

**REGIONE PUGLIA  
CITTÀ METROPOLITANA DI BARI  
COMUNE DI ALTAMURA**



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**Titolo del Progetto:**

**PARCO EOLICO SERRA DI MELE**

**Documento:** STUDIO DI IMPATTO AMBIENTALE

**N° Documento:** R2R-WSDM-RA11

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**Elaborato:**

**ANALISI DEGLI EFFETTI DI SHADOW - FLICKERING**

FOGLIO:	1 di 1	SCALA:	-	Nome file:	YDUOL75_R2R-WSDM-RA11
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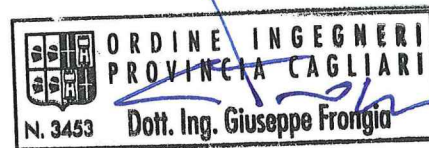
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## 1 INTRODUZIONE

La Società R2R S.r.l. (gruppo a2a) intende realizzare, su terreni agricoli del Comune di Altamura (BA), il progetto di un impianto di produzione di energia elettrica da fonte eolica denominato “Serra di Mele”, comprendente le opere e le infrastrutture indispensabili alla costruzione e all’esercizio del parco eolico.

Il presente elaborato, costituente parte integrante dello Studio di impatto ambientale allegato al progetto, 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 (YDUOL75\_R2R-WSDM-RA13\_Report fabbricati censiti).

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

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## 2 CRITERI GENERALI DI ANALISI E VALUTAZIONE

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;

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- 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 12 RPM si avrà una frequenza di passo pari a circa 0,6 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”.

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### 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 ne è stata verificata 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 YDUOL75\_R2R-WSDM-RA13 (*Report fabbricati censiti*) riporta l'individuazione degli edifici in accordo con la metodologia precedentemente indicata. Nel Report è contenuto inoltre lo stralcio della ripresa aerea zenitale, la categoria catastale di appartenenza ed una fotografia prospettica dei fabbricati.

Nel caso specifico, ai fini dei calcoli di esposizione all'ombra intermittente, sono stati individuati come ricettori n. 20 fabbricati ubicati entro una distanza di 1000 m dalle postazioni eoliche, catastalmente censiti e classificati come segue:



- Categoria A3 (di tipo popolare): 6 fabbricati;
- Categoria A4 (abitazioni di tipo economico): 8 fabbricati;
- Categoria A7 (abitazioni in villini): 6 fabbricati.

Entro tali distanze è, infatti, ragionevole che si manifestino i più avvertiti 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.

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*Tabella 1 - Ricettori esposti al potenziale disturbo da shadow flickering*

ID	FABBRICATO	COMUNE	UTM EST	UTM NORD	DISTANZA DAL PIÙ PROSSIMO WTG [M]	WTG PIÙ PROSSIMO [M]	CATEGORIA CATASTO FABBRICATI
1	F130	Altamura	626562	4518121	527	S3	A03
2	F131	Altamura	628007	4516979	405	S5	A07
3	F132	Altamura	627889	4515486	565	S6	A04
4	F133	Altamura	626661	4517053	666	S3	A03
5	F134	Altamura	625773	4517274	680	S3	A04
6	F136	Altamura	626203	4516912	742	S3	A07
7	F137	Altamura	626022	4516685	1.009	S3	A03
8	F138	Altamura	626036	4516701	988	S3	A04
9	F139	Altamura	628399	4515932	788	S6	A04
10	F140	Altamura	626763	4515441	1.006	S6	A07
11	F141	Altamura	626668	4516049	948	S6	A07_C02
12	F142	Gravina in Puglia	623785	4517789	1.004	S1	A07_C02
13	F143	Gravina in Puglia	624177	4518206	873	S1	A07
14	F144	Altamura	624929	4518649	829	S2	A04
15	F145	Altamura	627300	4518215	868	S4	A04_D10
16	F146	Altamura	628622	4516613	801	S5	A03
17	F147	Altamura	626163	4516950	714	S3	A03_F03
18	F148	Altamura	627274	4518271	926	S4	A04_D10
19	F149	Altamura	627298	4518296	949	S4	A04_D10
20	F150	Altamura	626173	4516947	714	S3	A03_F03

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## 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;



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- 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.

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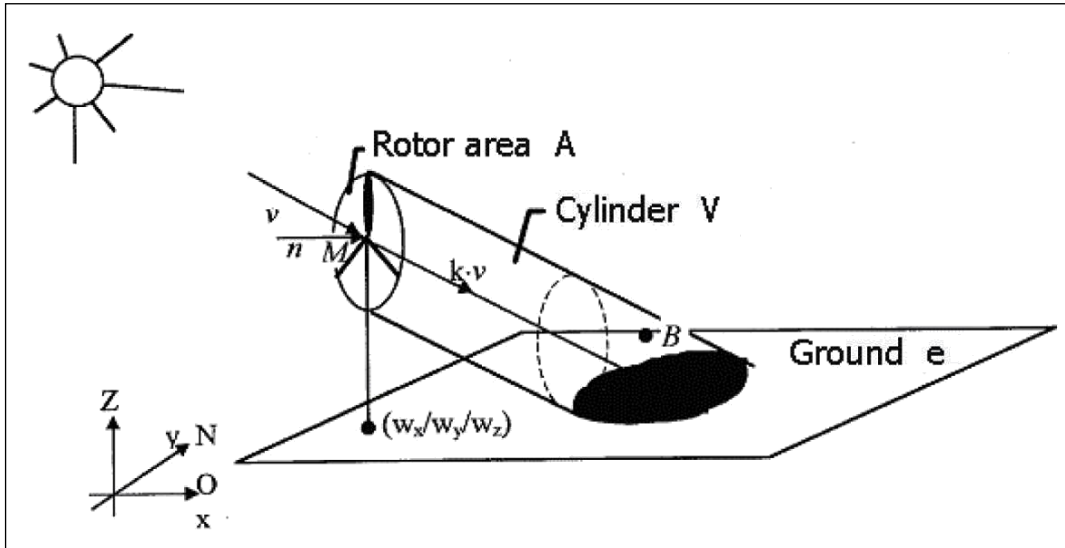


Figura 4.1: Rappresentazione schematica della proiezione dell'ombra del rotore.

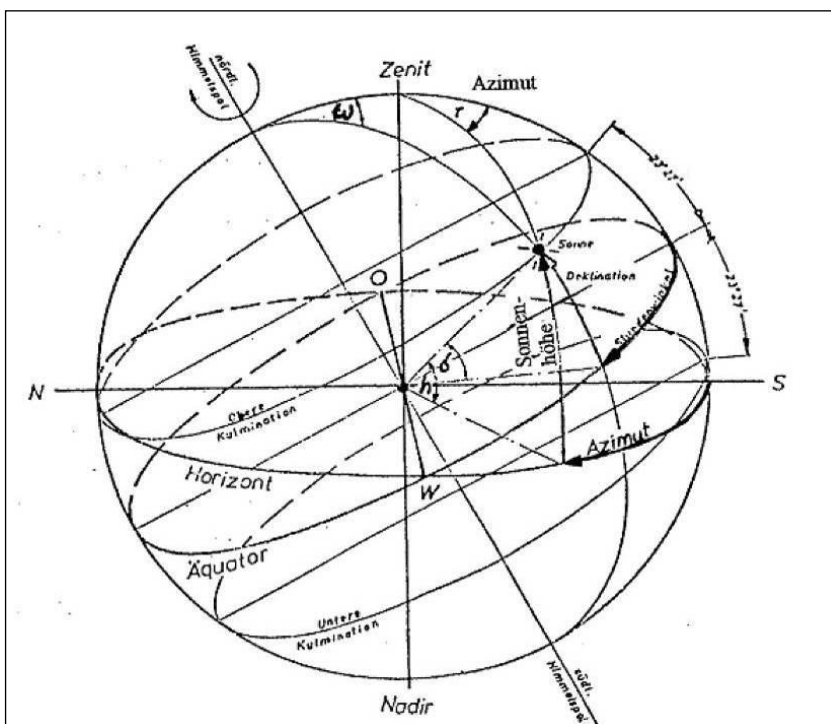




Figura 4.2: Schema dei moti terrestri e parametri di calcolo.

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## 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 recettore 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;

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- 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.

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## 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 YDUOL75\_R2R-WSDM-RA11-1).

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.

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## 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	WTG SF	WTG Più prossimo	Dist. Min. WTG	h/anno SF Worst Case	h/giorno SF Worst Case	h/anno SF Real Case
1	F130	A03		S3	527	22:57:00	0:32:00	<b>5:36:00</b>
2	F131	A07		S5	405	141:02:00	1:37:00	<b>31:15:00</b>
3	F132	A04		S6	565	0:00:00	0:00:00	<b>0:00:00</b>
4	F133	A03		S3	666	96:05:00	0:55:00	<b>28:48:00</b>
5	F134	A04		S3	680	59:08:00	0:39:00	<b>18:10:00</b>
6	F136	A07		S3	742	55:30:00	0:36:00	<b>16:09:00</b>
7	F137	A03		S3	1.009	25:53:00	0:18:00	<b>7:32:00</b>
8	F138	A04		S3	988	27:18:00	0:19:00	<b>7:57:00</b>
9	F139	A04		S6	788	45:21:00	0:50:00	<b>13:25:00</b>
10	F140	A07		S6	1.006	6:47:00	0:14:00	<b>2:04:00</b>
11	F141	A07_C02		S6	948	45:46:00	0:37:00	<b>13:15:00</b>
12	F142	A07_C02		S1	1.004	29:12:00	0:39:00	<b>7:19:00</b>
13	F143	A07		S1	873	14:05:00	0:28:00	<b>3:21:00</b>
14	F144	A04		S2	829	11:55:00	0:19:00	<b>2:32:00</b>
15	F145	A04_D10		S4	868	31:43:00	0:36:00	<b>7:01:00</b>
16	F146	A03		S5	801	70:37:00	0:49:00	<b>18:09:00</b>
17	F147	A03_F03		S3	714	53:13:00	0:25:00	<b>15:32:00</b>
18	F148	A04_D10		S4	926	41:24:00	0:36:00	<b>8:48:00</b>
19	F149	A04_D10		S4	949	39:18:00	0:35:00	<b>8:19:00</b>
20	F150	A03_F03		S3	714	53:17:00	0:27:00	<b>15:32:00</b>

Come si può osservare dall'esame della Tabella 2:



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- l'incidenza dell'ombreggiamento intermittente presso i ricettori considerati nello scenario "real case" è sempre al disotto del valore guida di 30 h/anno con la sola eccezione dell'edificio F131, ubicato in comune di Altamura, presso il quale l'intensità stimata del fenomeno è risultata superiore alla soglia di riferimento di appena 1 ora e 15 minuti nell'intero anno solare;
- Del tutto trascurabile può ritenersi l'ombreggiamento intermittente a cui risulterebbero esposti oltre la metà dei ricettori (11 su 20), in corrispondenza dei quali le stime conducono a prevedere una intensità del fenomeno inferiore alle 10 h/anno.

In riferimento al segnalato ricettore F131, presso il quale è attesa una intensità dello shadow-flickering lievemente superiore alla soglia guida, corre l'obbligo di precisare quanto segue:

- trattasi di un edificio di servizio al punto di approvvigionamento idrico denominato "Sorgente Serra di Mele" e non di un vero e proprio edificio abitativo;
- la frequentazione dell'edificio è pertanto occasionale e ragionevolmente limitata agli ordinari orari lavorativi (8.00-17.00);
- il fabbricato, in quanto locale tecnico, appare privo di aperture fenestrate, come desumibile dalle immagini seguenti;
- affinché il fenomeno sia percepito come un disturbo da parte degli occupanti l'edificio tutte le seguenti circostanze dovrebbero essere verificate:
  - o Presenza degli occupanti presso l'ambiente esposto all'ombreggiamento;
  - o Elevato contrasto luci/ombre (assenza di schermature nelle finestre)
  - o gli individui potenzialmente soggetti ad un impatto da *shadow flickering* dovrebbero permanere esposti alla luce tremolante per un tempo sufficiente ad avvertire fastidio.

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

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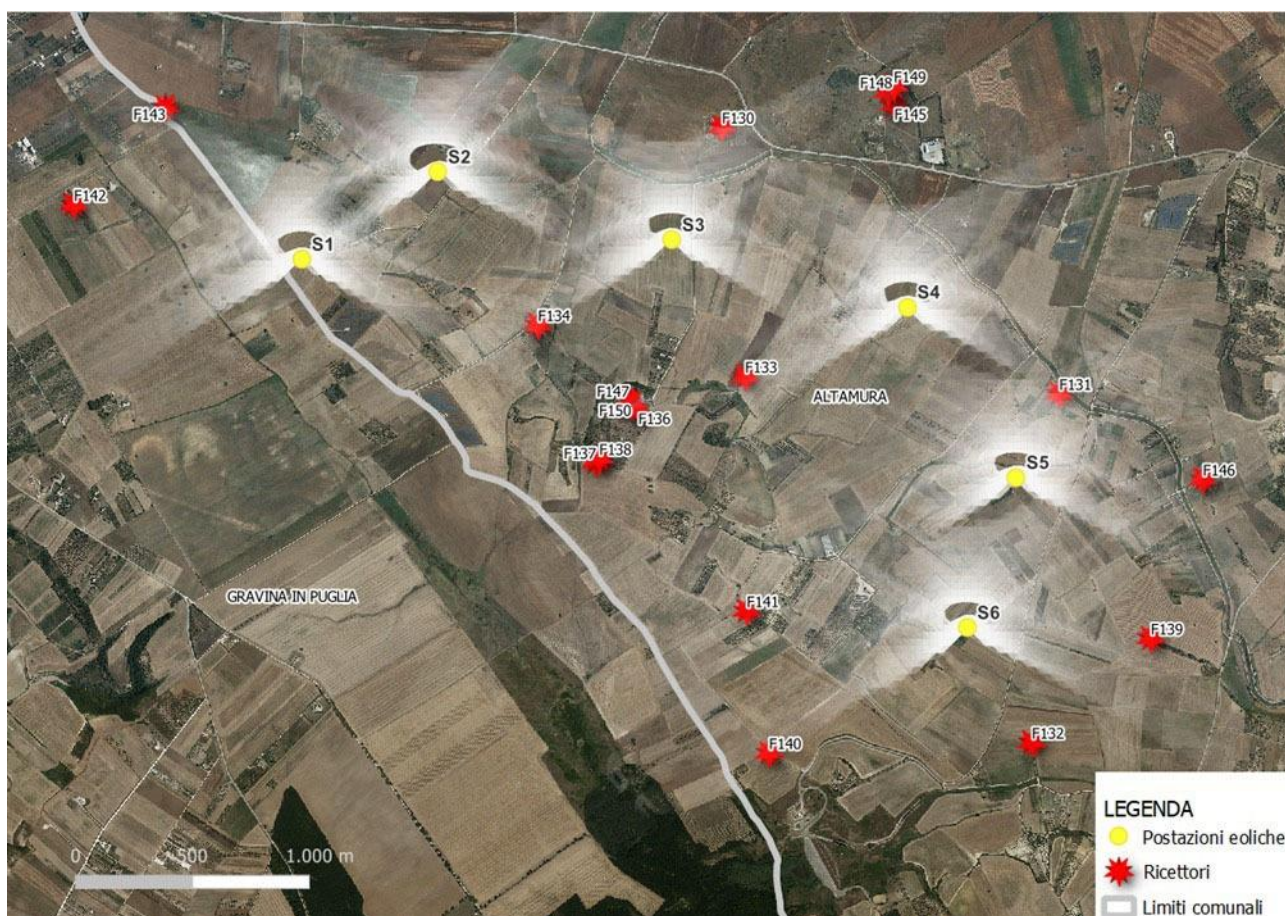




Figura 6.1 – Ricettori e isolinee d’ombra (in bianco)



Figura 6.2 – Edificio F131 (locale tecnico presso il punto di derivazione idrico denominato “Sorgente Serra di Mele”)



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## 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 Serra di Mele, proposto dalla R2R S.r.l. (gruppo a2a) nel comune di Altamura (BA). L'individuazione dei ricettori ha fatto riferimento alla ricognizione sugli edifici esistenti eseguita nell'ambito della definizione del layout di impianto e dell'analisi ambientale, i cui risultati sono riepilogati in opportune "schede fabbricati" all'interno di apposito report allegato alla documentazione progettuale.

Ai fini dei calcoli di esposizione all'ombra intermittente, sono stati individuati come ricettori n. 20 fabbricati ubicati entro una distanza di 1000 m dalle postazioni eoliche, catastalmente censiti e classificati nella categoria "A" (Abitazioni).

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



L'incidenza dell'ombreggiamento intermittente presso i ricettori considerati nello scenario "real case" è risultata sempre al disotto del valore guida di 30 h/anno con la sola eccezione dell'edificio con identificativo F131, ubicato in comune di Altamura, presso il quale l'intensità stimata del fenomeno sarebbe superiore alla soglia di riferimento di appena 1 ora e 15 minuti nell'intero anno solare.

Del tutto trascurabile può ritenersi l'ombreggiamento intermittente a cui risulterebbero esposti oltre la metà dei ricettori (11 su 20), in corrispondenza dei quali le stime conducono a prevedere una intensità del fenomeno inferiore alle 10 h/anno.

In riferimento al segnalato ricettore F131, presso il quale è attesa una intensità dello shadow-flickering lievemente superiore alla soglia guida, trattasi di un locale tecnico afferente alla stazione di presa idrica denominata "Sorgente Serra di Mele" e non di un vero e proprio edificio abitativo. La frequentazione dell'edificio, peraltro privo apparentemente di aperture fenestrate, è pertanto occasionale e ragionevolmente limitata agli ordinari orari lavorativi.

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

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

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**ALLEGATI: REPORT DI CALCOLO SCENARI WORST CASE E REAL CASE**

## SHADOW - Main Result

Calculation: Real\_case\_Progetto\_20231218

### 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

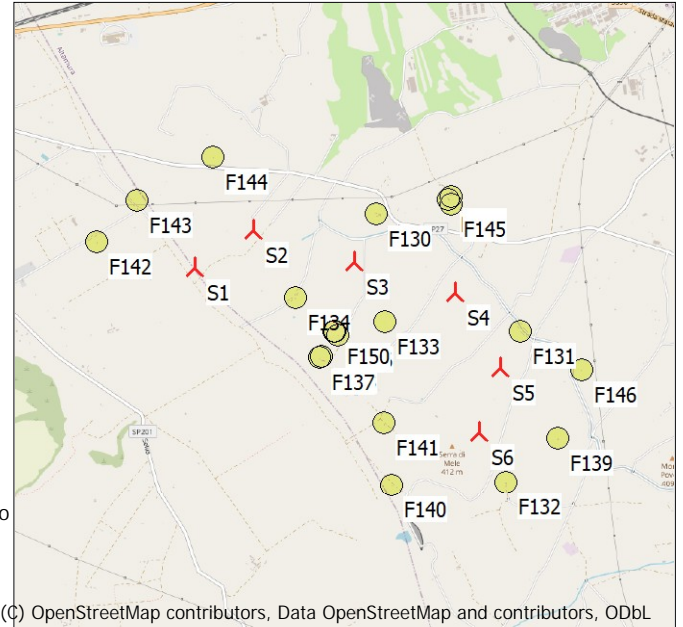
Minimum sun height over horizon for influence 3 °  
Day step for calculation 1 days  
Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time  
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

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\_A2A\_5.wpo  
Obstacles used in calculation  
Eye height for map: 1,5 m  
Grid resolution: 1,0 m

All coordinates are in  
UTM (north)-WGS84 Zone: 33  
WTGs



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL  
Scale 1:75.000  
New WTG Shadow receptor

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
S1	624.761	4.517.557	410,0	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8
S2	625.343	4.517.931	383,2	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8
S3	626.346	4.517.640	371,5	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8
S4	627.356	4.517.349	370,3	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8
S5	627.821	4.516.620	365,6	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8
S6	627.613	4.515.979	380,0	Siemens Gamesa SG 6....	Yes	Siemens Gamesa	SG 6.6-170!-6.600	6.600	170,0	115,0	2.041	8,8

### Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window [°]	Direction mode	Eye height (ZVI) a.g.l. [m]
F130	A03	626.562	4.518.121	370,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F131	A07	628.007	4.516.979	360,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F132	A04	627.889	4.515.486	370,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F133	A03	626.661	4.517.053	387,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F134	A04	625.773	4.517.274	384,3	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F136	A07	626.203	4.516.912	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F137	A03	626.022	4.516.685	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F138	A04	626.036	4.516.701	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F139	A04	628.399	4.515.932	362,1	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F140	A07	626.763	4.515.441	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F141	A07_C02	626.668	4.516.049	406,8	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F142	A07_C02	623.785	4.517.789	411,7	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F143	A07	624.177	4.518.206	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F144	A04	624.929	4.518.649	390,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F145	A04_D10	627.300	4.518.215	377,9	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F146	A03	628.622	4.516.613	360,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F147	A03_F03	626.163	4.516.950	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F148	A04_D10	627.274	4.518.271	377,4	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F149	A04_D10	627.298	4.518.296	378,8	1,2	1,4	1,2	90,0	"Green house mode"	2,6
F150	A03_F03	626.173	4.516.947	410,0	1,2	1,4	1,2	90,0	"Green house mode"	2,6

## SHADOW - Main Result

Calculation: Real\_case\_Progetto\_20231218

### Calculation Results

#### Shadow receptor

No.	Name	Shadow, expected values	
		Shadow hours	per year [h/year]
F130	A03	5:36	
F131	A07	31:15	
F132	A04	0:00	
F133	A03	28:48	
F134	A04	18:10	
F136	A07	16:09	
F137	A03	7:32	
F138	A04	7:57	
F139	A04	13:25	
F140	A07	2:04	
F141	A07_C02	13:15	
F142	A07_C02	7:19	
F143	A07	3:21	
F144	A04	2:32	
F145	A04_D10	7:01	
F146	A03	18:09	
F147	A03_F03	15:32	
F148	A04_D10	8:48	
F149	A04_D10	8:19	
F150	A03_F03	15:32	

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

No.	Name					Worst case	Expected
						[h/year]	[h/year]
S1	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (48)	96:07	28:08
S2	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (44)	33:51	8:35
S3	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (45)	88:24	21:30
S4	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (46)	100:14	30:52
S5	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (49)	202:42	47:53
S6	Siemens Gamesa SG 6.6-170!	6600	170.0	!O!	hub: 115,0 m (TOT: 200,0 m) (47)	121:42	31:44

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.

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F130 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	17:01 (S1) 17:17 (S1)	06:40 19:18	05:54 19:50
2	07:19 16:38	07:05 17:12	06:29 17:46	17:02 (S1) 17:15 (S1)	06:38 19:19	05:53 19:51
3	07:19 16:39	07:04 17:13	06:27 17:47	17:05 (S1) 17:13 (S1)	06:36 19:20	05:52 19:52
4	07:19 16:41	07:03 17:15	06:26 17:48		06:35 19:21	05:50 19:53
5	07:19 16:40	07:02 17:16	06:24 17:49	17:27 (S2) 17:28 (S2)	06:33 19:23	05:49 19:54
6	07:19 16:41	07:01 17:17	06:22 17:50	17:20 (S2) 17:29 (S2)	06:32 19:24	05:48 19:55
7	07:19 16:42	07:00 17:18	06:21 17:51	17:18 (S2) 17:31 (S2)	06:30 19:25	05:47 19:56
8	07:19 16:43	06:58 17:20	06:19 17:53	17:15 (S2) 17:32 (S2)	06:28 19:26	05:46 19:57
9	07:19 16:44	06:57 17:21	06:18 17:54	17:13 (S2) 17:32 (S2)	06:27 19:27	05:45 19:58
10	07:19 16:45	06:56 17:22	06:16 17:55	17:13 (S2) 17:34 (S2)	06:25 19:28	05:43 19:59
11	07:18 16:46	06:55 17:23	06:14 17:56	17:11 (S2) 17:35 (S2)	06:24 19:29	05:42 20:00
12	07:18 16:47	06:54 17:24	06:13 17:57	17:10 (S2) 17:36 (S2)	06:22 19:30	05:41 20:01
13	07:18 16:48	06:52 17:26	06:11 17:58	17:10 (S2) 17:37 (S2)	06:20 19:31	05:40 20:02
14	07:18 16:50	06:51 17:27	06:10 17:59	17:09 (S2) 17:38 (S2)	06:19 19:32	05:39 20:03
15	07:17 16:51	06:50 17:28	06:08 18:00	17:09 (S2) 17:39 (S2)	06:17 19:33	05:38 20:04
16	07:17 16:52	06:49 17:29	06:06 18:01	17:09 (S2) 17:41 (S2)	06:16 19:34	05:37 20:05
17	07:16 16:53	06:47 17:31	06:05 18:02	17:09 (S2) 17:40 (S2)	06:14 19:35	05:36 20:06
18	07:16 16:54	06:46 17:32	17:06 (S1) 17:09 (S1)	06:03 18:03	17:08 (S2) 17:39 (S2)	06:13 19:36
19	07:15 16:55	06:45 17:33	17:04 (S1) 17:11 (S1)	06:01 18:05	17:09 (S2) 17:39 (S2)	06:11 19:37
20	07:15 16:56	06:43 17:34	17:02 (S1) 17:12 (S1)	06:00 18:06	17:10 (S2) 17:37 (S2)	06:10 19:38
21	07:14 16:58	06:42 17:35	17:01 (S1) 17:13 (S1)	05:58 18:07	17:10 (S2) 17:35 (S2)	06:08 19:39
22	07:14 16:59	06:40 17:37	17:01 (S1) 17:15 (S1)	05:56 18:08	17:12 (S2) 17:34 (S2)	06:07 19:40
23	07:13 17:00	06:39 17:38	16:59 (S1) 17:16 (S1)	05:55 18:09	17:13 (S2) 17:32 (S2)	06:05 19:41
24	07:12 17:01	06:38 17:39	17:00 (S1) 17:18 (S1)	05:53 18:10	17:15 (S2) 17:29 (S2)	06:04 19:42
25	07:12 17:02	06:36 17:40	16:59 (S1) 17:18 (S1)	05:51 18:11	17:20 (S2) 17:25 (S2)	06:02 19:43
26	07:11 17:04	06:35 17:41	16:59 (S1) 17:20 (S1)	05:50 18:12		06:01 19:44
27	07:10 17:05	06:33 17:42	16:59 (S1) 17:19 (S1)	05:48 18:13	06:00 19:46	05:28 20:15
28	07:09 17:06	06:32 17:44	17:00 (S1) 17:19 (S1)	05:46 18:14	05:58 19:47	05:28 20:16
29	07:08 17:07		06:45 19:15		05:57 19:48	05:27 20:17
30	07:08 17:08		06:43 19:16		05:56 19:49	05:27 20:18
31	07:07 17:10		06:41 19:17			05:26 20:18
Potential sun hours	298	297	369	398	448	451
Total, worst case		160	489			
Sun reduction		0,44	0,44			
Oper. time red.		0,77	0,77			
Wind dir. red.		0,63	0,64			
Total reduction		0,21	0,22			
Total, real		34	107			

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F130 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 20:30	05:50 20:11	06:20 19:28	06:50 18:38	17:50 (S2) 18:16 (S2)	06:24 16:52
2	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	17:50 (S2) 18:14 (S2)	06:25 16:51
3	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	17:50 (S2) 18:12 (S2)	06:26 16:50
4	05:28 20:30	05:53 20:08	06:23 19:24	06:53 18:33	17:51 (S2) 18:11 (S2)	06:27 16:48
5	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	17:51 (S2) 18:09 (S2)	06:29 16:47
6	05:29 20:29	05:55 20:06	06:25 19:20	06:55 18:30	17:53 (S2) 18:07 (S2)	06:30 16:46
7	05:30 20:29	05:56 20:04	06:26 19:19	06:56 18:28	17:54 (S2) 18:05 (S2)	06:31 16:45
8	05:30 20:28	05:57 20:03	06:27 19:17	06:57 18:27	17:57 (S2) 18:04 (S2)	06:32 16:44
9	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43	07:06 16:27
10	05:31 20:28	05:59 20:01	06:29 19:14	06:59 18:24	06:34 16:42	07:07 16:27
11	05:32 20:27	06:00 19:59	06:30 19:12	07:00 18:22	17:38 (S1) 17:48 (S1)	06:36 16:41
12	05:33 20:27	06:01 19:58	06:31 19:10	07:01 18:20	17:35 (S1) 17:50 (S1)	06:37 16:40
13	05:34 20:26	06:02 19:57	06:32 19:09	07:03 18:19	17:34 (S1) 17:51 (S1)	06:38 16:39
14	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	17:32 (S1) 17:51 (S1)	06:39 16:38
15	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	17:32 (S1) 17:52 (S1)	06:40 16:37
16	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	17:31 (S1) 17:51 (S1)	06:42 16:36
17	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	17:30 (S1) 17:49 (S1)	06:43 16:36
18	05:37 20:23	06:07 19:50	06:37 19:00	07:08 18:11	17:30 (S1) 17:48 (S1)	06:44 16:35
19	05:38 20:23	06:08 19:48	06:38 18:58	07:09 18:03 (S2)	17:31 (S1) 17:47 (S1)	06:45 16:34
20	05:39 20:22	06:09 19:47	06:39 18:57	07:10 18:18 (S2)	17:31 (S1) 17:45 (S1)	06:46 16:33
21	05:40 20:21	06:10 19:45	06:40 18:55	07:11 18:19 (S2)	17:32 (S1) 17:44 (S1)	06:47 16:33
22	05:41 20:21	06:11 19:44	06:41 18:53	07:12 18:20 (S2)	17:33 (S1) 17:42 (S1)	06:49 16:32
23	05:42 20:20	06:11 19:42	06:42 18:52	07:14 18:21 (S2)	17:34 (S1) 17:40 (S1)	06:50 16:31
24	05:43 20:19	06:12 19:41	06:43 18:50	07:15 18:22 (S2)	17:38 (S1) 17:40 (S1)	06:51 16:31
25	05:43 20:18	06:13 19:39	06:44 18:48	06:16 18:22 (S2)	06:52 16:30	07:17 16:32
26	05:44 20:17	06:14 19:38	06:45 18:47	06:17 18:22 (S2)	06:53 16:30	07:17 16:32
27	05:45 20:16	06:15 19:36	06:46 18:45	06:18 18:22 (S2)	06:54 16:29	07:18 16:33
28	05:46 20:15	06:16 19:35	06:47 18:43	06:19 18:21 (S2)	06:55 16:29	07:18 16:34
29	05:47 20:14	06:17 19:33	06:48 18:42	06:20 18:19 (S2)	06:56 16:28	07:18 16:34
30	05:48 20:13	06:18 19:32	06:49 18:40	06:22 18:17 (S2)	06:57 16:28	07:18 16:35
31	05:49 20:12	06:19 19:30	06:50 18:38	06:23 16:53	06:58 16:36	07:19 16:36
Potential sun hours	458	427	375	346	299	289
Total, worst case			311	339		78
Sun reduction			0,61	0,52		0,41
Oper. time red.			0,77	0,77		0,77
Wind dir. red.			0,64	0,64		0,61
Total reduction			0,30	0,25		0,19
Total, real			94	86		15

