06:51 (VI06)	06:35		06:56 (VI06)	07:03		18:07 (VI05)	07:32	07:05	07:35
	20:53	33	07:24 (VI06)	20:26	30	07:26 (VI06)	19:41	32	18:39 (VI05)	18:53	17:15	17:03
13	06:10		06:50 (VI06)	06:36		06:57 (VI06)	07:04		18:06 (VI05)	07:33	07:06	07:36
	20:53	34	07:24 (VI06)	20:25	28	07:25 (VI06)	19:39	33	18:39 (VI05)	18:51	17:14	17:03
14	06:10		06:50 (VI06)	06:37		06:58 (VI06)	07:05		18:05 (VI05)	07:34	07:07	07:37
	20:53	35	07:25 (VI06)	20:24	26	07:24 (VI06)	19:37	35	18:40 (VI05)	18:50	17:13	17:03
15	06:11		06:49 (VI06)	06:38		06:59 (VI06)	07:06		18:05 (VI05)	07:35	07:08	07:38
	20:52	37	07:26 (VI06)	20:22	23	07:22 (VI06)	19:36	35	18:40 (VI05)	18:48	17:12	17:04
16	06:12		06:48 (VI06)	06:39		07:00 (VI06)	07:07		18:04 (VI05)	07:36	07:09	07:38
	20:51	38	07:26 (VI06)	20:21	20	07:20 (VI06)	19:34	36	18:40 (VI05)	18:47	17:11	17:04
17	06:13		06:48 (VI06)	06:40		07:00 (VI06)	07:08		18:04 (VI05)	07:37	07:10	07:39
	20:51	39	07:27 (VI06)	20:20	17	07:17 (VI06)	19:33	35	18:39 (VI05)	18:46	17:10	17:04
18	06:13		06:48 (VI06)	06:41		07:01 (VI06)	07:09		18:02 (VI05)	07:38	07:12	07:40
	20:50	40	07:28 (VI06)	20:18	13	07:14 (VI06)	19:31	36	18:38 (VI05)	18:44	17:10	17:04
19	06:14		06:48 (VI06)	06:42			07:10		18:02 (VI05)	07:39	07:13	07:40
	20:50	41	07:29 (VI06)	20:17			19:29	36	18:38 (VI05)	18:43	17:09	17:05
20	06:15		06:47 (VI06)	06:42			07:11		18:02 (VI05)	07:40	07:14	07:41
	20:49	41	07:28 (VI06)	20:16			19:28	35	18:37 (VI05)	18:41	17:08	17:05
21	06:16		06:47 (VI06)	06:43			07:12		18:02 (VI05)	07:41	07:15	07:41
	20:48	42	07:29 (VI06)	20:14			19:26	34	18:36 (VI05)	18:40	17:08	17:06
22	06:16		06:47 (VI06)	06:44			07:13		18:02 (VI05)	07:42	07:16	07:42
	20:48	43	07:30 (VI06)	20:13			19:24	33	18:35 (VI05)	18:39	17:07	17:06
23	06:17		06:47 (VI06)	06:45			07:13		18:03 (VI05)	07:43	07:17	07:42
	20:47	43	07:30 (VI06)	20:11			19:23	31	18:34 (VI05)	18:37	17:07	17:07
24	06:18		06:47 (VI06)	06:46			07:14		18:04 (VI05)	07:44	07:18	07:43
	20:46	44	07:31 (VI06)	20:10			19:21	29	18:33 (VI05)	18:36	17:06	17:07
25	06:19		06:46 (VI06)	06:47			07:15		18:05 (VI05)	06:45	07:19	07:43
	20:45	44	07:30 (VI06)	20:09			19:20	26	18:31 (VI05)	17:35	17:06	17:08
26	06:20		06:45 (VI07)	06:48			07:16		18:06 (VI05)	06:46	07:20	07:44
	20:44	46	07:31 (VI06)	20:07			19:18	24	18:30 (VI05)	17:33	17:05	17:08
27	06:21		06:45 (VI07)	06:49			07:17		18:08 (VI05)	06:47	07:21	07:44
	20:44	46	07:31 (VI06)	20:06			19:16	19	18:27 (VI05)	17:32	17:05	17:09
28	06:22		06:45 (VI07)	06:50			07:18		18:10 (VI05)	06:48	07:22	07:44
	20:43	46	07:31 (VI06)	20:04			19:15	14	18:24 (VI05)	17:31	17:04	17:10
29	06:22		06:46 (VI06)	06:51			07:19			06:49	07:23	07:45
	20:42	46	07:32 (VI06)	20:03			19:13			17:29	17:04	17:10
30	06:23		06:46 (VI06)	06:52			07:20			06:50	07:24	07:45
	20:41	46	07:32 (VI06)	20:01			19:12			17:28	17:04	17:11
31	06:24		06:46 (VI06)	06:53						06:51		07:45
	20:40	46	07:32 (VI06)	20:00						17:27		17:12
Potential sun hours	454			425			374			347	302	293
Total, worst case		1125			588			657				
Sun reduction		0,74			0,73			0,65				
Oper. time red.		0,88			0,88			0,88				
Wind dir. red.		0,68			0,68			0,71				
Total reduction		0,44			0,44			0,41				
Total, real		499			258			266				

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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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F111 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (65)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February			March	April	May	June	July	August	September	October	November			December		
1	07:46		10:29 (VI03)	07:34		10:52 (VI03)	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53			07:26		10:16 (VI03)
	17:13	124	16:05 (VI01)	17:46	30	11:22 (VI03)	18:18	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:04	119	15:54 (VI01)
2	07:46		10:30 (VI03)	07:33		10:55 (VI03)	06:59	07:11	06:28	06:01	06:03	06:26	06:55	07:22	06:54			07:27		10:16 (VI03)
	17:14	123	16:06 (VI01)	17:47	24	11:19 (VI03)	18:19	19:50	20:19	20:47	20:56	20:38	19:57	19:09	17:25			17:03	120	15:54 (VI01)
3	07:46		10:30 (VI03)	07:32		10:59 (VI03)	06:57	07:09	06:26	06:01	06:04	06:27	06:55	07:23	06:55			07:28		10:16 (VI03)
	17:15	124	16:07 (VI01)	17:48	16	11:15 (VI03)	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	122	15:55 (VI01)
4	07:46		10:30 (VI03)	07:31			06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56			07:29		10:17 (VI03)
	17:16	124	16:07 (VI01)	17:49			18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23			17:03	122	15:55 (VI01)
5	07:46		10:31 (VI03)	07:30			06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:30		10:17 (VI03)
	17:16	123	16:08 (VI01)	17:50			18:22	19:53	20:22	20:49	20:56	20:35	19:52	19:04	17:22			17:03	123	15:55 (VI01)
6	07:46		10:31 (VI03)	07:29			06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58			07:30		10:17 (VI03)
	17:17	124	16:09 (VI01)	17:52			18:23	19:54	20:23	20:49	20:56	20:34	19:50	19:02	17:21			17:03	124	15:55 (VI01)
7	07:46		10:32 (VI03)	07:28			06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59			07:31		10:18 (VI03)
	17:18	123	16:10 (VI01)	17:53			18:24	19:55	20:24	20:50	20:55	20:33	19:49	19:01	17:19			17:03	123	15:55 (VI01)
8	07:46		10:33 (VI03)	07:27			06:50	07:01	06:21	06:00	06:07	06:32	07:00	07:28	07:01		10:29 (VI03)	07:32		10:19 (VI03)
	17:19	122	16:11 (VI01)	17:54			18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18	17	10:46 (VI03)	17:03	123	15:55 (VI01)
9	07:46		10:33 (VI03)	07:26			06:48	07:00	06:20	05:59	06:07	06:32	07:01	07:29	07:02		10:25 (VI03)	07:33		10:19 (VI03)
	17:20	122	16:11 (VI01)	17:55			18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:17	25	10:50 (VI03)	17:03	125	15:56 (VI01)
10	07:46		10:34 (VI03)	07:25			06:47	06:58	06:18	05:59	06:08	06:33	07:02	07:30	07:03		10:23 (VI03)	07:34		10:20 (VI03)
	17:21	121	16:12 (VI01)	17:56			18:27	19:58	20:27	20:52	20:54	20:29	19:44	18:56	17:17	30	10:53 (VI03)	17:03	123	15:56 (VI01)
11	07:46		10:34 (VI03)	07:24			06:45	06:57	06:17	05:59	06:08	06:34	07:03	07:31	07:04		10:22 (VI03)	07:35		10:20 (VI03)
	17:22	119	16:12 (VI01)	17:57			18:28	19:59	20:28	20:52	20:54	20:28	19:42	18:55	17:16	38	15:38 (VI01)	17:03	124	15:56 (VI01)
12	07:45		10:34 (VI03)	07:23			06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05		10:20 (VI03)	07:36		10:20 (VI03)
	17:23	118	16:13 (VI01)	17:59			18:29	20:00	20:29	20:53	20:54	20:26	19:41	18:53	17:15	49	15:42 (VI01)	17:03	124	15:56 (VI01)
13	07:45		10:35 (VI03)	07:21			06:42	06:54	06:15	05:59	06:10	06:36	07:05	07:33	07:06		10:19 (VI03)	07:36		10:21 (VI03)
	17:24	115	16:14 (VI01)	18:00			18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14	57	15:44 (VI01)	17:03	123	15:56 (VI01)
14	07:45		10:35 (VI03)	07:20			06:41	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07		10:18 (VI03)	07:37		10:21 (VI03)
	17:25	113	16:14 (VI01)	18:01			18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13	63	15:46 (VI01)	17:03	124	15:56 (VI01)
15	07:45		10:36 (VI03)	07:19			06:39	06:51	06:14	05:59	06:11	06:38	07:06	07:35	07:08		10:17 (VI03)	07:38		10:22 (VI03)
	17:26	110	16:15 (VI01)	18:02			18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12	67	15:47 (VI01)	17:04	124	15:57 (VI01)
16	07:44		10:37 (VI03)	07:18			06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:10		10:17 (VI03)	07:39		10:22 (VI03)
	17:27	106	16:16 (VI01)	18:03			18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11	71	15:49 (VI01)	17:04	122	15:56 (VI01)
17	07:44		10:37 (VI03)	07:17			06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11		10:16 (VI03)	07:39		10:23 (VI03)
	17:29	98	16:15 (VI01)	18:04			18:34	20:05	20:34	20:55	20:51	20:20	19:33	18:46	17:11	74	15:49 (VI01)	17:04	123	15:57 (VI01)
18	07:43		10:38 (VI03)	07:15			06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12		10:16 (VI03)	07:40		10:23 (VI03)
	17:30	87	16:16 (VI01)	18:05			18:35	20:06	20:34	20:55	20:50	20:19	19:31	18:44	17:10	77	15:50 (VI01)	17:05	123	15:57 (VI01)
19	07:43		10:38 (VI03)	07:14			06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13		10:15 (VI03)	07:40		10:24 (VI03)
	17:31	86	16:16 (VI01)	18:07			18:36	20:07	20:35	20:55	20:50	20:17	19:30	18:43	17:09	80	15:51 (VI01)	17:05	122	15:58 (VI01)
20	07:42		10:39 (VI03)	07:13			06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14		10:15 (VI03)	07:41		10:25 (VI03)
	17:32	85	16:17 (VI01)	18:08			18:37	20:08	20:36	20:55	20:49	20:16	19:28	18:41	17:09	82	15:51 (VI01)	17:05	121	15:58 (VI01)
21	07:42		10:40 (VI03)	07:11			06:30	06:42	06:08	06:00	06:16	06:44	07:12	07:41	07:15		10:15 (VI03)	07:42		10:25 (VI03)
	17:33	83	16:16 (VI01)	18:09			18:38	20:09	20:37	20:56	20:48	20:14	19:26	18:40	17:08	83	15:51 (VI01)	17:06	121	15:58 (VI01)
22	07:41		10:40 (VI03)	07:10			06:28	06:41	06:08	06:00	06:17	06:44	07:13	07:42	07:16		10:15 (VI03)	07:42		10:26 (VI03)
	17:34	82	16:16 (VI01)	18:10			18:39	20:10	20:38	20:56	20:48	20:13	19:25	18:39	17:07	85	15:53 (VI01)	17:06	121	15:59 (VI01)
23	07:41		10:41 (VI03)	07:09			06:26	06:39	06:07	06:00	06:17	06:45	07:14	07:43	07:17		10:15 (VI03)	07:43		10:26 (VI03)
	17:35	80	16:17 (VI01)	18:11			18:40	20:10	20:39	20:56	20:47	20:12	19:23	18:37	17:07	86	15:53 (VI01)	17:07	121	15:59 (VI01)
24	07:40		10:42 (VI03)	07:07			06:25	06:38	06:06	06:00	06:18	06:46	07:15	07:44	07:18		10:15 (VI03)	07:43		10:26 (VI03)
	17:36	77	16:16 (VI01)	18:12			18:41	20:11	20:40	20:56	20:46	20:10	19:21	18:36	17:06	87	15:53 (VI01)	17:07	121	15:59 (VI01)
25	07:39		10:42 (VI03)	07:06			06:23	06:36	06:06	06:00	06:19	06:47	07:15	06:45	07:19		10:15 (VI03)	07:44		10:27 (VI03)
	17:38	74	16:15 (VI01)	18:13			18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06	98	15:53 (VI01)	17:08	123	16:01 (VI01)
26	07:39		10:43 (VI03)	07:05			06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:21		10:15 (VI03)	07:44		10:27 (VI03)
	17:39	71	16:15 (VI01)	18:14			18:43	20:13	20:41	20:56	20:45	20:07	19:18	17:33	17:05	106	15:54 (VI01)	17:09	123	16:01 (VI01)
27	07:38		10:45 (VI03)	07:03			06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:22		10:15 (VI03)	07:44		10:27 (VI03)
	17:40	67	16:15 (VI01)	18:15			18:44	20:14	20:42	20:57	20:44	20:06	19:17	17:32	17:05	109	15:54 (VI01)	17:09	122	16:01 (VI01)
28	07:37		10:46 (VI03)	07:02			06:18	06:33	06:04	06:02	06:22	06:50	07:18	06:48	07:23		10:15 (VI03)	07:45		10:28 (VI03)
	17:41	63	16:14 (VI01)	18:16			18:45	20:15	20:43	20:57	20:43	20:04	19:15	17:31	17:05	113	15:54 (VI01)	17:10	123	16:03 (VI01)
29	07:36		10:47 (VI03)				07:17	06:31	06:03	06:02	06:23	06:51	07:19	06:49	07:24		10:15 (VI03)	07:45		10:28 (VI03)
	17:42	56	16:12 (VI01)				19:46	20:16	20:44	20:57	20:42	20:03	19:13	17:30	17:04	115	15:54 (VI01)	17:11	124	16:03 (VI01)
30	07:36		10:49 (VI03)				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:51	07:25		10:15 (VI03)	07:45		10:29 (VI03)
	17:43	48	16:10 (VI01)				19:47	20:17	20:44	20:57	20:41	20:01	19:12	17:28	17:04	118	15:54 (VI01)	17:11	123	16:04 (VI01)
31	07:35		10:50 (VI03)				07:14		06:02		06:24	06:53		06:52				07:45		10:29 (VI03)
	17:45	35	16:05 (VI01)				19:48		20:45		20:40	20:00		17:27				17:12	123	16:04 (VI01)
Potential sun hours	302			300			370	396	444	446	454	425	374	347	302			293		
Total, worst case		3003			70											1730			3799	
Sun reduction		0,45			0,47											0,50			0,45	
Oper. time red.		0,88			0,88											0,88			0,88	
Wind dir. red.		0,60			0,63											0,61			0,59	
Total reduction		0,24			0,26											0,27			0,23	
Total, real		711			18											464			882	