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F131 - A07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June	
1	07:19	13:13 (S5)   07:06	13:56 (S5)   06:30	06:40	05:54	05:26	19:34 (S3)
	16:37	95 14:48 (S5)   17:11	39 14:35 (S5)   17:45	19:18	19:50	20:19	11 19:45 (S3)
2	07:19	13:13 (S5)   07:05	14:00 (S5)   06:29	06:38	05:53	05:25	19:35 (S3)
	16:38	95 14:48 (S5)   17:12	32 14:32 (S5)   17:46	19:19	19:51	20:20	10 19:45 (S3)
3	07:19	13:14 (S5)   07:04	14:05 (S5)   06:27	06:36	05:52	05:25	19:36 (S3)
	16:39	95 14:49 (S5)   17:13	23 14:28 (S5)   17:47	19:20	19:52	20:20	7 19:43 (S3)
4	07:19	13:15 (S5)   07:03	06:25	06:35	05:50	05:24	
	16:39	94 14:49 (S5)   17:15	17:48	19:21	19:53	20:21	
5	07:19	13:16 (S5)   07:02	06:24	06:33	05:49	05:24	
	16:40	93 14:49 (S5)   17:16	17:49	19:22	19:54	20:22	
6	07:19	13:16 (S5)   07:01	06:22	06:31	05:48	05:24	19:43 (S4)
	16:41	93 14:49 (S5)   17:17	17:50	19:24	19:55	20:22	5 19:48 (S4)
7	07:19	13:17 (S5)   06:59	06:21	06:30	05:47	05:23	19:40 (S4)
	16:42	93 14:50 (S5)   17:18	17:51	19:25	19:56	20:23	12 19:52 (S4)
8	07:19	13:18 (S5)   06:58	06:19	06:28	05:46	05:23	19:39 (S4)
	16:43	92 14:50 (S5)   17:20	17:53	19:26	19:57	20:24	15 19:54 (S4)
9	07:19	13:18 (S5)   06:57	06:18	06:27	05:44	05:23	19:38 (S4)
	16:44	91 14:49 (S5)   17:21	17:54	19:27	19:58	20:24	18 19:56 (S4)
10	07:19	13:20 (S5)   06:56	06:16	06:25	05:43	05:23	19:37 (S4)
	16:45	90 14:50 (S5)   17:22	17:55	19:28	19:59	20:25	20 19:57 (S4)
11	07:18	13:21 (S5)   06:55	06:14	06:23	05:42	05:23	19:37 (S4)
	16:46	89 14:50 (S5)   17:23	17:56	19:29	20:00	20:25	21 19:58 (S4)
12	07:18	13:22 (S5)   06:54	06:13	06:22	05:41	05:23	19:35 (S4)
	16:47	88 14:50 (S5)   17:24	17:57	19:30	20:01	20:26	23 19:58 (S4)
13	07:18	13:22 (S5)   06:52	06:11	06:20	05:40	05:22	19:35 (S4)
	16:48	88 14:50 (S5)   17:26	17:58	19:31	20:02	20:26	24 19:59 (S4)
14	07:17	13:24 (S5)   06:51	06:09	06:19	05:39	05:22	19:35 (S4)
	16:49	86 14:50 (S5)   17:27	17:59	19:32	20:03	20:27	25 20:00 (S4)
15	07:17	13:24 (S5)   06:50	06:08	06:17	05:38	05:22	19:34 (S4)
	16:51	85 14:49 (S5)   17:28	18:00	19:33	20:04	20:27	26 20:00 (S4)
16	07:17	13:26 (S5)   06:49	06:06	06:16	05:37	05:22	19:34 (S4)
	16:52	84 14:50 (S5)   17:29	18:01	19:34	20:05	20:28	27 20:01 (S4)
17	07:16	13:27 (S5)   06:47	06:05	06:14	05:36	05:22	19:35 (S4)
	16:53	82 14:49 (S5)   17:30	18:02	19:35	20:06	20:28	27 20:02 (S4)
18	07:16	13:28 (S5)   06:46	06:03	06:13	05:35	05:22	19:35 (S4)
	16:54	81 14:49 (S5)   17:32	18:03	19:36	20:07	20:28	27 20:02 (S4)
19	07:15	13:29 (S5)   06:45	06:01	06:11	05:34	05:23	19:35 (S4)
	16:55	79 14:48 (S5)   17:33	18:05	19:37	20:08	20:29	28 20:03 (S4)
20	07:15	13:31 (S5)   06:43	06:00	06:10	05:34	05:23	19:35 (S4)
	16:56	78 14:49 (S5)   17:34	18:06	19:38	20:09	20:29	28 20:03 (S4)
21	07:14	13:32 (S5)   06:42	05:58	06:08	05:33	05:23	19:35 (S4)
	16:57	76 14:48 (S5)   17:35	18:07	19:39	20:10	20:29	28 20:03 (S4)
22	07:14	13:33 (S5)   06:40	05:56	06:07	05:32	05:23	19:35 (S4)
	16:59	74 14:47 (S5)   17:36	18:08	19:40	20:11	20:29	28 20:03 (S4)
23	07:13	13:35 (S5)   06:39	05:55	06:05	05:31	05:23	19:36 (S4)
	17:00	71 14:46 (S5)   17:38	18:09	19:41	20:12	20:30	28 20:04 (S4)
24	07:12	13:37 (S5)   06:37	05:53	06:04	05:30	05:24	19:36 (S4)
	17:01	69 14:46 (S5)   17:39	18:10	19:42	20:12	20:30	28 20:04 (S4)
25	07:12	13:39 (S5)   06:36	05:51	06:02	05:30	05:24	19:36 (S4)
	17:02	66 14:45 (S5)   17:40	18:11	19:43	20:13	20:30	27 20:03 (S4)
26	07:11	13:40 (S5)   06:35	05:50	06:01	05:29	05:24	19:37 (S4)
	17:03	64 14:44 (S5)   17:41	18:12	19:45	20:14	20:30	27 20:04 (S4)
27	07:10	13:42 (S5)   06:33	05:48	06:00	05:28	05:25	19:37 (S4)
	17:05	61 14:43 (S5)   17:42	18:13	19:46	20:15	20:30	26 20:03 (S4)
28	07:09	13:44 (S5)   06:32	05:46	05:58	05:28	05:25	19:37 (S4)
	17:06	57 14:41 (S5)   17:43	18:14	19:47	20:16	20:30	26 20:03 (S4)
29	07:08	13:46 (S5)	06:45	05:57	05:27	05:25	19:39 (S4)
	17:07	54 14:40 (S5)	19:15	19:48	20:17	20:30	24 20:03 (S4)
30	07:07	13:50 (S5)	06:43	05:56	05:27	05:26	19:39 (S4)
	17:08	49 14:39 (S5)	19:16	19:49	20:17	20:30	23 20:02 (S4)
31	07:07	13:53 (S5)	06:41		05:26	19:32 (S3)	
	17:10	44 14:37 (S5)	19:17		20:18	19:46 (S3)	
Potential sun hours	298	298	369	398	448	451	
Total, worst case	2456	94				619	
Sun reduction	0,43	0,44			0,57	0,62	
Oper. time red.	0,77	0,77			0,77	0,77	
Wind dir. red.	0,61	0,61			0,67	0,67	
Total reduction	0,20	0,21			0,29	0,32	
Total, real	493	19			97	198	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F131 - A07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26	19:40 (S4)   05:50	19:40 (S3)   06:20	06:50	06:24	06:58
2	05:27	19:41 (S4)   05:51	19:41 (S3)   06:21	06:51	06:25	06:59
3	05:27	19:43 (S4)   05:52	19:42 (S3)   06:22	06:52	06:26	07:00
4	05:28	19:43 (S4)   05:53	19:43 (S3)   06:23	06:53	06:27	07:01
5	05:28	19:46 (S4)   05:54	19:45 (S3)   06:24	06:54	06:28	07:02
6	05:29	19:47 (S4)   05:55	19:44 (S3)   06:25	06:55	06:30	07:03
7	05:29	19:52 (S4)   05:56	19:45 (S3)   06:26	06:56	06:31	07:04
8	05:30	19:45 (S3)   05:58	19:46 (S3)   06:27	06:57	06:32	07:05
9	05:31	19:49 (S3)   06:00	19:47 (S3)   06:28	06:58	06:33	07:06
10	05:31	19:43 (S3)   05:59	19:48 (S3)   06:29	06:59	06:34	07:07
11	05:32	19:43 (S3)   06:00	19:49 (S3)   06:30	07:00	06:35	07:08
12	05:33	19:41 (S3)   06:01	19:50 (S3)   06:31	07:01	06:36	07:09
13	05:34	19:54 (S3)   06:02	19:51 (S3)   06:32	07:02	06:37	07:10
14	05:34	19:40 (S3)   06:03	19:52 (S3)   06:33	07:03	06:38	07:11
15	05:35	19:39 (S3)   06:04	19:53 (S3)   06:34	07:04	06:39	07:12
16	05:36	19:56 (S3)   06:05	19:54 (S3)   06:35	07:05	06:40	07:13
17	05:37	19:39 (S3)   06:06	19:55 (S3)   06:36	07:06	06:41	07:14
18	05:37	19:38 (S3)   06:07	19:56 (S3)   06:37	07:07	06:42	07:15
19	05:38	19:59 (S3)   06:08	19:57 (S3)   06:38	07:08	06:43	07:16
20	05:39	19:37 (S3)   06:08	19:58 (S3)   06:39	07:09	06:44	07:17
21	05:40	19:57 (S3)   06:09	19:59 (S3)   06:40	07:10	06:45	07:18
22	05:41	19:37 (S3)   06:10	20:00 (S3)   06:41	07:11	06:46	07:19
23	05:42	19:56 (S3)   06:11	20:01 (S3)   06:42	07:12	06:47	07:20
24	05:43	19:37 (S3)   06:12	20:02 (S3)   06:43	07:13	06:48	07:21
25	05:43	19:55 (S3)   06:13	20:03 (S3)   06:44	07:14	06:49	07:22
26	05:44	19:37 (S3)   06:14	20:04 (S3)   06:45	07:15	06:50	07:23
27	05:45	19:53 (S3)   06:15	20:05 (S3)   06:46	07:16	06:51	07:24
28	05:46	19:37 (S3)   06:16	20:06 (S3)   06:47	07:17	06:52	07:25
29	05:47	19:51 (S3)   06:17	20:07 (S3)   06:48	07:18	06:53	07:26
30	05:48	19:38 (S3)   06:18	20:08 (S3)   06:49	07:19	06:54	07:27
31	05:49	19:39 (S3)   06:19	20:09 (S3)   06:50	07:20	06:55	07:28
Potential sun hours	458	427	375	346	299	289
Total, worst case	453	20			1537	2949
Sun reduction	0,69	0,69			0,77	0,41
Oper. time red.	0,77	0,77			0,77	0,77
Wind dir. red.	0,67	0,67			0,61	0,61
Total reduction	0,35	0,35			0,22	0,19
Total, real	159	7			336	567

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F132 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	05:54 19:50	05:26 20:19	05:26 20:30	05:50 20:11	06:20 19:28	06:50 18:38	06:24 16:52	06:58 16:28
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	05:53 19:51	05:25 20:20	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	06:25 16:51	06:59 16:28
3	07:19 16:39	07:04 17:13	06:27 17:47	06:36 19:20	05:52 19:52	05:25 20:20	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	06:26 16:49	07:00 16:27
4	07:19 16:39	07:03 17:15	06:25 17:48	06:35 19:21	05:50 19:53	05:24 20:21	05:28 20:29	05:53 20:08	06:23 19:24	06:53 18:33	06:27 16:48	07:01 16:27
5	07:19 16:40	07:02 17:16	06:24 17:49	06:33 19:22	05:49 19:54	05:24 20:22	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	06:28 16:47	07:02 16:27
6	07:19 16:41	07:01 17:17	06:22 17:50	06:32 19:24	05:48 19:55	05:24 20:22	05:29 20:29	05:55 20:05	06:25 19:20	06:55 18:30	06:30 16:46	07:03 16:27
7	07:19 16:42	06:59 17:18	06:21 17:51	06:30 19:25	05:47 19:56	05:24 20:23	05:30 20:29	05:56 20:04	06:26 19:19	06:56 18:28	06:31 16:45	07:04 16:27
8	07:19 16:43	06:58 17:20	06:19 17:53	06:28 19:26	05:46 19:57	05:23 20:24	05:30 20:28	05:57 20:03	06:27 19:17	06:57 18:27	06:32 16:44	07:05 16:27
9	07:19 16:44	06:57 17:21	06:18 17:54	06:27 19:27	05:45 19:58	05:23 20:24	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43	07:06 16:27
10	07:19 16:45	06:56 17:22	06:16 17:55	06:25 19:28	05:43 19:59	05:23 20:25	05:31 20:28	05:59 20:01	06:29 19:14	06:59 18:23	06:34 16:42	07:07 16:27
11	07:18 16:46	06:55 17:23	06:14 17:56	06:23 19:29	05:42 20:00	05:23 20:25	05:32 20:27	06:00 19:59	06:30 19:12	07:00 18:22	06:36 16:41	07:08 16:27
12	07:18 16:47	06:54 17:24	06:13 17:57	06:22 19:30	05:41 20:01	05:23 20:26	05:33 20:27	06:01 19:58	06:31 19:10	07:01 18:20	06:37 16:40	07:09 16:27
13	07:18 16:48	06:52 17:26	06:11 17:58	06:20 19:31	05:40 20:02	05:22 20:26	05:34 20:26	06:02 19:57	06:32 19:09	07:02 18:19	06:38 16:39	07:09 16:27
14	07:17 16:50	06:51 17:27	06:09 17:59	06:19 19:32	05:39 20:03	05:22 20:27	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38	07:10 16:27
15	07:17 16:51	06:50 17:28	06:08 18:00	06:17 19:33	05:38 20:04	05:22 20:27	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	06:40 16:37	07:11 16:27
16	07:17 16:52	06:49 17:29	06:06 18:01	06:16 19:34	05:37 20:05	05:22 20:28	05:36 20:25	06:05 19:53	06:35 19:03	07:06 18:14	06:41 16:36	07:12 16:28
17	07:16 16:53	06:47 17:31	06:05 18:02	06:14 19:35	05:36 20:06	05:22 20:28	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:36	07:12 16:28
18	07:16 16:54	06:46 17:32	06:03 18:03	06:13 19:36	05:35 20:07	05:23 20:28	05:37 20:23	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35	07:13 16:28
19	07:15 16:55	06:45 17:33	06:01 18:05	06:11 19:37	05:34 20:08	05:23 20:29	05:38 20:23	06:08 19:48	06:38 18:58	07:09 18:10	06:45 16:34	07:14 16:29
20	07:15 16:56	06:43 17:34	06:00 18:06	06:10 19:38	05:34 20:09	05:23 20:29	05:39 20:22	06:09 19:47	06:39 18:57	07:10 18:08	06:46 16:33	07:14 16:29
21	07:14 16:58	06:42 17:35	05:58 18:07	06:08 19:39	05:33 20:10	05:23 20:29	05:40 20:21	06:09 19:45	06:40 18:55	07:11 18:07	06:47 16:33	07:15 16:30
22	07:14 16:59	06:40 17:36	05:56 18:08	06:07 19:40	05:32 20:11	05:23 20:29	05:41 20:20	06:10 19:44	06:41 18:53	07:12 18:05	06:48 16:32	07:15 16:30
23	07:13 17:00	06:39 17:38	05:55 18:09	06:05 19:41	05:31 20:11	05:23 20:30	05:42 20:20	06:11 19:42	06:42 18:52	07:13 18:04	06:50 16:31	07:16 16:31
24	07:12 17:01	06:37 17:39	05:53 18:10	06:04 19:42	05:31 20:12	05:24 20:30	05:43 20:19	06:12 19:41	06:43 18:50	07:15 18:02	06:51 16:31	07:16 16:31
25	07:11 17:02	06:36 17:40	05:51 18:11	06:02 19:43	05:30 20:13	05:24 20:30	05:43 20:18	06:13 19:39	06:44 18:48	07:16 17:01	06:52 16:30	07:17 16:32
26	07:11 17:04	06:35 17:41	05:50 18:12	06:01 19:45	05:29 20:14	05:24 20:30	05:44 20:17	06:14 19:38	06:45 18:47	07:17 17:00	06:53 16:30	07:17 16:32
27	07:10 17:05	06:33 17:42	05:48 18:13	06:00 19:46	05:28 20:15	05:25 20:30	05:45 20:16	06:15 19:36	06:46 18:45	07:18 16:58	06:54 16:29	07:17 16:33
28	07:09 17:06	06:32 17:43	05:46 18:14	05:58 19:47	05:28 20:16	05:25 20:30	05:46 20:15	06:16 19:35	06:47 18:43	07:19 16:57	06:55 16:29	07:18 16:34
29	07:08 17:07		06:45 19:15	05:57 19:48	05:27 20:17	05:25 20:30	05:47 20:14	06:17 19:33	06:48 18:42	07:20 16:56	06:56 16:29	07:18 16:34
30	07:07 17:08		06:43 19:16	05:56 19:49	05:27 20:17	05:26 20:30	05:48 20:13	06:18 19:32	06:49 18:40	07:21 16:54	06:57 16:28	07:18 16:35
31	07:07 17:10		06:41 19:17		05:26 20:18		05:49 20:12	06:19 19:30		06:23 16:53		07:18 16:36
Potential sun hours	298	298	369	398	448	451	458	427	375	346	299	289
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F133 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June		
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	05:54 19:50	06:13 (S4) 20:19	05:47 (S4) 54	
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	05:53 19:51	06:12 (S4) 20:20	05:47 (S4) 55	
3	07:19 16:39	07:04 17:13	07:24 (S5) 07:26 (S5)	06:27 17:47	06:36 19:20	06:11 (S4) 19:29 (S1)	05:25 20:21	05:47 (S4) 54
4	07:19 16:39	07:03 17:15	07:23 (S5) 07:28 (S5)	06:26 17:48	06:35 19:21	06:10 (S4) 19:29 (S1)	05:24 20:21	05:47 (S4) 55
5	07:19 16:40	07:02 17:16	07:21 (S5) 07:29 (S5)	06:24 17:49	06:33 19:23	06:09 (S4) 19:28 (S1)	05:24 20:22	05:48 (S4) 54
6	07:19 16:41	07:01 17:17	07:20 (S5) 07:30 (S5)	06:22 17:50	06:32 19:24	06:08 (S4) 19:26 (S1)	05:24 20:23	05:47 (S4) 54
7	07:19 16:42	07:00 17:18	07:19 (S5) 07:31 (S5)	06:21 17:51	06:30 19:25	06:06 (S4) 19:24 (S1)	05:24 20:23	05:48 (S4) 54
8	07:19 16:43	06:58 17:20	07:18 (S5) 07:32 (S5)	06:19 17:53	06:28 19:26	06:05 (S4) 06:33 (S4)	05:23 20:24	05:48 (S4) 54
9	07:19 16:44	06:57 17:21	07:17 (S5) 07:33 (S5)	06:18 17:54	06:27 19:27	06:04 (S4) 06:34 (S4)	05:23 20:24	05:49 (S4) 53
10	07:19 16:45	06:56 17:22	07:16 (S5) 07:34 (S5)	06:16 17:55	06:25 19:28	06:03 (S4) 06:35 (S4)	05:23 20:25	05:49 (S4) 54
11	07:18 16:46	06:55 17:23	07:14 (S5) 07:33 (S5)	06:14 17:56	06:24 19:29	06:02 (S4) 06:36 (S4)	05:23 20:25	05:49 (S4) 54
12	07:18 16:47	06:54 17:24	07:13 (S5) 07:34 (S5)	06:13 17:57	06:22 19:30	06:01 (S4) 06:36 (S4)	05:23 20:26	05:50 (S4) 53
13	07:18 16:48	06:52 17:26	07:12 (S5) 07:34 (S5)	06:11 17:58	06:20 19:31	06:00 (S4) 06:37 (S4)	05:22 20:26	05:49 (S4) 53
14	07:18 16:50	06:51 17:27	07:11 (S5) 07:35 (S5)	06:10 17:59	06:19 19:32	05:59 (S4) 06:37 (S4)	05:22 20:27	05:49 (S4) 53
15	07:17 16:51	06:50 17:28	07:09 (S5) 07:34 (S5)	06:08 18:00	06:17 19:33	05:58 (S4) 06:38 (S4)	05:22 20:27	05:50 (S4) 52
16	07:17 16:52	06:49 17:29	07:08 (S5) 07:34 (S5)	06:06 18:01	06:16 19:34	05:57 (S4) 06:38 (S4)	05:22 20:28	05:51 (S4) 52
17	07:16 16:53	06:47 17:31	07:07 (S5) 07:34 (S5)	06:05 18:02	06:14 19:35	05:57 (S4) 06:39 (S4)	05:22 20:28	05:51 (S4) 53
18	07:16 16:54	06:46 17:32	07:05 (S5) 07:33 (S5)	06:03 18:03	06:13 19:36	05:56 (S4) 06:40 (S4)	05:23 20:28	05:51 (S4) 53
19	07:15 16:55	06:45 17:33	07:04 (S5) 07:32 (S5)	06:01 18:05	06:11 19:37	05:55 (S4) 06:40 (S4)	05:23 20:29	05:51 (S4) 53
20	07:15 16:56	06:43 17:34	07:04 (S5) 07:31 (S5)	06:10 18:06	06:10 19:38	05:54 (S4) 06:40 (S4)	05:23 20:29	05:51 (S4) 53
21	07:14 16:58	06:42 17:35	07:06 (S5) 07:30 (S5)	05:58 18:07	06:08 19:39	05:53 (S4) 06:40 (S4)	05:23 20:29	05:51 (S4) 53
22	07:14 16:59	06:40 17:37	07:07 (S5) 07:28 (S5)	05:56 18:08	06:07 19:40	05:53 (S4) 06:41 (S4)	05:23 20:29	05:51 (S4) 53
23	07:13 17:00	06:39 17:38	07:09 (S5) 07:26 (S5)	05:55 18:09	06:05 19:41	05:52 (S4) 19:16 (S1)	05:23 20:12	05:52 (S4) 53
24	07:12 17:01	06:38 17:39	07:12 (S5) 07:23 (S5)	05:53 18:10	06:04 19:42	05:51 (S4) 19:12 (S1)	05:24 20:12	05:52 (S4) 53
25	07:12 17:02	06:36 17:40	05:51 18:11	06:02 19:44	05:30 19:21 (S1)	05:51 (S4) 06:41 (S4)	05:24 20:30	05:52 (S4) 53
26	07:11 17:04	06:35 17:41	05:50 18:12	06:01 19:45	05:29 19:22 (S1)	05:50 (S4) 06:41 (S4)	05:24 20:30	05:53 (S4) 53
27	07:10 17:05	06:33 17:42	05:48 18:13	06:00 19:46	05:28 19:23 (S1)	05:49 (S4) 06:41 (S4)	05:25 20:30	05:53 (S4) 52
28	07:09 17:06	06:32 17:44	05:46 18:14	05:58 19:47	05:28 19:24 (S1)	05:49 (S4) 06:41 (S4)	05:25 20:30	05:52 (S4) 53
29	07:08 17:07	06:31 17:45	05:45 19:15	05:57 19:48	05:27 19:25 (S1)	05:48 (S4) 06:41 (S4)	05:25 20:30	05:53 (S4) 53
30	07:08 17:08	06:30 17:46	05:54 19:16	05:56 19:49	05:27 19:26 (S1)	05:48 (S4) 06:41 (S4)	05:26 20:30	05:53 (S4) 53
31	07:07 17:10	06:29 17:47	06:43 19:17	05:55 19:18	05:26 20:18	05:47 (S4) 06:41 (S4)	05:26 20:30	06:46 (S4)
Potential sun hours	298	298	369	398	448	451		
Total, worst case		405		84	1275	1599		
Sun reduction		0,44		0,51	0,57	0,62		
Oper. time red.		0,77		0,77	0,77	0,77		
Wind dir. red.		0,66		0,65	0,64	0,63		
Total reduction		0,22		0,25	0,28	0,30		
Total, real		91		21	356	484		

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F133 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

	July	August	September	October	November	December
1	05:26	05:54 (S4)   05:50	06:12 (S4)   06:20	06:50	06:24	06:45 (S5)   06:58
2	05:27	05:53 (S4)   05:51	06:13 (S4)   06:21	06:51	06:25	06:47 (S5)   06:59
3	05:27	05:54 (S4)   05:52	06:14 (S4)   06:22	06:52	06:26	06:48 (S5)   07:00
4	05:28	05:53 (S4)   05:53	06:15 (S4)   06:23	06:53	06:27	06:49 (S5)   07:01
5	05:28	05:54 (S4)   05:54	06:16 (S4)   06:24	06:54	06:29	06:50 (S5)   07:02
6	05:29	05:53 (S4)   05:55	06:17 (S4)   06:25	06:55	06:30	06:52 (S5)   07:03
7	05:30	05:54 (S4)   05:56	06:18 (S4)   06:26	06:56	06:31	06:53 (S5)   07:04
8	05:30	05:54 (S4)   05:57	06:18 (S4)   06:27	06:57	06:32	06:54 (S5)   07:05
9	05:31	05:54 (S4)   05:58	06:19 (S4)   06:28	06:58	06:33	06:55 (S5)   07:06
10	05:31	05:54 (S4)   05:59	06:20 (S4)   06:29	06:59	06:34	06:56 (S5)   07:07
11	05:32	05:55 (S4)   06:00	06:21 (S4)   06:30	07:00	06:35	06:57 (S5)   07:08
12	05:33	05:55 (S4)   06:01	06:22 (S4)   06:31	07:01	06:36	06:58 (S5)   07:09
13	05:34	05:56 (S4)   06:02	06:23 (S4)   06:32	07:02	06:37	06:59 (S5)   07:10
14	05:34	05:57 (S4)   06:03	06:24 (S4)   06:33	07:03	06:38	07:00 (S5)   07:11
15	05:35	05:58 (S4)   06:04	06:25 (S4)   06:34	07:04	06:39	07:01 (S5)   07:12
16	05:36	05:58 (S4)   06:05	06:26 (S4)   06:35	07:05	06:40	07:02 (S5)   07:13
17	05:37	05:59 (S4)   06:06	06:27 (S4)   06:36	07:06	06:41	07:03 (S5)   07:14
18	05:37	06:00 (S4)   06:07	06:28 (S4)   06:37	07:07	06:42	07:04 (S5)   07:15
19	05:38	06:01 (S4)   06:08	06:29 (S4)   06:38	07:08	06:43	07:05 (S5)   07:16
20	05:39	06:01 (S4)   06:09	06:30 (S4)   06:39	07:09	06:44	07:06 (S5)   07:17
21	05:40	06:02 (S4)   06:10	06:31 (S4)   06:40	07:10	06:45	07:07 (S5)   07:18
22	05:41	06:03 (S4)   06:11	06:32 (S4)   06:41	07:11	06:46	07:08 (S5)   07:19
23	05:42	06:04 (S4)   06:12	06:33 (S4)   06:42	07:12	06:47	07:09 (S5)   07:20
24	05:43	06:05 (S4)   06:12	06:34 (S4)   06:43	07:13	06:48	07:10 (S5)   07:21
25	05:43	06:06 (S4)   06:13	06:35 (S4)   06:44	07:14	06:49	07:11 (S5)   07:22
26	05:44	06:07 (S4)   06:14	06:36 (S4)   06:45	07:15	06:50	07:12 (S5)   07:23
27	05:45	06:07 (S4)   06:15	06:37 (S4)   06:46	07:16	06:51	07:13 (S5)   07:24
28	05:46	06:08 (S4)   06:16	06:38 (S4)   06:47	07:17	06:52	07:14 (S5)   07:25
29	05:47	06:09 (S4)   06:17	06:39 (S4)   06:48	07:18	06:53	07:15 (S5)   07:26
30	05:48	06:10 (S4)   06:18	06:40 (S4)   06:49	07:19	06:54	07:16 (S5)   07:27
31	05:49	06:11 (S4)   06:19	06:41 (S4)   06:50	07:20	06:55	07:17 (S5)   07:28
Potential sun hours	458	427	375	346	299	289
Total, worst case	1530	464		324		84
Sun reduction	0,69	0,69		0,52		0,47
Oper. time red.	0,77	0,77		0,77		0,77
Wind dir. red.	0,63	0,64		0,66		0,66
Total reduction	0,34	0,34		0,27		0,24
Total, real	513	157		86		20

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F134 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	06:58 (S4) 19:18	05:54 19:28 (S1)
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	06:57 (S4) 19:19	05:53 19:28 (S1)
3	07:19 16:39	07:04 17:13	06:27 17:47	06:36 19:20	06:55 (S4) 07:14 (S4)	05:52 19:52
4	07:19 16:40	07:03 17:15	06:26 17:48	06:35 19:22	06:54 (S4) 07:12 (S4)	05:51 19:53
5	07:19 16:40	07:02 17:16	06:24 17:49	06:33 19:23	06:56 (S4) 07:11 (S4)	05:49 19:54
6	07:19 16:41	07:01 17:17	06:22 17:50	06:32 19:24	06:57 (S4) 07:08 (S4)	05:48 19:55
7	07:19 16:42	07:00 17:18	06:21 17:51	06:30 19:25	05:47 19:56	18:51 (S1) 20:23
8	07:19 16:43	06:58 17:20	06:19 17:53	06:28 19:26	05:46 19:57	18:51 (S1) 20:24
9	07:19 16:44	06:57 17:21	06:18 17:54	06:27 19:27	05:45 19:58	18:51 (S1) 20:24
10	07:19 16:45	06:56 17:22	06:16 17:55	06:25 19:28	05:43 19:59	18:51 (S1) 20:25
11	07:18 16:46	06:55 17:23	06:14 17:56	06:24 19:29	05:42 20:00	18:51 (S1) 20:26
12	07:18 16:47	06:54 17:25	06:13 17:57	06:22 19:30	05:41 20:01	18:51 (S1) 20:26
13	07:18 16:48	06:53 17:26	06:11 17:58	06:20 19:31	05:40 20:02	18:51 (S1) 20:26
14	07:18 16:50	06:51 17:27	06:10 17:59	06:19 19:32	05:39 20:03	18:51 (S1) 20:27
15	07:17 16:51	06:50 17:28	06:08 18:00	06:17 19:33	05:38 20:04	18:52 (S1) 20:27
16	07:17 16:52	06:49 17:29	06:06 18:01	06:16 19:34	05:37 20:05	18:52 (S1) 20:28
17	07:16 16:53	06:47 17:31	06:05 18:02	06:14 19:35	05:36 20:06	18:53 (S1) 20:28
18	07:16 16:54	06:46 17:32	06:03 18:04	06:13 19:36	05:35 20:07	18:54 (S1) 20:28
19	07:15 16:55	06:45 17:33	06:01 18:05	06:11 19:37	05:35 20:08	18:54 (S1) 20:29
20	07:15 16:56	06:43 17:34	06:00 18:06	06:10 19:38	05:34 20:09	18:54 (S1) 20:29
21	07:14 16:58	06:42 17:35	05:58 18:07	06:08 19:39	05:33 20:10	18:55 (S1) 20:29
22	07:14 16:59	06:40 17:37	05:56 18:08	06:07 19:40	05:32 20:11	18:56 (S1) 20:30
23	07:13 17:00	06:39 17:38	05:55 18:09	06:05 19:41	05:31 20:12	18:57 (S1) 20:30
24	07:12 17:01	06:38 17:39	05:53 18:10	06:04 19:43	05:31 19:10 (S1) 19:15 (S1)	18:57 (S1) 05:24 20:13
25	07:12 17:02	06:36 17:40	05:51 18:11	06:02 19:44	05:30 19:04 (S1) 19:19 (S1)	18:59 (S1) 05:24 20:13
26	07:11 17:04	06:35 17:41	05:50 18:12	06:01 19:45	05:29 19:02 (S1) 19:22 (S1)	18:59 (S1) 05:24 20:14
27	07:10 17:05	06:33 17:42	05:48 18:13	06:00 19:46	05:29 19:00 (S1) 19:23 (S1)	19:01 (S1) 05:25 20:15
28	07:09 17:06	06:32 17:44	05:46 18:14	05:58 19:47	05:28 18:58 (S1) 19:24 (S1)	19:02 (S1) 05:25 20:16
29	07:08 17:07	06:31 19:15	05:45 19:15	05:57 19:48	05:27 18:57 (S1) 19:25 (S1)	19:03 (S1) 05:25 20:17
30	07:08 17:08	06:30 19:16	05:44 19:16	05:56 19:49	05:27 18:56 (S1) 19:26 (S1)	19:05 (S1) 05:26 20:18
31	07:07 17:10	06:29 19:17	05:43 19:17	05:55 07:00 (S4) 07:17 (S4)	05:26 20:18 20:18	19:07 (S1) 19:17 (S1)
Potential sun hours	298	298	369	398	448	451
Total, worst case			91	247		706
Sun reduction			0,44	0,51		0,62
Oper. time red.			0,77	0,77		0,77
Wind dir. red.			0,66	0,65		0,63
Total reduction			0,22	0,25		0,30
Total, real			20	63		212