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

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar

Calculation: Real_case_Progetto_2023_03_31Shadow receptor: F112 - Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (66)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:46		11:21 (VI03)	07:34	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53			07:26		15:18 (VI01)
	17:13	34	15:54 (VI01)	17:46	18:18	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26			17:04	19	15:37 (VI01)
2	07:46		11:25 (VI03)	07:33	06:59	07:11	06:28	06:01	06:03	06:26	06:55	07:22	06:54			07:27		15:18 (VI01)
	17:14	26	15:54 (VI01)	17:47	18:19	19:50	20:19	20:47	20:56	20:38	19:57	19:09	17:25			17:03	20	15:38 (VI01)
3	07:46		15:30 (VI01)	07:32	06:57	07:09	06:26	06:01	06:04	06:27	06:55	07:23	06:55			07:28		15:18 (VI01)
	17:15	25	15:55 (VI01)	17:48	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24			17:03	21	15:39 (VI01)
4	07:46		15:30 (VI01)	07:31	06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56			07:29		15:18 (VI01)
	17:16	25	15:55 (VI01)	17:49	18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23			17:03	22	15:40 (VI01)
5	07:46		15:31 (VI01)	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57			07:30		15:18 (VI01)
	17:16	24	15:55 (VI01)	17:50	18:22	19:53	20:22	20:49	20:56	20:35	19:52	19:04	17:22			17:03	23	15:41 (VI01)
6	07:46		15:32 (VI01)	07:29	06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58			07:30		15:18 (VI01)
	17:17	24	15:56 (VI01)	17:52	18:23	19:54	20:23	20:49	20:56	20:34	19:50	19:02	17:21			17:03	24	15:42 (VI01)
7	07:46		15:33 (VI01)	07:28	06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59			07:31		15:18 (VI01)
	17:18	23	15:56 (VI01)	17:53	18:24	19:55	20:24	20:50	20:55	20:33	19:49	19:01	17:19			17:03	24	15:42 (VI01)
8	07:46		15:34 (VI01)	07:27	06:50	07:01	06:21	06:00	06:07	06:32	07:00	07:28	07:01			07:32		15:18 (VI01)
	17:19	22	15:56 (VI01)	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18			17:03	25	15:43 (VI01)
9	07:46		15:35 (VI01)	07:26	06:48	07:00	06:20	05:59	06:07	06:32	07:01	07:29	07:02			07:33		15:19 (VI01)
	17:20	21	15:56 (VI01)	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:17			17:03	25	15:44 (VI01)
10	07:46		15:36 (VI01)	07:25	06:47	06:58	06:18	05:59	06:08	06:33	07:02	07:30	07:03			07:34		15:19 (VI01)
	17:21	20	15:56 (VI01)	17:56	18:27	19:58	20:27	20:52	20:54	20:29	19:44	18:56	17:17			17:03	25	15:44 (VI01)
11	07:46		15:36 (VI01)	07:24	06:45	06:57	06:17	05:59	06:08	06:34	07:03	07:31	07:04			07:35		11:12 (VI03)
	17:22	19	15:55 (VI01)	17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:42	18:55	17:16			17:03	34	15:45 (VI01)
12	07:45		15:38 (VI01)	07:23	06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05			07:36		11:10 (VI03)
	17:23	17	15:55 (VI01)	17:59	18:29	20:00	20:29	20:53	20:54	20:26	19:41	18:53	17:15			17:03	38	15:45 (VI01)
13	07:45		15:39 (VI01)	07:21	06:42	06:54	06:15	05:59	06:10	06:36	07:05	07:33	07:06			07:36		11:09 (VI03)
	17:24	16	15:55 (VI01)	18:00	18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14			17:03	41	15:46 (VI01)
14	07:45		15:40 (VI01)	07:20	06:41	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07			07:37		11:09 (VI03)
	17:25	14	15:54 (VI01)	18:01	18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13			17:03	44	15:47 (VI01)
15	07:45		15:42 (VI01)	07:19	06:39	06:51	06:14	05:59	06:11	06:38	07:06	07:35	07:08			07:38		11:09 (VI03)
	17:26	11	15:53 (VI01)	18:02	18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12			17:04	45	15:47 (VI01)
16	07:44		15:45 (VI01)	07:18	06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:10			07:39		11:08 (VI03)
	17:27	7	15:52 (VI01)	18:03	18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11			17:04	46	15:47 (VI01)
17	07:44			07:17	06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11			07:39		11:08 (VI03)
	17:29			18:04	18:34	20:05	20:34	20:55	20:51	20:20	19:33	18:46	17:11			17:04	47	15:48 (VI01)
18	07:43			07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12			07:40		11:08 (VI03)
	17:30			18:05	18:35	20:06	20:34	20:55	20:50	20:19	19:31	18:44	17:10			17:05	49	15:48 (VI01)
19	07:43			07:14	06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13			07:40		11:09 (VI03)
	17:31			18:07	18:36	20:07	20:35	20:55	20:50	20:17	19:30	18:43	17:09			17:05	49	15:49 (VI01)
20	07:42			07:13	06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14			07:41		11:09 (VI03)
	17:32			18:08	18:37	20:08	20:36	20:55	20:49	20:16	19:28	18:41	17:09			17:05	50	15:50 (VI01)
21	07:42			07:11	06:30	06:42	06:08	06:00	06:16	06:44	07:12	07:41	07:15			07:42		11:09 (VI03)
	17:33			18:09	18:38	20:09	20:37	20:56	20:48	20:14	19:26	18:40	17:08			17:06	50	15:50 (VI01)
22	07:41			07:10	06:28	06:41	06:08	06:00	06:17	06:44	07:13	07:42	07:16			07:42		11:10 (VI03)
	17:34			18:10	18:39	20:10	20:38	20:56	20:48	20:13	19:25	18:39	17:07			17:06	50	15:51 (VI01)
23	07:41			07:09	06:26	06:39	06:07	06:00	06:17	06:45	07:14	07:43	07:17			07:43		11:10 (VI03)
	17:35			18:11	18:40	20:10	20:39	20:56	20:47	20:12	19:23	18:37	17:07			17:07	50	15:51 (VI01)
24	07:40			07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:15	07:44	07:18			07:43		11:11 (VI03)
	17:36			18:12	18:41	20:11	20:40	20:56	20:46	20:10	19:21	18:36	17:06			17:07	49	15:51 (VI01)
25	07:39			07:06	06:23	06:36	06:06	06:00	06:19	06:47	07:15	06:45	07:19			07:44		11:12 (VI03)
	17:38			18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06			17:08	49	15:52 (VI01)
26	07:39			07:05	06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:21		15:24 (VI01)	07:44		11:12 (VI03)
	17:39			18:14	18:43	20:13	20:41	20:56	20:45	20:07	19:18	17:33	17:05	6	15:30 (VI01)	17:09	49	15:52 (VI01)
27	07:38			07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:22		15:21 (VI01)	07:44		11:13 (VI03)
	17:40			18:15	18:44	20:14	20:42	20:57	20:44	20:06	19:17	17:32	17:05	11	15:32 (VI01)	17:09	46	15:52 (VI01)
28	07:37			07:02	06:18	06:33	06:04	06:01	06:22	06:50	07:18	06:48	07:23		15:20 (VI01)	07:45		11:15 (VI03)
	17:41			18:16	18:45	20:15	20:43	20:57	20:43	20:04	19:15	17:31	17:05	14	15:34 (VI01)	17:10	45	15:53 (VI01)
29	07:36				07:17	06:31	06:03	06:02	06:23	06:51	07:19	06:49	07:24		15:19 (VI01)	07:45		11:15 (VI03)
	17:42				19:46	20:16	20:44	20:57	20:42	20:03	19:13	17:30	17:04	16	15:35 (VI01)	17:11	44	15:53 (VI01)
30	07:36				07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:51	07:25		15:19 (VI01)	07:45		11:17 (VI03)
	17:43				19:47	20:17	20:44	20:57	20:41	20:01	19:12	17:28	17:04	17	15:36 (VI01)	17:11	42	15:54 (VI01)
31	07:35				07:14		06:02		06:24	06:53		06:52				07:45		11:18 (VI03)
	17:45				19:48		20:45		20:40	20:00		17:27				17:12	40	15:54 (VI01)
Potential sun hours	302			300	370	396	444	446	454	425	374	347	302			293		
Total, worst case		328												64			1185	
Sun reduction		0,45												0,50			0,45	
Oper. time red.		0,88												0,88			0,88	
Wind dir. red.		0,58												0,58			0,58	
Total reduction		0,23												0,25			0,23	
Total, real		75												16			272	

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

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

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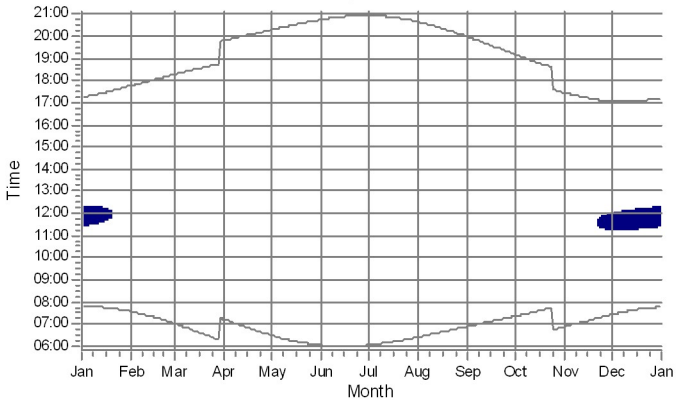
Calculated:
31/03/2023 15:38/3.4.415