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F134 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July		August		September		October	November	December
1	05:26	05:49 (S3)	05:50	19:02 (S1)	06:20	06:50	06:24	06:58	
	20:30	06:13 (S3)	20:11	19:40 (S1)	19:28	18:38	16:52	16:28	
2	05:27	05:49 (S3)	05:51	19:02 (S1)	06:21	06:51	06:25	07:00	
	20:30	06:13 (S3)	20:10	19:40 (S1)	19:27	18:37	16:51	16:28	
3	05:27	05:50 (S3)	05:52	19:02 (S1)	06:22	06:52	06:26	07:01	
	20:30	06:13 (S3)	20:09	19:40 (S1)	19:25	18:35	16:50	16:27	
4	05:28	05:50 (S3)	05:53	19:02 (S1)	06:23	06:53	06:27	07:02	
	20:30	06:12 (S3)	20:08	19:40 (S1)	19:24	18:33	16:48	16:27	
5	05:28	05:51 (S3)	05:54	19:02 (S1)	06:24	06:54	06:29	07:03	
	20:29	06:12 (S3)	20:07	19:40 (S1)	19:22	18:32	16:47	16:27	
6	05:29	05:51 (S3)	05:55	19:02 (S1)	06:25	06:55	06:30	07:03	
	20:29	06:10 (S3)	20:06	19:40 (S1)	19:20	11 07:04 (S4)	18:30	16:46	16:27
7	05:30	05:52 (S3)	05:56	19:02 (S1)	06:26	06:56	06:31	07:04	
	20:29	06:10 (S3)	20:04	19:40 (S1)	19:19	15 07:06 (S4)	18:28	16:45	16:27
8	05:30	05:53 (S3)	05:57	19:01 (S1)	06:27	06:49 (S4)	06:57	07:05	
	20:28	06:09 (S3)	20:03	19:38 (S1)	19:17	18 07:07 (S4)	18:27	16:44	16:27
9	05:31	05:53 (S3)	05:58	19:01 (S1)	06:28	06:49 (S4)	06:58	07:06	
	20:28	06:07 (S3)	20:02	19:38 (S1)	19:15	19 07:08 (S4)	18:25	16:43	16:27
10	05:32	05:54 (S3)	05:59	19:02 (S1)	06:29	06:50 (S4)	06:59	07:07	
	20:28	06:06 (S3)	20:01	19:37 (S1)	19:14	19 07:09 (S4)	18:24	16:42	16:27
11	05:32	05:55 (S3)	06:00	19:02 (S1)	06:30	06:51 (S4)	07:00	07:08	
	20:27	06:04 (S3)	19:59	19:36 (S1)	19:12	18 07:09 (S4)	18:22	16:41	16:27
12	05:33	19:16 (S1)	06:01	19:03 (S1)	06:31	06:51 (S4)	07:02	07:09	
	20:27	19:23 (S1)	19:58	19:35 (S1)	19:10	17 07:08 (S4)	18:20	16:40	16:27
13	05:34	19:14 (S1)	06:02	19:04 (S1)	06:32	06:52 (S4)	07:03	07:10	
	20:26	19:26 (S1)	19:57	19:34 (S1)	19:09	16 07:08 (S4)	18:19	16:39	16:27
14	05:34	19:13 (S1)	06:03	19:05 (S1)	06:33	06:53 (S4)	07:04	07:10	
	20:26	19:28 (S1)	19:55	19:32 (S1)	19:07	15 07:08 (S4)	18:17	16:38	16:27
15	05:35	19:12 (S1)	06:04	19:06 (S1)	06:34	06:54 (S4)	07:05	07:11	
	20:25	19:30 (S1)	19:54	19:31 (S1)	19:05	13 07:07 (S4)	18:16	16:37	16:28
16	05:36	19:10 (S1)	06:05	19:07 (S1)	06:35	06:55 (S4)	07:06	07:12	
	20:25	19:30 (S1)	19:53	19:30 (S1)	19:04	11 07:06 (S4)	18:14	16:36	16:28
17	05:37	19:09 (S1)	06:06	19:09 (S1)	06:36	06:56 (S4)	07:07	07:12	
	20:24	19:32 (S1)	19:51	19:28 (S1)	19:02	9 07:05 (S4)	18:13	16:36	16:28
18	05:37	19:09 (S1)	06:07	19:12 (S1)	06:37	06:57 (S4)	07:08	07:13	
	20:23	19:33 (S1)	19:50	19:25 (S1)	19:00	7 07:04 (S4)	18:11	16:35	16:28
19	05:38	19:08 (S1)	06:08	06:38	06:58 (S4)	07:09	06:45	07:14	
	20:23	19:34 (S1)	19:48	18:59	5 07:03 (S4)	18:10	16:34	16:29	
20	05:39	19:06 (S1)	06:09	06:39	06:59 (S4)	07:10	06:46	07:14	
	20:22	19:34 (S1)	19:47	18:57	1 07:00 (S4)	18:08	16:33	16:29	
21	05:40	19:06 (S1)	06:10	06:40	07:11	06:47	07:15		
	20:21	19:35 (S1)	19:45	18:55	18:07	16:33	16:30		
22	05:41	19:05 (S1)	06:11	06:41	07:12	06:49	07:15		
	20:21	19:36 (S1)	19:44	18:53	18:05	16:32	16:30		
23	05:42	19:05 (S1)	06:12	06:42	07:14	06:50	07:16		
	20:20	19:37 (S1)	19:43	18:52	18:04	16:31	16:31		
24	05:43	19:05 (S1)	06:13	06:43	07:15	06:51	07:16		
	20:19	19:38 (S1)	19:41	18:50	18:03	16:31	16:31		
25	05:43	19:04 (S1)	06:14	06:44	07:16	06:52	07:17		
	20:18	19:38 (S1)	19:39	18:48	17:01	16:30	16:32		
26	05:44	19:04 (S1)	06:15	06:45	07:17	06:53	07:17		
	20:17	19:39 (S1)	19:38	18:47	17:00	16:30	16:32		
27	05:45	19:03 (S1)	06:15	06:46	07:18	06:54	07:18		
	20:16	19:38 (S1)	19:36	18:45	16:58	16:29	16:33		
28	05:46	19:02 (S1)	06:16	06:47	07:19	06:55	07:18		
	20:15	19:39 (S1)	19:35	18:43	16:57	16:29	16:34		
29	05:47	19:02 (S1)	06:17	06:48	07:20	06:56	07:18		
	20:14	19:39 (S1)	19:33	18:42	16:56	16:29	16:34		
30	05:48	19:02 (S1)	06:18	06:49	07:21	06:57	07:18		
	20:13	19:40 (S1)	19:32	18:40	16:54	16:28	16:35		
31	05:49	19:02 (S1)	06:19	06:50	07:22	06:58	07:19		
	20:12	19:40 (S1)	19:30	18:39	16:53	16:27	16:36		
Potential sun hours	458		427		375		346		299
Total, worst case	754		578		194				
Sun reduction	0,69		0,69		0,61				
Oper. time red.	0,77		0,77		0,77				
Wind dir. red.	0,65		0,65		0,66				
Total reduction	0,34		0,34		0,31				
Total, real	257		198		60				

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F136 - A07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26	19:41 (S1) 05:50	06:12 (S4) 06:20	06:50	06:24	06:58
	20:30	20:04 (S1) 20:11	06:34 (S4) 19:28	18:38	16:52	16:28
2	05:27	19:41 (S1) 05:51	06:13 (S4) 06:21	06:51	06:25	06:59
	20:30	20:04 (S1) 20:10	06:34 (S4) 19:27	18:37	16:51	16:28
3	05:27	19:41 (S1) 05:52	06:14 (S4) 06:22	06:52	07:17 (S5) 06:26	07:00
	20:30	20:05 (S1) 20:09	06:34 (S4) 19:25	18:35	07:21 (S5) 16:50	16:27
4	05:28	19:41 (S1) 05:53	06:15 (S4) 06:23	06:53	07:13 (S5) 06:27	07:01
	20:30	20:04 (S1) 20:08	06:34 (S4) 19:24	18:33	07:25 (S5) 16:48	16:27
5	05:28	19:41 (S1) 05:54	06:16 (S4) 06:24	06:54	07:14 (S5) 06:29	07:02
	20:29	20:04 (S1) 20:07	06:34 (S4) 19:22	18:32	07:27 (S5) 16:47	16:27
6	05:29	19:40 (S1) 05:55	06:17 (S4) 06:25	06:55	07:15 (S5) 06:30	07:03
	20:29	20:03 (S1) 20:06	06:34 (S4) 19:20	18:30	07:28 (S5) 16:46	16:27
7	05:30	19:41 (S1) 05:56	06:18 (S4) 06:26	06:56	07:16 (S5) 06:31	07:04
	20:29	20:04 (S1) 20:04	06:34 (S4) 19:19	18:28	07:28 (S5) 16:45	16:27
8	05:30	19:41 (S1) 05:57	06:18 (S4) 06:27	06:57	07:17 (S5) 06:32	07:05
	20:28	20:04 (S1) 20:03	06:33 (S4) 19:17	18:27	07:29 (S5) 16:44	16:27
9	05:31	19:41 (S1) 05:58	06:19 (S4) 06:28	06:58	07:18 (S5) 06:33	07:06
	20:28	20:03 (S1) 20:02	06:32 (S4) 19:15	18:25	07:29 (S5) 16:43	16:27
10	05:31	19:41 (S1) 05:59	06:20 (S4) 06:29	06:59	07:19 (S5) 06:34	07:07
	20:28	20:03 (S1) 20:01	06:32 (S4) 19:14	18:24	07:29 (S5) 16:42	16:27
11	05:32	19:41 (S1) 06:00	06:21 (S4) 06:30	07:00	07:21 (S5) 06:36	07:08
	20:27	20:03 (S1) 19:59	06:31 (S4) 19:12	18:22	07:29 (S5) 16:41	16:27
12	05:33	19:41 (S1) 06:01	06:22 (S4) 06:31	07:01	07:22 (S5) 06:37	07:09
	20:27	20:02 (S1) 19:58	06:30 (S4) 19:10	18:20	07:29 (S5) 16:40	16:27
13	05:34	19:41 (S1) 06:02	06:23 (S4) 06:32	07:03	07:23 (S5) 06:38	07:10
	20:26	20:01 (S1) 19:57	06:29 (S4) 19:09	18:19	07:28 (S5) 16:39	16:27
14	05:34	19:41 (S1) 06:03	06:24 (S4) 06:33	07:04	07:24 (S5) 06:39	07:10
	20:26	20:01 (S1) 19:55	06:28 (S4) 19:07	18:17	07:27 (S5) 16:38	16:27
15	05:35	19:42 (S1) 06:04	06:25 (S4) 06:34	07:05	07:25 (S5) 06:40	07:11
	20:25	20:01 (S1) 19:54	06:26 (S4) 19:05	18:16	07:26 (S5) 16:37	16:27
16	05:36	19:41 (S1) 06:05	06:35	07:06	06:42	07:12
	20:25	20:00 (S1) 19:53	19:04	18:14	16:36	16:28
17	05:37	19:41 (S1) 06:06	06:36	07:07	06:43	07:12
	20:24	19:59 (S1) 19:51	19:02	18:13	16:36	16:28
18	05:37	06:14 (S4) 06:07	06:37	07:08	06:44	07:13
	20:23	19:59 (S1) 19:50	19:00	18:11	16:35	16:28
19	05:38	06:12 (S4) 06:08	06:38	07:09	06:45	07:14
	20:23	19:59 (S1) 19:48	18:58	18:10	16:34	16:29
20	05:39	06:09 (S4) 06:09	06:39	07:10	06:46	07:14
	20:22	19:57 (S1) 19:47	18:57	18:08	16:33	16:29
21	05:40	06:08 (S4) 06:10	06:40	07:11	06:47	07:15
	20:21	19:57 (S1) 19:45	18:55	18:07	16:33	16:30
22	05:41	06:07 (S4) 06:11	06:41	07:12	06:49	07:15
	20:21	19:56 (S1) 19:44	18:53	18:05	16:32	16:30
23	05:42	06:06 (S4) 06:12	06:42	07:14	06:50	07:16
	20:20	19:56 (S1) 19:42	18:52	18:04	16:31	16:31
24	05:43	06:06 (S4) 06:13	06:43	07:15	06:51	07:22 (S6) 07:16
	20:19	19:55 (S1) 19:41	18:50	18:02	16:31	07:29 (S6) 16:31
25	05:43	06:06 (S4) 06:14	06:44	06:16	06:52	07:20 (S6) 07:17
	20:18	19:54 (S1) 19:39	18:48	17:01	16:30	11 07:31 (S6) 16:32
26	05:44	06:07 (S4) 06:14	06:45	06:17	06:53	07:19 (S6) 07:17
	20:17	19:54 (S1) 19:38	18:47	17:00	16:30	14 07:33 (S6) 16:32
27	05:45	06:07 (S4) 06:15	06:46	06:18	06:54	07:19 (S6) 07:18
	20:16	19:52 (S1) 19:36	18:45	16:58	16:29	16 07:35 (S6) 16:33
28	05:46	06:08 (S4) 06:16	06:47	06:19	06:55	07:19 (S6) 07:18
	20:15	19:51 (S1) 19:35	18:43	16:57	16:29	17 07:36 (S6) 16:34
29	05:47	06:09 (S4) 06:17	06:48	06:20	06:56	07:20 (S6) 07:18
	20:14	19:50 (S1) 19:33	18:42	16:56	16:29	17 07:37 (S6) 16:34
30	05:48	06:10 (S4) 06:18	06:49	06:22	06:57	07:21 (S6) 07:18
	20:13	06:33 (S4) 19:32	18:40	16:54	16:28	17 07:38 (S6) 16:35
31	05:49	06:11 (S4) 06:19		06:23		07:19
	20:12	06:34 (S4) 19:30		16:53		16:36
Potential sun hours	458	427	375	346	299	289
Total, worst case	783	202		111		99
Sun reduction	0,69	0,69		0,52		0,47
Oper. time red.	0,77	0,77		0,77		0,77
Wind dir. red.	0,66	0,63		0,66		0,67
Total reduction	0,35	0,33		0,26		0,24
Total, real	272	67		29		24

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F137 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June			
1	07:19	07:06	07:26 (S6)	06:30	06:40	05:54	05:26	05:47 (S4)	
	16:37	17:11	8 07:34 (S6)	17:45	19:18	19:50	20:19	17 06:04 (S4)	
2	07:19	07:05	07:25 (S6)	06:29	06:38	05:53	05:25	05:47 (S4)	
	16:38	17:12	10 07:35 (S6)	17:46	19:19	19:51	20:20	17 06:04 (S4)	
3	07:19	07:04	07:24 (S6)	06:27	06:36	05:52	05:25	05:46 (S4)	
	16:39	17:13	11 07:35 (S6)	17:47	19:20	19:52	20:21	17 06:03 (S4)	
4	07:19	07:03	07:23 (S6)	06:26	06:35	05:51	05:25	05:46 (S4)	
	16:40	17:15	12 07:35 (S6)	17:48	19:22	19:53	20:21	18 06:04 (S4)	
5	07:19	07:02	07:21 (S6)	06:24	06:33	05:49	05:24	05:46 (S4)	
	16:40	17:16	13 07:34 (S6)	17:49	19:23	19:54	20:22	18 06:04 (S4)	
6	07:19	07:01	07:20 (S6)	06:22	06:32	05:48	05:24	05:45 (S4)	
	16:41	17:17	14 07:34 (S6)	17:50	19:24	19:55	20:23	18 06:03 (S4)	
7	07:19	07:00	07:19 (S6)	06:21	06:30	05:47	05:24	05:45 (S4)	
	16:42	17:18	14 07:33 (S6)	17:51	19:25	19:56	20:23	18 06:03 (S4)	
8	07:19	06:58	07:18 (S6)	06:19	06:28	05:46	05:23	05:45 (S4)	
	16:43	17:20	15 07:33 (S6)	17:53	19:26	19:57	20:24	18 06:03 (S4)	
9	07:19	06:57	07:17 (S6)	06:18	06:27	05:45	05:23	05:45 (S4)	
	16:44	17:21	15 07:32 (S6)	17:54	19:27	19:58	20:24	18 06:03 (S4)	
10	07:19	06:56	07:17 (S6)	06:16	06:25	05:43	05:23	05:45 (S4)	
	16:45	17:22	13 07:30 (S6)	17:55	19:28	19:59	20:25	18 06:03 (S4)	
11	07:18	06:55	07:19 (S6)	06:14	06:24	05:42	05:23	05:45 (S4)	
	16:46	17:23	8 07:27 (S6)	17:56	19:29	20:00	20:25	18 06:03 (S4)	
12	07:18	06:54	06:54	06:13	06:22	05:41	05:23	05:45 (S4)	
	16:47	17:25	17:57	17:57	19:30	20:01	20:26	18 06:03 (S4)	
13	07:18	06:53	06:53	06:11	06:20	05:40	05:23	05:45 (S4)	
	16:48	17:26	17:58	17:58	19:31	20:02	20:26	18 06:03 (S4)	
14	07:18	06:51	06:51	06:10	06:19	05:39	05:22	05:45 (S4)	
	16:50	17:27	17:59	17:59	19:32	20:03	20:27	18 06:03 (S4)	
15	07:17	06:50	06:50	06:08	06:17	05:38	05:22	05:45 (S4)	
	16:51	17:28	18:00	1 06:27 (S5)	19:33	20:04	2 06:00 (S4)	20:27	18 06:03 (S4)
16	07:17	06:49	06:49	06:06	06:16	05:37	05:22	05:45 (S4)	
	16:52	17:29	18:01	3 06:28 (S5)	19:34	20:05	3 06:00 (S4)	20:28	18 06:03 (S4)
17	07:16	06:47	06:47	06:05	06:14	05:36	05:22	05:45 (S4)	
	16:53	17:31	18:02	5 06:28 (S5)	19:35	20:06	5 06:02 (S4)	20:28	18 06:03 (S4)
18	07:16	06:46	06:46	06:03	06:13	05:35	05:23	05:45 (S4)	
	16:54	17:32	18:03	6 06:28 (S5)	19:36	20:07	6 06:02 (S4)	20:28	18 06:03 (S4)
19	07:15	06:45	06:45	06:01	06:11	05:35	05:23	05:45 (S4)	
	16:55	17:33	18:05	8 06:28 (S5)	19:37	20:08	7 06:02 (S4)	20:29	18 06:03 (S4)
20	07:15	06:43	06:43	06:00	06:10	05:34	05:23	05:45 (S4)	
	16:56	17:34	18:06	9 06:27 (S5)	19:38	20:09	9 06:03 (S4)	20:29	18 06:03 (S4)
21	07:14	06:42	06:42	05:58	06:16 (S5)	06:08	05:33	05:23	05:45 (S4)
	16:58	17:35	18:07	9 06:25 (S5)	19:39	20:10	10 06:03 (S4)	20:29	18 06:03 (S4)
22	07:14	06:40	06:40	05:56	06:15 (S5)	06:07	05:32	05:23	05:46 (S4)
	16:59	17:37	18:08	10 06:25 (S5)	19:40	20:11	11 06:04 (S4)	20:29	18 06:04 (S4)
23	07:13	06:39	06:39	05:55	06:13 (S5)	06:05	05:31	05:23	05:46 (S4)
	17:00	17:38	18:09	10 06:23 (S5)	19:41	20:12	11 06:03 (S4)	20:30	18 06:04 (S4)
24	07:12	06:38	06:38	05:53	06:11 (S5)	06:04	05:31	05:24	05:46 (S4)
	17:01	17:39	18:10	10 06:21 (S5)	19:43	20:12	12 06:03 (S4)	20:30	18 06:04 (S4)
25	07:12	06:36	06:36	05:51	06:13 (S5)	06:02	05:30	05:24	05:46 (S4)
	17:02	17:40	18:11	4 06:17 (S5)	19:44	20:13	13 06:04 (S4)	20:30	18 06:04 (S4)
26	07:11	06:35	06:35	05:50	06:01	05:29	05:50 (S4)	05:24	05:47 (S4)
	17:04	17:41	18:12	19:45	20:14	14 06:04 (S4)	20:30	18 06:05 (S4)	
27	07:10	06:33	06:33	05:48	06:00	05:29	05:50 (S4)	05:25	05:47 (S4)
	17:05	17:42	18:13	19:46	20:15	14 06:04 (S4)	20:30	18 06:05 (S4)	
28	07:09	07:29 (S6)	06:32	05:46	05:58	05:28	05:49 (S4)	05:25	05:47 (S4)
	17:06	2 07:31 (S6)	17:44	18:14	19:47	20:16	15 06:04 (S4)	20:30	18 06:05 (S4)
29	07:08	07:29 (S6)	06:45	05:45	05:57	05:27	05:48 (S4)	05:25	05:48 (S4)
	17:07	4 07:33 (S6)	19:15	19:48	20:17	15 06:03 (S4)	20:30	18 06:06 (S4)	
30	07:08	07:28 (S6)	06:43	05:46	05:56	05:27	05:48 (S4)	05:26	05:48 (S4)
	17:08	6 07:34 (S6)	19:16	19:49	20:18	16 06:04 (S4)	20:30	18 06:06 (S4)	
31	07:07	07:27 (S6)	06:41	05:45	05:26	05:48 (S4)	05:26	05:48 (S4)	
	17:10	7 07:34 (S6)	19:17	19:50	20:18	16 06:04 (S4)	20:30	18 06:06 (S4)	
Potential sun hours	298	298	369	398	448	451			
Total, worst case	19	133	75			179		537	
Sun reduction	0,43	0,44	0,44			0,57		0,62	
Oper. time red.	0,77	0,77	0,77			0,77		0,77	
Wind dir. red.	0,67	0,67	0,66			0,63		0,63	
Total reduction	0,22	0,23	0,23			0,28		0,30	
Total, real	4	30	17			50		163	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F137 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December		
1	05:26	05:49 (S4)	05:50	06:20	06:50	06:24	06:46 (S6)	06:58
	20:30	18 06:07 (S4)	20:11	19:28	18:38	16:52	13 06:59 (S6)	16:28
2	05:27	05:49 (S4)	05:51	06:21	06:51	06:25	06:47 (S6)	06:59
	20:30	18 06:07 (S4)	20:10	19:27	18:37	16:51	15 07:02 (S6)	16:28
3	05:27	05:50 (S4)	05:52	06:22	06:52	06:26	06:48 (S6)	07:00
	20:30	18 06:08 (S4)	20:09	19:25	18:35	16:50	15 07:03 (S6)	16:27
4	05:28	05:50 (S4)	05:53	06:23	06:53	06:27	06:49 (S6)	07:01
	20:30	18 06:08 (S4)	20:08	19:24	18:33	16:48	14 07:03 (S6)	16:27
5	05:28	05:51 (S4)	05:54	06:24	06:54	06:29	06:50 (S6)	07:02
	20:29	18 06:09 (S4)	20:07	19:22	18:32	16:47	14 07:04 (S6)	16:27
6	05:29	05:51 (S4)	05:55	06:25	06:55	06:30	06:52 (S6)	07:03
	20:29	18 06:09 (S4)	20:06	19:20	18:30	16:46	13 07:05 (S6)	16:27
7	05:30	05:52 (S4)	05:56	06:26	06:56	06:31	06:53 (S6)	07:04
	20:29	18 06:10 (S4)	20:04	19:19	18:28	16:45	12 07:05 (S6)	16:27
8	05:30	05:53 (S4)	05:57	06:27	06:57	06:32	06:54 (S6)	07:05
	20:28	18 06:11 (S4)	20:03	19:17	18:27	16:44	11 07:05 (S6)	16:27
9	05:31	05:53 (S4)	05:58	06:28	06:58	06:33	06:55 (S6)	07:06
	20:28	17 06:10 (S4)	20:02	19:15	18:25	16:43	10 07:05 (S6)	16:27
10	05:32	05:54 (S4)	05:59	06:29	06:59	06:34	06:57 (S6)	07:07
	20:28	17 06:11 (S4)	20:01	19:14	18:24	16:42	8 07:05 (S6)	16:27
11	05:32	05:55 (S4)	06:00	06:30	07:00	06:36	06:58 (S6)	07:08
	20:27	17 06:12 (S4)	19:59	19:12	18:22	16:41	7 07:05 (S6)	16:27
12	05:33	05:55 (S4)	06:01	06:31	07:01	06:37	06:59 (S6)	07:09
	20:27	16 06:11 (S4)	19:58	19:10	18:20	16:40	5 07:04 (S6)	16:27
13	05:34	05:56 (S4)	06:02	06:32	07:03	06:38	07:01 (S6)	07:10
	20:26	16 06:12 (S4)	19:57	19:09	18:19	16:39	4 07:05 (S6)	16:27
14	05:34	05:57 (S4)	06:03	06:33	07:04	06:39	07:02 (S6)	07:10
	20:26	16 06:13 (S4)	19:55	19:07	18:17	16:38	2 07:04 (S6)	16:27
15	05:35	05:58 (S4)	06:04	06:34	07:05	06:40		07:11
	20:25	15 06:13 (S4)	19:54	19:05	18:16	16:37		16:28
16	05:36	05:58 (S4)	06:05	06:35	07:06	06:42		07:12
	20:25	15 06:13 (S4)	19:53	19:04	18:14	16:36		16:28
17	05:37	05:59 (S4)	06:06	06:36	07:07	06:43		07:12
	20:24	14 06:13 (S4)	19:51	19:02	18:13	16:36		16:28
18	05:37	06:00 (S4)	06:07	06:37	07:08	06:44		07:13
	20:23	13 06:13 (S4)	19:50	19:00	18:11	16:35		16:28
19	05:38	06:01 (S4)	06:08	06:38	07:09	06:45		07:14
	20:23	13 06:14 (S4)	19:48	18:58	9 07:07 (S5)	18:10		16:29
20	05:39	06:01 (S4)	06:09	06:39	07:10	06:46		07:14
	20:22	12 06:13 (S4)	19:47	18:57	10 07:09 (S5)	18:08		16:29
21	05:40	06:02 (S4)	06:10	06:40	07:11	06:47		07:15
	20:21	11 06:13 (S4)	19:45	18:55	10 07:10 (S5)	18:07		16:30
22	05:41	06:03 (S4)	06:11	06:41	07:12	06:49		07:15
	20:21	10 06:13 (S4)	19:44	18:53	10 07:11 (S5)	18:05		16:30
23	05:42	06:04 (S4)	06:12	06:42	07:14	06:50		07:16
	20:20	9 06:13 (S4)	19:42	18:52	9 07:11 (S5)	18:04		16:31
24	05:43	06:05 (S4)	06:13	06:43	07:15	06:51		07:16
	20:19	8 06:13 (S4)	19:41	18:50	8 07:11 (S5)	18:03		16:31
25	05:43	06:06 (S4)	06:14	06:44	07:16	06:52		07:17
	20:18	7 06:13 (S4)	19:39	18:48	7 07:11 (S5)	17:01		16:32
26	05:44	06:07 (S4)	06:15	06:45	07:17	06:53		07:17
	20:17	6 06:13 (S4)	19:38	18:47	5 07:10 (S5)	17:00		16:32
27	05:45	06:07 (S4)	06:15	06:46	07:18	06:54		07:18
	20:16	4 06:11 (S4)	19:36	18:45	4 07:10 (S5)	16:58		16:33
28	05:46	06:08 (S4)	06:16	06:47	07:19	06:55		07:18
	20:15	3 06:11 (S4)	19:35	18:43	2 07:09 (S5)	16:57		16:34
29	05:47	06:09 (S4)	06:17	06:48	06:20	06:56		07:18
	20:14	1 06:10 (S4)	19:33	18:42		16:56		16:34
30	05:48		06:18	06:49	06:22	06:57		07:18
	20:13		19:32	18:40		16:54		16:35
31	05:49		06:19		06:23	06:58 (S6)		07:19
	20:12		19:30		16:53	9 06:57 (S6)		16:36
Potential sun hours	458	427	375	346	299		289	
Total, worst case	384		74		9		143	
Sun reduction	0,69		0,61		0,52		0,47	
Oper. time red.	0,77		0,77		0,77		0,77	
Wind dir. red.	0,63		0,66		0,67		0,67	
Total reduction	0,34		0,31		0,27		0,24	
Total, real	129		23		2		34	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F138 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June			
1	07:19	07:06	07:26 (S6)	06:30	06:40	05:54	05:26	05:47 (S4)	
	16:37	17:11	07:37 (S6)	17:45	19:18	19:50	20:19	18 06:05 (S4)	
2	07:19	07:05	07:25 (S6)	06:29	06:38	05:53	05:25	05:47 (S4)	
	16:38	17:12	07:37 (S6)	17:46	19:19	19:51	20:20	18 06:05 (S4)	
3	07:19	07:04	07:24 (S6)	06:27	06:36	05:52	05:25	05:46 (S4)	
	16:39	17:13	07:37 (S6)	17:47	19:20	19:52	20:21	18 06:04 (S4)	
4	07:19	07:03	07:23 (S6)	06:26	06:35	05:51	05:25	05:46 (S4)	
	16:40	17:15	07:36 (S6)	17:48	19:22	19:53	20:21	18 06:04 (S4)	
5	07:19	07:02	07:21 (S6)	06:24	06:33	05:49	05:24	05:46 (S4)	
	16:40	17:16	07:35 (S6)	17:49	19:23	19:54	20:22	18 06:04 (S4)	
6	07:19	07:01	07:20 (S6)	06:22	06:32	05:48	05:24	05:45 (S4)	
	16:41	17:17	07:35 (S6)	17:50	19:24	19:55	20:23	19 06:04 (S4)	
7	07:19	07:00	07:19 (S6)	06:21	06:30	05:47	05:24	05:45 (S4)	
	16:42	17:18	07:34 (S6)	17:51	19:25	19:56	20:23	19 06:04 (S4)	
8	07:19	06:58	07:18 (S6)	06:19	06:28	05:46	05:23	05:45 (S4)	
	16:43	17:20	07:33 (S6)	17:53	19:26	19:57	20:24	19 06:04 (S4)	
9	07:19	06:57	07:20 (S6)	06:18	06:27	05:45	05:23	05:45 (S4)	
	16:44	17:21	07:31 (S6)	17:54	19:27	19:58	20:24	19 06:04 (S4)	
10	07:19	06:56	07:24 (S6)	06:16	06:25	05:43	05:23	05:45 (S4)	
	16:45	17:22	07:27 (S6)	17:55	19:28	19:59	20:25	19 06:04 (S4)	
11	07:18	06:55		06:14	06:24	05:42	05:23	05:45 (S4)	
	16:46	17:23		17:56	19:29	20:00	20:25	19 06:04 (S4)	
12	07:18	06:54		06:13	06:22	05:41	05:23	05:45 (S4)	
	16:47	17:25		17:57	19:30	20:01	20:26	19 06:04 (S4)	
13	07:18	06:53		06:11	06:20	05:40	05:23	05:45 (S4)	
	16:48	17:26		17:58	19:31	20:02	20:26	19 06:04 (S4)	
14	07:18	06:51		06:10	06:19	05:39	05:22	05:45 (S4)	
	16:50	17:27		17:59	19:32	20:03	2 06:01 (S4)	20:27 19 06:04 (S4)	
15	07:17	06:50		06:08	06:26 (S5)	06:17	05:38	2 05:58 (S4)	05:22 05:45 (S4)
	16:51	17:28		18:00	3 06:29 (S5)	19:33	20:04	4 06:02 (S4)	20:27 19 06:04 (S4)
16	07:17	06:49		06:06	06:25 (S5)	06:16	05:37	05:57 (S4)	05:22 05:46 (S4)
	16:52	17:29		18:01	5 06:30 (S5)	19:34	20:05	5 06:02 (S4)	20:28 18 06:04 (S4)
17	07:16	06:47		06:05	06:23 (S5)	06:14	05:36	05:57 (S4)	05:22 05:46 (S4)
	16:53	17:31		18:02	6 06:29 (S5)	19:35	20:06	6 06:03 (S4)	20:28 18 06:04 (S4)
18	07:16	06:46		06:03	06:22 (S5)	06:13	05:35	05:56 (S4)	05:23 05:46 (S4)
	16:54	17:32		18:04	8 06:30 (S5)	19:36	20:07	8 06:04 (S4)	20:28 18 06:04 (S4)
19	07:15	06:45		06:01	06:20 (S5)	06:11	05:35	05:55 (S4)	05:23 05:46 (S4)
	16:55	17:33		18:05	9 06:29 (S5)	19:37	20:08	9 06:04 (S4)	20:29 18 06:04 (S4)
20	07:15	06:43		06:00	06:18 (S5)	06:10	05:34	05:54 (S4)	05:23 05:47 (S4)
	16:56	17:34		18:06	10 06:28 (S5)	19:38	20:09	10 06:04 (S4)	20:29 17 06:04 (S4)
21	07:14	06:42		05:58	06:16 (S5)	06:08	05:33	05:53 (S4)	05:23 05:47 (S4)
	16:58	17:35		18:07	10 06:26 (S5)	19:39	20:10	11 06:04 (S4)	20:29 17 06:04 (S4)
22	07:14	06:40		05:56	06:15 (S5)	06:07	05:32	05:53 (S4)	05:23 05:48 (S4)
	16:59	17:37		18:08	10 06:25 (S5)	19:40	20:11	12 06:05 (S4)	20:29 17 06:05 (S4)
23	07:13	06:39		05:55	06:13 (S5)	06:05	05:31	05:52 (S4)	05:23 05:48 (S4)
	17:00	17:38		18:09	10 06:23 (S5)	19:41	20:12	13 06:05 (S4)	20:30 17 06:05 (S4)
24	07:12	06:38		05:53	06:13 (S5)	06:04	05:31	05:51 (S4)	05:24 05:47 (S4)
	17:01	17:39		18:10	6 06:19 (S5)	19:43	20:12	14 06:05 (S4)	20:30 18 06:05 (S4)
25	07:12	06:36		05:51	06:02	05:30	05:30	05:51 (S4)	05:24 05:47 (S4)
	17:02	17:40		18:11	19:44	20:13	14 06:05 (S4)	20:30 18 06:05 (S4)	
26	07:11	06:35		05:50	06:01	05:29	05:50 (S4)	05:24 05:48 (S4)	
	17:04	2 07:33 (S6)	17:41	18:12	19:45	20:14	15 06:05 (S4)	20:30 18 06:06 (S4)	
27	07:10	06:33		05:48	06:00	05:29	05:50 (S4)	05:25 05:48 (S4)	
	17:05	4 07:34 (S6)	17:42	18:13	19:46	20:15	15 06:05 (S4)	20:30 18 06:06 (S4)	
28	07:09	06:32		05:46	05:58	05:28	05:49 (S4)	05:25 05:47 (S4)	
	17:06	5 07:34 (S6)	17:44	18:14	19:47	20:16	16 06:05 (S4)	20:30 19 06:06 (S4)	
29	07:08	06:31		06:45	05:57	05:27	05:48 (S4)	05:25 05:48 (S4)	
	17:07	7 07:36 (S6)		19:15	19:48	20:17	16 06:04 (S4)	20:30 19 06:07 (S4)	
30	07:08	06:30		06:43	05:56	05:27	05:48 (S4)	05:26 05:48 (S4)	
	17:08	8 07:36 (S6)		19:16	19:49	20:18	17 06:05 (S4)	20:30 19 06:07 (S4)	
31	07:07	06:29		06:41		05:26	05:48 (S4)		
	17:10	9 07:36 (S6)		19:17		20:18	17 06:05 (S4)		
Potential sun hours	298	298	369	398	448		451		
Total, worst case	35	122	78			204		549	
Sun reduction	0,43	0,44	0,44			0,57		0,62	
Oper. time red.	0,77	0,77	0,77			0,77		0,77	
Wind dir. red.	0,67	0,67	0,66			0,63		0,63	
Total reduction	0,22	0,23	0,23			0,28		0,30	
Total, real	8	28	18			57		167	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F138 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

	July	August	September	October	November	December
1	05:26 20:30	05:49 (S4) 06:08 (S4)	05:50 20:11	06:20 19:28	06:50 18:38	06:24 16:52
2	05:27 20:30	05:49 (S4) 06:08 (S4)	05:51 20:10	06:21 19:27	06:51 18:37	06:25 16:51
3	05:27 20:30	05:50 (S4) 06:09 (S4)	05:52 20:09	06:22 19:25	06:52 18:35	06:26 16:50
4	05:28 20:30	05:50 (S4) 06:09 (S4)	05:53 20:08	06:23 19:24	06:53 18:33	06:27 16:48
5	05:28 20:29	05:51 (S4) 06:10 (S4)	05:54 20:07	06:24 19:22	06:54 18:32	06:29 16:47
6	05:29 20:29	05:51 (S4) 06:10 (S4)	05:55 20:06	06:25 19:20	06:55 18:30	06:30 16:46
7	05:30 20:29	05:52 (S4) 06:10 (S4)	05:56 20:04	06:26 19:19	06:56 18:28	06:31 16:45
8	05:30 20:28	05:53 (S4) 06:11 (S4)	05:57 20:03	06:27 19:17	06:57 18:27	06:32 16:44
9	05:31 20:28	05:53 (S4) 06:11 (S4)	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43
10	05:32 20:28	05:54 (S4) 06:12 (S4)	05:59 20:01	06:29 19:14	06:59 18:24	06:34 16:42
11	05:32 20:27	05:55 (S4) 06:13 (S4)	06:00 19:59	06:30 19:12	07:00 18:22	06:36 16:41
12	05:33 20:27	05:55 (S4) 06:12 (S4)	06:01 19:58	06:31 19:10	07:01 18:20	06:37 16:40
13	05:34 20:26	05:56 (S4) 06:13 (S4)	06:02 19:57	06:32 19:09	07:03 18:19	06:38 16:39
14	05:34 20:26	05:57 (S4) 06:14 (S4)	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38
15	05:35 20:25	05:58 (S4) 06:14 (S4)	06:04 19:54	06:34 19:05	07:05 18:16	06:40 16:37
16	05:36 20:25	05:58 (S4) 06:14 (S4)	06:05 19:53	06:35 19:04	07:06 18:14	06:42 16:36
17	05:37 20:24	05:59 (S4) 06:14 (S4)	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:36
18	05:37 20:23	06:00 (S4) 06:15 (S4)	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35
19	05:38 20:23	06:01 (S4) 06:15 (S4)	06:08 19:48	06:38 18:58	07:09 18:10	06:45 16:34
20	05:39 20:22	06:01 (S4) 06:14 (S4)	06:09 19:47	06:39 18:57	07:10 18:08	06:46 16:33
21	05:40 20:21	06:02 (S4) 06:14 (S4)	06:10 19:45	06:40 18:55	07:11 18:07	06:47 16:33
22	05:41 20:21	06:03 (S4) 06:14 (S4)	06:11 19:44	06:41 18:53	07:12 18:05	06:49 16:32
23	05:42 20:20	06:04 (S4) 06:15 (S4)	06:12 19:42	06:42 18:52	07:13 18:04	06:50 16:31
24	05:43 20:19	06:05 (S4) 06:15 (S4)	06:13 19:41	06:43 18:50	07:14 18:03	06:51 16:31
25	05:43 20:18	06:06 (S4) 06:14 (S4)	06:14 19:39	06:44 18:48	07:15 18:01	06:52 16:30
26	05:44 20:17	06:07 (S4) 06:14 (S4)	06:15 19:38	06:45 18:47	07:16 18:00	06:53 16:30
27	05:45 20:16	06:07 (S4) 06:13 (S4)	06:15 19:36	06:46 18:45	07:17 17:59	06:54 16:29
28	05:46 20:15	06:08 (S4) 06:12 (S4)	06:16 19:35	06:47 18:43	07:18 17:57	06:55 16:29
29	05:47 20:14	06:09 (S4) 06:12 (S4)	06:17 19:33	06:48 18:42	07:19 17:56	06:56 16:29
30	05:48 20:13	06:10 (S4) 06:11 (S4)	06:18 19:32	06:49 18:40	07:20 17:55	06:57 16:28
31	05:49 20:12	06:11 (S4) 19:30	06:19 19:30	06:50 18:39	07:21 17:54	06:58 16:28
Potential sun hours	458	427	375	346	299	289
Total, worst case	417		74		159	
Sun reduction	0,69		0,61		0,47	
Oper. time red.	0,77		0,77		0,77	
Wind dir. red.	0,63		0,66		0,67	
Total reduction	0,34		0,31		0,24	
Total, real	140		23		38	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F139 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	18:26 (S6) 05:54	18:23 (S6) 05:26
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	18:23 (S6) 05:53	18:27 (S6) 05:25
3	07:19 16:39	07:04 17:13	06:27 17:47	06:36 19:20	18:56 (S6) 05:52	18:40 (S6) 05:20
4	07:19 16:39	07:03 17:15	06:25 17:48	06:35 19:21	18:22 (S6) 05:52	18:22 (S6) 05:25
5	07:19 16:40	07:02 17:16	06:24 17:49	06:33 19:22	18:58 (S6) 05:52	18:20 (S6) 05:20
6	07:19 16:41	07:01 17:17	06:22 17:50	06:31 19:23	18:20 (S6) 05:50	18:17 (S6) 05:48
7	07:19 16:42	06:59 17:18	06:21 17:51	06:30 19:25	18:59 (S6) 05:49	19:01 (S6) 05:55
8	07:19 16:43	06:58 17:20	06:19 17:52	06:28 19:26	18:18 (S6) 05:49	18:16 (S6) 05:47
9	07:19 16:44	06:57 17:21	06:18 17:54	06:27 19:27	19:01 (S6) 05:56	18:14 (S6) 05:44
10	07:19 16:45	06:56 17:22	06:16 17:55	06:25 19:28	18:59 (S6) 05:46	19:02 (S6) 05:58
11	07:18 16:46	06:55 17:23	06:14 17:56	06:23 19:29	18:13 (S6) 05:42	18:13 (S6) 05:42
12	07:18 16:47	06:54 17:24	06:13 17:57	06:22 19:30	19:02 (S6) 05:48	19:01 (S6) 05:55
13	07:18 16:48	06:52 17:26	06:11 17:58	06:20 19:31	18:12 (S6) 05:40	18:12 (S6) 05:40
14	07:17 16:49	06:51 17:27	06:09 17:59	06:19 19:32	19:02 (S6) 05:47	19:02 (S6) 05:47
15	07:17 16:51	06:50 17:28	06:08 18:00	06:17 19:33	18:12 (S6) 05:38	18:12 (S6) 05:38
16	07:17 16:52	06:49 17:29	06:06 18:01	06:16 19:34	19:02 (S6) 05:37	18:11 (S6) 05:37
17	07:16 16:53	06:47 17:30	06:05 18:02	06:14 19:35	19:01 (S6) 05:36	18:11 (S6) 05:35
18	07:16 16:54	06:46 17:32	06:03 18:03	06:13 19:36	18:12 (S6) 05:34	18:11 (S6) 05:34
19	07:15 16:55	06:45 17:33	06:01 18:04	06:11 19:37	19:00 (S6) 05:33	18:12 (S6) 05:33
20	07:15 16:56	06:43 17:34	06:00 18:06	06:10 19:38	18:12 (S6) 05:32	18:12 (S6) 05:32
21	07:14 16:57	06:42 17:35	05:58 18:07	06:08 19:39	18:58 (S6) 05:33	18:13 (S6) 05:33
22	07:14 16:59	06:40 17:36	05:56 18:08	06:07 19:40	18:13 (S6) 05:32	18:13 (S6) 05:32
23	07:13 17:00	06:39 17:38	05:55 18:09	06:05 19:41	18:57 (S6) 05:31	18:14 (S6) 05:31
24	07:12 17:01	06:37 17:39	05:53 18:10	06:04 19:42	18:56 (S6) 05:30	18:15 (S6) 05:30
25	07:11 17:02	06:36 17:40	05:51 18:11	06:02 19:43	18:56 (S6) 05:29	18:15 (S6) 05:30
26	07:11 17:03	06:35 17:41	05:50 18:12	06:01 19:44	18:54 (S6) 05:29	18:16 (S6) 05:29
27	07:10 17:05	06:33 17:42	05:48 18:13	06:00 19:46	18:53 (S6) 05:28	18:17 (S6) 05:28
28	07:09 17:06	06:32 17:43	05:46 18:14	05:58 19:47	18:52 (S6) 05:28	18:18 (S6) 05:28
29	07:08 17:07	06:30 19:15	05:45 19:15	05:57 18:38 (S6) 18:45 (S6)	18:20 (S6) 05:27	18:20 (S6) 05:27
30	07:07 17:08	06:30 19:16	05:45 18:32 (S6) 18:50 (S6)	05:56 19:48 19:49	18:22 (S6) 05:27	18:22 (S6) 05:27
31	07:07 17:10	06:30 19:17	05:45 18:29 (S6) 18:53 (S6)	05:56 19:49	18:46 (S6) 05:26	18:46 (S6) 05:26
Potential sun hours	298	298	369	398	448	451
Total, worst case			49	1266		33
Sun reduction			0,44	0,51		0,57
Oper. time red.			0,77	0,77		0,77
Wind dir. red.			0,66	0,66		0,66
Total reduction			0,23	0,26		0,29
Total, real			11	326		10

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F139 - A04

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 20:30	05:50 20:11	06:20 19:28	18:12 (S6) 19:01 (S6)	06:50 18:38	06:58 16:28
2	05:27 20:30	05:51 20:10	06:21 19:27	18:12 (S6) 19:00 (S6)	06:51 18:37	06:59 16:28
3	05:27 20:30	05:52 20:09	06:22 19:25	18:12 (S6) 19:00 (S6)	06:52 18:35	07:00 16:27
4	05:28 20:29	05:53 20:08	06:23 19:23	18:13 (S6) 18:59 (S6)	06:53 18:33	07:01 16:27
5	05:28 20:29	05:54 20:07	06:24 19:22	18:13 (S6) 18:58 (S6)	06:54 18:32	07:02 16:27
6	05:29 20:29	05:55 20:05	06:25 19:20	18:13 (S6) 18:57 (S6)	06:55 18:30	07:03 16:27
7	05:29 20:29	05:56 20:04	06:26 19:19	18:14 (S6) 18:56 (S6)	06:56 18:28	07:04 16:27
8	05:30 20:28	05:57 20:03	06:27 19:17	18:15 (S6) 18:54 (S6)	06:57 18:27	07:05 16:27
9	05:31 20:28	05:58 20:02	06:28 19:15	18:16 (S6) 18:53 (S6)	06:58 18:25	07:06 16:27
10	05:31 20:28	05:59 20:01	18:41 (S6) 06:29	18:16 (S6) 19:14	06:59 18:23	07:07 16:27
11	05:32 20:27	06:00 19:59	18:34 (S6) 18:50 (S6)	06:30 19:12	18:18 (S6) 18:22	07:08 16:27
12	05:33 20:27	06:01 19:58	18:31 (S6) 18:53 (S6)	06:31 19:10	18:19 (S6) 18:20	07:09 16:27
13	05:34 20:26	06:02 19:57	18:29 (S6) 18:55 (S6)	06:32 19:09	18:22 (S6) 18:19	07:09 16:27
14	05:34 20:26	06:03 19:55	18:27 (S6) 18:56 (S6)	06:33 19:07	18:27 (S6) 18:17	07:10 16:27
15	05:35 20:25	06:04 19:54	18:25 (S6) 18:58 (S6)	06:34 19:05	07:05 18:16	07:11 16:27
16	05:36 20:25	06:05 19:53	18:24 (S6) 18:59 (S6)	06:35 19:03	07:06 18:14	07:12 16:28
17	05:37 20:24	06:06 19:51	18:23 (S6) 19:00 (S6)	06:36 19:02	07:07 18:13	07:12 16:28
18	05:37 20:23	06:07 19:50	18:21 (S6) 19:01 (S6)	06:37 19:00	07:08 18:11	07:13 16:28
19	05:38 20:23	06:07 19:48	18:20 (S6) 19:02 (S6)	06:38 18:58	07:09 18:10	07:14 16:29
20	05:39 20:22	06:08 19:47	18:19 (S6) 19:02 (S6)	06:39 18:57	07:10 18:08	07:14 16:29
21	05:40 20:21	06:09 19:45	18:18 (S6) 19:03 (S6)	06:40 18:55	07:11 18:07	07:15 16:30
22	05:41 20:20	06:10 19:44	18:17 (S6) 19:03 (S6)	06:41 18:53	07:12 18:05	07:15 16:30
23	05:42 20:20	06:11 19:42	18:17 (S6) 19:03 (S6)	06:42 18:52	07:13 18:04	07:16 16:31
24	05:43 20:19	06:12 19:41	18:16 (S6) 19:04 (S6)	06:43 18:50	07:15 18:02	07:16 16:31
25	05:43 20:18	06:13 19:39	18:14 (S6) 19:03 (S6)	06:44 18:48	06:16 17:01	07:17 16:32
26	05:44 20:17	06:14 19:38	18:14 (S6) 19:03 (S6)	06:45 18:47	06:17 17:00	07:17 16:32
27	05:45 20:16	06:15 19:36	18:13 (S6) 19:03 (S6)	06:46 18:45	06:18 16:58	07:17 16:33
28	05:46 20:15	06:16 19:35	18:13 (S6) 19:02 (S6)	06:47 18:43	06:19 16:57	07:18 16:34
29	05:47 20:14	06:17 19:33	18:13 (S6) 19:02 (S6)	06:48 18:42	06:20 16:56	07:18 16:34
30	05:48 20:13	06:18 19:32	18:12 (S6) 19:02 (S6)	06:49 18:40	06:21 16:54	07:18 16:35
31	05:49 20:12	06:19 19:30	18:12 (S6) 19:01 (S6)	06:23 16:53	06:23 16:53	07:18 16:36
Potential sun hours	458	427	375	346	299	289
Total, worst case		856	517			
Sun reduction		0,69	0,61			
Oper. time red.		0,77	0,77			
Wind dir. red.		0,66	0,66			
Total reduction		0,35	0,31			
Total, real		298	161			

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

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

Progetto\_A2A

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:
18/12/2023 14:52/3.4.415

SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F140 - A07

Assumptions for shadow calculations

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

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
607 505 420 506 599 570 495 488 555 624 686 669 6.724

Table with 13 columns for months (January-December) and 31 rows for days. Each cell contains a time range (Sunrise-Sunset) and a number of occurrences. Summary rows include Potential sun hours, Total, worst case, Sun reduction, Oper. time red., Wind dir. red., Total reduction, and Total, real.

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

Matrix with 4 columns: Day in month, Sun rise (hh:mm), Sun set (hh:mm), Minutes with flicker, First time (hh:mm) with flicker, Last time (hh:mm) with flicker, (WTG causing flicker first time), (WTG causing flicker last time)

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F141 - A07\_C02

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	07:23 (S6) 07:31 (S6)	05:54 19:50
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	05:53 19:51	05:25 20:20
3	07:19 16:39	07:04 17:13	06:27 17:47	06:36 19:20	05:52 19:52	05:25 20:20
4	07:19 16:40	07:03 17:15	06:26 17:48	06:35 19:21	05:51 19:53	05:25 20:21
5	07:19 16:40	07:02 17:16	06:24 17:49	06:33 19:23	05:49 19:54	05:24 20:22
6	07:19 16:41	07:01 17:17	06:22 17:50	06:32 19:24	05:48 19:55	05:24 20:23
7	07:19 16:42	07:00 17:18	06:21 17:51	06:40 (S6) 06:43 (S6)	06:30 19:25	05:47 19:56
8	07:19 16:43	06:58 17:20	06:19 17:53	06:38 (S6) 06:45 (S6)	06:28 19:26	05:46 19:57
9	07:19 16:44	06:57 17:21	06:18 17:54	06:36 (S6) 06:47 (S6)	06:27 19:27	05:45 19:58
10	07:19 16:45	06:56 17:22	06:16 17:55	06:35 (S6) 06:49 (S6)	06:25 19:28	05:43 19:59
11	07:18 16:46	06:55 17:23	06:14 17:56	06:33 (S6) 06:50 (S6)	06:24 19:29	05:42 20:00
12	07:18 16:47	06:54 17:25	06:13 17:57	06:31 (S6) 06:50 (S6)	06:22 19:30	05:41 20:01
13	07:18 16:48	06:52 17:26	06:11 17:58	06:30 (S6) 06:52 (S6)	06:20 19:31	05:40 20:02
14	07:18 16:50	06:51 17:27	06:10 17:59	06:28 (S6) 06:52 (S6)	06:19 19:32	05:39 20:03
15	07:17 16:51	06:50 17:28	06:08 18:00	06:26 (S6) 06:52 (S6)	06:17 19:33	05:38 20:04
16	07:17 16:52	06:49 17:29	06:06 18:01	06:25 (S6) 06:52 (S6)	06:16 19:34	05:37 20:05
17	07:16 16:53	06:47 17:31	06:05 18:02	06:23 (S6) 06:52 (S6)	06:14 19:35	05:36 20:06
18	07:16 16:54	06:46 17:32	06:03 18:03	06:21 (S6) 06:52 (S6)	06:13 19:36	05:35 20:07
19	07:15 16:55	06:45 17:33	06:01 18:05	06:20 (S6) 06:52 (S6)	06:11 19:37	05:35 20:08
20	07:15 16:56	06:43 17:34	06:00 18:06	06:18 (S6) 06:51 (S6)	06:10 19:38	05:34 20:09
21	07:14 16:58	06:42 17:35	05:58 18:07	06:16 (S6) 06:51 (S6)	06:08 19:39	05:33 20:10
22	07:14 16:59	06:40 17:37	05:56 18:08	06:15 (S6) 06:51 (S6)	06:07 19:40	05:32 20:11
23	07:13 17:00	06:39 17:38	05:55 18:09	06:13 (S6) 06:50 (S6)	06:05 19:41	05:31 20:12
24	07:12 17:01	06:38 17:39	05:53 18:10	06:11 (S6) 06:48 (S6)	06:04 19:42	05:31 20:12
25	07:12 17:02	06:36 17:40	05:51 18:11	06:11 (S6) 06:48 (S6)	06:02 19:44	05:30 20:13
26	07:11 17:04	06:35 17:41	05:50 18:12	06:11 (S6) 06:46 (S6)	06:01 19:45	05:29 20:14
27	07:10 17:05	06:33 17:42	05:48 18:13	06:12 (S6) 06:45 (S6)	06:00 19:46	05:29 20:15
28	07:09 17:06	06:32 17:44	05:46 18:14	06:14 (S6) 06:44 (S6)	05:58 19:47	05:28 20:16
29	07:08 17:07		06:45 19:15	07:15 (S6) 07:41 (S6)	05:57 19:48	05:27 20:17
30	07:08 17:08		06:43 19:16	07:16 (S6) 07:39 (S6)	05:56 19:49	05:27 20:17
31	07:07 17:10		06:41 19:17	07:19 (S6) 07:36 (S6)		05:26 20:18
Potential sun hours	298	298	369	398	448	451
Total, worst case			641	8	248	689
Sun reduction			0,44	0,51	0,57	0,62
Oper. time red.			0,77	0,77	0,77	0,77
Wind dir. red.			0,66	0,66	0,63	0,63
Total reduction			0,23	0,26	0,28	0,30
Total, real			145	2	69	209

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F141 - A07\_C02

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December	
1	05:26 20:30	05:49 (S5) 06:12 (S5)	05:50 20:11	06:20 19:28	06:50 18:38	07:10 (S6) 07:30 (S6)	06:24 16:52
2	05:27 20:30	05:49 (S5) 06:12 (S5)	05:51 20:10	06:21 19:27	06:51 18:37	07:11 (S6) 07:29 (S6)	06:25 16:51
3	05:27 20:30	05:50 (S5) 06:13 (S5)	05:52 20:09	06:22 19:25	06:52 18:35	07:12 (S6) 07:27 (S6)	06:26 16:50
4	05:28 20:29	05:50 (S5) 06:13 (S5)	05:53 20:08	06:23 19:24	06:53 18:33	07:13 (S6) 07:25 (S6)	06:27 16:48
5	05:28 20:29	05:51 (S5) 06:14 (S5)	05:54 20:07	06:24 19:22	06:54 18:32	07:14 (S6) 07:23 (S6)	06:29 16:47
6	05:29 20:29	05:51 (S5) 06:13 (S5)	05:55 20:06	06:25 19:20	06:55 18:30	07:15 (S6) 07:20 (S6)	06:30 16:46
7	05:30 20:29	05:52 (S5) 06:14 (S5)	05:56 20:04	06:26 19:19	06:56 18:28	06:31 16:45	07:04 16:27
8	05:30 20:28	05:53 (S5) 06:15 (S5)	05:57 20:03	06:27 19:17	06:57 18:27	06:32 16:44	07:05 16:27
9	05:31 20:28	05:53 (S5) 06:15 (S5)	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43	07:06 16:27
10	05:32 20:28	05:54 (S5) 06:15 (S5)	05:59 20:01	06:29 19:14	06:59 18:24	06:34 16:42	07:07 16:27
11	05:32 20:27	05:55 (S5) 06:16 (S5)	06:00 19:59	06:30 19:12	07:16 (S6) 07:22 (S6)	07:00 18:22	06:36 16:41
12	05:33 20:27	05:55 (S5) 06:16 (S5)	06:01 19:58	06:31 19:10	07:11 (S6) 07:27 (S6)	07:01 18:20	06:37 16:40
13	05:34 20:26	05:56 (S5) 06:16 (S5)	06:02 19:57	06:32 19:09	07:07 (S6) 07:29 (S6)	07:03 18:19	06:38 16:39
14	05:34 20:26	05:57 (S5) 06:17 (S5)	06:03 19:55	06:33 19:07	07:05 (S6) 07:31 (S6)	07:04 18:17	06:39 16:38
15	05:35 20:25	05:58 (S5) 06:17 (S5)	06:04 19:54	06:34 19:05	07:03 (S6) 07:32 (S6)	07:05 18:16	06:40 16:37
16	05:36 20:25	05:58 (S5) 06:16 (S5)	06:05 19:53	06:35 19:04	07:01 (S6) 07:34 (S6)	07:06 18:14	06:42 16:36
17	05:37 20:24	05:59 (S5) 06:17 (S5)	06:06 19:51	06:36 19:02	07:00 (S6) 07:34 (S6)	07:07 18:13	06:43 16:36
18	05:37 20:23	06:00 (S5) 06:17 (S5)	06:07 19:50	06:37 19:00	06:59 (S6) 07:35 (S6)	07:08 18:11	06:44 16:35
19	05:38 20:23	06:01 (S5) 06:17 (S5)	06:08 19:48	06:38 18:58	06:58 (S6) 07:35 (S6)	07:09 18:10	06:45 16:34
20	05:39 20:22	06:01 (S5) 06:17 (S5)	06:09 19:47	06:39 18:57	06:59 (S6) 07:36 (S6)	07:10 18:08	06:46 16:33
21	05:40 20:21	06:02 (S5) 06:17 (S5)	06:10 19:45	06:40 18:55	07:00 (S6) 07:36 (S6)	07:11 18:07	06:47 16:33
22	05:41 20:20	06:03 (S5) 06:17 (S5)	06:11 19:44	06:41 18:53	07:01 (S6) 07:36 (S6)	07:12 18:05	06:49 16:32
23	05:42 20:20	06:04 (S5) 06:17 (S5)	06:12 19:42	06:42 18:52	07:02 (S6) 07:36 (S6)	07:13 18:04	06:50 16:31
24	05:43 20:19	06:05 (S5) 06:17 (S5)	06:13 19:41	06:43 18:50	07:03 (S6) 07:36 (S6)	07:15 18:02	06:51 16:31
25	05:43 20:18	06:06 (S5) 06:16 (S5)	06:13 19:39	06:44 18:48	07:04 (S6) 07:35 (S6)	06:16 17:01	06:52 16:30
26	05:44 20:17	06:07 (S5) 06:16 (S5)	06:14 19:38	06:45 18:47	07:05 (S6) 07:35 (S6)	06:17 17:00	06:53 16:30
27	05:45 20:16	06:07 (S5) 06:15 (S5)	06:15 19:36	06:46 18:45	07:06 (S6) 07:34 (S6)	06:18 16:58	06:54 16:29
28	05:46 20:15	06:08 (S5) 06:14 (S5)	06:16 19:35	06:47 18:43	07:07 (S6) 07:33 (S6)	06:19 16:57	06:55 16:29
29	05:47 20:14	06:09 (S5) 06:14 (S5)	06:17 19:33	06:48 18:42	07:08 (S6) 07:32 (S6)	06:20 16:56	06:56 16:29
30	05:48 20:13	06:10 (S5) 06:13 (S5)	06:18 19:32	06:49 18:40	07:09 (S6) 07:31 (S6)	06:22 16:54	06:57 16:28
31	05:49 20:12	06:11 (S5) 06:12 (S5)	06:19 19:30	06:53 18:39	06:23 16:53	06:23 16:53	07:19 16:36
Potential sun hours	458	427	375	346	299	289	
Total, worst case	506			575		79	
Sun reduction	0,69			0,61		0,52	
Oper. time red.	0,77			0,77		0,77	
Wind dir. red.	0,63			0,66		0,66	
Total reduction	0,34			0,31		0,27	
Total, real	170			179		21	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F142 - A07\_C02

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	06:49 (S1) 07:22 (S1)	06:40 19:18	06:58 (S2) 19:50
2	07:19 16:38	07:05 17:12	06:29 17:46	06:48 (S1) 07:23 (S1)	06:38 19:20	06:57 (S2) 19:51
3	07:19 16:39	07:04 17:13	06:27 17:47	06:46 (S1) 07:23 (S1)	06:37 19:21	06:55 (S2) 19:52
4	07:19 16:40	07:03 17:15	06:26 17:48	06:44 (S1) 07:22 (S1)	06:35 19:22	06:53 (S2) 19:53
5	07:19 16:41	07:02 17:16	06:24 17:49	06:43 (S1) 07:22 (S1)	06:33 19:23	06:52 (S2) 19:54
6	07:19 16:41	07:01 17:17	06:23 17:50	06:43 (S1) 07:21 (S1)	06:32 19:24	06:50 (S2) 19:55
7	07:19 16:42	07:00 17:18	06:21 17:52	06:44 (S1) 07:21 (S1)	06:30 19:25	06:48 (S2) 19:56
8	07:19 16:43	06:59 17:20	06:19 17:53	06:44 (S1) 07:20 (S1)	06:28 19:26	06:47 (S2) 19:57
9	07:19 16:44	06:57 17:21	06:18 17:54	06:44 (S1) 07:19 (S1)	06:27 19:27	06:45 (S2) 19:58
10	07:19 16:45	06:56 17:22	06:16 17:55	06:45 (S1) 07:18 (S1)	06:25 19:28	06:47 (S2) 19:59
11	07:19 16:46	06:55 17:23	06:15 17:56	06:45 (S1) 07:17 (S1)	06:24 19:29	06:50 (S2) 20:00
12	07:18 16:47	06:54 17:25	06:13 17:57	06:47 (S1) 07:16 (S1)	06:22 19:30	05:41 20:01
13	07:18 16:49	06:53 17:26	06:11 17:58	06:48 (S1) 07:13 (S1)	06:21 19:31	05:40 20:02
14	07:18 16:50	06:51 17:27	06:10 17:59	06:49 (S1) 07:11 (S1)	06:19 19:32	05:39 20:03
15	07:17 16:51	06:50 17:28	06:08 18:00	06:52 (S1) 07:08 (S1)	06:17 19:33	05:38 20:04
16	07:17 16:52	06:49 17:29	06:06 18:01	06:57 (S1) 07:03 (S1)	06:16 19:34	05:37 20:05
17	07:17 16:53	06:47 17:31	06:05 18:03		06:14 19:35	05:36 20:06
18	07:16 16:54	06:46 17:32	06:03 18:04		06:13 19:36	05:36 20:07
19	07:16 16:55	06:45 17:33	07:04 (S1) 07:09 (S1)	06:01 18:05	06:11 19:37	05:35 20:08
20	07:15 16:56	06:43 17:34	07:03 (S1) 07:14 (S1)	06:00 18:06	06:10 19:38	05:34 20:09
21	07:14 16:58	06:42 17:35	07:01 (S1) 07:16 (S1)	05:58 18:07	06:08 19:39	05:33 20:10
22	07:14 16:59	06:41 17:37	07:00 (S1) 07:18 (S1)	05:56 18:08	06:07 19:41	05:32 20:11
23	07:13 17:00	06:39 17:38	06:58 (S1) 07:19 (S1)	05:55 18:09	06:05 19:42	05:31 20:12
24	07:12 17:01	06:38 17:39	06:57 (S1) 07:20 (S1)	05:53 18:10	06:04 19:43	05:31 20:13
25	07:12 17:02	06:36 17:40	06:55 (S1) 07:21 (S1)	05:51 18:11	06:03 19:44	05:30 20:14
26	07:11 17:04	06:35 17:41	06:54 (S1) 07:22 (S1)	05:50 18:12	06:01 19:45	05:29 20:14
27	07:10 17:05	06:33 17:42	06:52 (S1) 07:22 (S1)	05:48 18:13	06:00 19:46	05:29 20:15
28	07:09 17:06	06:32 17:44	06:51 (S1) 07:23 (S1)	05:46 18:14	06:05 (S2) 06:06 (S2)	05:28 20:16
29	07:09 17:07		06:45 19:15	4 07:07 (S2)	05:57 19:48	05:27 20:17
30	07:08 17:09		06:43 19:16	6 07:08 (S2)	05:56 19:49	05:27 20:18
31	07:07 17:10		06:42 19:17	9 07:09 (S2)		05:26 20:18
Potential sun hours	298	297	369	398	448	451
Total, worst case		209	511		150	
Sun reduction		0,44	0,44		0,51	
Oper. time red.		0,77	0,77		0,77	
Wind dir. red.		0,65	0,65		0,65	
Total reduction		0,22	0,22		0,25	
Total, real		46	114		38	