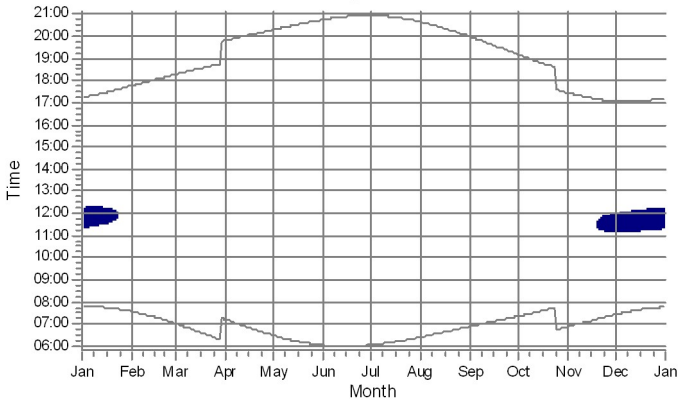
SHADOW - Calendar, graphical

Calculation: Real_case_Progetto_2023_03_31

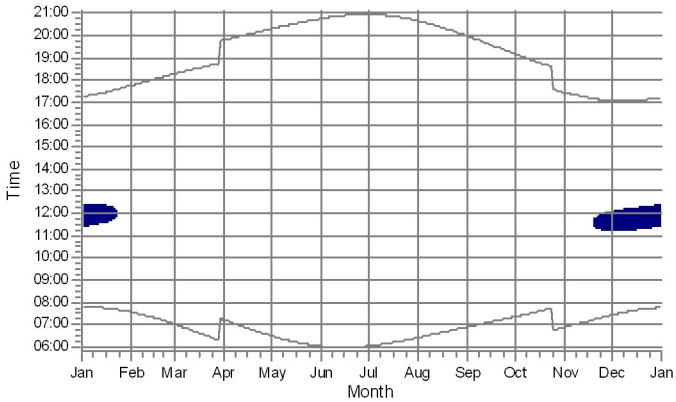
F013: Agritur



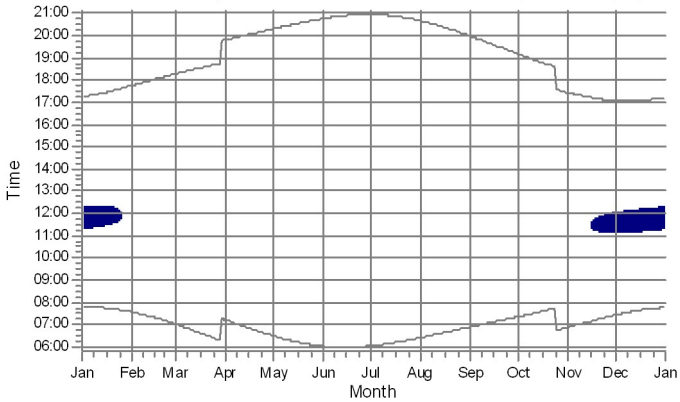
F014: Agritur



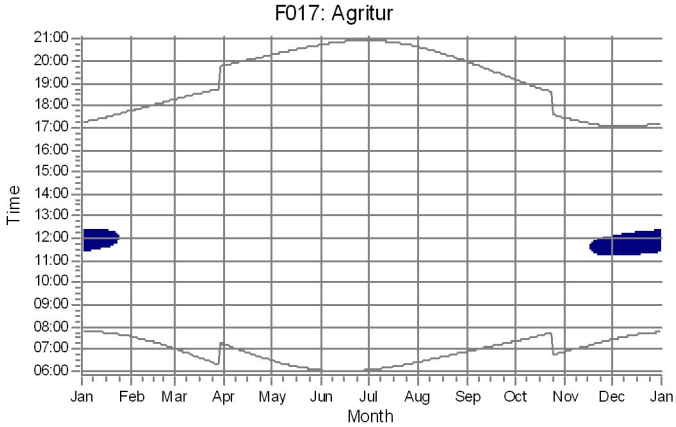
F015: Agritur



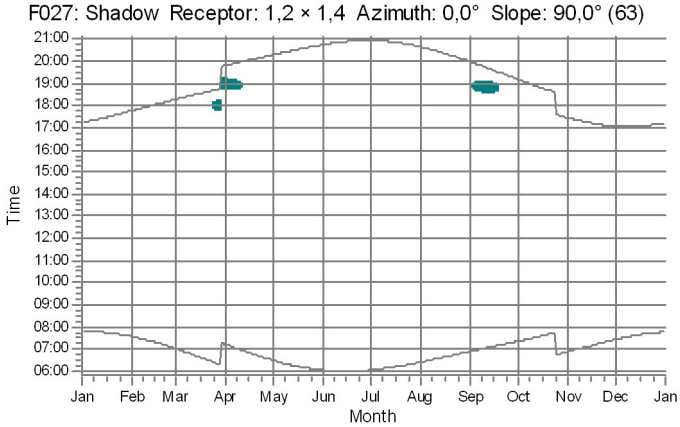
F016: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (61)



F017: Agritur



F027: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (63)



WTGs

VI05: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (52)
VI07: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (53)

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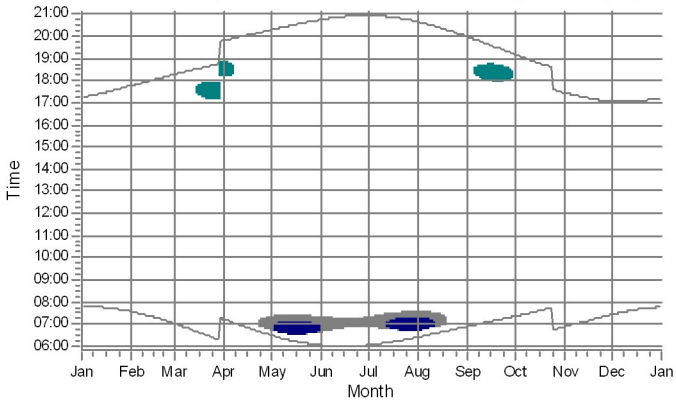
Calculated:
31/03/2023 15:38/3.4.415

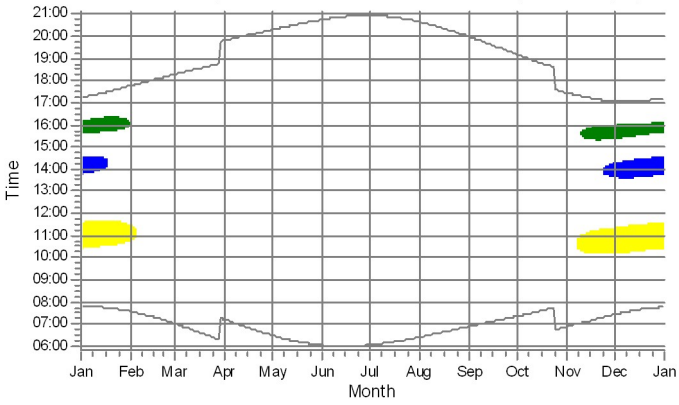
SHADOW - Calendar, graphical

Calculation: Real_case_Progetto_2023_03_31

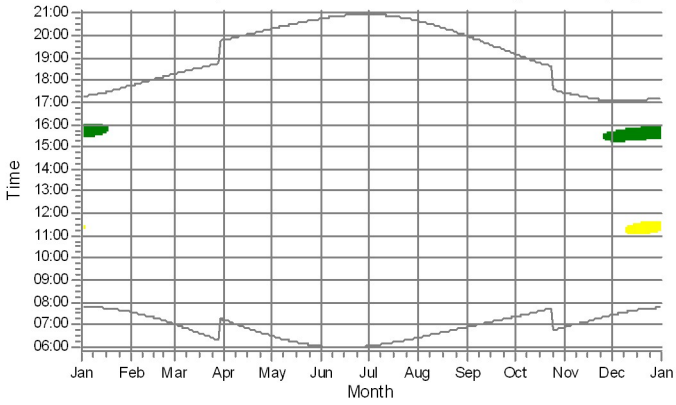
F030: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (64)



F111: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (65)



F112: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (66)



WTGs

- VI01: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (47)
- VI03: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (48)
- VI02: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (49)
- VI06: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (50)
- VI05: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (52)
- VI07: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (53)

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI01 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (47)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:46 15:29-16:05/36	07:34	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53	07:26 15:18-15:54/36
	17:13	17:46	18:18	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26	17:04
2	07:46 15:29-16:06/37	07:33	06:59	07:11	06:28	06:02	06:03	06:26	06:55	07:22	06:54	07:27 15:18-15:54/36
	17:14	17:47	18:19	19:50	20:19	20:47	20:56	20:38	19:57	19:09	17:25	17:04
3	07:46 15:30-16:07/37	07:32	06:57	07:09	06:26	06:01	06:04	06:27	06:56	07:23	06:55	07:28 15:18-15:55/37
	17:15	17:48	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24	17:03
4	07:46 15:30-16:07/37	07:31	06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56	07:29 15:18-15:55/37
	17:16	17:49	18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23	17:03
5	07:46 15:31-16:08/37	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57	07:30 15:18-15:55/37
	17:17	17:50	18:22	19:53	20:22	20:49	20:56	20:35	19:52	19:04	17:22	17:03
6	07:46 15:32-16:09/37	07:29	06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58	07:30 15:18-15:55/37
	17:17	17:52	18:23	19:54	20:23	20:49	20:56	20:34	19:51	19:02	17:21	17:03
7	07:46 15:33-16:10/37	07:28	06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59	07:31 15:18-15:55/37
	17:18	17:53	18:24	19:55	20:24	20:50	20:55	20:33	19:49	19:01	17:20	17:03
8	07:46 15:34-16:11/37	07:27	06:50	07:01	06:21	06:00	06:07	06:32	07:00	07:28	07:01	07:32 15:18-15:55/37
	17:19	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:19	17:03
9	07:46 15:35-16:11/36	07:26	06:48	07:00	06:20	06:00	06:07	06:33	07:01	07:29	07:02	07:33 15:19-15:56/37
	17:20	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:18	17:03
10	07:46 15:36-16:12/36	07:25	06:47	06:58	06:19	05:59	06:08	06:33	07:02	07:30	07:03	07:34 15:19-15:56/37
	17:21	17:56	18:27	19:58	20:27	20:52	20:54	20:29	19:44	18:56	17:17	17:03
11	07:46 15:36-16:12/36	07:24	06:45	06:57	06:18	05:59	06:08	06:34	07:03	07:31	07:04 15:35-15:38/3	07:35 15:20-15:56/36
	17:22	17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:43	18:55	17:16	17:03
12	07:45 15:38-16:13/35	07:23	06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05 15:31-15:42/11	07:36 15:19-15:56/37
	17:23	17:59	18:29	20:00	20:29	20:53	20:54	20:27	19:41	18:53	17:15	17:03
13	07:45 15:39-16:14/35	07:22	06:42	06:54	06:16	05:59	06:10	06:36	07:05	07:33	07:06 15:28-15:44/16	07:36 15:20-15:56/36
	17:24	18:00	18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14	17:03
14	07:45 15:40-16:14/34	07:20	06:41	06:52	06:15	05:59	06:11	06:37	07:05	07:34	07:07 15:27-15:46/19	07:37 15:20-15:56/36
	17:25	18:01	18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13	17:04
15	07:45 15:42-16:15/33	07:19	06:39	06:51	06:14	05:59	06:11	06:38	07:06	07:35	07:08 15:26-15:47/21	07:38 15:21-15:57/36
	17:26	18:02	18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12	17:04
16	07:44 15:45-16:16/31	07:18	06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:10 15:26-15:49/23	07:39 15:21-15:56/35
	17:27	18:03	18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11	17:04
17	07:44 15:46-16:15/29	07:17	06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11 15:25-15:49/24	07:39 15:22-15:57/35
	17:29	18:04	18:34	20:05	20:34	20:55	20:51	20:20	19:33	18:46	17:11	17:04
18	07:43 15:47-16:16/29	07:15	06:34	06:46	06:11	05:59	06:14	06:41	07:09	07:38	07:12 15:24-15:50/26	07:40 15:21-15:57/36
	17:30	18:05	18:35	20:06	20:34	20:55	20:50	20:19	19:31	18:44	17:10	17:05
19	07:43 15:47-16:16/29	07:14	06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13 15:24-15:51/27	07:40 15:22-15:58/36
	17:31	18:07	18:36	20:07	20:35	20:55	20:50	20:17	19:30	18:43	17:09	17:05
20	07:42 15:48-16:17/29	07:13	06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14 15:23-15:51/28	07:41 15:23-15:58/35
	17:32	18:08	18:37	20:08	20:36	20:55	20:49	20:16	19:28	18:42	17:09	17:05
21	07:42 15:48-16:16/28	07:11	06:30	06:42	06:09	06:00	06:16	06:44	07:12	07:41	07:15 15:23-15:51/28	07:42 15:23-15:58/35
	17:33	18:09	18:38	20:09	20:37	20:56	20:49	20:15	19:26	18:40	17:08	17:06
22	07:41 15:48-16:16/28	07:10	06:28	06:41	06:08	06:00	06:17	06:45	07:13	07:42	07:16 15:24-15:53/29	07:42 15:24-15:59/35
	17:34	18:10	18:39	20:10	20:38	20:56	20:48	20:13	19:25	18:39	17:07	17:06
23	07:41 15:50-16:17/27	07:09	06:26	06:39	06:07	06:00	06:18	06:45	07:14	07:43	07:17 15:24-15:53/29	07:43 15:24-15:59/35
	17:35	18:11	18:40	20:11	20:39	20:56	20:47	20:12	19:23	18:37	17:07	17:07
24	07:40 15:50-16:16/26	07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:15	07:44	07:18 15:24-15:53/29	07:43 15:24-15:59/35
	17:36	18:12	18:41	20:12	20:40	20:56	20:46	20:10	19:21	18:36	17:06	17:07
25	07:39 15:51-16:15/24	07:06	06:23	06:37	06:06	06:01	06:19	06:47	07:16	06:45	07:19 15:24-15:53/29	07:44 15:25-16:01/36
	17:38	18:13	18:42	20:12	20:41	20:56	20:45	20:09	19:20	17:35	17:06	17:08
26	07:39 15:52-16:15/23	07:05	06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:21 15:24-15:54/30	07:44 15:25-16:01/36
	17:39	18:14	18:43	20:13	20:41	20:56	20:45	20:07	19:18	17:33	17:05	17:09
27	07:38 15:54-16:15/21	07:03	06:20	06:34	06:05	06:01	06:21	06:49	07:17	06:47	07:22 15:21-15:54/33	07:44 15:26-16:01/35
	17:40	18:15	18:44	20:14	20:42	20:57	20:44	20:06	19:17	17:32	17:05	17:09
28	07:37 15:55-16:14/19	07:02	06:18	06:33	06:04	06:02	06:22	06:50	07:18	06:48	07:23 15:20-15:54/34	07:45 15:27-16:03/36
	17:41	18:17	18:45	20:15	20:43	20:57	20:43	20:04	19:15	17:31	17:05	17:10
29	07:36 15:57-16:12/15		07:17	06:31	06:03	06:02	06:23	06:51	07:19	06:50	07:24 15:19-15:54/35	07:45 15:27-16:03/36
	17:42		19:46	20:16	20:44	20:57	20:42	20:03	19:13	17:30	17:04	17:11
30	07:36 15:59-16:10/11		07:15	06:30	06:03	06:02	06:24	06:52	07:20	06:51	07:25 15:19-15:54/35	07:45 15:28-16:04/36
	17:43		19:47	20:17	20:44	20:57	20:41	20:01	19:12	17:28	17:04	17:11
31	07:35 16:04-16:05/1		07:14		06:02		06:24	06:53		06:52		07:45 15:28-16:04/36
	17:45		19:48		20:45		20:40	20:00		17:27		17:12
Potential sun hours	302	300	370	396	444	446	454	425	374	347	302	293
Sum of minutes with flicker	910	0	0	0	0	0	0	0	0	0	509	1117