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F142 - A07\_C02

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December	
1	05:26 20:30	05:50 20:11	06:21 19:29	6 06:49 (S2) 18:38	06:50 18:38	28 07:26 (S1) 16:24	06:59 16:28
2	05:27 20:30	05:51 20:10	06:21 19:27	13 06:45 (S2) 18:37	06:51 18:37	31 07:24 (S1) 16:51	07:00 16:28
3	05:27 20:30	05:52 20:09	06:22 19:25	17 06:43 (S2) 18:35	06:52 18:35	32 07:23 (S1) 16:50	07:01 16:27
4	05:28 20:30	05:53 20:08	06:23 19:24	17 06:44 (S2) 18:33	06:53 18:33	34 07:22 (S1) 16:48	07:02 16:27
5	05:28 20:29	05:54 20:07	06:24 19:22	17 06:45 (S2) 18:32	06:54 18:32	36 07:20 (S1) 16:47	07:03 16:27
6	05:29 20:29	05:55 20:06	06:25 19:20	16 06:46 (S2) 18:30	06:55 18:30	37 07:20 (S1) 16:46	07:04 16:27
7	05:30 20:29	05:56 20:05	06:26 19:19	16 06:47 (S2) 18:29	06:56 18:29	38 07:19 (S1) 16:45	07:05 16:27
8	05:30 20:29	05:57 20:03	06:27 19:17	15 06:48 (S2) 18:27	06:57 18:27	39 07:18 (S1) 16:44	07:05 16:27
9	05:31 20:28	05:58 20:02	06:28 19:15	13 06:49 (S2) 18:25	06:58 18:25	39 07:19 (S1) 16:43	07:06 16:27
10	05:32 20:28	05:59 20:01	06:29 19:14	12 07:00 (S2) 18:24	06:59 18:24	37 07:20 (S1) 16:42	07:07 16:27
11	05:32 20:27	06:00 19:59	06:30 19:12	11 06:51 (S2) 18:22	07:01 18:22	36 07:21 (S1) 16:41	07:08 16:27
12	05:33 20:27	06:01 19:58	06:31 19:10	9 07:02 (S2) 18:21	07:02 18:21	34 07:22 (S1) 16:40	07:09 16:27
13	05:34 20:26	06:02 19:57	06:32 19:09	7 07:03 (S2) 18:19	07:03 18:19	33 07:23 (S1) 16:39	07:10 16:27
14	05:34 20:26	06:03 19:56	06:33 19:07	5 06:53 (S2) 18:17	07:04 18:17	31 07:24 (S1) 16:38	07:10 16:27
15	05:35 20:25	06:04 19:54	06:34 19:05	2 06:54 (S2) 18:16	07:05 18:16	29 07:25 (S1) 16:37	07:11 16:28
16	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	27 07:26 (S1) 16:36	06:42 16:36	07:12 16:28
17	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	25 07:27 (S1) 16:35	06:43 16:35	07:13 16:28
18	05:38 20:24	06:07 19:50	06:37 19:00	07:08 18:11	22 07:29 (S1) 16:34	06:44 16:34	07:13 16:28
19	05:38 20:23	06:08 19:49	06:38 18:59	07:09 18:10	20 07:30 (S1) 16:33	06:45 16:33	07:14 16:29
20	05:39 20:22	06:09 19:47	06:39 18:57	07:10 18:08	17 07:31 (S1) 16:32	06:46 16:32	07:14 16:29
21	05:40 20:21	06:10 19:46	06:40 18:55	07:11 18:07	13 07:32 (S1) 16:31	06:48 16:31	07:15 16:30
22	05:41 20:21	06:11 19:44	06:41 18:54	07:13 18:05	9 07:33 (S1) 16:30	06:49 16:30	07:16 16:30
23	05:42 20:20	06:12 19:43	06:42 18:52	07:14 18:04	3 07:34 (S1) 16:29	06:50 16:29	07:16 16:31
24	05:43 20:19	06:13 19:41	06:43 18:50	07:15 18:03	06:51 16:28	06:51 16:28	07:16 16:31
25	05:44 20:18	06:14 19:40	06:44 18:48	06:16 17:01	06:52 16:30	06:52 16:30	07:17 16:32
26	05:44 20:17	06:15 19:38	06:45 18:47	06:17 17:00	06:53 16:30	06:53 16:30	07:17 16:32
27	05:45 20:16	06:16 19:36	06:46 18:45	06:18 16:58	06:54 16:29	06:54 16:29	07:18 16:33
28	05:46 20:15	06:17 19:35	06:47 18:43	13 07:34 (S1) 16:57	06:19 16:57	06:55 16:57	07:18 16:34
29	05:47 20:14	06:18 19:33	06:48 18:42	19 07:31 (S1) 16:56	06:21 16:56	06:56 16:29	07:18 16:34
30	05:48 20:13	06:19 19:32	06:49 18:40	24 07:50 (S1) 16:55	06:22 16:55	06:58 16:28	07:19 16:35
31	05:49 20:12	06:20 19:30	06:50 18:38	06:23 16:53	06:23 16:53	06:59 16:36	07:19 16:36
Potential sun hours	458	427	375	346	299	289	
Total, worst case			232	650			
Sun reduction			0,61	0,52			
Oper. time red.			0,77	0,77			
Wind dir. red.			0,65	0,65			
Total reduction			0,31	0,26			
Total, real			71	170			

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F143 - A07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:19 16:37	07:06 17:11	06:30 17:45	06:49 (S2) 19:18	06:40 19:50	05:54 20:19	05:26 20:30	05:26 20:11	05:50 19:29	06:20 18:38	06:50 16:52	06:59 16:28
2	07:19 16:38	07:05 17:12	06:29 17:46	06:48 (S2) 19:20	06:38 19:51	05:53 20:20	05:25 20:30	05:27 20:10	05:51 19:27	06:21 18:37	06:51 16:51	07:00 16:28
3	07:19 16:39	07:04 17:13	06:27 17:47	06:46 (S2) 19:21	06:37 19:52	05:52 20:21	05:25 20:30	05:27 20:09	05:52 19:25	06:22 18:35	06:52 16:50	07:01 16:27
4	07:19 16:40	07:03 17:15	06:26 17:48	06:44 (S2) 19:22	06:35 19:53	05:51 20:21	05:25 20:30	05:28 20:08	05:53 19:24	06:23 18:33	07:25 (S2) 16:48	06:28 16:27
5	07:19 16:40	07:02 17:16	06:24 17:49	06:43 (S2) 19:23	06:33 19:54	05:49 20:22	05:24 20:29	05:28 20:07	05:54 19:22	06:24 18:32	06:54 16:47	07:22 (S2) 16:27
6	07:19 16:41	07:01 17:17	06:23 17:50	06:42 (S2) 19:24	06:32 19:55	05:48 20:23	05:24 20:29	05:29 20:06	05:55 19:20	06:25 18:30	06:55 16:46	07:20 (S2) 16:27
7	07:19 16:42	07:00 17:18	06:21 17:52	06:43 (S2) 19:25	06:30 19:56	05:47 20:23	05:24 20:29	05:30 20:04	05:56 19:19	06:26 18:28	06:56 16:45	07:18 (S2) 16:27
8	07:19 16:43	06:59 17:20	06:19 17:53	06:44 (S2) 19:26	06:28 19:57	05:46 20:24	05:23 20:29	05:30 20:03	05:57 19:17	06:27 18:27	06:57 16:44	07:17 (S2) 16:27
9	07:19 16:44	06:57 17:21	06:18 17:54	06:46 (S2) 19:27	06:27 19:58	05:45 20:25	05:23 20:28	05:31 20:02	05:58 19:15	06:28 18:25	06:58 16:43	07:19 (S2) 16:27
10	07:19 16:45	06:56 17:22	06:16 17:55	06:49 (S2) 19:28	06:25 19:59	05:44 20:25	05:23 20:28	05:32 20:01	05:59 19:14	06:29 18:24	06:59 16:42	07:20 (S2) 16:27
11	07:19 16:46	06:55 17:23	06:15 17:56	07:00 (S2) 19:29	06:24 20:00	05:42 20:26	05:23 20:27	05:32 19:59	06:00 19:12	06:30 18:22	07:01 16:41	07:21 (S2) 16:27
12	07:18 16:47	06:54 17:25	06:13 17:57	06:45 (S2) 19:30	06:22 20:01	05:41 20:26	05:23 20:27	05:33 19:58	06:01 19:10	06:31 18:20	07:02 16:40	07:22 (S2) 16:27
13	07:18 16:49	06:53 17:26	06:11 17:58	06:47 (S2) 19:31	06:20 20:02	05:40 20:27	05:23 20:26	05:34 19:57	06:02 19:09	06:32 18:19	07:03 16:39	07:23 (S2) 16:27
14	07:18 16:50	06:51 17:27	06:10 17:59	06:48 (S2) 19:32	06:19 20:03	05:39 20:27	05:23 20:26	05:34 19:55	06:03 19:07	06:33 18:17	07:04 16:38	07:24 (S2) 16:27
15	07:17 16:51	06:50 17:28	06:08 18:00	06:49 (S2) 19:33	06:17 20:04	05:38 20:27	05:22 20:25	05:35 19:54	06:04 19:05	06:34 18:16	07:05 16:37	07:25 (S2) 16:27
16	07:17 16:52	06:49 17:29	06:06 18:01	06:50 (S2) 19:34	06:16 20:05	05:37 20:28	05:22 20:25	05:36 19:53	06:05 19:04	06:35 18:14	07:06 16:36	07:26 (S2) 16:27
17	07:16 16:53	06:47 17:31	06:05 18:03	06:51 (S2) 19:35	06:14 20:06	05:36 20:28	05:23 20:24	05:37 19:51	06:06 19:02	06:36 18:13	07:07 16:36	07:27 (S2) 16:27
18	07:16 16:54	06:46 17:32	06:03 18:04	06:52 (S2) 19:36	06:13 20:07	05:35 20:29	05:23 20:24	05:38 19:50	06:07 19:00	06:37 18:11	07:08 16:35	07:28 (S2) 16:27
19	07:16 16:55	06:45 17:33	06:01 18:05	06:53 (S2) 19:37	06:11 20:08	05:35 20:29	05:23 20:23	05:38 19:48	06:08 18:59	06:38 18:10	07:09 16:34	07:29 (S2) 16:27
20	07:15 16:56	06:43 17:34	06:00 18:06	06:54 (S2) 19:38	06:10 20:09	05:34 20:29	05:23 20:22	05:39 19:47	06:09 18:57	06:39 18:08	07:10 16:33	07:30 (S2) 16:27
21	07:14 16:58	06:42 17:35	05:58 18:07	06:55 (S2) 19:39	06:08 20:10	05:33 20:29	05:23 20:21	05:40 19:46	06:10 18:55	06:40 18:07	07:11 16:33	07:31 (S2) 16:27
22	07:14 16:59	06:41 17:37	05:56 18:08	06:56 (S2) 19:40	06:07 20:11	05:32 20:30	05:23 20:21	05:41 19:44	06:11 18:54	06:41 18:05	07:13 16:32	07:32 (S2) 16:27
23	07:13 17:00	06:39 17:38	05:55 18:09	06:57 (S2) 19:41	06:05 20:12	05:31 20:30	05:23 20:20	05:42 19:43	06:12 18:52	06:42 18:04	07:14 16:31	07:33 (S2) 16:27
24	07:12 17:01	06:38 17:39	05:53 18:10	06:58 (S2) 19:42	06:04 20:13	05:31 20:30	05:24 20:19	05:43 19:41	06:13 18:50	06:43 18:03	07:15 16:31	07:34 (S2) 16:27
25	07:12 17:02	06:36 17:40	05:51 18:11	06:59 (S2) 19:43	06:03 20:14	05:30 20:30	05:24 20:18	05:44 19:40	06:14 18:48	06:44 17:01	06:16 16:30	07:35 (S2) 16:27
26	07:11 17:04	06:35 17:41	05:50 18:12	07:00 (S2) 19:44	06:01 20:15	05:29 20:30	05:24 20:17	05:44 19:38	06:15 18:47	06:45 17:00	06:17 16:30	07:36 (S2) 16:27
27	07:10 17:05	06:33 17:42	05:48 18:13	07:01 (S2) 19:45	06:00 20:16	05:29 20:30	05:25 20:16	05:45 19:36	06:16 18:45	06:46 16:58	06:18 16:29	07:37 (S2) 16:27
28	07:09 17:06	06:32 17:44	05:46 18:14	07:02 (S2) 19:46	05:58 20:17	05:28 20:30	05:25 20:15	05:46 19:35	06:17 18:43	06:47 16:57	06:19 16:29	07:38 (S2) 16:27
29	07:09 17:07		05:45 19:15	07:03 (S2) 19:47	05:57 20:18	05:27 20:30	05:25 20:14	05:47 19:33	06:18 18:42	06:48 16:56	06:20 16:29	07:39 (S2) 16:27
30	07:08 17:09		05:44 19:16	07:04 (S2) 19:48	05:56 20:19	05:26 20:30	05:24 20:13	05:48 19:32	06:19 18:40	06:49 16:55	06:22 16:28	07:40 (S2) 16:27
31	07:07 17:10		05:43 19:17	07:05 (S2) 19:49	05:55 20:20	05:25 20:30	05:23 20:12	05:49 19:30	06:20 16:53	06:50 16:33	06:23 16:36	07:41 (S2) 16:27
Potential sun hours	298	297	369	398	448	451	458	427	375	346	299	289
Total, worst case		144	231							380		90
Sun reduction		0,44	0,44							0,52		0,41
Oper. time red.		0,77	0,77							0,77		0,77
Wind dir. red.		0,65	0,65							0,65		0,65
Total reduction		0,22	0,22							0,26		0,21
Total, real		32	52							100		19

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F144 - A04

Assumptions for shadow calculations

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

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:19 16:37	07:41 (S3) 07:59 (S3)	07:06 17:11	06:30 17:45	06:40 19:18	05:54 19:50	05:26 20:19	05:26 20:30	05:50 20:11	06:20 19:29	06:50 18:38	06:24 16:52
2	07:19 16:38	07:41 (S3) 07:59 (S3)	07:05 17:12	06:29 17:46	06:38 19:19	05:53 19:51	05:25 20:20	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	06:25 16:51
3	07:19 16:39	07:41 (S3) 07:59 (S3)	07:04 17:13	06:27 17:47	06:37 19:21	05:52 19:52	05:25 20:21	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	06:26 16:50
4	07:19 16:40	07:41 (S3) 08:00 (S3)	07:03 17:15	06:26 17:48	06:35 19:22	05:51 19:53	05:25 20:21	05:28 20:30	05:53 20:08	06:23 19:24	06:53 18:33	06:27 16:48
5	07:19 16:40	07:41 (S3) 08:00 (S3)	07:02 17:16	06:24 17:49	06:33 19:23	05:49 19:54	05:24 20:22	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	06:29 16:47
6	07:19 16:41	07:42 (S3) 08:00 (S3)	07:01 17:17	06:22 17:50	06:32 19:24	05:48 19:55	05:24 20:23	05:29 20:29	05:55 20:06	06:25 19:20	06:55 18:30	06:30 16:46
7	07:19 16:42	07:43 (S3) 08:00 (S3)	07:00 17:18	06:21 17:52	06:30 19:25	05:47 19:56	05:24 20:23	05:30 20:29	05:56 20:04	06:26 19:19	06:56 18:28	06:31 16:45
8	07:19 16:43	07:44 (S3) 08:00 (S3)	06:59 17:20	06:19 17:53	06:28 19:26	05:46 19:57	05:23 20:24	05:30 20:29	05:57 20:03	06:27 19:17	06:57 18:27	06:32 16:44
9	07:19 16:44	07:45 (S3) 08:00 (S3)	06:57 17:21	06:18 17:54	06:27 19:27	05:45 19:58	05:23 20:24	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43
10	07:19 16:45	07:46 (S3) 07:58 (S3)	06:56 17:22	06:16 17:55	06:25 19:28	05:43 19:59	05:23 20:25	05:32 20:28	05:59 20:01	06:29 19:14	06:59 18:24	06:35 16:42
11	07:19 16:46	07:48 (S3) 07:58 (S3)	06:55 17:23	06:14 17:56	06:24 19:29	05:42 20:00	05:23 20:26	05:32 20:27	05:59 19:59	06:30 19:12	07:00 18:22	06:36 16:41
12	07:18 16:47	07:51 (S3) 07:56 (S3)	06:54 17:25	06:13 17:57	06:22 19:30	05:41 20:01	05:23 20:26	05:33 20:27	06:01 19:58	06:31 19:10	07:02 18:20	06:37 16:40
13	07:18 16:48	07:56 (S3) 07:56 (S3)	06:53 17:26	06:11 17:58	06:20 19:31	05:40 20:02	05:23 20:27	05:34 20:26	06:02 19:57	06:32 19:09	07:03 18:19	06:38 16:39
14	07:18 16:50	08:00 (S3) 08:00 (S3)	06:51 17:27	06:10 17:59	06:19 19:32	05:39 20:03	05:22 20:27	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38
15	07:17 16:51	08:00 (S3) 08:00 (S3)	06:50 17:28	06:08 18:00	06:17 19:33	05:38 20:04	05:22 20:27	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	06:41 16:37
16	07:17 16:52	08:00 (S3) 08:00 (S3)	06:49 17:29	06:06 18:01	06:16 19:34	05:37 20:05	05:22 20:28	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	06:42 16:36
17	07:16 16:53	08:00 (S3) 08:00 (S3)	06:47 17:31	06:05 18:02	06:14 19:35	05:36 20:06	05:22 20:28	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:36
18	07:16 16:54	08:00 (S3) 08:00 (S3)	06:46 17:32	06:03 18:04	06:13 19:36	05:35 20:07	05:23 20:29	05:37 20:24	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35
19	07:15 16:55	08:00 (S3) 08:00 (S3)	06:45 17:33	06:01 18:05	06:11 19:37	05:35 20:08	05:23 20:29	05:38 20:23	06:08 19:48	06:38 18:59	07:09 18:10	06:45 16:34
20	07:15 16:56	08:00 (S3) 08:00 (S3)	06:43 17:34	06:00 18:06	06:10 19:38	05:34 20:09	05:23 20:29	05:39 20:22	06:09 19:47	06:39 18:57	07:10 18:08	06:46 16:33
21	07:14 16:58	08:00 (S3) 08:00 (S3)	06:42 17:35	05:58 18:07	06:08 19:39	05:33 20:10	05:23 20:29	05:40 20:21	06:10 19:46	06:40 18:55	07:11 18:07	06:48 16:33
22	07:14 16:59	08:00 (S3) 08:00 (S3)	06:41 17:37	05:56 18:08	06:07 19:40	05:32 20:11	05:23 20:30	05:41 20:21	06:11 19:44	06:41 18:53	07:12 18:05	06:49 16:32
23	07:13 17:00	08:00 (S3) 08:00 (S3)	06:39 17:38	05:55 18:09	06:05 19:42	05:31 20:12	05:23 20:30	05:42 20:20	06:12 19:43	06:42 18:52	07:14 18:04	06:50 16:31
24	07:12 17:01	08:00 (S3) 08:00 (S3)	06:38 17:39	05:53 18:10	06:04 19:43	05:31 20:13	05:24 20:30	05:43 20:19	06:13 19:41	06:43 18:50	07:15 18:03	06:51 16:31
25	07:12 17:02	08:00 (S3) 08:00 (S3)	06:36 17:40	05:51 18:11	06:03 19:44	05:30 20:13	05:24 20:30	05:43 20:18	06:14 19:40	06:44 18:48	07:16 18:01	06:52 16:30
26	07:11 17:04	08:00 (S3) 08:00 (S3)	06:35 17:41	05:50 18:12	06:01 19:45	05:29 20:14	05:24 20:30	05:44 20:17	06:15 19:38	06:45 18:47	07:17 17:00	06:53 16:30
27	07:10 17:05	08:00 (S3) 08:00 (S3)	06:33 17:42	05:48 18:13	06:00 19:46	05:29 20:15	05:25 20:30	05:45 20:16	06:16 19:36	06:46 18:45	07:18 16:58	06:54 16:29
28	07:09 17:06	08:00 (S3) 08:00 (S3)	06:32 17:44	05:46 18:14	05:58 19:47	05:28 20:16	05:25 20:30	05:46 20:15	06:17 19:35	06:47 18:43	07:19 16:57	06:55 16:29
29	07:09 17:07	08:00 (S3) 08:00 (S3)	06:32 17:44	05:46 18:14	05:58 19:47	05:28 20:16	05:25 20:30	05:46 20:15	06:17 19:35	06:47 18:43	07:19 16:57	06:55 16:29
30	07:08 17:08	08:00 (S3) 08:00 (S3)	06:32 17:44	05:46 18:14	05:58 19:47	05:28 20:16	05:25 20:30	05:46 20:15	06:17 19:35	06:47 18:43	07:19 16:57	06:55 16:29
31	07:07 17:10	08:00 (S3) 08:00 (S3)	06:32 17:44	05:46 18:14	05:58 19:47	05:28 20:16	05:25 20:30	05:46 20:15	06:17 19:35	06:47 18:43	07:19 16:57	06:55 16:29
Potential sun hours	298	297	369	398	448	451	458	427	375	346	299	289
Total, worst case												
Sun reduction	185										5	525
Oper. time red.	0,43										0,47	0,41
Wind dir. red.	0,77										0,77	0,77
Total reduction	0,67										0,67	0,67
Total, real	0,22										0,24	0,21
	41										1	111

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F145 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

	January	February	March	April	May	June	
1	07:19 16:37	07:06 17:11	16:10 (S3) 17:45	06:40 19:18	05:54 19:50	05:26 20:19	
2	07:19 16:38	07:05 17:12	16:11 (S3) 17:46	06:38 19:19	05:53 19:51	05:25 20:20	
3	07:19 16:39	07:04 17:13	16:12 (S3) 17:47	06:36 19:20	05:52 19:52	05:25 20:21	
4	07:19 16:39	07:03 17:15	16:12 (S3) 17:48	06:35 19:21	05:50 19:53	05:24 20:21	
5	07:19 16:40	16:13 (S3) 07:02	16:13 (S3) 17:49	06:33 19:23	05:49 19:54	05:24 20:22	
6	07:19 16:41	16:13 (S3) 07:01	16:14 (S3) 17:50	06:32 19:24	05:48 19:55	05:24 20:23	
7	07:19 16:42	3 16:16 (S3) 07:00	16:15 (S3) 17:51	06:30 19:25	05:47 19:56	05:23 20:23	
8	07:19 16:43	5 16:17 (S3) 06:58	16:17 (S3) 17:53	06:19 17:28 (S2)	06:28 19:26	05:46 19:57	05:23 20:24
9	07:19 16:44	7 16:18 (S3) 17:20	16:19 (S3) 17:54	4 17:32 (S2)	06:27 19:27	05:44 19:58	05:23 20:24
10	07:19 16:45	8 16:18 (S3) 17:21	16:22 (S3) 17:55	6 17:32 (S2)	06:25 19:28	05:43 19:59	05:23 20:25
11	07:18 16:46	9 16:19 (S3) 17:22	14 16:36 (S3) 17:56	8 17:34 (S2)	19:28	19:59	20:25
12	07:18 16:47	11 16:21 (S3) 17:23	3 16:30 (S3) 17:56	10 17:35 (S2)	19:29	20:00	20:25
13	07:18 16:48	12 16:22 (S3) 17:24	06:13 17:57	12 17:36 (S2)	06:22 19:30	05:41 20:01	05:23 20:26
14	07:18 16:49	14 16:23 (S3) 17:26	06:11 17:58	12 17:37 (S2)	06:20 19:31	05:40 20:02	05:22 20:26
15	07:17 16:51	15 16:24 (S3) 17:27	06:10 17:59	14 17:38 (S2)	06:19 19:32	05:39 20:03	05:22 20:27
16	07:17 16:52	17 16:25 (S3) 17:28	06:08 18:00	15 17:39 (S2)	06:17 19:33	05:38 20:04	05:22 20:27
17	07:16 16:53	19 16:27 (S3) 17:29	06:06 18:01	15 17:41 (S2)	06:16 19:34	05:37 20:05	05:22 20:28
18	07:16 16:54	20 16:27 (S3) 17:31	06:05 18:02	12 17:39 (S2)	06:14 19:35	05:36 20:06	05:22 20:28
19	07:15 16:55	21 16:29 (S3) 17:32	06:03 18:03	7 17:36 (S2)	06:13 19:36	05:35 20:07	05:22 20:28
20	07:15 16:56	23 16:30 (S3) 17:33	06:01 18:05	06:11 19:37	05:34 20:08	05:23 20:29	05:23 20:29
21	07:14 16:57	24 16:32 (S3) 17:34	06:00 18:06	06:10 19:38	05:34 20:09	05:23 20:29	05:23 20:29
22	07:14 16:59	26 16:33 (S3) 17:35	05:58 18:07	06:08 19:39	05:33 20:10	05:23 20:29	05:23 20:29
23	07:13 17:00	27 16:34 (S3) 17:36	05:56 18:08	06:07 19:40	05:32 20:11	05:23 20:29	05:23 20:29
24	07:12 17:01	28 16:36 (S3) 17:38	05:55 18:09	06:05 19:41	05:31 20:12	05:23 20:30	05:23 20:30
25	07:12 17:02	29 16:37 (S3) 17:39	05:53 18:10	06:04 19:42	05:30 20:12	05:24 20:30	05:24 20:30
26	07:11 17:03	30 16:38 (S3) 17:40	05:51 18:11	06:02 19:44	05:29 20:13	05:24 20:30	05:24 20:30
27	07:10 17:05	32 16:39 (S3) 17:41	05:50 18:12	06:01 19:45	05:29 20:14	05:24 20:30	05:24 20:30
28	07:09 17:06	33 16:08 (S3) 17:42	05:48 18:13	06:00 19:46	05:28 20:15	05:25 20:30	05:25 20:30
29	07:08 17:07	35 16:08 (S3) 17:42	05:46 18:14	05:46 19:47	05:28 20:16	05:25 20:30	05:25 20:30
30	07:08 17:08	36 16:09 (S3) 17:43	06:45 19:15	05:57 19:48	05:27 20:17	05:25 20:30	05:25 20:30
31	07:07 17:10	36 16:46 (S3)	06:43 19:16	05:56 19:49	05:27 20:17	05:26 20:30	05:26 20:30
Potential sun hours	298	297	369	398	448	451	
Total, worst case	553	277	115				
Sun reduction	0,43	0,44	0,44				
Oper. time red.	0,77	0,77	0,77				
Wind dir. red.	0,63	0,63	0,65				
Total reduction	0,21	0,21	0,22				
Total, real	115	59	25				

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F145 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December				
1	05:26 20:30	05:50 20:11	06:20 19:28	06:50 18:38	18:04 (S2) 18:16 (S2)	06:24 16:52	15:50 (S3) 16:05 (S3)	06:58 16:28	11	15:52 (S3) 16:03 (S3)
2	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	18:03 (S2) 18:14 (S2)	06:25 16:51	15:49 (S3) 16:08 (S3)	06:59 16:28	10	15:53 (S3) 16:03 (S3)
3	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	18:03 (S2) 18:12 (S2)	06:26 16:49	15:46 (S3) 16:10 (S3)	07:00 16:27	8	15:54 (S3) 16:02 (S3)
4	05:28 20:29	05:53 20:08	06:23 19:24	06:53 18:33	18:04 (S2) 18:11 (S2)	06:27 16:48	15:45 (S3) 16:11 (S3)	07:01 16:27	7	15:55 (S3) 16:02 (S3)
5	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	18:04 (S2) 18:09 (S2)	06:29 16:47	15:43 (S3) 16:12 (S3)	07:02 16:27	5	15:57 (S3) 16:02 (S3)
6	05:29 20:29	05:55 20:06	06:25 19:20	06:55 18:30	18:05 (S2) 18:07 (S2)	06:30 16:46	15:43 (S3) 16:14 (S3)	07:03 16:27	4	15:58 (S3) 16:02 (S3)
7	05:29 20:29	05:56 20:04	06:26 19:19	06:56 18:28	06:31 16:45	06:31 16:45	15:42 (S3) 16:14 (S3)	07:04 16:27	2	16:00 (S3) 16:02 (S3)
8	05:30 20:28	05:57 20:03	06:27 19:17	06:57 18:27	06:32 16:44	06:32 16:44	15:41 (S3) 16:15 (S3)	07:05 16:27		
9	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	06:33 16:43	06:33 16:43	15:41 (S3) 16:15 (S3)	07:06 16:27		
10	05:31 20:28	05:59 20:01	06:29 19:14	06:59 18:24	06:34 16:42	06:34 16:42	15:41 (S3) 16:16 (S3)	07:07 16:27		
11	05:32 20:27	06:00 19:59	06:30 19:12	07:00 18:22	06:36 16:41	06:36 16:41	15:41 (S3) 16:16 (S3)	07:08 16:27		
12	05:33 20:27	06:01 19:58	06:31 19:10	07:01 18:20	06:37 16:40	06:37 16:40	15:40 (S3) 16:16 (S3)	07:09 16:27		
13	05:34 20:26	06:02 19:57	06:32 19:09	07:03 18:19	06:38 16:39	06:38 16:39	15:40 (S3) 16:14 (S3)	07:09 16:27		
14	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38	06:39 16:38	15:41 (S3) 16:14 (S3)	07:10 16:27		
15	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	06:40 16:37	06:40 16:37	15:41 (S3) 16:13 (S3)	07:11 16:27		
16	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	06:42 16:36	06:42 16:36	15:40 (S3) 16:12 (S3)	07:12 16:28		
17	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:35	06:43 16:35	15:41 (S3) 16:12 (S3)	07:12 16:28		
18	05:37 20:23	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35	06:44 16:35	15:42 (S3) 16:11 (S3)	07:13 16:28		
19	05:38 20:23	06:08 19:48	06:38 18:58	07:09 18:10	06:45 16:34	06:45 16:34	15:42 (S3) 16:10 (S3)	07:14 16:29		
20	05:39 20:22	06:08 19:47	06:39 18:57	07:10 18:08	06:46 16:33	06:46 16:33	15:42 (S3) 16:09 (S3)	07:14 16:29		
21	05:40 20:21	06:09 19:45	06:40 18:55	07:11 18:07	06:47 16:33	06:47 16:33	15:42 (S3) 16:08 (S3)	07:15 16:30		
22	05:41 20:20	06:10 19:44	06:41 18:53	07:12 18:05	06:49 16:32	06:49 16:32	15:44 (S3) 16:08 (S3)	07:15 16:30		
23	05:42 20:20	06:11 19:42	06:42 18:52	07:13 18:04	06:50 16:31	06:50 16:31	15:44 (S3) 16:07 (S3)	07:16 16:31		
24	05:43 20:19	06:12 19:41	06:43 18:50	07:15 18:02	06:51 16:31	06:51 16:31	15:45 (S3) 16:06 (S3)	07:16 16:31		
25	05:43 20:18	06:13 19:39	06:44 18:48	18:14 (S2) 18:18 (S2)	06:16 17:01	06:16 17:01	15:45 (S3) 16:05 (S3)	07:17 16:32		
26	05:44 20:17	06:14 19:38	06:45 18:47	18:10 (S2) 18:21 (S2)	06:17 17:00	06:17 17:00	15:46 (S3) 16:05 (S3)	07:17 16:32		
27	05:45 20:16	06:15 19:36	06:46 18:45	18:08 (S2) 18:23 (S2)	06:18 16:58	06:18 16:58	15:48 (S3) 16:05 (S3)	07:18 16:33		
28	05:46 20:15	06:16 19:35	06:47 18:43	18:06 (S2) 18:21 (S2)	06:19 16:57	06:19 16:57	15:49 (S3) 16:04 (S3)	07:18 16:34		
29	05:47 20:14	06:17 19:33	06:48 18:42	18:05 (S2) 18:19 (S2)	06:20 16:56	06:20 16:56	15:50 (S3) 16:04 (S3)	07:18 16:34		
30	05:48 20:13	06:18 19:32	06:49 18:40	18:04 (S2) 18:17 (S2)	06:22 16:54	06:22 16:54	15:51 (S3) 16:03 (S3)	07:18 16:35		
31	05:49 20:12	06:19 19:30		06:23 16:53	15:55 (S3) 16:01 (S3)	06:23 16:53		07:19 16:36		
Potential sun hours	458	427	375	346	299	289				
Total, worst case			72	52	787	47				
Sun reduction			0,61	0,52	0,47	0,41				
Oper. time red.			0,77	0,77	0,77	0,77				
Wind dir. red.			0,65	0,64	0,63	0,63				
Total reduction			0,30	0,26	0,23	0,20				
Total, real			22	13	178	9				