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

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Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI02 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (49)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January		February	March	April	May	June	July	August	September	October	November		December	
1	07:46	13:50-14:29/39	07:34	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53		07:26	13:41-14:12/31
	17:13		17:46	18:18	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26		17:04	
2	07:46	13:51-14:30/39	07:33	06:59	07:11	06:28	06:02	06:03	06:26	06:55	07:22	06:54		07:27	13:41-14:13/32
	17:14		17:47	18:19	19:50	20:19	20:47	20:56	20:38	19:57	19:09	17:25		17:03	
3	07:46	13:51-14:30/39	07:32	06:57	07:09	06:26	06:01	06:04	06:27	06:55	07:23	06:55		07:28	13:41-14:14/33
	17:15		17:48	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24		17:03	
4	07:46	13:52-14:30/38	07:31	06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56		07:29	13:40-14:14/34
	17:16		17:49	18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23		17:03	
5	07:46	13:53-14:30/37	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57		07:30	13:40-14:15/35
	17:17		17:50	18:22	19:53	20:22	20:49	20:56	20:35	19:52	19:04	17:22		17:03	
6	07:46	13:54-14:30/36	07:29	06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58		07:30	13:40-14:16/36
	17:17		17:52	18:23	19:54	20:23	20:49	20:56	20:34	19:50	19:02	17:21		17:03	
7	07:46	13:55-14:30/35	07:28	06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59		07:31	13:40-14:17/37
	17:18		17:53	18:24	19:55	20:24	20:50	20:55	20:33	19:49	19:01	17:20		17:03	
8	07:46	13:56-14:30/34	07:27	06:50	07:01	06:21	06:00	06:07	06:32	07:00	07:28	07:01		07:32	13:40-14:18/38
	17:19		17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:19		17:03	
9	07:46	13:57-14:31/34	07:26	06:48	07:00	06:20	05:59	06:07	06:33	07:01	07:29	07:02		07:33	13:40-14:19/39
	17:20		17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:18		17:03	
10	07:46	13:59-14:31/32	07:25	06:47	06:58	06:19	05:59	06:08	06:33	07:02	07:30	07:03		07:34	13:41-14:20/39
	17:21		17:56	18:27	19:58	20:27	20:52	20:54	20:29	19:44	18:56	17:17		17:03	
11	07:46	13:59-14:30/31	07:24	06:45	06:57	06:17	05:59	06:08	06:34	07:03	07:31	07:04		07:35	13:41-14:20/39
	17:22		17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:43	18:55	17:16		17:03	
12	07:45	14:01-14:29/28	07:23	06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05		07:36	13:40-14:20/40
	17:23		17:59	18:29	20:00	20:29	20:53	20:54	20:26	19:41	18:53	17:15		17:03	
13	07:45	14:03-14:29/26	07:21	06:42	06:54	06:15	05:59	06:10	06:36	07:05	07:33	07:06		07:36	13:41-14:21/40
	17:24		18:00	18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14		17:03	
14	07:45	14:04-14:28/24	07:20	06:41	06:52	06:15	05:59	06:11	06:37	07:05	07:34	07:07		07:37	13:41-14:22/41
	17:25		18:01	18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13		17:03	
15	07:44	14:06-14:27/21	07:19	06:39	06:51	06:14	05:59	06:11	06:38	07:06	07:35	07:08		07:38	13:42-14:23/41
	17:26		18:02	18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12		17:04	
16	07:44	14:09-14:26/17	07:18	06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:10		07:39	13:42-14:23/41
	17:27		18:03	18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11		17:04	
17	07:44	14:12-14:23/11	07:17	06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11		07:39	13:42-14:24/42
	17:29		18:04	18:34	20:05	20:34	20:55	20:51	20:20	19:33	18:46	17:11		17:04	
18	07:43		07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12		07:40	13:42-14:24/42
	17:30		18:05	18:35	20:06	20:34	20:55	20:50	20:19	19:31	18:44	17:10		17:05	
19	07:43		07:14	06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13		07:40	13:43-14:24/41
	17:31		18:07	18:36	20:07	20:35	20:55	20:50	20:17	19:30	18:43	17:09		17:05	
20	07:42		07:13	06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14		07:41	13:44-14:25/41
	17:32		18:08	18:37	20:08	20:36	20:55	20:49	20:16	19:28	18:42	17:09		17:05	
21	07:42		07:11	06:30	06:42	06:09	06:00	06:16	06:44	07:12	07:41	07:15		07:42	13:44-14:25/41
	17:33		18:09	18:38	20:09	20:37	20:56	20:48	20:14	19:26	18:40	17:08		17:06	
22	07:41		07:10	06:28	06:41	06:08	06:00	06:17	06:44	07:13	07:42	07:16		07:42	13:45-14:26/41
	17:34		18:10	18:39	20:10	20:38	20:56	20:48	20:13	19:25	18:39	17:07		17:06	
23	07:41		07:09	06:26	06:39	06:07	06:00	06:17	06:45	07:14	07:43	07:17		07:43	13:45-14:26/41
	17:35		18:11	18:40	20:10	20:39	20:56	20:47	20:12	19:23	18:37	17:07		17:07	
24	07:40		07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:15	07:44	07:18		07:43	13:45-14:26/41
	17:36		18:12	18:41	20:11	20:40	20:56	20:46	20:10	19:21	18:36	17:06		17:07	
25	07:39		07:06	06:23	06:37	06:06	06:01	06:19	06:47	07:16	06:45	07:19	13:50-14:01/11	07:44	13:46-14:28/42
	17:38		18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06		17:08	
26	07:39		07:05	06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:21	13:47-14:04/17	07:44	13:46-14:28/42
	17:39		18:14	18:43	20:13	20:41	20:56	20:45	20:07	19:18	17:33	17:05		17:09	
27	07:38		07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:22	13:46-14:06/20	07:44	13:47-14:28/41
	17:40		18:15	18:44	20:14	20:42	20:57	20:44	20:06	19:17	17:32	17:05		17:09	
28	07:37		07:02	06:18	06:33	06:04	06:02	06:22	06:50	07:18	06:48	07:23	13:44-14:08/24	07:45	13:48-14:29/41
	17:41		18:16	18:45	20:15	20:43	20:57	20:43	20:04	19:15	17:31	17:05		17:10	
29	07:36			07:17	06:31	06:03	06:02	06:23	06:51	07:19	06:50	07:24	13:43-14:09/26	07:45	13:48-14:29/41
	17:42			19:46	20:16	20:44	20:57	20:42	20:03	19:13	17:30	17:04		17:11	
30	07:36			07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:51	07:25	13:42-14:10/28	07:45	13:49-14:29/40
	17:43			19:47	20:17	20:44	20:57	20:41	20:01	19:12	17:28	17:04		17:11	
31	07:35			07:14		06:02		06:24	06:53		06:52			07:45	13:49-14:29/40
	17:45			19:48		20:45		20:40	20:00		17:27			17:12	
Potential sun hours	302		300	370	396	444	446	454	425	374	347	302		293	
Sum of minutes with flicker	521		0	0	0	0	0	0	0	0	0	126		1213	