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F146 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	16:06 (S6) 17:45	06:30 17:11	06:40 19:18	18:13 (S5) 05:54 20:19
2	07:19 16:38	07:05 17:12	16:07 (S6) 17:46	06:29 17:46	06:38 19:19	18:12 (S5) 05:53 20:20
3	07:19 16:39	07:04 17:13	16:07 (S6) 17:47	06:27 17:47	06:36 19:20	18:12 (S5) 05:52 20:20
4	07:19 16:39	07:03 17:15	16:07 (S6) 17:48	06:25 17:48	06:35 19:21	18:11 (S5) 05:50 20:21
5	07:19 16:40	07:02 17:16	16:09 (S6) 17:49	06:24 17:49	06:33 19:22	18:10 (S5) 05:49 20:22
6	07:19 16:41	16:10 (S6) 07:01	16:10 (S6) 17:50	06:22 17:50	06:31 19:23	18:10 (S5) 05:48 20:22
7	07:19 16:42	6 16:16 (S6) 06:59	16:12 (S6) 17:51	06:21 17:51	06:30 19:25	18:10 (S5) 05:47 20:23
8	07:19 16:43	8 16:17 (S6) 06:58	16:13 (S6) 17:52	17:51 17:52	06:28 19:26	18:10 (S5) 05:46 20:24
9	07:19 16:44	10 16:18 (S6) 06:57	16:14 (S6) 17:53	17:52 17:53	06:27 19:27	18:10 (S5) 05:45 20:24
10	07:19 16:45	12 16:18 (S6) 06:56	16:17 (S6) 17:54	06:18 17:54	06:25 19:28	18:10 (S5) 05:43 20:25
11	07:18 16:46	14 16:20 (S6) 06:55	16:17 (S6) 17:55	06:16 17:55	06:25 19:28	18:10 (S5) 05:43 20:25
12	07:18 16:46	15 16:21 (S6) 06:54	16:18 (S6) 17:56	06:14 17:56	06:23 19:29	18:10 (S5) 05:42 20:25
13	07:18 16:48	16:21 (S6) 06:54	16:18 (S6) 17:56	06:13 17:56	06:22 19:29	18:10 (S5) 05:41 20:25
14	07:17 16:49	17 16:21 (S6) 06:52	16:19 (S6) 17:57	06:11 17:57	06:20 19:30	18:11 (S5) 05:40 20:26
15	07:17 16:48	19 16:23 (S6) 06:52	16:20 (S6) 17:58	06:11 17:58	06:20 19:31	18:11 (S5) 05:40 20:26
16	07:17 16:51	20 16:24 (S6) 06:51	16:21 (S6) 17:59	06:09 17:59	06:19 19:32	18:11 (S5) 05:39 20:27
17	07:17 16:52	22 16:25 (S6) 06:49	16:22 (S6) 18:00	06:08 18:00	06:17 19:33	18:12 (S5) 05:38 20:27
18	07:16 16:53	23 16:27 (S6) 06:47	16:23 (S6) 18:01	06:06 18:01	06:16 19:34	18:12 (S5) 05:37 20:28
19	07:16 16:54	24 16:29 (S6) 06:45	16:24 (S6) 18:02	06:03 18:02	06:13 19:35	18:14 (S5) 05:35 20:28
20	07:15 16:55	26 16:29 (S6) 06:43	16:25 (S6) 18:03	06:03 18:03	06:13 19:36	18:14 (S5) 05:35 20:28
21	07:15 16:56	27 16:30 (S6) 06:42	16:26 (S6) 18:04	06:01 18:04	06:11 19:37	18:16 (S5) 05:34 20:29
22	07:14 16:57	29 16:31 (S6) 06:42	16:27 (S6) 18:05	06:00 18:05	06:10 19:38	18:17 (S5) 05:34 20:29
23	07:14 17:00	30 16:33 (S6) 06:40	16:28 (S6) 18:06	05:58 18:06	06:08 19:38	18:19 (S5) 05:33 20:29
24	07:12 17:01	32 16:34 (S6) 06:37	16:29 (S6) 18:07	05:56 18:07	06:07 19:39	18:21 (S5) 05:32 20:29
25	07:11 17:02	33 16:35 (S6) 06:36	16:30 (S6) 18:08	05:55 18:08	06:05 19:40	18:22 (S5) 05:32 20:29
26	07:11 17:03	34 16:37 (S6) 06:35	16:31 (S6) 18:09	05:53 18:09	06:04 19:41	18:24 (S5) 05:31 20:30
27	07:10 17:05	35 16:38 (S6) 06:32	16:32 (S6) 18:10	05:51 18:10	06:02 19:42	18:26 (S5) 05:31 20:30
28	07:09 17:06	36 16:39 (S6) 06:31	16:33 (S6) 18:11	05:49 18:11	06:01 19:43	18:28 (S5) 05:30 20:30
29	07:08 17:07	37 16:40 (S6) 06:30	16:34 (S6) 18:12	05:47 18:12	05:59 19:44	18:30 (S5) 05:29 20:30
30	07:07 17:08	38 16:41 (S6) 06:29	16:35 (S6) 18:13	05:45 18:13	05:57 19:45	18:32 (S5) 05:28 20:30
31	07:07 17:10	39 16:42 (S6) 06:28	16:36 (S6) 18:14	05:43 18:14	05:55 19:46	18:34 (S5) 05:27 20:30
Potential sun hours	298	298	369	398	448	451
Total, worst case	641	223	294	920		56
Sun reduction	0,43	0,44	0,44	0,51		0,62
Oper. time red.	0,77	0,77	0,77	0,77		0,77
Wind dir. red.	0,63	0,63	0,66	0,66		0,67
Total reduction	0,21	0,21	0,22	0,26		0,32
Total, real	132	47	66	236		18

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F146 - A03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

	July	August	September	October	November	December			
1	05:26 20:30	05:50 20:11	06:20 19:28	18:09 (S5) 18:56 (S5)	06:50 18:38	06:24 16:52	15:50 (S6) 15:54 (S6)	06:58 16:28	15:48 (S6) 16:03 (S6)
2	05:27 20:30	05:51 20:10	06:21 19:27	18:08 (S5) 18:56 (S5)	06:51 18:36	06:25 16:51	15:45 (S6) 15:59 (S6)	06:59 16:28	15:49 (S6) 16:03 (S6)
3	05:27 20:30	05:52 20:09	06:22 19:25	18:08 (S5) 18:56 (S5)	06:52 18:35	06:26 16:49	15:43 (S6) 16:02 (S6)	07:00 16:27	15:50 (S6) 16:02 (S6)
4	05:28 20:29	05:53 20:08	06:23 19:23	18:07 (S5) 18:56 (S5)	06:53 18:33	06:27 16:48	15:41 (S6) 16:03 (S6)	07:01 16:27	15:52 (S6) 16:02 (S6)
5	05:28 20:29	05:54 20:07	06:24 19:22	18:07 (S5) 18:55 (S5)	06:54 18:32	06:28 16:47	15:40 (S6) 16:04 (S6)	07:02 16:27	15:54 (S6) 16:02 (S6)
6	05:29 20:29	05:55 20:05	06:25 19:20	18:07 (S5) 18:55 (S5)	06:55 18:30	06:30 16:46	15:39 (S6) 16:06 (S6)	07:03 16:27	15:56 (S6) 16:02 (S6)
7	05:29 20:29	05:56 20:04	06:26 19:19	18:06 (S5) 18:55 (S5)	06:56 18:28	06:31 16:45	15:38 (S6) 16:07 (S6)	07:04 16:27	
8	05:30 20:28	05:57 20:03	06:27 19:17	18:06 (S5) 18:54 (S5)	06:57 18:27	06:32 16:44	15:37 (S6) 16:07 (S6)	07:05 16:27	
9	05:31 20:28	05:58 20:02	06:28 19:15	18:06 (S5) 18:54 (S5)	06:58 18:25	06:33 16:43	15:36 (S6) 16:08 (S6)	07:06 16:27	
10	05:31 20:28	05:59 20:01	06:29 19:14	18:05 (S5) 18:51 (S5)	06:59 18:23	06:34 16:42	15:37 (S6) 16:09 (S6)	07:07 16:27	
11	05:32 20:27	06:00 19:59	06:30 19:12	18:05 (S5) 18:49 (S5)	07:00 18:22	06:36 16:41	15:36 (S6) 16:09 (S6)	07:08 16:27	
12	05:33 20:27	06:01 19:58	06:31 19:10	18:06 (S5) 18:48 (S5)	07:01 18:20	06:37 16:40	15:36 (S6) 16:09 (S6)	07:09 16:27	
13	05:34 20:26	06:02 19:57	06:32 19:09	18:06 (S5) 18:46 (S5)	07:02 18:19	06:38 16:39	15:35 (S6) 16:10 (S6)	07:09 16:27	
14	05:34 20:26	06:03 19:55	06:33 19:07	18:06 (S5) 18:44 (S5)	07:04 18:17	06:39 16:38	15:36 (S6) 16:11 (S6)	07:10 16:27	
15	05:35 20:25	06:04 19:54	06:34 19:05	18:07 (S5) 18:43 (S5)	07:05 18:16	06:40 16:37	15:36 (S6) 16:11 (S6)	07:11 16:27	
16	05:36 20:25	06:05 19:53	06:35 19:03	18:08 (S5) 18:41 (S5)	07:06 18:14	06:41 16:36	15:36 (S6) 16:10 (S6)	07:12 16:28	
17	05:37 20:24	06:05 19:51	06:36 19:02	18:09 (S5) 18:39 (S5)	07:07 18:13	06:43 16:35	15:36 (S6) 16:10 (S6)	07:12 16:28	
18	05:37 20:23	06:06 19:50	06:37 19:00	18:11 (S5) 18:38 (S5)	07:08 18:11	06:44 16:35	15:37 (S6) 16:11 (S6)	07:13 16:28	
19	05:38 20:23	06:07 19:48	06:38 18:58	18:12 (S5) 18:36 (S5)	07:09 18:10	06:45 16:34	15:37 (S6) 16:10 (S6)	07:14 16:29	
20	05:39 20:22	06:08 19:47	06:39 18:57	18:15 (S5) 18:34 (S5)	07:10 18:08	06:46 16:33	15:37 (S6) 16:09 (S6)	07:14 16:29	
21	05:40 20:21	06:09 19:45	06:40 18:55	18:19 (S5) 18:31 (S5)	07:11 18:07	06:47 16:33	15:38 (S6) 16:08 (S6)	07:15 16:30	
22	05:41 20:20	06:10 19:44	06:41 18:53	18:24 (S5) 18:48 (S5)	07:12 18:05	06:48 16:32	15:39 (S6) 16:08 (S6)	07:15 16:30	
23	05:42 20:20	06:11 19:42	06:42 18:52	18:21 (S5) 18:50 (S5)	07:13 18:04	06:50 16:31	15:40 (S6) 16:07 (S6)	07:16 16:30	
24	05:42 20:19	06:12 19:41	06:43 18:50	18:19 (S5) 18:51 (S5)	07:15 18:02	06:51 16:31	15:40 (S6) 16:06 (S6)	07:16 16:31	
25	05:43 20:18	06:13 19:39	06:44 18:48	18:17 (S5) 18:52 (S5)	07:16 17:01	06:52 16:30	15:41 (S6) 16:06 (S6)	07:17 16:32	
26	05:44 20:17	06:14 19:38	06:45 18:47	18:15 (S5) 18:53 (S5)	07:17 17:00	06:53 16:30	15:42 (S6) 16:05 (S6)	07:17 16:32	
27	05:45 20:16	06:15 19:36	06:46 18:45	18:14 (S5) 18:54 (S5)	07:18 16:58	06:54 16:29	15:42 (S6) 16:04 (S6)	07:17 16:33	
28	05:46 20:15	06:16 19:35	06:47 18:43	18:13 (S5) 18:54 (S5)	07:19 16:57	06:55 16:29	15:44 (S6) 16:05 (S6)	07:18 16:34	
29	05:47 20:14	06:17 19:33	06:48 18:41	18:12 (S5) 18:55 (S5)	07:20 16:56	06:56 16:28	15:45 (S6) 16:04 (S6)	07:18 16:34	
30	05:48 20:13	06:18 19:32	06:49 18:40	18:11 (S5) 18:55 (S5)	07:21 16:54	06:57 16:28	15:46 (S6) 16:04 (S6)	07:18 16:35	
31	05:49 20:12	06:19 19:30	06:50 18:38	18:10 (S5) 18:55 (S5)	07:22 16:53	06:58 16:27	15:47 (S6) 16:03 (S6)	07:19 16:36	
Potential sun hours	458	427	375	346	299	289			
Total, worst case			403	824			811		65
Sun reduction			0,69	0,61			0,47		0,41
Oper. time red.			0,77	0,77			0,77		0,77
Wind dir. red.			0,66	0,66			0,63		0,63
Total reduction			0,35	0,31			0,23		0,20
Total, real			140	255			183		13

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

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

Progetto\_A2A

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:
18/12/2023 14:52/3.4.415

SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F147 - A03\_F03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
607 505 420 506 599 570 495 488 555 624 686 669 6.724

Table with columns for months (January to June) and rows for days (1-31) and summary metrics (Potential sun hours, Total, worst case, Sun reduction, Oper. time red., Wind dir. red., Total reduction, Total, real).

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

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

### SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F147 - A03\_F03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time  
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26	19:39 (S1) 05:50	06:12 (S4) 06:20	06:50	06:24	06:58
	20:30	22 20:01 (S1) 20:11	24 06:36 (S4) 19:28	18:38	16:52	16:28 16
2	05:27	19:39 (S1) 05:51	06:13 (S4) 06:21	06:51	06:25	06:59
	20:30	22 20:01 (S1) 20:10	24 06:37 (S4) 19:27	18:37	16:51	16:28 16
3	05:27	19:39 (S1) 05:52	06:14 (S4) 06:22	06:52	06:26	07:00
	20:30	23 20:02 (S1) 20:09	23 06:37 (S4) 19:25	18:35	16:50	16:27 16
4	05:28	19:39 (S1) 05:53	06:15 (S4) 06:23	06:53	06:27	07:01
	20:30	23 20:02 (S1) 20:08	23 06:38 (S4) 19:24	18:33	16:48	16:27 15
5	05:28	19:39 (S1) 05:54	06:16 (S4) 06:24	06:54	06:29	07:02
	20:29	23 20:02 (S1) 20:07	23 06:39 (S4) 19:22	18:32	16:47	16:27 15
6	05:29	19:38 (S1) 05:55	06:17 (S4) 06:25	06:55	06:30	07:03
	20:29	24 20:02 (S1) 20:06	22 06:39 (S4) 19:20	18:30	11 07:26 (S5) 16:46	16:27 15
7	05:30	19:39 (S1) 05:56	06:18 (S4) 06:26	06:56	06:31	07:04
	20:29	24 20:03 (S1) 20:04	21 06:39 (S4) 19:19	18:28	12 07:28 (S5) 16:45	16:27 14
8	05:30	19:39 (S1) 05:57	06:18 (S4) 06:27	06:57	06:32	07:05
	20:28	25 20:04 (S1) 20:03	21 06:39 (S4) 19:17	18:27	12 07:29 (S5) 16:44	16:27 14
9	05:31	19:38 (S1) 05:58	06:19 (S4) 06:28	06:58	06:33	07:06
	20:28	25 20:03 (S1) 20:02	20 06:39 (S4) 19:15	18:25	12 07:30 (S5) 16:43	16:27 14
10	05:31	19:39 (S1) 05:59	06:20 (S4) 06:29	06:59	06:34	07:07
	20:28	24 20:03 (S1) 20:01	19 06:39 (S4) 19:14	18:24	11 07:30 (S5) 16:42	16:27 13
11	05:32	19:39 (S1) 06:00	06:21 (S4) 06:30	07:00	06:36	07:08
	20:27	24 20:03 (S1) 19:59	18 06:39 (S4) 19:12	18:22	10 07:31 (S5) 16:41	16:27 13
12	05:33	19:38 (S1) 06:01	06:22 (S4) 06:31	07:01	06:37	07:09
	20:27	24 20:02 (S1) 19:58	16 06:38 (S4) 19:10	18:20	9 07:31 (S5) 16:40	16:27 13
13	05:34	19:38 (S1) 06:02	06:23 (S4) 06:32	07:03	06:38	07:10
	20:26	23 20:01 (S1) 19:57	15 06:38 (S4) 19:09	18:19	8 07:31 (S5) 16:39	16:27 12
14	05:34	19:39 (S1) 06:03	06:24 (S4) 06:33	07:04	06:39	07:10
	20:26	22 20:01 (S1) 19:55	14 06:38 (S4) 19:07	18:17	6 07:30 (S5) 16:38	16:27 12
15	05:35	19:39 (S1) 06:04	06:25 (S4) 06:34	07:05	06:40	07:11
	20:25	22 20:01 (S1) 19:54	12 06:37 (S4) 19:05	18:16	5 07:30 (S5) 16:37	16:27 12
16	05:36	19:38 (S1) 06:05	06:26 (S4) 06:35	07:06	06:42	07:12
	20:25	22 20:00 (S1) 19:53	10 06:36 (S4) 19:04	18:14	3 07:29 (S5) 16:36	16:28 12
17	05:37	19:39 (S1) 06:06	06:27 (S4) 06:36	07:07	06:43	07:12
	20:24	20 19:59 (S1) 19:51	9 06:36 (S4) 19:02	18:13	1 07:28 (S5) 16:36	16:28 12
18	05:37	19:39 (S1) 06:07	06:28 (S4) 06:37	07:08	06:44	07:13
	20:23	20 19:59 (S1) 19:50	7 06:35 (S4) 19:00	18:11	16:35	16:28 11
19	05:38	19:39 (S1) 06:08	06:29 (S4) 06:38	07:09	06:45	07:14
	20:23	20 19:59 (S1) 19:48	4 06:33 (S4) 18:58	18:10	16:34	16:29 11
20	05:39	19:39 (S1) 06:09	06:30 (S4) 06:39	07:10	06:46	07:14
	20:22	18 19:57 (S1) 19:47	2 06:32 (S4) 18:57	18:08	16:33	16:29 11
21	05:40	19:39 (S1) 06:10	06:40	07:11	06:47	07:15
	20:21	18 19:57 (S1) 19:45	18:55	18:07	16:33	16:30 11
22	05:41	19:39 (S1) 06:11	06:41	07:12	06:49	07:15
	20:21	17 19:56 (S1) 19:44	18:53	18:05	16:32	16:30 11
23	05:42	19:40 (S1) 06:12	06:42	07:14	06:50	07:16
	20:20	16 19:56 (S1) 19:42	18:52	18:04	16:31	16:31 11
24	05:43	19:40 (S1) 06:13	06:43	07:15	06:51	07:16
	20:19	15 19:55 (S1) 19:41	18:50	18:02	16:31	16:31 11
25	05:43	19:41 (S1) 06:14	06:44	06:16	06:52	07:17
	20:18	13 19:54 (S1) 19:39	18:48	17:01	16:30	16:32 11
26	05:44	19:42 (S1) 06:14	06:45	06:17	06:53	07:17
	20:17	12 19:54 (S1) 19:38	18:47	17:00	16:30	7 07:30 (S6) 16:32
27	05:45	06:20 (S4) 06:15	06:46	06:18	06:54	07:22 (S6) 07:18
	20:16	17 19:52 (S1) 19:36	18:45	16:58	16:29	11 07:33 (S6) 16:33
28	05:46	06:17 (S4) 06:16	06:47	06:19	06:55	07:21 (S6) 07:18
	20:15	22 19:51 (S1) 19:35	18:43	16:57	16:29	14 07:35 (S6) 16:34
29	05:47	06:15 (S4) 06:17	06:48	06:20	06:56	07:20 (S6) 07:18
	20:14	24 19:50 (S1) 19:33	18:42	16:56	16:29	16 07:36 (S6) 16:34
30	05:48	06:14 (S4) 06:18	06:49	06:22	06:57	07:21 (S6) 07:18
	20:13	23 19:49 (S1) 19:32	18:40	16:54	16:28	16 07:37 (S6) 16:35
31	05:49	06:13 (S4) 06:19	06:50	06:23	06:58	07:19
	20:12	25 19:49 (S1) 19:30	16:53	16:53	16:36	13 07:54 (S6)
Potential sun hours	458	427	375	346	299	289
Total, worst case	652	327		100	64	395
Sun reduction	0,69	0,69		0,52	0,47	0,41
Oper. time red.	0,77	0,77		0,77	0,77	0,77
Wind dir. red.	0,66	0,63		0,66	0,67	0,67
Total reduction	0,35	0,33		0,26	0,24	0,21
Total, real	229	109		26	15	84

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F148 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19   16:37	15:52 (S3)   17:11	16:07 (S3)   17:45	06:40   19:18	05:54   19:50	05:26   20:19
2	07:19   16:38	15:52 (S3)   17:12	16:09 (S3)   17:46	06:38   19:19	05:53   19:51	05:25   20:20
3	07:19   16:39	15:52 (S3)   17:13	16:12 (S3)   17:47	06:36   19:20	05:52   19:52	05:25   20:21
4	07:19   16:41	15:52 (S3)   17:15	16:16 (S3)   17:48	06:25   17:25 (S2)	06:35   06:35	05:50   05:24
5	07:19   16:40	15:53 (S3)   17:16	06:24   17:24 (S2)	06:33   19:21	05:49   19:53	05:24   20:21
6	07:19   16:42	15:53 (S3)   17:18	06:22   17:22 (S2)	06:32   19:23	05:48   19:54	05:24   20:22
7	07:19   16:43	15:53 (S3)   17:20	06:21   17:22 (S2)	06:30   19:24	05:47   19:55	05:23   20:23
8	07:19   16:44	15:54 (S3)   17:21	06:19   17:21 (S2)	06:28   19:25	05:46   19:56	05:23   20:23
9	07:19   16:45	15:54 (S3)   17:22	06:18   17:20 (S2)	06:27   19:26	05:44   19:57	05:23   20:24
10	07:19   16:46	15:53 (S3)   17:23	06:16   17:19 (S2)	06:25   19:27	05:43   19:58	05:23   20:24
11	07:18   16:47	15:54 (S3)   17:24	06:14   17:18 (S2)	06:23   19:28	05:42   19:59	05:23   20:25
12	07:18   16:48	16:21 (S3)   17:25	06:13   17:17 (S2)	06:22   19:29	05:41   20:00	05:23   20:25
13	07:18   16:49	16:22 (S3)   17:26	06:11   17:16 (S2)	06:20   19:30	05:40   20:01	05:22   20:26
14	07:18   16:51	16:23 (S3)   17:27	06:10   17:15 (S2)	06:19   19:31	05:39   20:02	05:22   20:26
15	07:17   16:52	16:24 (S3)   17:28	06:08   17:14 (S2)	06:17   19:32	05:38   20:03	05:22   20:27
16	07:17   16:53	16:25 (S3)   17:29	06:06   17:13 (S2)	06:16   19:33	05:37   20:04	05:22   20:27
17	07:16   16:54	16:27 (S3)   17:30	06:05   17:12 (S2)	06:14   19:34	05:36   20:05	05:22   20:28
18	07:16   16:55	16:27 (S3)   17:31	06:03   17:11 (S2)	06:13   19:35	05:35   20:06	05:22   20:28
19	07:15   16:56	16:29 (S3)   17:32	06:01   17:10 (S2)	06:11   19:36	05:34   20:07	05:23   20:28
20	07:15   16:57	16:30 (S3)   17:33	06:00   17:09 (S2)	06:10   19:37	05:34   20:08	05:23   20:29
21	07:14   16:58	16:31 (S3)   17:34	05:58   17:08 (S2)	06:08   19:38	05:33   20:09	05:23   20:29
22	07:14   16:59	16:33 (S3)   17:35	05:56   17:07 (S2)	06:07   19:39	05:32   20:10	05:23   20:29
23	07:13   17:00	16:34 (S3)   17:36	05:55   17:06 (S2)	06:05   19:40	05:31   20:11	05:23   20:29
24	07:12   17:01	16:35 (S3)   17:37	05:53   17:05 (S2)	06:04   19:41	05:30   20:12	05:24   20:30
25	07:12   17:02	16:36 (S3)   17:38	05:51   17:04 (S2)	06:02   19:42	05:30   20:12	05:24   20:30
26	07:11   17:03	16:37 (S3)   17:39	05:50   17:03 (S2)	06:01   19:43	05:29   20:13	05:24   20:30
27	07:10   17:04	16:38 (S3)   17:40	05:48   17:02 (S2)	06:00   19:44	05:28   20:14	05:25   20:30
28	07:09   17:05	16:39 (S3)   17:41	05:46   17:01 (S2)	05:58   19:45	05:28   20:15	05:25   20:30
29	07:08   17:06	16:40 (S3)   17:42	05:45   17:00 (S2)	05:57   19:46	05:27   20:16	05:25   20:30
30	07:08   17:07	16:41 (S3)   17:43	05:43   16:59 (S2)	05:55   19:47	05:27   20:17	05:26   20:30
31	07:07   17:08	16:42 (S3)   17:44	05:41   16:58 (S2)	05:54   19:48	05:26   20:18	05:26   20:30
Potential sun hours	298	297	369	398	448	451
Total, worst case	891	60	121			
Sun reduction	0,43	0,44	0,44			
Oper. time red.	0,77	0,77	0,77			
Wind dir. red.	0,63	0,63	0,64			
Total reduction	0,21	0,21	0,22			
Total, real	183	13	27			

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F148 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 20:30	05:50 20:11	06:20 19:28	06:50 18:38	18:01 (S2) 18:16 (S2)	06:24 16:52
2	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	17:59 (S2) 18:14 (S2)	06:25 16:51
3	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	17:59 (S2) 18:12 (S2)	06:26 16:49
4	05:28 20:30	05:53 20:08	06:23 19:24	06:53 18:33	17:58 (S2) 18:11 (S2)	06:27 16:48
5	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	17:58 (S2) 18:09 (S2)	06:29 16:47
6	05:29 20:29	05:55 20:06	06:25 19:20	06:55 18:30	17:57 (S2) 18:07 (S2)	06:30 16:46
7	05:29 20:29	05:56 20:04	06:26 19:19	06:56 18:28	17:58 (S2) 18:05 (S2)	06:31 16:45
8	05:30 20:28	05:57 20:03	06:27 19:17	06:57 18:27	17:58 (S2) 18:04 (S2)	06:32 16:44
9	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	17:59 (S2) 18:02 (S2)	06:33 16:43
10	05:31 20:28	05:59 20:01	06:29 19:14	06:59 18:24	06:34 16:42	15:38 (S3) 16:00 (S3)
11	05:32 20:27	06:00 19:59	06:30 19:12	07:00 18:22	06:36 16:41	15:36 (S3) 16:02 (S3)
12	05:33 20:27	06:01 19:58	06:31 19:10	07:01 18:20	06:37 16:40	15:35 (S3) 16:03 (S3)
13	05:34 20:26	06:02 19:57	06:32 19:09	07:03 18:19	06:38 16:39	15:34 (S3) 16:03 (S3)
14	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38	15:34 (S3) 16:05 (S3)
15	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	06:40 16:37	15:33 (S3) 16:06 (S3)
16	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	06:42 16:36	15:33 (S3) 16:06 (S3)
17	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:35	15:33 (S3) 16:08 (S3)
18	05:37 20:23	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35	15:33 (S3) 16:08 (S3)
19	05:38 20:23	06:08 19:48	06:38 18:58	07:09 18:10	06:45 16:34	15:32 (S3) 16:08 (S3)
20	05:39 20:22	06:08 19:47	06:39 18:57	07:10 18:08	06:46 16:33	15:32 (S3) 16:08 (S3)
21	05:40 20:21	06:09 19:45	06:40 18:55	07:11 18:07	06:47 16:33	15:32 (S3) 16:08 (S3)
22	05:41 20:20	06:10 19:44	06:41 18:53	07:12 18:05	06:49 16:32	15:33 (S3) 16:08 (S3)
23	05:42 20:20	06:11 19:42	06:42 18:52	07:13 18:04	06:50 16:31	15:33 (S3) 16:07 (S3)
24	05:43 20:19	06:12 19:41	06:43 18:50	07:15 18:02	06:51 16:31	15:33 (S3) 16:06 (S3)
25	05:43 20:18	06:13 19:39	06:44 18:48	06:16 17:01	06:52 16:30	15:33 (S3) 16:05 (S3)
26	05:44 20:17	06:14 19:38	06:45 18:47	06:17 17:00	06:53 16:30	15:33 (S3) 16:05 (S3)
27	05:45 20:16	06:15 19:36	06:46 18:45	06:18 16:58	06:54 16:29	15:34 (S3) 16:05 (S3)
28	05:46 20:15	06:16 19:35	06:47 18:43	06:19 16:57	06:55 16:29	15:35 (S3) 16:04 (S3)
29	05:47 20:14	06:17 19:33	06:48 18:42	18:04 (S2) 18:15 (S2)	06:20 16:56	15:35 (S3) 16:04 (S3)
30	05:48 20:13	06:18 19:32	06:49 18:40	18:02 (S2) 18:17 (S2)	06:22 16:54	15:35 (S3) 16:03 (S3)
31	05:49 20:12	06:19 19:30	06:23 16:53	06:23 16:53		07:19 16:36
Potential sun hours	458	427	375	346	299	289
Total, worst case			26	93	704	589
Sun reduction			0,61	0,52	0,47	0,41
Oper. time red.			0,77	0,77	0,77	0,77
Wind dir. red.			0,64	0,64	0,63	0,63
Total reduction			0,30	0,26	0,22	0,20
Total, real			8	24	158	116

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F149 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19   16:37	15:51 (S3)   07:06	16:10 (S3)   06:30	06:40   05:54	05:26	05:26
2	07:19   16:38	15:51 (S3)   07:05	16:14 (S3)   06:29	06:38   05:53	05:25	05:25
3	07:19   16:39	15:51 (S3)   07:04	06:27   17:24 (S2)	06:36   05:52	05:25	05:25
4	07:19   16:39	15:52 (S3)   07:03	06:25   17:26 (S2)	06:35   05:50	05:24	05:24
5	07:19   16:40	15:52 (S3)   07:02	06:24   17:27 (S2)	06:33   05:49	05:24	05:24
6	07:19   16:41	15:52 (S3)   07:01	06:22   17:28 (S2)	06:32   05:48	05:24	05:24
7	07:19   16:42	15:53 (S3)   07:00	06:21   17:29 (S2)	06:30   05:47	05:23	05:23
8	07:19   16:43	15:53 (S3)   06:58	06:19   17:31 (S2)	06:28   05:46	05:23	05:23
9	07:19   16:44	15:52 (S3)   06:57	06:18   17:32 (S2)	06:27   05:44	05:23	05:23
10	07:19   16:45	15:53 (S3)   06:56	06:16   17:33 (S2)	06:25   05:43	05:23	05:23
11	07:18   16:46	15:53 (S3)   06:55	06:14   17:34 (S2)	06:23   05:42	05:23	05:23
12	07:18   16:47	15:54 (S3)   06:54	06:13   17:35 (S2)	06:22   05:41	05:23	05:23
13	07:18   16:48	15:54 (S3)   06:52	06:11   17:36 (S2)	06:20   05:40	05:22	05:22
14	07:18   16:49	15:54 (S3)   06:51	06:10   17:37 (S2)	06:19   05:39	05:22	05:22
15	07:17   16:50	15:54 (S3)   06:50	06:08   17:38 (S2)	06:17   05:38	05:22	05:22
16	07:17   16:51	15:55 (S3)   06:49	06:06   17:39 (S2)	06:16   05:37	05:22	05:22
17	07:16   16:52	15:55 (S3)   06:47	06:05   17:40 (S2)	06:14   05:36	05:22	05:22
18	07:16   16:53	15:56 (S3)   06:46	06:03   17:41 (S2)	06:13   05:35	05:22	05:22
19	07:15   16:54	15:56 (S3)   06:45	06:01   17:42 (S2)	06:11   05:34	05:23	05:23
20	07:15   16:55	15:57 (S3)   06:43	06:00   17:43 (S2)	06:10   05:34	05:23	05:23
21	07:14   16:56	15:57 (S3)   06:42	05:58   17:44 (S2)	06:08   05:33	05:23	05:23
22	07:14   16:57	15:58 (S3)   06:40	05:56   17:45 (S2)	06:07   05:32	05:23	05:23
23	07:13   16:58	15:58 (S3)   06:39	05:55   17:46 (S2)	06:05   05:31	05:23	05:23
24	07:12   16:59	15:59 (S3)   06:38	05:53   17:47 (S2)	06:04   05:30	05:24	05:24
25	07:12   17:00	15:59 (S3)   06:36	05:51   17:48 (S2)	06:02   05:29	05:24	05:24
26	07:11   17:01	16:00 (S3)   06:35	05:50   17:49 (S2)	06:01   05:28	05:24	05:24
27	07:10   17:02	16:01 (S3)   06:34	05:48   17:50 (S2)	06:00   05:27	05:24	05:24
28	07:09   17:03	16:02 (S3)   06:33	05:46   17:51 (S2)	05:58   05:26	05:24	05:24
29	07:08   17:04	16:03 (S3)   06:32	05:45   17:52 (S2)	05:57   05:25	05:24	05:24
30	07:08   17:05	16:04 (S3)   06:31	05:43   17:53 (S2)	05:56   05:24	05:24	05:24
31	07:07   17:06	16:05 (S3)   06:30	05:41   17:54 (S2)	05:54   05:23	05:24	05:24
Potential sun hours	298	297	369	398	448	451
Total, worst case	863	23	113			
Sun reduction	0,43	0,44	0,44			
Oper. time red.	0,77	0,77	0,77			
Wind dir. red.	0,63	0,63	0,64			
Total reduction	0,21	0,21	0,22			
Total, real	178	5	25			

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

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

## SHADOW - Calendar

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F149 - A04\_D10

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 20:30	05:50 20:11	06:20 19:28	06:50 18:38	18:01 (S2) 18:14 (S2)	06:24 16:52
2	05:27 20:30	05:51 20:10	06:21 19:27	06:51 18:37	17:59 (S2) 18:14 (S2)	06:25 16:51
3	05:27 20:30	05:52 20:09	06:22 19:25	06:52 18:35	17:58 (S2) 18:12 (S2)	06:26 16:49
4	05:28 20:30	05:53 20:08	06:23 19:24	06:53 18:33	17:57 (S2) 18:11 (S2)	06:27 16:48
5	05:28 20:29	05:54 20:07	06:24 19:22	06:54 18:32	17:56 (S2) 18:09 (S2)	06:29 16:47
6	05:29 20:29	05:55 20:06	06:25 19:20	06:55 18:30	17:56 (S2) 18:07 (S2)	06:30 16:46
7	05:29 20:29	05:56 20:04	06:26 19:19	06:56 18:28	17:56 (S2) 18:05 (S2)	06:31 16:45
8	05:30 20:28	05:57 20:03	06:27 19:17	06:57 18:27	17:56 (S2) 18:04 (S2)	06:32 16:44
9	05:31 20:28	05:58 20:02	06:28 19:15	06:58 18:25	17:56 (S2) 18:02 (S2)	06:33 16:43
10	05:31 20:28	05:59 20:01	06:29 19:14	06:59 18:24	17:57 (S2) 18:00 (S2)	06:34 16:42
11	05:32 20:27	06:00 19:59	06:30 19:12	07:00 18:22	17:59 (S2) 18:00 (S2)	06:36 16:41
12	05:33 20:27	06:01 19:58	06:31 19:10	07:01 18:20	18:00 (S2) 16:40	19 15:58 (S3) 23 16:00 (S3)
13	05:34 20:26	06:02 19:57	06:32 19:09	07:03 18:19	06:38 16:39	25 15:36 (S3) 18 16:01 (S3)
14	05:34 20:26	06:03 19:55	06:33 19:07	07:04 18:17	06:39 16:38	27 15:36 (S3) 19 16:02 (S3)
15	05:35 20:25	06:04 19:54	06:34 19:05	07:05 18:16	06:40 16:37	29 15:35 (S3) 18 16:01 (S3)
16	05:36 20:25	06:05 19:53	06:35 19:04	07:06 18:14	06:42 16:36	30 15:34 (S3) 18 16:02 (S3)
17	05:37 20:24	06:06 19:51	06:36 19:02	07:07 18:13	06:43 16:35	32 15:34 (S3) 18 16:03 (S3)
18	05:37 20:23	06:07 19:50	06:37 19:00	07:08 18:11	06:44 16:35	33 15:33 (S3) 17 16:28 (S3)
19	05:38 20:23	06:08 19:48	06:38 18:58	07:09 18:10	06:45 16:34	34 15:33 (S3) 17 16:03 (S3)
20	05:39 20:22	06:08 19:47	06:39 18:57	07:10 18:08	06:46 16:33	34 15:33 (S3) 17 16:04 (S3)
21	05:40 20:21	06:09 19:45	06:40 18:55	07:11 18:07	06:47 16:33	35 15:32 (S3) 17 16:04 (S3)
22	05:41 20:20	06:10 19:44	06:41 18:53	07:12 18:05	06:49 16:32	35 15:33 (S3) 17 16:05 (S3)
23	05:42 20:20	06:11 19:42	06:42 18:52	07:13 18:04	06:50 16:31	34 15:33 (S3) 17 16:05 (S3)
24	05:43 20:19	06:12 19:41	06:43 18:50	07:15 18:02	06:51 16:31	33 15:33 (S3) 17 16:05 (S3)
25	05:43 20:18	06:13 19:39	06:44 18:48	06:16 17:01	06:52 16:30	32 15:33 (S3) 17 16:06 (S3)
26	05:44 20:17	06:14 19:38	06:45 18:47	06:17 17:00	06:53 16:30	32 15:33 (S3) 17 16:06 (S3)
27	05:45 20:16	06:15 19:36	06:46 18:45	06:18 16:58	06:54 16:29	31 15:34 (S3) 18 16:07 (S3)
28	05:46 20:15	06:16 19:35	06:47 18:43	06:19 16:57	06:55 16:29	29 15:35 (S3) 18 16:08 (S3)
29	05:47 20:14	06:17 19:33	06:48 18:42	06:20 16:56	06:56 16:28	29 15:35 (S3) 19 16:09 (S3)
30	05:48 20:13	06:18 19:32	06:49 18:40	18:04 (S2) 16:54	06:22 16:28	28 15:35 (S3) 19 16:09 (S3)
31	05:49 20:12	06:19 19:30	06:50 18:38	06:23 16:53		07:19 19 16:10 (S3)
Potential sun hours	458	427	375	346	299	289
Total, worst case			8	107	627	617
Sun reduction			0,61	0,52	0,47	0,41
Oper. time red.			0,77	0,77	0,77	0,77
Wind dir. red.			0,64	0,64	0,63	0,63
Total reduction			0,30	0,26	0,22	0,20
Total, real			2	27	141	122

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

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F150 - A03\_F03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
607	505	420	506	599	570	495	488	555	624	686	669	6.724

January		February		March		April		May		June	
1	07:19 16:37	07:41 (S6) 07:54 (S6)	07:06 17:11	06:30 17:45	06:49 (S5) 06:57 (S5)	06:40 19:18	05:54 19:50	06:14 (S4) 06:30 (S4)	05:26 20:19	19:31 (S1) 19:54 (S1)	
2	07:19 16:38	07:41 (S6) 07:55 (S6)	07:05 17:12	06:29 17:46	06:47 (S5) 06:57 (S5)	06:38 19:19	05:53 19:51	06:12 (S4) 06:29 (S4)	05:25 20:20	19:31 (S1) 19:55 (S1)	
3	07:19 16:39	07:41 (S6) 07:55 (S6)	07:04 17:13	06:27 17:47	06:46 (S5) 06:57 (S5)	06:36 19:20	05:52 19:52	06:11 (S4) 06:29 (S4)	05:25 20:21	19:31 (S1) 19:55 (S1)	
4	07:19 16:40	07:41 (S6) 07:55 (S6)	07:03 17:15	06:26 17:48	06:44 (S5) 06:55 (S5)	06:35 19:22	05:51 19:53	06:10 (S4) 06:29 (S4)	05:25 20:21	19:32 (S1) 19:56 (S1)	
5	07:19 16:40	07:41 (S6) 07:56 (S6)	07:02 17:16	06:24 17:49	06:43 (S5) 06:55 (S5)	06:33 19:23	05:49 19:54	06:09 (S4) 06:29 (S4)	05:24 20:22	19:33 (S1) 19:57 (S1)	
6	07:19 16:41	07:41 (S6) 07:56 (S6)	07:01 17:17	06:22 17:50	06:41 (S5) 06:53 (S5)	19:23 19:24	05:48 19:55	06:08 (S4) 06:29 (S4)	05:24 20:23	19:32 (S1) 19:56 (S1)	
7	07:19 16:42	07:41 (S6) 07:56 (S6)	07:00 17:18	06:21 17:51	06:40 (S5) 06:52 (S5)	06:30 19:25	05:47 19:56	06:06 (S4) 06:28 (S4)	05:24 20:23	19:33 (S1) 19:56 (S1)	
8	07:19 16:43	07:41 (S6) 07:57 (S6)	06:58 17:20	06:19 17:53	06:40 (S5) 06:48 (S5)	06:28 19:26	05:46 19:57	06:05 (S4) 06:28 (S4)	05:23 20:24	19:34 (S1) 19:56 (S1)	
9	07:19 16:44	07:41 (S6) 07:56 (S6)	06:57 17:21	06:18 17:54	06:18 19:27	06:27 19:27	05:45 19:58	06:04 (S4) 06:27 (S4)	05:23 20:24	19:34 (S1) 19:56 (S1)	
10	07:19 16:45	07:41 (S6) 07:56 (S6)	06:56 17:22	06:16 17:55	06:16 19:28	06:25 19:28	05:43 19:59	06:03 (S4) 06:26 (S4)	05:23 20:25	19:35 (S1) 19:56 (S1)	
11	07:18 16:46	07:40 (S6) 07:56 (S6)	06:55 17:23	06:14 17:56	06:14 19:29	06:24 19:29	05:42 20:00	06:02 (S4) 06:26 (S4)	05:23 20:25	19:35 (S1) 19:56 (S1)	
12	07:18 16:47	07:40 (S6) 07:56 (S6)	06:54 17:25	06:13 17:57	06:13 19:30	06:22 19:30	05:41 20:01	06:01 (S4) 06:25 (S4)	05:23 20:26	19:36 (S1) 19:56 (S1)	
13	07:18 16:48	07:40 (S6) 07:55 (S6)	06:52 17:26	06:11 17:58	06:11 19:31	06:20 19:31	05:40 20:02	06:01 (S4) 19:38 (S1)	05:23 20:26	19:36 (S1) 19:56 (S1)	
14	07:18 16:50	07:41 (S6) 07:55 (S6)	06:51 17:27	06:10 17:59	06:10 19:32	06:19 19:32	05:39 20:03	06:02 (S4) 19:39 (S1)	05:22 20:27	19:36 (S1) 19:55 (S1)	
15	07:17 16:51	07:42 (S6) 07:53 (S6)	06:50 17:28	06:08 18:00	06:17 19:33	06:17 19:33	05:38 20:04	06:03 (S4) 19:40 (S1)	05:22 20:27	19:37 (S1) 19:56 (S1)	
16	07:17 16:52	07:45 (S6) 07:52 (S6)	06:49 17:29	06:06 18:01	06:16 19:34	06:16 19:34	05:37 20:05	06:04 (S4) 19:41 (S1)	05:22 20:28	19:38 (S1) 19:56 (S1)	
17	07:16 16:53	07:44 (S6) 07:51 (S6)	06:47 17:31	06:05 18:02	06:14 19:35	06:14 19:35	05:36 20:06	06:07 (S4) 19:43 (S1)	05:22 20:28	19:38 (S1) 19:56 (S1)	
18	07:16 16:54	07:44 (S6) 07:52 (S6)	06:46 17:32	06:03 18:04	06:13 19:36	06:13 19:36	05:35 20:07	06:12 (S4) 19:43 (S1)	05:23 20:28	19:38 (S1) 19:56 (S1)	
19	07:15 16:55	07:43 (S6) 07:51 (S6)	06:45 17:33	06:01 18:05	06:11 19:37	06:11 19:37	05:35 20:08	19:30 (S1) 19:44 (S1)	05:23 20:29	19:38 (S1) 19:56 (S1)	
20	07:15 16:56	07:43 (S6) 07:51 (S6)	06:43 17:34	06:00 18:06	06:10 19:38	06:10 19:38	05:34 20:09	19:30 (S1) 19:45 (S1)	05:23 20:29	19:38 (S1) 19:56 (S1)	
21	07:14 16:58	07:43 (S6) 07:51 (S6)	06:42 17:35	05:58 18:07	06:08 19:39	06:08 19:39	05:33 20:10	19:29 (S1) 19:45 (S1)	05:23 20:29	19:38 (S1) 19:56 (S1)	
22	07:14 16:59	07:43 (S6) 07:51 (S6)	06:40 17:37	05:56 18:08	06:07 19:40	06:07 19:40	05:32 20:11	19:30 (S1) 19:47 (S1)	05:23 20:29	19:38 (S1) 19:56 (S1)	
23	07:13 17:00	07:43 (S6) 07:51 (S6)	06:39 17:38	05:55 18:09	06:05 19:41	06:05 19:41	05:31 20:12	19:29 (S1) 19:47 (S1)	05:23 20:30	19:39 (S1) 19:57 (S1)	
24	07:12 17:01	07:43 (S6) 07:51 (S6)	06:38 17:39	05:53 18:10	06:04 19:43	06:04 19:43	05:31 20:12	19:29 (S1) 19:48 (S1)	05:24 20:30	19:39 (S1) 19:57 (S1)	
25	07:12 17:02	07:43 (S6) 07:55 (S5)	06:36 17:40	05:51 18:11	06:02 19:44	06:02 19:44	05:30 20:13	19:29 (S1) 19:49 (S1)	05:24 20:30	19:39 (S1) 19:57 (S1)	
26	07:11 17:04	07:43 (S6) 07:58 (S5)	06:35 17:41	05:50 18:12	06:01 19:45	06:01 19:45	05:29 20:14	19:29 (S1) 19:50 (S1)	05:24 20:30	19:40 (S1) 19:58 (S1)	
27	07:10 17:05	07:43 (S6) 07:58 (S5)	06:33 17:42	05:48 18:13	06:00 19:46	06:00 19:46	05:29 20:15	06:19 (S4) 19:50 (S1)	05:25 20:30	19:39 (S1) 19:58 (S1)	
28	07:09 17:06	07:43 (S6) 07:58 (S5)	06:32 17:44	05:46 18:14	05:58 19:47	05:58 19:47	05:28 20:16	19:50 (S1) 19:51 (S1)	05:25 20:30	19:39 (S1) 19:58 (S1)	
29	07:08 17:07	07:43 (S6) 07:58 (S5)	06:31 17:45	05:45 18:15	05:57 19:48	05:57 19:48	05:27 20:17	19:29 (S1) 19:52 (S1)	05:25 20:30	19:40 (S1) 19:59 (S1)	
30	07:08 17:08	07:43 (S6) 07:58 (S5)	06:30 17:46	05:43 18:16	05:56 19:49	05:56 19:49	05:27 20:18	19:30 (S1) 19:53 (S1)	05:26 20:30	19:39 (S1) 19:59 (S1)	
31	07:07 17:10	07:43 (S6) 07:58 (S5)	06:29 17:47	05:41 18:17	05:55 19:50	05:55 19:50	05:26 20:19	19:31 (S1) 19:54 (S1)	05:26 20:30	19:39 (S1) 19:59 (S1)	
Potential sun hours	298	298	369	398	448	451					
Total, worst case	227	17	84	68	642	605					
Sun reduction	0,43	0,44	0,44	0,51	0,57	0,62					
Oper. time red.	0,77	0,77	0,77	0,77	0,77	0,77					
Wind dir. red.	0,67	0,66	0,66	0,63	0,65	0,67					
Total reduction	0,22	0,22	0,22	0,25	0,28	0,32					
Total, real	50	4	19	17	183	193					

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

Calculation: Real\_case\_Progetto\_20231218Shadow receptor: F150 - A03\_F03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

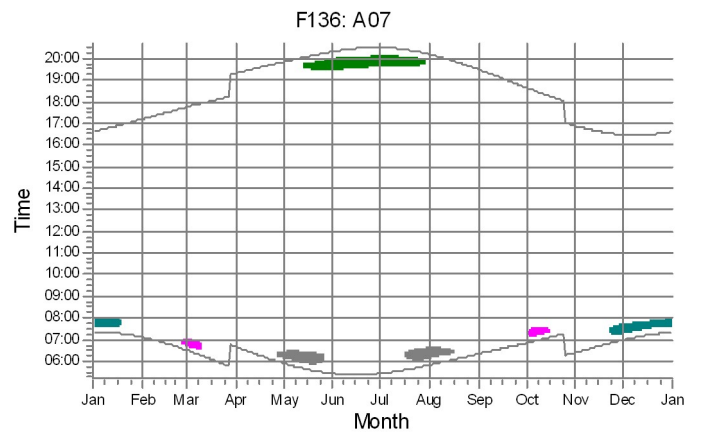
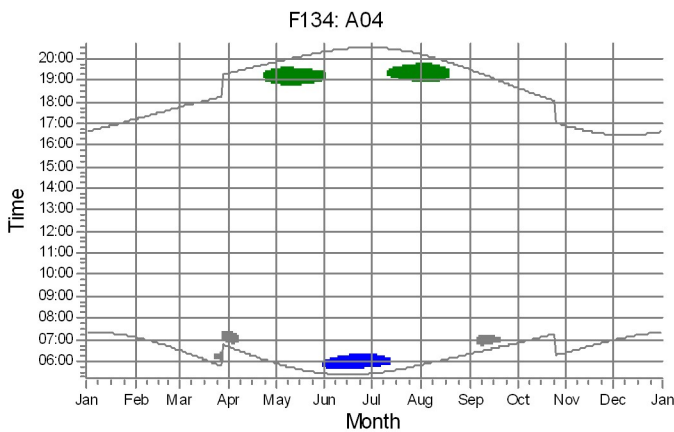
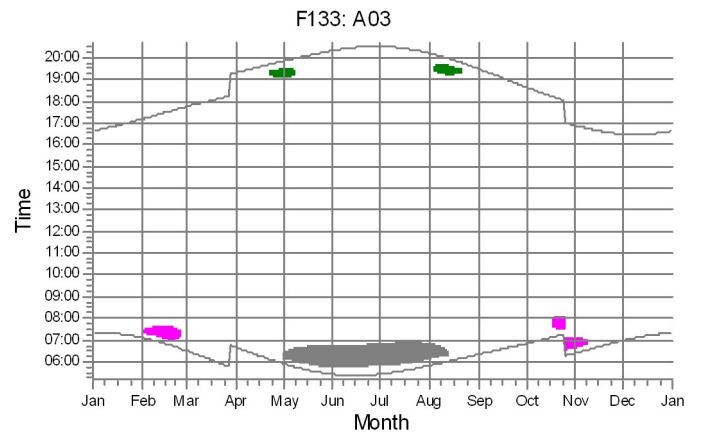
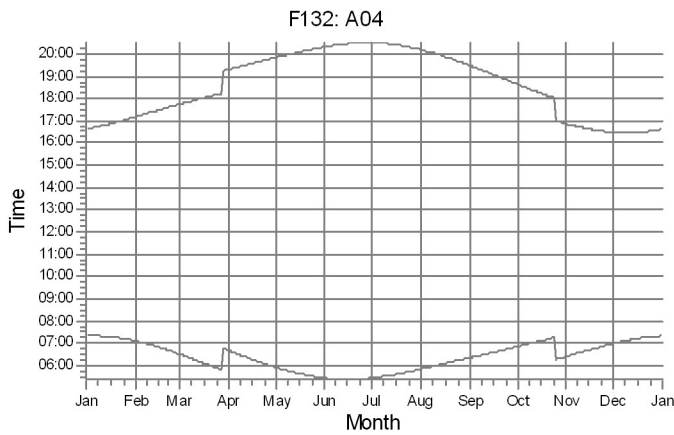
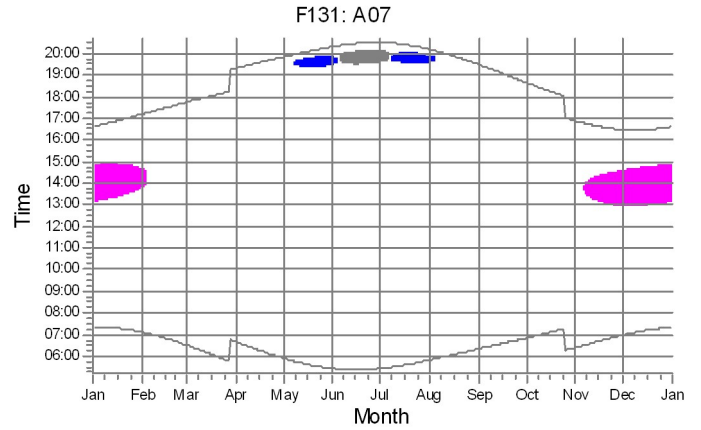
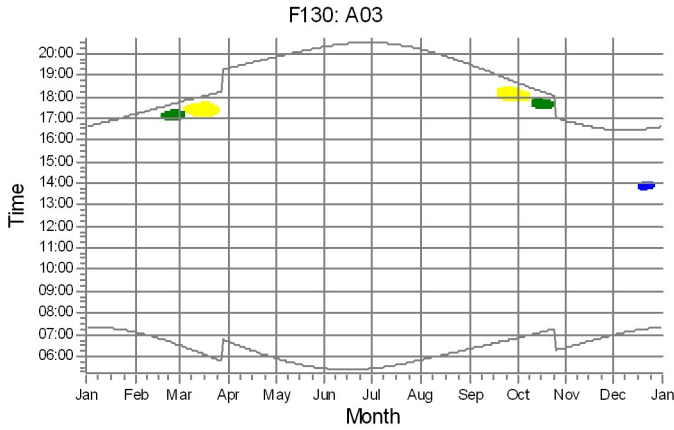
	July	August	September	October	November	December
1	05:26   19:40 (S1)   05:50	06:12 (S4)   06:20	06:50	06:24	06:58	07:22 (S6)
2	05:27   19:39 (S1)   05:51	06:13 (S4)   06:21	06:51	06:25	06:59	07:23 (S6)
3	05:27   19:40 (S1)   05:52	06:14 (S4)   06:22	06:52	06:26	07:00	07:24 (S6)
4	05:28   19:39 (S1)   05:53	06:15 (S4)   06:23	06:53	06:27	07:01	07:25 (S6)
5	05:28   19:39 (S1)   05:54	06:16 (S4)   06:24	06:54	06:29	07:02	07:26 (S6)
6	05:29   19:39 (S1)   05:55	06:17 (S4)   06:25	06:55	06:30	07:03	07:27 (S6)
7	05:30   19:39 (S1)   05:56	06:18 (S4)   06:26	06:56	06:31	07:04	07:28 (S6)
8	05:30   19:39 (S1)   05:57	06:18 (S4)   06:27	06:57	06:32	07:05	07:29 (S6)
9	05:31   19:38 (S1)   05:58	06:19 (S4)   06:28	06:58	06:33	07:06	07:30 (S6)
10	05:31   19:39 (S1)   05:59	06:20 (S4)   06:29	06:59	06:34	07:07	07:31 (S6)
11	05:32   19:39 (S1)   06:00	06:21 (S4)   06:30	07:00	06:36	07:08	07:31 (S6)
12	05:33   19:38 (S1)   06:01	06:22 (S4)   06:31	07:01	06:37	07:09	07:32 (S6)
13	05:34   19:39 (S1)   06:02	06:23 (S4)   06:32	07:03	06:38	07:10	07:33 (S6)
14	05:34   19:39 (S1)   06:03	06:24 (S4)   06:33	07:04	06:39	07:10	07:34 (S6)
15	05:35   19:39 (S1)   06:04	06:25 (S4)   06:34	07:05	06:40	07:11	07:35 (S6)
16	05:36   19:38 (S1)   06:05	06:26 (S4)   06:35	07:06	06:42	07:12	07:35 (S6)
17	05:37   19:39 (S1)   06:06	06:27 (S4)   06:36	07:07	06:43	07:12	07:36 (S6)
18	05:37   19:39 (S1)   06:07	06:28 (S4)   06:37	07:08	06:44	07:13	07:36 (S6)
19	05:38   19:39 (S1)   06:08	06:29 (S4)   06:38	07:09	06:45	07:14	07:37 (S6)
20	05:39   19:39 (S1)   06:09	06:30 (S4)   06:39	07:10	06:46	07:14	07:38 (S6)
21	05:40   19:39 (S1)   06:10	06:31 (S4)   06:40	07:11	06:47	07:15	07:38 (S6)
22	05:41   19:39 (S1)   06:11	06:32 (S4)   06:41	07:12	06:49	07:15	07:39 (S6)
23	05:42   19:40 (S1)   06:12	06:33 (S4)   06:42	07:14	06:50	07:16	07:39 (S6)
24	05:43   19:40 (S1)   06:13	06:34 (S4)   06:43	07:15	06:51	07:16	07:39 (S6)
25	05:43   19:41 (S1)   06:14	06:35 (S4)   06:44	07:16	06:52	07:17	07:40 (S6)
26	05:44   19:54 (S1)   06:14	06:36 (S4)   06:45	07:17	06:53	07:17	07:40 (S6)
27	05:45   19:54 (S1)   06:15	06:37 (S4)   06:46	07:18	06:54	07:18	07:40 (S6)
28	05:46   19:51 (S1)   06:16	06:38 (S4)   06:47	07:19	06:55	07:18	07:41 (S6)
29	05:47   19:51 (S1)   06:17	06:39 (S4)   06:48	07:20	06:56	07:18	07:41 (S6)
30	05:48   19:50 (S1)   06:18	06:40 (S4)   06:49	07:21	06:57	07:18	07:41 (S6)
31	05:49   19:49 (S1)   06:19	06:41 (S4)   06:50	07:22	06:58	07:19	07:41 (S6)
Potential sun hours	458	427	375	346	299	289
Total, worst case	671	312		100	61	410
Sun reduction	0,69	0,69		0,52	0,47	0,41
Oper. time red.	0,77	0,77		0,77	0,77	0,77
Wind dir. red.	0,66	0,63		0,66	0,67	0,67
Total reduction	0,35	0,33		0,26	0,24	0,21
Total, real	235	104		26	15	87

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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SHADOW - Calendar, graphical  
Calculation: Real\_case\_Progetto\_20231218

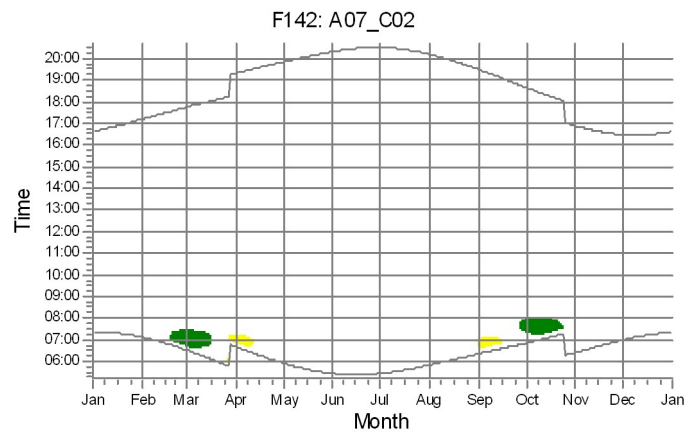
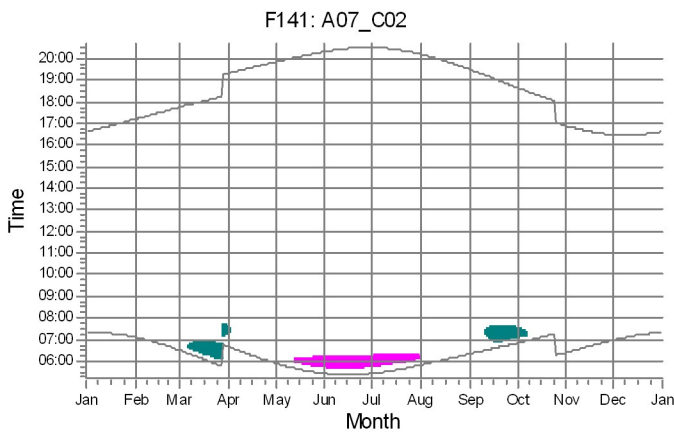
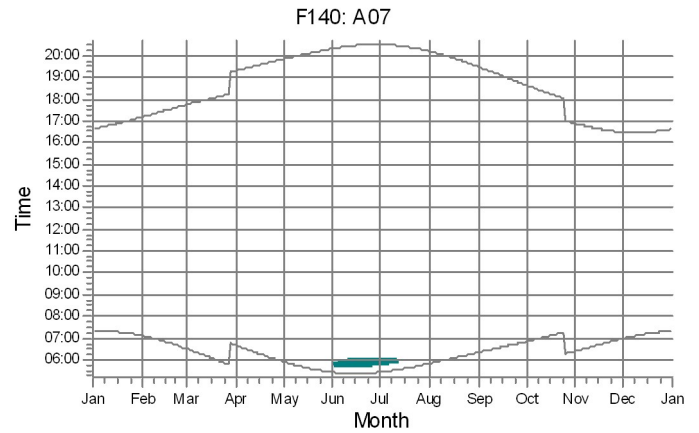
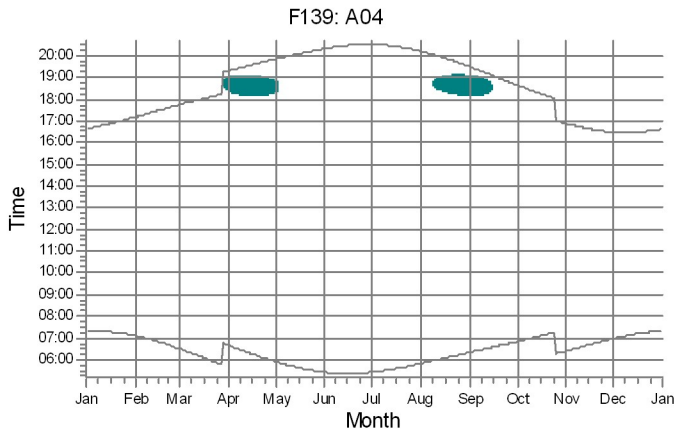
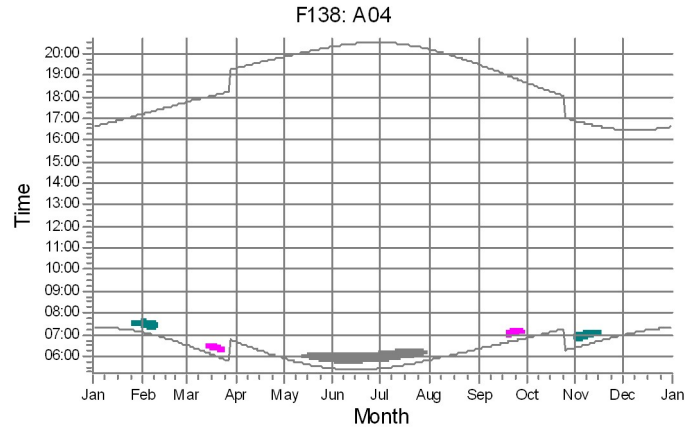
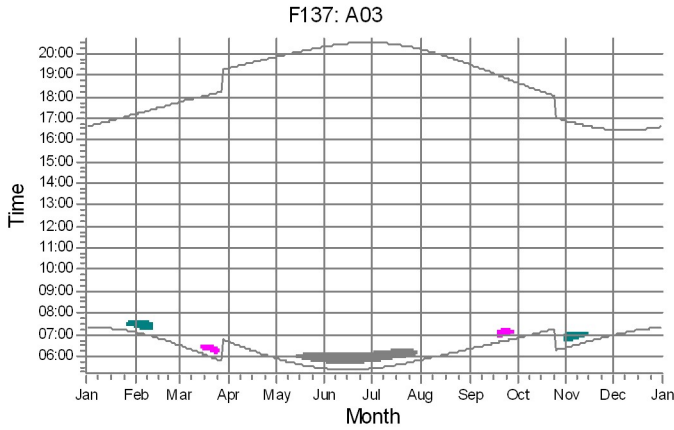