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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI03 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (48)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:46 10:29-11:31/62	07:34 10:52-11:22/30	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53	07:26 10:16-11:16/60
	17:13	17:46	18:18	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26	17:04
2	07:46 10:30-11:31/61	07:33 10:55-11:19/24	06:59	07:11	06:28	06:01	06:03	06:26	06:55	07:22	06:54	07:27 10:16-11:17/61
	17:14	17:47	18:19	19:50	20:19	20:47	20:56	20:38	19:57	19:09	17:25	17:03
3	07:46 10:30-11:31/61	07:32 10:59-11:15/16	06:57	07:09	06:26	06:01	06:04	06:27	06:55	07:23	06:55	07:28 10:16-11:17/61
	17:15	17:48	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24	17:03
4	07:46 10:30-11:32/62	07:31	06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56	07:29 10:17-11:18/61
	17:16	17:49	18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23	17:03
5	07:46 10:31-11:32/61	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57	07:30 10:17-11:18/61
	17:16	17:50	18:22	19:53	20:22	20:49	20:56	20:35	19:52	19:04	17:22	17:03
6	07:46 10:31-11:33/62	07:29	06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58	07:30 10:17-11:19/62
	17:17	17:52	18:23	19:54	20:23	20:49	20:56	20:34	19:50	19:02	17:21	17:03
7	07:46 10:32-11:33/61	07:28	06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59	07:31 10:18-11:19/61
	17:18	17:53	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:01	17:19	17:03
8	07:46 10:33-11:34/61	07:27	06:50	07:01	06:21	06:00	06:07	06:32	07:00	07:28	07:01 10:29-10:46/17	07:32 10:19-11:20/61
	17:19	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18	17:03
9	07:46 10:33-11:34/61	07:26	06:48	07:00	06:20	05:59	06:07	06:32	07:01	07:29	07:02 10:25-10:50/25	07:33 10:19-11:21/62
	17:20	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:17	17:03
10	07:46 10:34-11:35/61	07:25	06:47	06:58	06:18	05:59	06:08	06:33	07:02	07:30	07:03 10:23-10:53/30	07:34 10:20-11:21/61
	17:21	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:17	17:03
11	07:46 10:34-11:34/60	07:24	06:45	06:57	06:17	05:59	06:08	06:34	07:03	07:31	07:04 10:22-10:57/35	07:35 10:20-11:22/62
	17:22	17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:42	18:55	17:16	17:03
12	07:45 10:34-11:35/61	07:23	06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05 10:20-10:58/38	07:36 10:20-11:22/62
	17:23	17:59	18:29	20:00	20:29	20:52	20:54	20:26	19:41	18:53	17:15	17:03
13	07:45 10:35-11:35/60	07:21	06:42	06:54	06:15	05:59	06:10	06:36	07:05	07:33	07:06 10:19-11:00/41	07:36 10:21-11:24/63
	17:24	18:00	18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14	17:03
14	07:45 10:35-11:35/60	07:20	06:41	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07 10:18-11:02/44	07:37 10:21-11:26/65
	17:25	18:01	18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13	17:03
15	07:44 10:36-11:35/59	07:19	06:39	06:51	06:14	05:59	06:11	06:38	07:06	07:35	07:08 10:17-11:03/46	07:38 10:22-11:28/66
	17:26	18:02	18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12	17:04
16	07:44 10:37-11:36/59	07:18	06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:10 10:17-11:05/48	07:39 10:22-11:28/66
	17:27	18:03	18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11	17:04
17	07:44 10:37-11:35/58	07:17	06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11 10:16-11:06/50	07:39 10:23-11:29/66
	17:29	18:04	18:34	20:05	20:34	20:55	20:51	20:20	19:33	18:46	17:11	17:04
18	07:43 10:38-11:36/58	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12 10:16-11:07/51	07:40 10:23-11:30/67
	17:30	18:05	18:35	20:06	20:34	20:55	20:50	20:19	19:31	18:44	17:10	17:05
19	07:43 10:38-11:35/57	07:14	06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13 10:15-11:08/53	07:40 10:24-11:31/67
	17:31	18:07	18:36	20:07	20:35	20:55	20:50	20:17	19:30	18:43	17:09	17:05
20	07:42 10:39-11:35/56	07:13	06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14 10:15-11:09/54	07:41 10:25-11:32/67
	17:32	18:08	18:37	20:08	20:36	20:55	20:49	20:16	19:28	18:41	17:09	17:05
21	07:42 10:40-11:35/55	07:11	06:30	06:42	06:08	06:00	06:16	06:44	07:12	07:41	07:15 10:15-11:10/55	07:42 10:25-11:32/67
	17:33	18:09	18:38	20:09	20:37	20:56	20:48	20:14	19:26	18:40	17:08	17:06
22	07:41 10:40-11:34/54	07:10	06:28	06:41	06:08	06:00	06:17	06:44	07:13	07:42	07:16 10:15-11:11/56	07:42 10:26-11:33/67
	17:34	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:25	18:39	17:07	17:06
23	07:41 10:41-11:34/53	07:09	06:26	06:39	06:07	06:00	06:17	06:45	07:14	07:43	07:17 10:15-11:12/57	07:43 10:26-11:33/67
	17:35	18:11	18:40	20:10	20:39	20:56	20:47	20:12	19:23	18:37	17:07	17:07
24	07:40 10:42-11:33/51	07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:15	07:44	07:18 10:15-11:13/58	07:43 10:26-11:33/67
	17:36	18:12	18:41	20:11	20:40	20:56	20:46	20:10	19:21	18:36	17:06	17:07
25	07:39 10:42-11:32/50	07:06	06:23	06:36	06:06	06:00	06:19	06:47	07:15	06:45	07:19 10:15-11:13/58	07:44 10:27-11:34/67
	17:38	18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06	17:08
26	07:39 10:43-11:31/48	07:05	06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20 10:15-11:14/59	07:44 10:27-11:34/67
	17:39	18:14	18:43	20:13	20:41	20:56	20:45	20:07	19:18	17:33	17:05	17:09
27	07:38 10:45-11:31/46	07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:22 10:15-11:14/59	07:44 10:27-11:33/66
	17:40	18:15	18:44	20:14	20:42	20:57	20:44	20:06	19:17	17:32	17:05	17:09
28	07:37 10:46-11:30/44	07:02	06:18	06:33	06:04	06:02	06:22	06:50	07:18	06:48	07:23 10:15-11:15/60	07:45 10:28-11:34/66
	17:41	18:16	18:45	20:15	20:43	20:57	20:43	20:04	19:15	17:31	17:05	17:10
29	07:36 10:47-11:28/41		07:17	06:31	06:03	06:02	06:23	06:51	07:19	06:49	07:24 10:15-11:15/60	07:45 10:28-11:33/65
	17:42		19:46	20:16	20:44	20:57	20:42	20:03	19:13	17:30	17:04	17:11
30	07:36 10:49-11:26/37		07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:51	07:25 10:15-11:16/61	07:45 10:29-11:33/64
	17:43		19:47	20:17	20:44	20:57	20:41	20:01	19:12	17:28	17:04	17:11
31	07:35 10:50-11:24/34		07:14		06:02		06:24	06:53		06:52		07:45 10:29-11:32/63
	17:45		19:48		20:45		20:40	20:00		17:27		17:12
Potential sun hours	302	300	370	396	444	446	454	425	374	347	302	293
Sum of minutes with flicker	1714	70	0	0	0	0	0	0	0	0	1115	1988

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

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Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI04 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (51)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:46	07:34	07:00	07:12	06:29	06:02	06:03	06:25	06:54	07:21	06:53	07:26
	17:13	17:46	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26	17:04
2	07:46	07:33	06:59	07:10	06:27	06:01	06:03	06:26	06:54	07:22	06:54	07:27
	17:14	17:47	18:19	19:50	20:19	20:46	20:56	20:38	19:57	19:09	17:25	17:03
3	07:46	07:32	06:57	07:09	06:26	06:01	06:04	06:27	06:55	07:23	06:55	07:28
	17:15	17:48	18:20	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24	17:03
4	07:46	07:31	06:56	07:07	06:25	06:01	06:04	06:28	06:56	07:24	06:56	07:28
	17:16	17:49	18:21	19:52	20:21	20:48	20:56	20:36	19:54	19:05	17:23	17:03
5	07:46	07:30	06:54	07:06	06:24	06:00	06:05	06:29	06:57	07:25	06:57	07:29
	17:16	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:22	17:03
6	07:46	07:29	06:53	07:04	06:23	06:00	06:05	06:30	06:58	07:26	06:58	07:30
	17:17	17:51	18:23	19:54	20:23	20:49	20:56	20:34	19:50	19:02	17:20	17:03
7	07:46	07:28	06:51	07:03	06:22	06:00	06:06	06:31	06:59	07:27	06:59	07:31
	17:18	17:53	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:01	17:19	17:03
8	07:46	07:27	06:50	07:01	06:21	06:00	06:06	06:31	07:00	07:28	07:00	07:32
	17:19	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18	17:03
9	07:46	07:26	06:48	07:00	06:19	05:59	06:07	06:32	07:01	07:29	07:02	07:33
	17:20	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:46	18:58	17:17	17:03
10	07:46	07:25	06:47	06:58	06:18	05:59	06:08	06:33	07:02	07:30	07:03	07:34
	17:21	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16	17:03
11	07:45	07:24	06:45	06:57	06:17	05:59	06:08	06:34	07:03	07:31	07:04	07:35
	17:22	17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:42	18:55	17:16	17:03
12	07:45	07:23	06:44	06:55	06:16	05:59	06:09	06:35	07:04	07:32	07:05	07:35
	17:23	17:58	18:29	20:00	20:29	20:52	20:54	20:26	19:41	18:53	17:15	17:03
13	07:45	07:21	06:42	06:54	06:15	05:59	06:10	06:36	07:04	07:33	07:06	07:36
	17:24	18:00	18:30	20:01	20:30	20:53	20:53	20:25	19:39	18:52	17:14	17:03
14	07:45	07:20	06:40	06:52	06:14	05:59	06:10	06:37	07:05	07:34	07:07	07:37
	17:25	18:01	18:31	20:02	20:31	20:53	20:53	20:24	19:38	18:50	17:13	17:03
15	07:44	07:19	06:39	06:51	06:13	05:59	06:11	06:38	07:06	07:35	07:08	07:38
	17:26	18:02	18:32	20:03	20:32	20:54	20:52	20:23	19:36	18:49	17:12	17:04
16	07:44	07:18	06:37	06:49	06:13	05:59	06:12	06:39	07:07	07:36	07:09	07:38
	17:27	18:03	18:33	20:04	20:33	20:54	20:52	20:21	19:34	18:47	17:11	17:04
17	07:44	07:16	06:36	06:48	06:12	05:59	06:13	06:40	07:08	07:37	07:11	07:39
	17:28	18:04	18:34	20:05	20:33	20:54	20:51	20:20	19:33	18:46	17:11	17:04
18	07:43	07:15	06:34	06:46	06:11	05:59	06:13	06:41	07:09	07:38	07:12	07:40
	17:30	18:05	18:35	20:05	20:34	20:55	20:50	20:19	19:31	18:44	17:10	17:05
19	07:43	07:14	06:33	06:45	06:10	05:59	06:14	06:42	07:10	07:39	07:13	07:40
	17:31	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09	17:05
20	07:42	07:13	06:31	06:43	06:09	05:59	06:15	06:43	07:11	07:40	07:14	07:41
	17:32	18:08	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:09	17:05
21	07:42	07:11	06:29	06:42	06:08	05:59	06:16	06:43	07:12	07:41	07:15	07:42
	17:33	18:09	18:38	20:08	20:37	20:56	20:48	20:14	19:26	18:40	17:08	17:06
22	07:41	07:10	06:28	06:41	06:08	06:00	06:17	06:44	07:13	07:42	07:16	07:42
	17:34	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:25	18:39	17:07	17:06
23	07:41	07:09	06:26	06:39	06:07	06:00	06:17	06:45	07:14	07:43	07:17	07:43
	17:35	18:11	18:40	20:10	20:39	20:56	20:47	20:12	19:23	18:37	17:07	17:07
24	07:40	07:07	06:25	06:38	06:06	06:00	06:18	06:46	07:14	07:44	07:18	07:43
	17:36	18:12	18:41	20:11	20:40	20:56	20:46	20:10	19:21	18:36	17:06	17:07
25	07:39	07:06	06:23	06:36	06:06	06:00	06:19	06:47	07:15	06:45	07:19	07:43
	17:37	18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06	17:08
26	07:39	07:04	06:22	06:35	06:05	06:01	06:20	06:48	07:16	06:46	07:20	07:44
	17:39	18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	17:09
27	07:38	07:03	06:20	06:34	06:04	06:01	06:21	06:49	07:17	06:47	07:21	07:44
	17:40	18:15	18:44	20:14	20:42	20:56	20:44	20:06	19:17	17:32	17:05	17:09
28	07:37	07:02	06:18	06:32	06:04	06:01	06:22	06:50	07:18	06:48	07:23	07:45
	17:41	18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:05	17:10
29	07:36		07:17	06:31	06:03	06:02	06:22	06:51	07:19	06:49	07:24	07:45
	17:42		19:46	20:16	20:44	20:56	20:42	20:03	19:13	17:30	17:04	17:11
30	07:36		07:15	06:30	06:03	06:02	06:23	06:52	07:20	06:50	07:25	07:45
	17:43		19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	17:11
31	07:35		07:14		06:02		06:24	06:53		06:52		07:45
	17:44		19:48		20:45		20:40	20:00		17:27		17:12
Potential sun hours	302	300	370	396	444	446	454	425	374	347	302	293
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

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Giuseppe Frongia / direttore@iatprogetti.it
Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI05 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (52)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March		April		May	June	July	August	September		October	November	December
1	07:46	07:34	07:00		07:12	18:16-19:11/55	06:29	06:02	06:03	06:25	06:53		07:21	06:53	07:26
	17:13	17:46	18:17		19:49		20:18	20:46	20:56	20:39	19:58		19:10	17:26	17:04
2	07:46	07:33	06:59		07:10	18:16-19:10/54	06:27	06:01	06:03	06:26	06:54	18:52-18:55/3	07:22	06:54	07:27
	17:14	17:47	18:18		19:50		20:19	20:46	20:56	20:38	19:57		19:08	17:25	17:03
3	07:46	07:32	06:57		07:09	18:18-18:44/26	06:26	06:01	06:04	06:27	06:55	18:47-18:59/12	07:23	06:55	07:27
	17:15	17:48	18:20		19:51	18:45-19:10/25	20:20	20:47	20:56	20:37	19:55		19:07	17:24	17:03
4	07:46	07:31	06:56		07:07	18:19-18:41/22	06:25	06:01	06:04	06:28	06:56	18:45-19:01/16	07:24	06:56	07:28
	17:15	17:49	18:21		19:52	18:45-19:09/24	20:21	20:48	20:56	20:36	19:53		19:05	17:23	17:03
5	07:46	07:30	06:54		07:06	18:21-18:39/18	06:24	06:00	06:05	06:29	06:57	18:43-19:03/20	07:25	06:57	07:29
	17:16	17:50	18:22		19:53	18:46-19:09/23	20:22	20:48	20:56	20:35	19:52		19:04	17:21	17:03
6	07:46	07:29	06:53		07:04	18:24-18:35/11	06:23	06:00	06:05	06:30	06:58	18:20-18:31/11	07:26	06:58	07:30
	17:17	17:51	18:23		19:54	18:46-19:07/21	20:23	20:49	20:56	20:33	19:50	18:42-19:03/21	19:02	17:20	17:03
7	07:46	07:28	06:51		07:03	18:47-19:07/20	06:22	06:00	06:06	06:31	06:59	18:17-18:34/17	07:27	06:59	07:31
	17:18	17:53	18:24		19:55		20:24	20:50	20:55	20:32	19:49	18:41-19:04/23	19:01	17:19	17:03
8	07:46	07:27	06:50		07:01	18:48-19:04/16	06:20	06:00	06:06	06:31	07:00	18:14-18:36/22	07:28	07:00	07:32
	17:19	17:54	18:25		19:56		20:25	20:50	20:55	20:31	19:47	18:40-19:04/24	18:59	17:18	17:03
9	07:46	07:26	06:48		07:00	18:49-19:02/13	06:19	05:59	06:07	06:32	07:01	18:12-18:38/26	07:29	07:02	07:33
	17:20	17:55	18:26		19:57		20:26	20:51	20:55	20:30	19:46	18:39-19:04/25	18:58	17:17	17:03
10	07:46	07:25	06:47		06:58	18:54-18:57/3	06:18	05:59	06:08	06:33	07:02	18:10-19:03/53	07:30	07:03	07:34
	17:21	17:56	18:27		19:58		20:27	20:51	20:54	20:29	19:44		18:56	17:16	17:03
11	07:45	07:24	06:45		06:56		06:17	05:59	06:08	06:34	07:03	18:08-19:03/55	07:31	07:04	07:35
	17:22	17:57	18:28		19:59		20:28	20:52	20:54	20:28	19:42		18:54	17:15	17:03
12	07:45	07:22	06:44		06:55		06:16	05:59	06:09	06:35	07:03	18:07-19:03/56	07:32	07:05	07:35
	17:23	17:58	18:29		20:00		20:29	20:52	20:53	20:26	19:41		18:53	17:15	17:03
13	07:45	07:21	06:42		06:53		06:15	05:59	06:10	06:36	07:04	18:06-19:02/56	07:33	07:06	07:36
	17:24	18:00	18:30		20:01		20:30	20:53	20:53	20:25	19:39		18:51	17:14	17:03
14	07:45	07:20	06:40		06:52		06:14	05:59	06:10	06:37	07:05	18:05-19:01/56	07:34	07:07	07:37
	17:25	18:01	18:31		20:02		20:31	20:53	20:53	20:24	19:38		18:50	17:13	17:03
15	07:44	07:19	06:39	17:31-17:41/10	06:50		06:13	05:59	06:11	06:38	07:06	18:05-19:00/55	07:35	07:08	07:38
	17:26	18:02	18:32		20:03		20:32	20:54	20:52	20:23	19:36		18:49	17:12	17:04
16	07:44	07:18	06:37	17:26-17:44/18	06:49		06:13	05:59	06:12	06:39	07:07	18:04-18:59/55	07:36	07:09	07:38
	17:27	18:03	18:33		20:03		20:33	20:54	20:52	20:21	19:34		18:47	17:11	17:04
17	07:44	07:16	06:36	17:24-17:47/23	06:48		06:12	05:59	06:13	06:40	07:08	18:04-18:39/35	07:37	07:11	07:39
	17:28	18:04	18:34		20:04		20:33	20:54	20:51	20:20	19:33	18:41-18:57/16	18:46	17:11	17:04
18	07:43	07:15	06:34	17:22-17:48/26	06:46		06:11	05:59	06:13	06:41	07:09	18:02-18:38/36	07:38	07:12	07:40
	17:29	18:05	18:35		20:05		20:34	20:55	20:50	20:18	19:31	18:42-18:53/11	18:44	17:10	17:04
19	07:43	07:14	06:33	17:21-17:49/28	06:45		06:10	05:59	06:14	06:42	07:10	18:02-18:38/36	07:39	07:13	07:40
	17:31	18:06	18:36		20:06		20:35	20:55	20:50	20:17	19:29		18:43	17:09	17:05
20	07:42	07:13	06:31	17:19-17:50/31	06:43		06:09	05:59	06:15	06:42	07:11	18:02-18:37/35	07:40	07:14	07:41
	17:32	18:08	18:37		20:07		20:36	20:55	20:49	20:16	19:28		18:41	17:08	17:05
21	07:42	07:11	06:29	17:17-17:50/33	06:42		06:08	05:59	06:16	06:43	07:12	18:02-18:36/34	07:41	07:15	07:41
	17:33	18:09	18:38		20:08		20:37	20:56	20:48	20:14	19:26		18:40	17:08	17:06
22	07:41	07:10	06:28	17:17-17:51/34	06:40		06:08	06:00	06:16	06:44	07:13	18:02-18:35/33	07:42	07:16	07:42
	17:34	18:10	18:39		20:09		20:38	20:56	20:48	20:13	19:25		18:39	17:07	17:06
23	07:41	07:09	06:26	17:16-17:51/35	06:39		06:07	06:00	06:17	06:45	07:14	18:03-18:34/31	07:43	07:17	07:42
	17:35	18:11	18:40		20:10		20:39	20:56	20:47	20:12	19:23		18:37	17:07	17:07
24	07:40	07:07	06:25	17:16-17:51/35	06:38		06:06	06:00	06:18	06:46	07:14	18:04-18:33/29	07:44	07:18	07:43
	17:36	18:12	18:41		20:11		20:40	20:56	20:46	20:10	19:21		18:36	17:06	17:07
25	07:39	07:06	06:23	17:15-17:51/36	06:36		06:06	06:00	06:19	06:47	07:15	18:05-18:31/26	06:45	07:19	07:43
	17:37	18:13	18:42	17:56-18:05/9	20:12		20:40	20:56	20:45	20:09	19:20		17:35	17:06	17:08
26	07:39	07:04	06:21	17:14-17:50/36	06:35		06:05	06:01	06:20	06:48	07:16	18:06-18:30/24	06:46	07:20	07:44
	17:39	18:14	18:43	17:52-18:07/15	20:13		20:41	20:56	20:44	20:07	19:18		17:33	17:05	17:08
27	07:38	07:03	06:20	17:15-17:50/35	06:34		06:04	06:01	06:21	06:49	07:17	18:08-18:27/19	06:47	07:21	07:44
	17:40	18:15	18:44	17:51-18:09/18	20:14		20:42	20:56	20:44	20:06	19:16		17:32	17:05	17:09
28	07:37	07:02	06:18	17:14-18:10/56	06:32		06:04	06:01	06:22	06:50	07:18	18:10-18:24/14	06:48	07:22	07:44
	17:41	18:16	18:45		20:15		20:43	20:56	20:43	20:04	19:15		17:31	17:04	17:10
29	07:36		07:17	18:15-19:11/56	06:31		06:03	06:02	06:22	06:51	07:19		06:49	07:23	07:45
	17:42		19:46		20:16		20:44	20:56	20:42	20:03	19:13		17:30	17:04	17:10
30	07:35		07:15	18:15-19:11/56	06:30		06:03	06:02	06:23	06:52	07:20		06:50	07:25	07:45
	17:43		19:47		20:17		20:44	20:56	20:41	20:01	19:12		17:28	17:04	17:11
31	07:35		07:14	18:16-19:10/54			06:02		06:24	06:53			06:52		07:45
	17:44		19:48				20:45		20:40	20:00			17:27		17:12
Potential sun hours	302	300	370		396		444	446	454	425	374		347	302	293
Sum of minutes with flicker	0	0	644		331		0	0	0	0	985		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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI06 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (50)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:34	07:00	07:12	06:29 06:47-07:17/30	06:02 06:42-07:15/33	06:03 06:54-07:16/22	06:25 06:46-07:31/45	06:53	07:21	06:53	07:25
	17:13	17:45	18:17	19:49	20:18	20:46	20:56	20:39	19:58	19:10	17:26	17:03
2	07:46	07:33	06:59	07:10	06:27 06:46-07:18/32	06:01 06:43-07:15/32	06:03 06:54-07:17/23	06:26 06:47-07:31/44	06:54	07:22	06:54	07:26
	17:14	17:47	18:18	19:50	20:19	20:46	20:56	20:38	19:56	19:08	17:25	17:03
3	07:46	07:32	06:57	07:09	06:26 06:45-07:19/34	06:01 06:44-07:15/31	06:03 06:54-07:17/23	06:27 06:48-07:31/43	06:55	07:23	06:55	07:27
	17:15	17:48	18:19	19:51	20:20	20:47	20:56	20:37	19:55	19:07	17:24	17:03
4	07:46	07:31	06:56	07:07	06:25 06:44-07:20/36	06:01 06:44-07:14/30	06:04 06:54-07:18/24	06:28 06:49-07:31/42	06:56	07:24	06:56	07:28
	17:15	17:49	18:20	19:52	20:21	20:48	20:56	20:36	19:53	19:05	17:22	17:03
5	07:46	07:30	06:54	07:06	06:24 06:43-07:20/37	06:00 06:45-07:14/29	06:05 06:53-07:19/26	06:29 06:50-07:31/41	06:57	07:25	06:57	07:29
	17:16	17:50	18:22	19:53	20:22	20:48	20:56	20:35	19:52	19:04	17:21	17:03
6	07:46	07:29	06:53	07:04	06:23 06:42-07:21/39	06:00 06:46-07:14/28	06:05 06:53-07:20/27	06:30 06:51-07:31/40	06:58	07:26	06:58	07:30
	17:17	17:51	18:23	19:54	20:23	20:49	20:55	20:33	19:50	19:02	17:20	17:03
7	07:46	07:28	06:51	07:02	06:21 06:41-07:21/40	06:00 06:47-07:14/27	06:06 06:53-07:21/28	06:30 06:52-07:30/38	06:59	07:27	06:59	07:31
	17:18	17:53	18:24	19:55	20:24	20:50	20:55	20:32	19:49	19:01	17:19	17:03
8	07:46	07:27	06:50	07:01	06:20 06:40-07:21/41	05:59 06:48-07:13/25	06:06 06:52-07:21/29	06:31 06:53-07:30/37	07:00	07:28	07:00	07:32
	17:19	17:54	18:25	19:56	20:25	20:50	20:55	20:31	19:47	18:59	17:18	17:03
9	07:46	07:26	06:48	06:59	06:19 06:39-07:21/42	05:59 06:48-07:12/24	06:07 06:52-07:22/30	06:32 06:53-07:28/35	07:01	07:29	07:01	07:33
	17:20	17:55	18:26	19:57	20:26	20:51	20:55	20:30	19:45	18:57	17:17	17:03
10	07:46	07:25	06:47	06:58	06:18 06:38-07:22/44	05:59 06:49-07:12/23	06:08 06:51-07:22/31	06:33 06:54-07:28/34	07:02	07:30	07:03	07:34
	17:21	17:56	18:27	19:58	20:27	20:51	20:54	20:29	19:44	18:56	17:16	17:03
11	07:45	07:24	06:45	06:56	06:17 06:37-07:22/45	05:59 06:50-07:12/22	06:08 06:51-07:23/32	06:34 06:55-07:27/32	07:02	07:31	07:04	07:35
	17:22	17:57	18:28	19:59	20:28	20:52	20:54	20:28	19:42	18:54	17:15	17:03
12	07:45	07:22	06:43	06:55	06:16 06:36-07:22/46	05:59 06:51-07:11/20	06:09 06:51-07:24/33	06:35 06:56-07:26/30	07:03	07:32	07:05	07:35
	17:23	17:58	18:29	19:59	20:29	20:52	20:53	20:26	19:41	18:53	17:14	17:03
13	07:45	07:21	06:42	06:53	06:15 06:35-07:21/46	05:59 06:51-07:11/20	06:10 06:50-07:24/34	06:36 06:57-07:25/28	07:04	07:33	07:06	07:36
	17:24	17:59	18:30	20:00	20:30	20:53	20:53	20:25	19:39	18:51	17:14	17:03
14	07:45	07:20	06:40	06:52	06:14 06:35-07:21/46	05:59 06:52-07:11/19	06:10 06:50-07:25/35	06:37 06:58-07:24/26	07:05	07:34	07:07	07:37
	17:25	18:01	18:31	20:01	20:31	20:53	20:52	20:24	19:37	18:50	17:13	17:03
15	07:44	07:19	06:39	06:50	06:13 06:35-07:21/46	05:59 06:53-07:11/18	06:11 06:49-07:26/37	06:38 06:59-07:22/23	07:06	07:35	07:08	07:38
	17:26	18:02	18:32	20:02	20:32	20:54	20:52	20:22	19:36	18:48	17:12	17:03
16	07:44	07:18	06:37	06:49	06:12 06:35-07:21/46	05:59 06:53-07:10/17	06:12 06:48-07:26/38	06:39 07:00-07:20/20	07:07	07:36	07:09	07:38
	17:27	18:03	18:33	20:03	20:32	20:54	20:51	20:21	19:34	18:47	17:11	17:04
17	07:44	07:16	06:36	06:47	06:12 06:35-07:20/45	05:59 06:54-07:10/16	06:12 06:48-07:27/39	06:40 07:00-07:17/17	07:08	07:37	07:10	07:39
	17:28	18:04	18:34	20:04	20:33	20:54	20:51	20:20	19:33	18:46	17:10	17:04
18	07:43	07:15	06:34	06:46	06:11 06:35-07:20/45	05:59 06:54-07:10/16	06:13 06:48-07:28/40	06:41 07:01-07:14/13	07:09	07:38	07:12	07:40
	17:29	18:05	18:35	20:05	20:34	20:55	20:50	20:18	19:31	18:44	17:10	17:04
19	07:43	07:14	06:32	06:45	06:10 06:36-07:21/45	05:59 06:55-07:11/16	06:14 06:48-07:29/41	06:41	07:10	07:39	07:13	07:40
	17:30	18:06	18:36	20:06	20:35	20:55	20:50	20:17	19:29	18:43	17:09	17:05
20	07:42	07:12	06:31	06:43	06:09 06:36-07:20/44	05:59 06:56-07:11/15	06:15 06:47-07:28/41	06:42	07:11	07:40	07:14	07:41
	17:32	18:07	18:37	20:07	20:36	20:55	20:49	20:16	19:28	18:41	17:08	17:05
21	07:42	07:11	06:29	06:42	06:08 06:36-07:19/43	05:59 06:56-07:11/15	06:16 06:47-07:29/42	06:43	07:12	07:41	07:15	07:41
	17:33	18:09	18:38	20:08	20:37	20:55	20:48	20:14	19:26	18:40	17:08	17:06
22	07:41	07:10	06:28	06:40	06:08 06:37-07:20/43	05:59 06:56-07:11/15	06:16 06:47-07:30/43	06:44	07:12	07:42	07:16	07:42
	17:34	18:10	18:39	20:09	20:38	20:56	20:48	20:13	19:24	18:39	17:07	17:06
23	07:40	07:08	06:26	06:39	06:07 06:38-07:19/41	06:00 06:56-07:11/15	06:17 06:47-07:30/43	06:45	07:13	07:43	07:17	07:42
	17:35	18:11	18:40	20:10	20:39	20:56	20:47	20:11	19:23	18:37	17:07	17:07
24	07:40	07:07	06:25	06:38 06:57-07:04/7	06:06 06:38-07:19/41	06:00 06:56-07:12/16	06:18 06:47-07:31/44	06:46	07:14	07:44	07:18	07:43
	17:36	18:12	18:41	20:11	20:39	20:56	20:46	20:10	19:21	18:36	17:06	17:07
25	07:39	07:06	06:23	06:36 06:55-07:09/14	06:05 06:39-07:19/40	06:00 06:56-07:12/16	06:19 06:46-07:30/44	06:47	07:15	06:45	07:19	07:43
	17:37	18:13	18:42	20:12	20:40	20:56	20:45	20:09	19:20	17:35	17:06	17:08
26	07:38	07:04	06:21	06:35 06:53-07:11/18	06:05 06:39-07:18/39	06:01 06:55-07:12/17	06:20 06:46-07:31/45	06:48	07:16	06:46	07:20	07:44
	17:38	18:14	18:43	20:13	20:41	20:56	20:44	20:07	19:18	17:33	17:05	17:08
27	07:38	07:03	06:20	06:34 06:52-07:13/21	06:04 06:40-07:18/38	06:01 06:56-07:13/17	06:21 06:46-07:31/45	06:49	07:17	06:47	07:21	07:44
	17:40	18:15	18:44	20:14	20:42	20:56	20:43	20:06	19:16	17:32	17:05	17:09
28	07:37	07:01	06:18	06:32 06:51-07:15/24	06:04 06:40-07:17/37	06:01 06:55-07:14/19	06:21 06:46-07:31/45	06:50	07:18	06:48	07:22	07:44
	17:41	18:16	18:45	20:15	20:43	20:56	20:43	20:04	19:15	17:31	17:04	17:10
29	07:36		07:17	06:31 06:50-07:16/26	06:03 06:41-07:17/36	06:02 06:55-07:14/19	06:22 06:46-07:32/46	06:51	07:19	06:49	07:23	07:45
	17:42		19:46	20:16	20:43	20:56	20:42	20:03	19:13	17:29	17:04	17:10
30	07:35		07:15	06:30 06:49-07:17/28	06:03 06:41-07:16/35	06:02 06:55-07:15/20	06:23 06:46-07:32/46	06:52	07:20	06:50	07:24	07:45
	17:43		19:47	20:17	20:44	20:56	20:41	20:01	19:12	17:28	17:04	17:11
31	07:35		07:13		06:02 06:42-07:16/34		06:24 06:46-07:32/46	06:52		06:51		07:45
	17:44		19:48		20:45		20:40	20:00		17:27		17:12
Potential sun hours	302	300	370	396	444	446	454	425	374	347	302	293
Sum of minutes with flicker	0	0	0	138	1256	630	1122	588	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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI07 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (53)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	January		February	March	April	May		June
1	07:45	11:23-12:19/56	07:34	07:00	07:12	06:29		06:02
	17:13		17:45	18:17	19:49	20:18		20:46
2	07:46	11:23-12:19/56	07:33	06:59	07:10	06:27		06:01
	17:14		17:47	18:18	19:50	20:19		20:46
3	07:46	11:24-12:19/55	07:32	06:57	07:09	06:26	06:45-06:55/10	06:01
	17:14		17:48	18:19	19:51	20:20		20:47
4	07:46	11:24-12:20/56	07:31	06:56	07:07	06:25	06:44-06:57/13	06:00
	17:15		17:49	18:20	19:52	20:21		20:48
5	07:46	11:25-12:20/55	07:30	06:54	07:06	06:24	06:43-06:58/15	06:00
	17:16		17:50	18:22	19:53	20:22		20:48
6	07:46	11:25-12:20/55	07:29	06:53	07:04	06:23	06:42-07:00/18	06:00
	17:17		17:51	18:23	19:54	20:23		20:49
7	07:46	11:26-12:20/54	07:28	06:51	07:02	06:21	06:41-07:00/19	06:00
	17:18		17:52	18:24	19:55	20:24		20:50
8	07:46	11:27-12:21/54	07:27	06:50	07:01	06:20	06:40-07:01/21	05:59
	17:19		17:54	18:25	19:56	20:25		20:50
9	07:46	11:28-12:21/53	07:26	06:48	06:59	06:19	06:39-07:02/23	05:59
	17:20		17:55	18:26	19:57	20:26		20:51
10	07:45	11:28-12:20/52	07:25	06:47	06:58	06:18	06:38-07:02/24	05:59
	17:21		17:56	18:27	19:58	20:27		20:51
11	07:45	11:28-12:20/52	07:24	06:45	06:56	06:17	06:37-07:02/25	05:59
	17:22		17:57	18:28	19:58	20:28		20:52
12	07:45	11:29-12:21/52	07:22	06:43	06:55	06:16	06:36-07:02/26	05:59
	17:23		17:58	18:29	19:59	20:29		20:52
13	07:45	11:31-12:21/50	07:21	06:42	06:53	06:15	06:35-07:02/27	05:59
	17:24		17:59	18:30	20:00	20:30		20:53
14	07:45	11:31-12:20/49	07:20	06:40	06:52	06:14	06:35-07:02/27	05:59
	17:25		18:01	18:31	20:01	20:31		20:53
15	07:44	11:32-12:20/48	07:19	06:39	06:50	06:13	06:35-07:02/27	05:59
	17:26		18:02	18:32	20:02	20:31		20:54
16	07:44	11:32-12:19/47	07:18	06:37	06:49	06:12	06:35-07:02/27	05:59
	17:27		18:03	18:33	20:03	20:32		20:54
17	07:44	11:34-12:19/45	07:16	06:36	06:47	06:11	06:35-07:02/27	05:59
	17:28		18:04	18:34	20:04	20:33		20:54
18	07:43	11:34-12:17/43	07:15	06:34	06:46	06:11	06:35-07:01/26	05:59
	17:29		18:05	18:35	20:05	20:34		20:55
19	07:43	11:36-12:17/41	07:14	06:32	06:45	06:10	06:36-07:02/26	05:59
	17:30		18:06	18:36	20:06	20:35		20:55
20	07:42	11:37-12:15/38	07:12	06:31	06:43	06:09	06:36-07:01/25	05:59
	17:32		18:07	18:37	20:07	20:36		20:55
21	07:42	11:39-12:14/35	07:11	06:29	06:42	06:08	06:36-07:00/24	05:59
	17:33		18:09	18:38	20:08	20:37		20:55
22	07:41	11:41-12:12/31	07:10	06:28	06:40	06:07	06:38-07:01/23	05:59
	17:34		18:10	18:39	20:09	20:38		20:56
23	07:40	11:42-12:09/27	07:08	06:26	06:39	06:07	06:38-07:00/22	06:00
	17:35		18:11	18:40	20:10	20:39		20:56
24	07:40	11:46-12:06/20	07:07	06:25	06:38	06:06	06:38-06:59/21	06:00
	17:36		18:12	18:41	20:11	20:39		20:56
25	07:39	11:50-12:02/12	07:06	06:23	06:36	06:05	06:40-06:59/19	06:00
	17:37		18:13	18:42	20:12	20:40		20:56
26	07:38		07:04	06:21	06:35	06:05	06:40-06:58/18	06:01
	17:38		18:14	18:43	20:13	20:41		20:56
27	07:38		07:03	06:20	06:34	06:04	06:42-06:57/15	06:01
	17:40		18:15	18:44	20:14	20:42		20:56
28	07:37		07:01	06:18	06:32	06:04	06:42-06:56/14	06:01
	17:41		18:16	18:45	20:15	20:43		20:56
29	07:36			07:17	06:31	06:03	06:44-06:55/11	06:02
	17:42			19:46	20:16	20:43		20:56
30	07:35			07:15	06:30	06:03	06:46-06:53/7	06:02
	17:43			19:47	20:17	20:44		20:56
31	07:35			07:13		06:02		
	17:44			19:48		20:45		
Potential sun hours	302		300	370	396	444		446
Sum of minutes with flicker		1136	0	0	0		580	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

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Calculated:
31/03/2023 15:38/3.4.415

SHADOW - Calendar per WTG

Calculation: Real_case_Progetto_2023_03_31WTG: VI07 - Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 210,0 m) (53)

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	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
227	250	261	300	427	403	363	323	320	335	398	489	612	1.174	1.190	594	7.666

	July		August		September	October	November		December	
1	06:03		06:25	06:46-07:12/26	06:53	07:21	06:53		07:25	11:11-12:02/51
	20:56		20:39		19:58	19:10	17:26		17:03	
2	06:03		06:26	06:47-07:12/25	06:54	07:22	06:54		07:26	11:11-12:03/52
	20:56		20:38		19:56	19:08	17:25		17:03	
3	06:03		06:27	06:48-07:12/24	06:55	07:23	06:55		07:27	11:11-12:04/53
	20:56		20:37		19:55	19:07	17:24		17:03	
4	06:04		06:28	06:49-07:11/22	06:56	07:24	06:56		07:28	11:11-12:05/54
	20:56		20:36		19:53	19:05	17:22		17:03	
5	06:05		06:29	06:50-07:11/21	06:57	07:25	06:57		07:29	11:11-12:05/54
	20:56		20:35		19:52	19:04	17:21		17:03	
6	06:05		06:29	06:51-07:10/19	06:58	07:26	06:58		07:30	11:11-12:06/55
	20:55		20:33		19:50	19:02	17:20		17:03	
7	06:06		06:30	06:52-07:09/17	06:59	07:27	06:59		07:31	11:12-12:07/55
	20:55		20:32		19:49	19:00	17:19		17:03	
8	06:06		06:31	06:53-07:08/15	07:00	07:28	07:00		07:32	11:12-12:08/56
	20:55		20:31		19:47	18:59	17:18		17:03	
9	06:07		06:32	06:53-07:05/12	07:01	07:29	07:01		07:33	11:13-12:08/55
	20:55		20:30		19:45	18:57	17:17		17:03	
10	06:08		06:33	06:54-07:02/8	07:02	07:30	07:03		07:34	11:13-12:09/56
	20:54		20:29		19:44	18:56	17:16		17:03	
11	06:08		06:34		07:02	07:31	07:04		07:35	11:13-12:09/56
	20:54		20:27		19:42	18:54	17:15		17:03	
12	06:09		06:35		07:03	07:32	07:05		07:35	11:13-12:10/57
	20:53		20:26		19:41	18:53	17:14		17:03	
13	06:10	06:55-07:00/5	06:36		07:04	07:33	07:06		07:36	11:14-12:10/56
	20:53		20:25		19:39	18:51	17:14		17:03	
14	06:10	06:53-07:02/9	06:37		07:05	07:34	07:07		07:37	11:15-12:11/56
	20:52		20:24		19:37	18:50	17:13		17:03	
15	06:11	06:52-07:04/12	06:38		07:06	07:35	07:08		07:38	11:14-12:11/57
	20:52		20:22		19:36	18:48	17:12		17:03	
16	06:12	06:51-07:05/14	06:39		07:07	07:36	07:09		07:38	11:15-12:12/57
	20:51		20:21		19:34	18:47	17:11		17:04	
17	06:12	06:50-07:06/16	06:40		07:08	07:37	07:10	11:24-11:36/12	07:39	11:16-12:13/57
	20:51		20:20		19:33	18:45	17:10		17:04	
18	06:13	06:49-07:08/19	06:41		07:09	07:38	07:12	11:20-11:40/20	07:40	11:16-12:13/57
	20:50		20:18		19:31	18:44	17:10		17:04	
19	06:14	06:49-07:09/20	06:41		07:10	07:39	07:13	11:17-11:44/27	07:40	11:17-12:14/57
	20:50		20:17		19:29	18:43	17:09		17:05	
20	06:15	06:48-07:09/21	06:42		07:11	07:40	07:14	11:16-11:47/31	07:41	11:16-12:13/57
	20:49		20:16		19:28	18:41	17:08		17:05	
21	06:16	06:47-07:10/23	06:43		07:12	07:41	07:15	11:14-11:49/35	07:41	11:17-12:14/57
	20:48		20:14		19:26	18:40	17:08		17:06	
22	06:16	06:47-07:10/23	06:44		07:12	07:42	07:16	11:13-11:51/38	07:42	11:17-12:14/57
	20:47		20:13		19:24	18:38	17:07		17:06	
23	06:17	06:47-07:11/24	06:45		07:13	07:43	07:17	11:12-11:53/41	07:42	11:18-12:15/57
	20:47		20:11		19:23	18:37	17:07		17:07	
24	06:18	06:47-07:12/25	06:46		07:14	07:44	07:18	11:13-11:55/42	07:43	11:19-12:16/57
	20:46		20:10		19:21	18:36	17:06		17:07	
25	06:19	06:46-07:11/25	06:47		07:15	06:45	07:19	11:12-11:57/45	07:43	11:20-12:17/57
	20:45		20:09		19:20	17:34	17:06		17:08	
26	06:20	06:45-07:12/27	06:48		07:16	06:46	07:20	11:11-11:58/47	07:44	11:20-12:17/57
	20:44		20:07		19:18	17:33	17:05		17:08	
27	06:21	06:45-07:12/27	06:49		07:17	06:47	07:21	11:11-11:59/48	07:44	11:20-12:17/57
	20:43		20:06		19:16	17:32	17:05		17:09	
28	06:21	06:45-07:13/28	06:50		07:18	06:48	07:22	11:11-12:00/49	07:44	11:20-12:17/57
	20:43		20:04		19:15	17:31	17:04		17:10	
29	06:22	06:46-07:13/27	06:51		07:19	06:49	07:23	11:11-12:01/50	07:45	11:21-12:18/57
	20:42		20:03		19:13	17:29	17:04		17:10	
30	06:23	06:46-07:13/27	06:52		07:20	06:50	07:24	11:11-12:02/51	07:45	11:22-12:18/56
	20:41		20:01		19:12	17:28	17:04		17:11	
31	06:24	06:46-07:13/27	06:52			06:51			07:45	11:22-12:19/57
	20:40		20:00			17:27			17:12	
Potential sun hours	454		425		374	347	302		293	
Sum of minutes with flicker		399		189		0	0	536		1734

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

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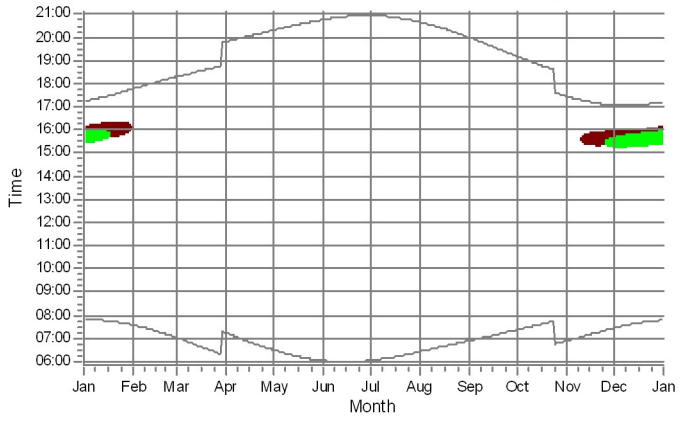
31/03/2023 15:38/3.4.415

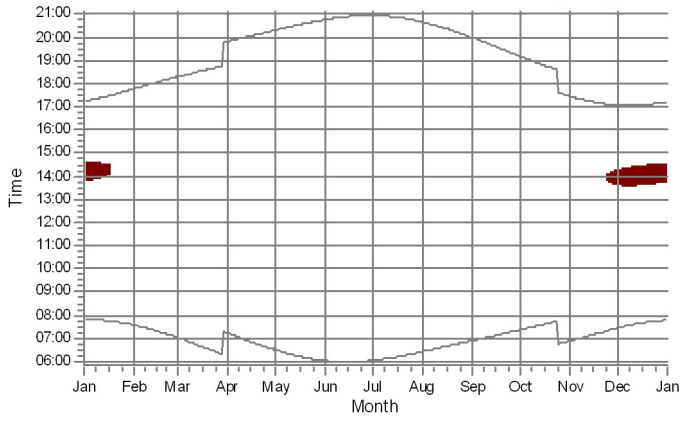
SHADOW - Calendar per WTG, graphical

Calculation: Real_case_Progetto_2023_03_31

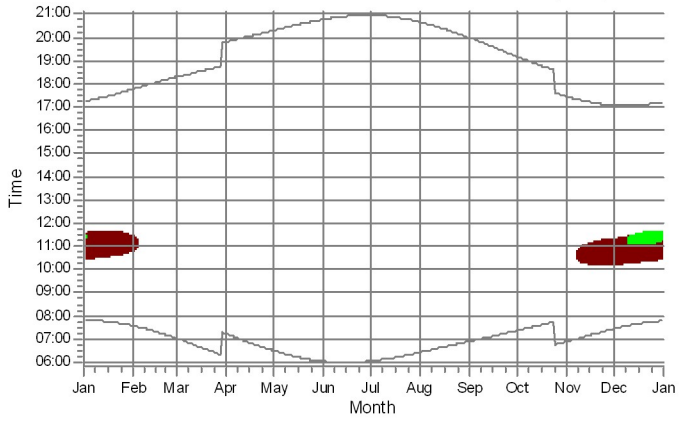
VI01: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



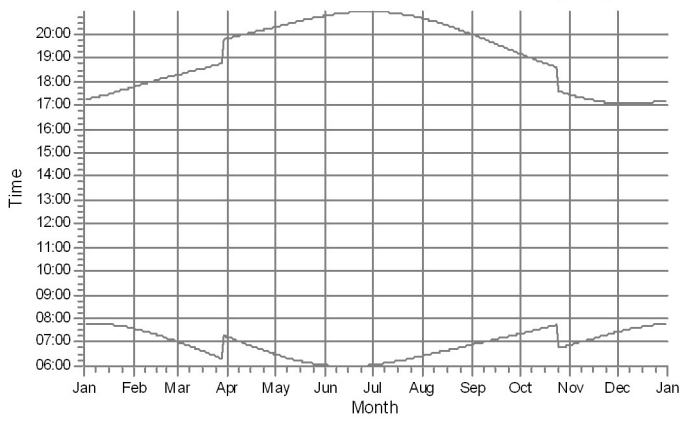
VI02: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



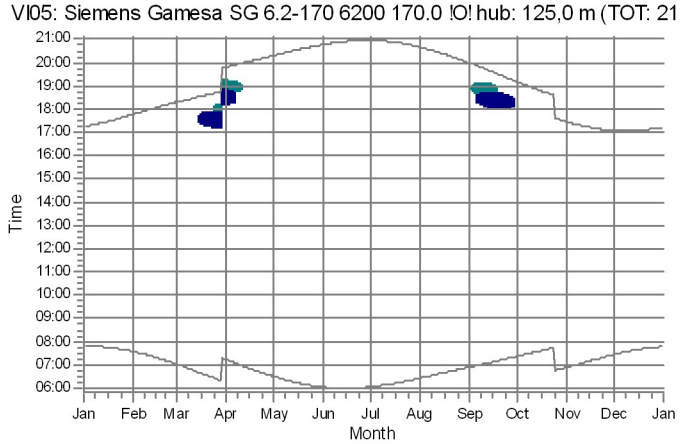
VI03: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



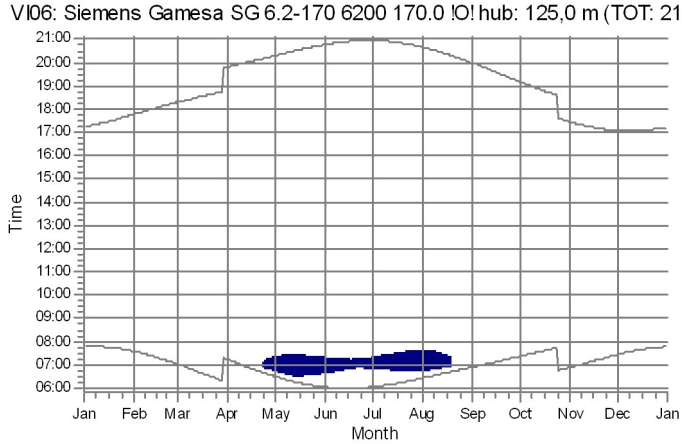
VI04: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



VI05: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



VI06: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



Shadow receptors

F027: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (63)

F030: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (64)

F111: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (65)

F112: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (66)

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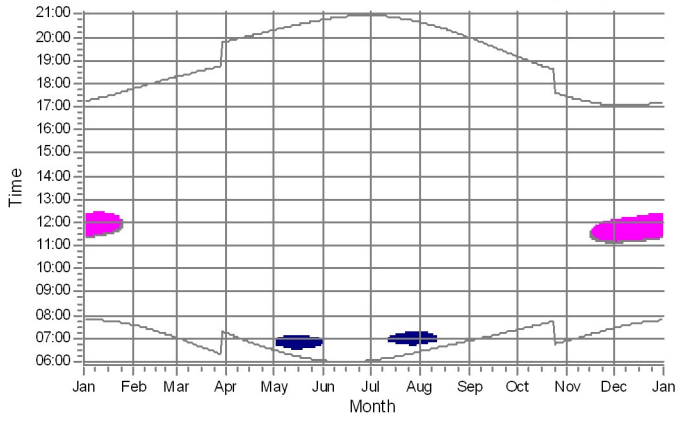
SHADOW - Calendar per WTG, graphical

Calculation: Real_case_Progetto_2023_03_31

VI07: Siemens Gamesa SG 6.2-170 6200 170.0 !O! hub: 125,0 m (TOT: 21(



Shadow receptors

- F013: Agritur
- F014: Agritur
- F015: Agritur
- F016: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (61)
- F017: Agritur
- F030: Shadow Receptor: 1,2 × 1,4 Azimuth: 0,0° Slope: 90,0° (64)