WTGs

- S1: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (48)
- S2: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)
- S3: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)
- S4: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (46)
- S5: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (49)
- S6: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (47)

## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_20231218

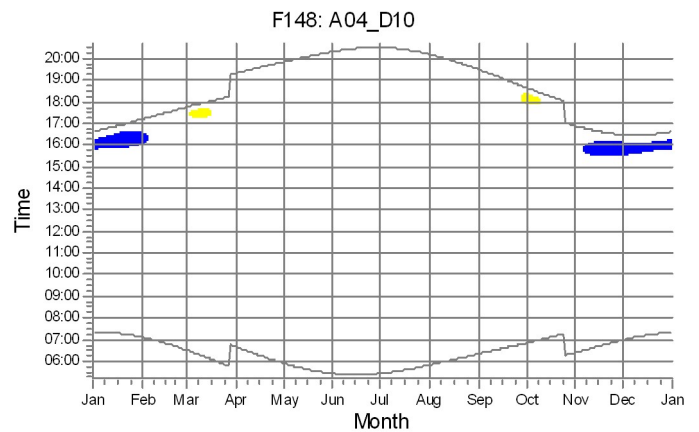
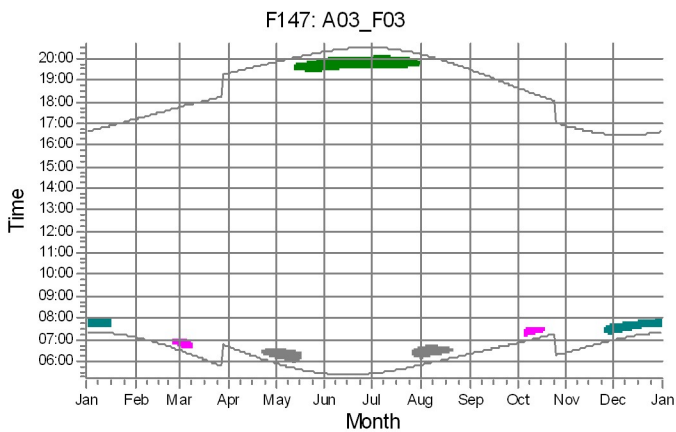
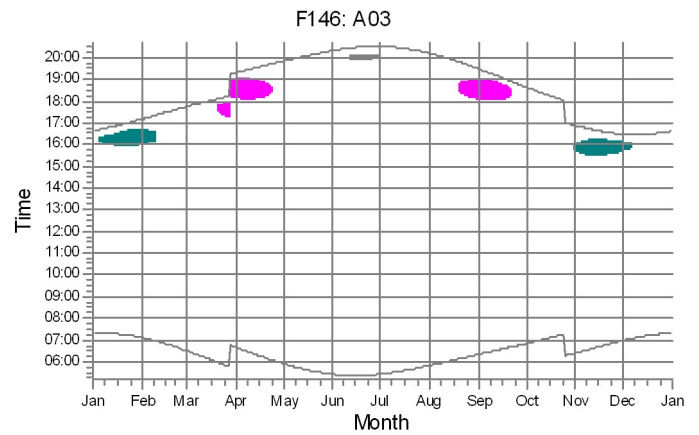
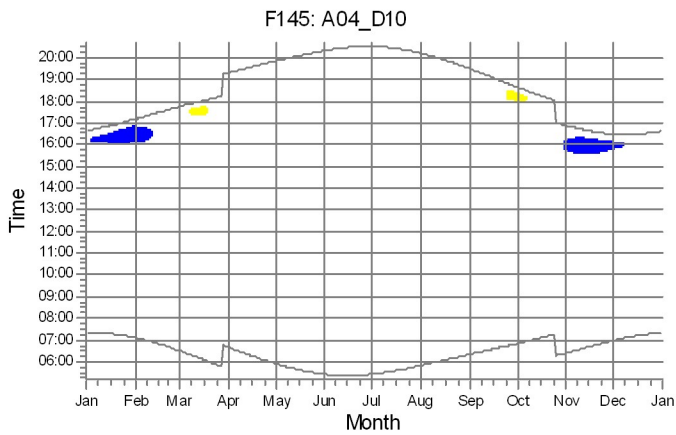
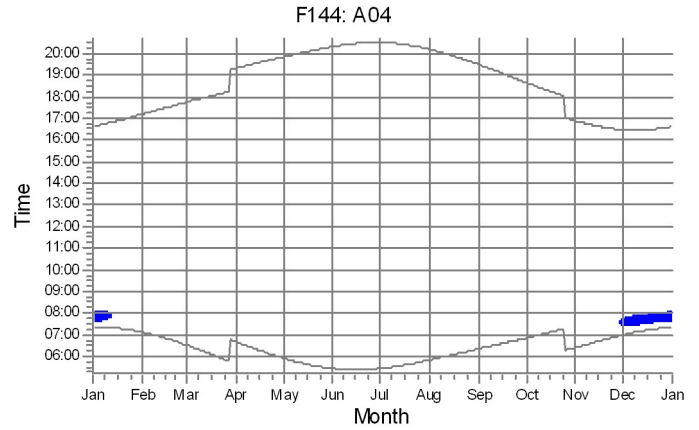
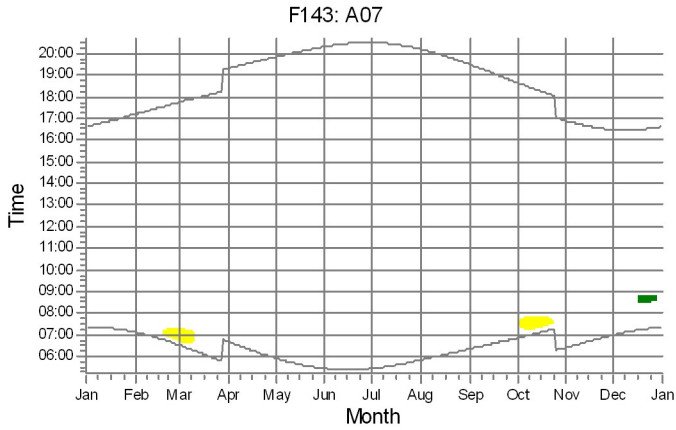


### WTGs

- S1: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (48)
- S2: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)
- S4: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (46)
- S5: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (49)
- S6: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (47)

## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_20231218

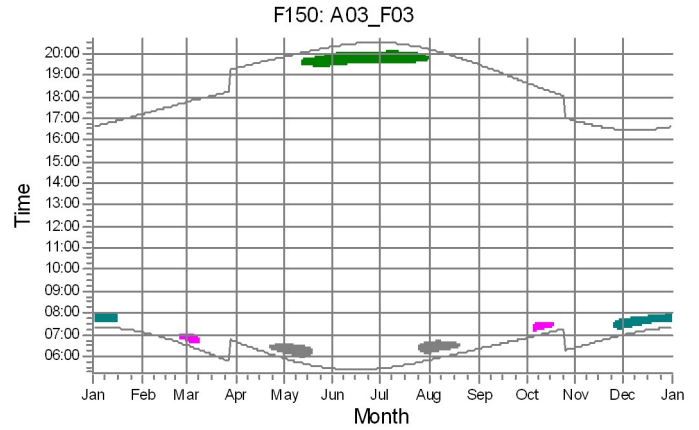
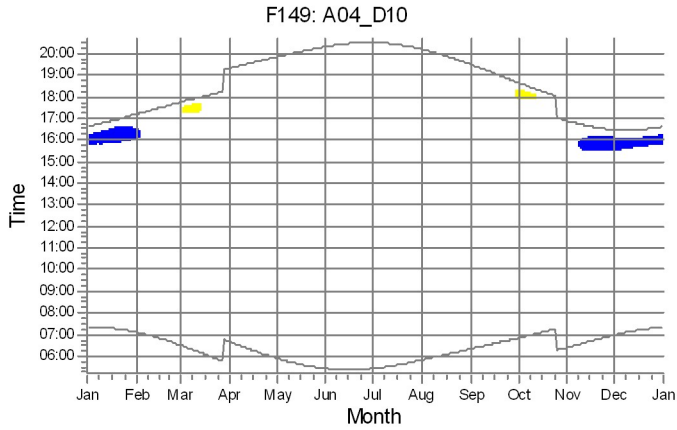


### WTGs


- S1: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (48)
- S2: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)
- S3: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)
- S4: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (46)
- S5: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (49)
- S6: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (47)

## SHADOW - Calendar, graphical

Calculation: Real\_case\_Progetto\_20231218



### WTGs

	S1: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (48)
	S2: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (44)
	S3: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (45)
	S4: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (46)
	S5: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (49)
	S6: Siemens Gamesa SG 6.6-170! 6600 170.0 !O! hub: 115,0 m (TOT: 200,0 m) (47)

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S1 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (48)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 06:49-07:22/33	06:40 19:18	05:54 18:55-19:28/33	05:26 19:31-19:54/23
2	07:19 16:38	07:05 17:12	06:29 06:48-07:23/35	06:38 19:19	05:53 18:53-19:28/35	05:25 19:31-19:55/24
3	07:19 16:39	07:04 17:13	06:27 06:46-07:23/37	06:37 19:21	05:52 18:53-19:29/36	05:25 19:31-19:55/24
4	07:19 16:40	07:03 17:15	06:26 06:44-07:22/38	06:35 19:22	05:51 18:53-19:29/36	05:25 19:32-19:56/24
5	07:19 16:40	07:02 17:16	06:24 06:43-07:22/39	06:33 19:23	05:49 18:52-19:30/38	05:24 19:32-19:57/25
6	07:19 16:41	07:01 17:17	06:22 06:43-07:21/38	06:32 19:24	05:48 18:52-19:30/38	05:24 19:32-19:57/25
7	07:19 16:42	07:00 17:18	06:21 06:44-07:21/37	06:30 19:25	05:47 18:51-19:29/38	05:24 19:33-19:58/25
8	07:19 16:43	06:59 17:20	06:19 06:44-07:20/36	06:28 19:26	05:46 18:51-19:30/39	05:23 19:33-19:59/26
9	07:19 16:44	06:57 17:21	06:18 06:44-07:19/35	06:27 19:27	05:45 18:51-19:30/39	05:23 19:34-19:59/25
10	07:19 16:45	06:56 17:22	06:16 06:45-07:18/33	06:25 19:28	05:44 18:51-19:30/39	05:23 19:35-20:00/25
11	07:19 16:46	06:55 17:23	06:14 06:45-07:17/32	06:24 19:29	05:42 18:51-19:30/39	05:23 19:35-20:00/25
12	07:18 16:47	06:54 17:25	06:13 06:47-07:16/29	06:22 19:30	05:41 18:51-19:29/38	05:23 19:36-20:00/24
13	07:18 16:49	06:53 17:26	06:11 06:48-07:13/25	06:20 19:31	05:40 19:35-19:38/3	05:23 19:36-20:00/24
14	07:18 16:50	06:51 17:27	06:10 06:49-07:11/22	06:19 19:32	05:39 19:33-19:39/6	05:23 19:36-19:59/23
15	07:17 16:51	06:50 17:28	06:08 06:52-07:08/16	06:17 19:33	05:38 19:32-19:40/8	05:22 19:37-20:00/23
16	07:17 16:52	06:49 17:29	06:06 06:57-07:03/6	06:16 19:34	05:37 19:31-19:41/10	05:22 19:37-20:00/23
17	07:16 16:53	06:47 17:31	06:05 18:03	06:14 19:35	05:36 19:31-19:43/12	05:23 19:38-20:00/22
18	07:16 16:54	06:46 17:06-17:09/3	06:03 18:04	06:13 19:36	05:35 19:31-19:43/12	05:23 19:38-20:00/22
19	07:15 16:55	06:45 07:04-07:09/5	06:01 18:05	06:11 19:37	05:35 19:30-19:44/14	05:23 19:38-20:00/22
20	07:15 16:56	06:43 07:03-07:14/11	06:00 18:06	06:10 19:38	05:34 19:30-19:45/15	05:23 19:38-20:00/22
21	07:14 16:58	06:42 07:01-07:16/15	05:58 18:07	06:08 19:39	05:33 19:29-19:45/16	05:23 19:38-20:00/22
22	07:14 16:59	06:41 07:00-07:18/18	05:56 18:08	06:07 19:40	05:32 19:30-19:47/17	05:23 19:38-20:00/22
23	07:13 17:00	06:39 06:58-07:19/21	05:55 18:09	06:05 19:16-19:19/3	05:31 19:29-19:47/18	05:23 19:39-20:01/22
24	07:12 17:01	06:38 06:57-07:20/23	05:53 18:10	06:04 19:10-19:20/10	05:31 19:29-19:48/19	05:24 19:39-20:01/22
25	07:12 17:02	06:36 06:55-07:21/26	05:51 18:11	06:03 19:04-19:21/17	05:30 19:29-19:49/20	05:24 19:39-20:01/22
26	07:11 17:04	06:35 06:54-07:22/28	05:50 18:12	06:01 19:02-19:22/20	05:29 19:29-19:50/21	05:24 19:39-20:02/23
27	07:10 17:05	06:33 06:52-07:22/30	05:48 18:13	06:00 19:00-19:23/23	05:29 19:29-19:50/21	05:25 19:39-20:02/23
28	07:09 17:06	06:32 06:51-07:23/32	05:46 18:14	05:58 18:58-19:24/26	05:28 19:30-19:51/21	05:25 19:39-20:02/23
29	07:09 17:07	07:00-17:19/19	06:45 19:15	05:57 18:57-19:25/28	05:27 19:29-19:52/23	05:25 19:39-20:03/24
30	07:08 17:09		06:43 19:16	05:56 18:56-19:26/30	05:27 19:30-19:53/23	05:26 19:39-20:03/24
31	07:07 17:10		06:41 19:17		05:26 19:31-19:54/23	
Potential sun hours	298	298	369	398	448	451
Sum of minutes with flicker	0	369	528	157	1280	707

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

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

### SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S1 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (48)  
 Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
 4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

#### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
 607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 19:39-20:04/25 20:30	05:50 19:02-19:40/38 20:11	06:20 19:29	06:50 07:26-07:54/28 18:38	06:24 16:52	06:59 16:28
2	05:27 19:39-20:04/25 20:30	05:51 19:02-19:40/38 20:10	06:21 19:27	06:51 07:24-07:55/31 18:37	06:25 16:51	07:00 16:28
3	05:27 19:39-20:05/26 20:30	05:52 19:02-19:40/38 20:09	06:22 19:25	06:52 07:23-07:55/32 18:35	06:26 16:50	07:01 16:27
4	05:28 19:39-20:04/25 20:30	05:53 19:02-19:40/38 20:08	06:23 19:24	06:53 07:22-07:56/34 18:33	06:27 16:48	07:02 16:27
5	05:28 19:39-20:04/25 20:29	05:54 19:02-19:40/38 20:07	06:24 19:22	06:54 07:20-07:56/36 18:32	06:29 16:47	07:03 16:27
6	05:29 19:38-20:03/25 20:29	05:55 19:02-19:40/38 20:06	06:25 19:20	06:55 07:20-07:57/37 18:30	06:30 16:46	07:04 16:27
7	05:30 19:39-20:04/25 20:29	05:56 19:02-19:40/38 20:04	06:26 19:19	06:56 07:19-07:57/38 18:28	06:31 16:45	07:04 16:27
8	05:30 19:39-20:04/25 20:29	05:57 19:01-19:38/37 20:03	06:27 19:17	06:57 07:18-07:57/39 18:27	06:32 16:44	07:05 16:27
9	05:31 19:38-20:03/25 20:28	05:58 19:01-19:38/37 20:02	06:28 19:15	06:58 07:19-07:58/39 18:25	06:33 16:43	07:06 16:27
10	05:32 19:39-20:03/24 20:28	05:59 19:02-19:37/35 20:01	06:29 19:14	06:59 07:20-07:57/37 18:24	06:35 16:42	07:07 16:27
11	05:32 19:39-20:03/24 20:27	06:00 19:02-19:36/34 19:59	06:30 19:12	07:00 07:21-07:57/36 18:22	06:36 16:41	07:08 16:27
12	05:33 19:38-20:02/24 20:27	06:01 19:03-19:35/32 19:58	06:31 19:10	07:02 07:22-07:56/34 18:20	06:37 16:40	07:09 16:27
13	05:34 19:38-20:01/23 20:26	06:02 19:04-19:34/30 19:57	06:32 19:09	07:03 07:23-07:56/33 18:19	06:38 16:39	07:10 16:27
14	05:34 19:39-20:01/22 20:26	06:03 19:05-19:32/27 19:55	06:33 19:07	07:04 07:24-07:55/31 18:17	06:39 16:38	07:10 16:27
15	05:35 19:39-20:01/22 20:25	06:04 19:06-19:31/25 19:54	06:34 19:05	07:05 07:25-07:54/29 18:16	06:40 16:37	07:11 16:28
16	05:36 19:38-20:00/22 20:25	06:05 19:07-19:30/23 19:53	06:35 19:04	07:06 07:26-07:53/27 18:14	06:42 16:36	07:12 16:28
17	05:37 19:39-19:59/20 20:24	06:06 19:09-19:29/20 19:51	06:36 19:02	07:07 07:27-07:52/25 18:13	06:43 16:36	08:34-08:40/6
18	05:38 19:39-19:59/20 20:24	06:07 19:12-19:27/15 19:50	06:37 19:00	07:08 07:29-07:51/22 18:11	06:44 16:35	07:13 08:34-08:41/7
19	05:38 19:39-19:59/20 20:23	06:08 19:20-19:26/6 19:48	06:38 18:59	07:09 07:30-07:50/20 18:10	06:45 16:34	08:33-08:42/9
20	05:39 19:39-19:57/18 20:22	06:09 19:22-19:25/3 19:47	06:39 18:57	07:10 07:31-07:48/17 18:08	06:46 16:33	08:34-08:43/9
21	05:40 19:39-19:57/18 20:21	06:10 19:46 19:46	06:40 18:55	07:11 07:32-07:45/13 18:07	06:47 16:33	08:33-08:43/10
22	05:41 19:39-19:56/17 20:21	06:11 19:44 19:44	06:41 18:53	07:12 07:33-07:42/9 18:05	06:49 16:32	08:34-08:45/11
23	05:42 19:40-19:56/16 20:20	06:12 19:43 19:43	06:42 18:52	07:14 07:34-07:37/3 18:04	06:50 16:31	08:34-08:44/10
24	05:43 19:40-19:55/15 20:19	06:13 19:41 19:41	06:43 18:50	07:15 17:38-17:40/2 18:03	06:51 16:31	08:36-08:45/9
25	05:44 19:41-19:54/13 20:18	06:14 19:40 19:40	06:44 18:48	06:16 17:01 17:01	06:52 16:30	08:36-08:45/9
26	05:44 19:42-19:54/12 20:17	06:15 19:38 19:38	06:45 18:47	06:17 17:00 17:00	06:53 16:30	08:37-08:44/7
27	05:45 19:41-19:52/11 20:16	06:16 19:36 19:36	06:46 18:45	06:18 16:58 16:58	06:54 16:29	08:39-08:42/3
28	05:46 19:42-19:51/9 20:15	06:17 19:35 19:35	06:47 18:43	07:34-07:47/13 06:19	06:55 16:29	16:33
29	05:47 19:43-19:50/7 20:14	06:18 19:33 19:33	06:48 18:42	07:31-07:50/19 06:20	06:56 16:29	07:18 16:34
30	05:48 19:44-19:49/5 20:13	06:18 19:32 19:32	06:49 18:40	07:28-07:52/24 06:22	06:57 16:28	07:18 16:35
31	05:49 19:46-19:49/3 20:12	06:19 19:30 19:30		16:55 06:23 16:53		07:19 16:36
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	1143	590	56	847	0	90

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

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



## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S3 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45)  
Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [AMENDOLA]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational time  
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 15:51-16:11/20 16:37 07:41-07:59/18	07:06 16:07-16:45/38 17:11	06:30 17:45	06:40 19:18	05:54 19:50	05:26 05:47-05:53/6 20:19 19:34-19:45/11
2	07:19 15:51-16:12/21 16:38 07:41-07:59/18	07:05 16:09-16:45/36 17:12	06:29 17:46	06:38 19:19	05:53 19:51	05:25 05:47-05:57/10 20:20 19:35-19:45/10
3	07:19 15:51-16:12/21 16:39 07:41-07:59/18	07:04 16:12-16:45/33 17:13	06:27 17:47	06:36 19:20	05:52 19:52	05:25 05:46-05:59/13 20:21 19:36-19:43/7
4	07:19 15:52-16:13/21 16:39 07:41-08:00/19	07:03 16:12-16:44/32 17:15	06:26 17:48	06:35 19:22	05:50 19:53	05:24 05:46-06:01/15 20:21
5	07:19 15:52-16:14/22 16:40 07:41-08:00/19	07:02 16:13-16:43/30 17:16	06:24 17:49	06:33 19:23	05:49 19:54	05:24 05:46-06:03/17 20:22
6	07:19 15:52-16:16/24 16:41 07:42-08:00/18	07:01 16:14-16:42/28 17:17	06:22 17:50	06:32 19:24	05:48 19:55	05:24 05:45-06:04/19 20:23
7	07:19 15:53-16:17/24 16:42 07:43-08:00/17	07:00 16:15-16:41/26 17:18	06:21 17:51	06:30 19:25	05:47 19:56	05:24 05:45-06:05/20 20:23
8	07:19 15:53-16:18/25 16:43 07:44-08:00/16	06:58 16:17-16:40/23 17:20	06:19 17:53	06:28 19:26	05:46 19:57	05:23 05:45-06:06/21 20:24
9	07:19 15:52-16:18/26 16:44 07:45-08:00/15	06:57 16:19-16:38/19 17:21	06:18 17:54	06:27 19:27	05:45 19:32-19:34/2 19:58	05:23 05:45-06:07/22 20:24
10	07:19 15:53-16:19/26 16:45 07:46-07:58/12	06:56 16:22-16:36/14 17:22	06:16 17:55	06:25 19:28	05:43 19:31-19:35/4 19:59	05:23 05:45-06:08/23 20:25
11	07:18 15:53-16:21/28 16:46 07:48-07:58/10	06:55 16:27-16:30/3 17:23	06:14 17:56	06:24 19:29	05:42 19:30-19:36/6 20:00	05:23 05:45-06:09/24 20:25
12	07:18 15:54-16:22/28 16:47 07:51-07:56/5	06:54 17:24	06:13 17:57	06:22 19:30	05:41 19:29-19:37/8 20:01	05:23 05:45-06:10/25 20:26
13	07:18 15:54-16:23/29 16:48	06:53 17:26	06:11 17:58	06:20 19:31	05:40 19:28-19:38/10 20:02	05:22 05:45-06:11/26 20:26
14	07:18 15:54-16:24/30 16:50	06:51 17:27	06:10 17:59	06:19 19:32	05:39 19:27-19:39/12 20:03	05:22 05:45-06:11/26 20:27
15	07:17 15:54-16:25/31 16:51	06:50 17:28	06:08 18:00	06:17 19:33	05:38 19:27-19:40/13 20:04	05:22 05:45-06:12/27 20:27
16	07:17 15:55-16:27/32 16:52	06:49 17:29	06:06 18:01	06:16 19:34	05:37 19:27-19:41/14 20:05	05:22 05:45-06:12/27 20:28
17	07:16 15:55-16:27/32 16:53	06:47 17:31	06:05 18:02	06:14 19:35	05:36 19:26-19:42/16 20:06	05:22 05:45-06:12/27 20:28
18	07:16 15:56-16:29/33 16:54	06:46 17:32	06:03 18:04	06:13 19:36	05:35 19:27-19:43/16 20:07	05:23 05:45-06:13/28 20:28
19	07:15 15:56-16:30/34 16:55	06:45 17:33	06:01 18:05	06:11 19:37	05:35 19:27-19:44/17 20:08	05:23 05:45-06:13/28 20:29
20	07:15 15:57-16:32/35 16:56	06:43 17:34	06:00 18:06	06:10 19:38	05:34 19:27-19:45/18 20:09	05:23 05:45-06:13/28 20:29
21	07:14 15:57-16:33/36 16:58	06:42 17:35	05:58 18:07	06:08 19:39	05:33 19:27-19:45/18 20:10	05:23 05:45-06:13/28 20:29
22	07:14 15:57-16:34/37 16:59	06:40 17:37	05:56 18:08	06:07 19:40	05:32 19:28-19:47/19 20:11	05:23 05:46-06:14/28 20:29
23	07:13 15:58-16:36/38 17:00	06:39 17:38	05:55 18:09	06:05 19:41	05:31 19:28-19:47/19 20:12	05:23 05:46-06:14/28 20:30
24	07:12 15:59-16:37/38 17:01	06:38 17:39	05:53 18:10	06:04 19:43	05:31 19:28-19:48/20 20:13	05:24 05:46-06:14/28 20:30
25	07:12 15:59-16:38/39 17:02	06:36 17:40	05:51 18:11	06:02 19:44	05:30 19:29-19:49/20 20:13	05:24 05:46-06:13/27 20:30
26	07:11 16:00-16:39/39 17:04	06:35 17:41	05:50 18:12	06:01 19:45	05:29 19:29-19:49/20 20:14	05:24 05:47-06:14/27 20:30
27	07:10 16:00-16:40/40 17:05	06:33 17:42	05:48 18:13	06:00 19:46	05:28 19:29-19:48/19 20:15	05:25 05:47-06:14/27 20:30
28	07:09 16:01-16:41/40 17:06	06:32 17:44	05:46 18:14	05:58 19:47	05:28 19:30-19:48/18 20:16	05:25 05:47-06:13/26 20:30
29	07:08 16:03-16:44/41 17:07		06:45 19:15	05:57 19:48	05:27 19:31-19:47/16 20:17	05:25 05:48-06:14/26 20:30
30	07:08 16:04-16:45/41 17:08		06:43 19:16	05:56 19:49	05:27 19:32-19:47/15 20:18	05:26 05:48-06:13/25 20:30
31	07:07 16:05-16:46/41 17:10		06:41 19:17		05:26 19:32-19:46/14 20:18	
Potential sun hours	298	297	369	398	448	451
Sum of minutes with flicker	1157	282	0	0	334	730

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

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



## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S3 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (45) Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 05:49-06:13/24 20:30	05:50 19:40-19:48/8 20:11	06:20 19:28 19:28	06:50 18:38 18:38	06:24 15:50-16:05/15 16:52	06:58 15:36-16:03/27 16:28 07:30-07:40/10
2	05:27 05:49-06:13/24 20:30	05:51 19:41-19:47/6 20:10	06:21 19:27 19:27	06:51 18:37 18:37	06:25 15:49-16:08/19 16:51	06:59 15:36-16:03/27 16:28 07:29-07:41/12
3	05:27 05:50-06:13/23 20:30	05:52 19:42-19:46/4 20:09	06:22 19:25 19:25	06:52 18:35 18:35	06:26 15:46-16:10/24 16:50	07:01 15:36-16:02/26 16:27 07:29-07:43/14
4	05:28 05:50-06:12/22 20:30	05:53 19:43-19:45/2 20:08	06:23 19:24 19:24	06:53 18:33 18:33	06:27 15:45-16:11/26 16:48	07:02 15:37-16:02/25 16:27 07:28-07:44/16
5	05:28 05:51-06:12/21 20:29	05:54 20:07 20:07	06:24 19:22 19:22	06:54 18:32 18:32	06:29 15:43-16:12/29 16:47	07:02 15:38-16:02/24 16:27 07:28-07:45/17
6	05:29 05:51-06:10/19 20:29	05:55 20:06 20:06	06:25 19:20 19:20	06:55 18:30 18:30	06:30 15:43-16:14/31 16:46	07:03 15:38-16:02/24 16:27 07:28-07:46/18
7	05:30 05:52-06:10/18 20:29	05:56 20:04 20:04	06:26 19:19 19:19	06:56 18:28 18:28	06:31 15:42-16:14/32 16:45	07:04 15:39-16:02/23 16:27 07:28-07:47/19
8	05:30 05:53-06:09/16 20:28	05:57 20:03 20:03	06:27 19:17 19:17	06:57 18:27 18:27	06:32 15:41-16:15/34 16:44	07:05 15:40-16:02/22 16:27 07:29-07:48/19
9	05:31 05:53-06:07/14 20:28	05:58 20:02 20:02	06:28 19:15 19:15	06:58 18:25 18:25	06:33 15:39-16:15/36 16:43	07:06 15:40-16:02/22 16:27 07:30-07:48/18
10	05:31 05:54-06:06/12 20:28	05:59 20:01 20:01	06:29 19:14 19:14	06:59 18:24 18:24	06:34 15:38-16:16/38 16:42	07:07 15:41-16:02/21 16:27 07:31-07:49/18
11	05:32 05:55-06:04/9 20:27	06:00 19:59 19:59	06:30 19:12 19:12	07:00 18:22 18:22	06:36 15:36-16:16/40 16:41	07:08 15:41-16:01/20 16:27 07:32-07:50/18
12	05:33 19:41-19:54/13 20:27	06:01 19:58 19:58	06:31 19:10 19:10	07:01 18:20 18:20	06:37 15:35-16:16/41 16:40	07:09 15:42-16:01/19 16:27 07:32-07:50/18
13	05:34 19:41-19:55/14 20:26	06:02 19:57 19:57	06:32 19:09 19:09	07:03 18:19 18:19	06:38 15:34-16:14/40 16:39	07:10 15:43-16:01/18 16:27 07:33-07:51/18
14	05:34 19:40-19:56/16 20:26	06:03 19:55 19:55	06:33 19:07 19:07	07:04 18:17 18:17	06:39 15:34-16:14/40 16:38	07:10 15:43-16:02/19 16:27 07:34-07:52/18
15	05:35 19:39-19:56/17 20:25	06:04 19:54 19:54	06:34 19:05 19:05	07:05 18:16 18:16	06:40 15:33-16:13/40 16:37	07:11 15:43-16:01/18 16:27 07:35-07:52/17
16	05:36 19:39-19:57/18 20:25	06:05 19:53 19:53	06:35 19:04 19:04	07:06 18:14 18:14	06:42 15:33-16:12/39 16:36	07:12 15:44-16:02/18 16:28 07:35-07:52/17
17	05:37 19:39-19:58/19 20:24	06:06 19:51 19:51	06:36 19:02 19:02	07:07 18:13 18:13	06:43 15:33-16:12/39 16:36	07:12 15:45-16:03/18 16:28 07:36-07:53/17
18	05:37 19:38-19:59/21 20:23	06:07 19:50 19:50	06:37 19:00 19:00	07:08 18:11 18:11	06:44 15:33-16:11/38 16:35	07:13 15:45-16:02/17 13:47-13:53/6 16:28 07:37-07:54/17
19	05:38 19:38-19:59/21 20:23	06:08 19:48 19:48	06:38 18:58 18:58	07:09 18:10 18:10	06:45 15:32-16:10/38 16:34	07:14 15:46-16:03/17 13:46-13:55/9 16:29 07:37-07:54/17
20	05:39 19:37-19:57/20 20:22	06:09 19:47 19:47	06:39 18:57 18:57	07:10 18:08 18:08	06:46 15:32-16:09/37 16:33	07:14 15:47-16:04/17 13:46-13:57/11 16:29 07:38-07:55/17
21	05:40 19:37-19:57/20 20:21	06:10 19:45 19:45	06:40 18:55 18:55	07:11 18:07 18:07	06:47 15:32-16:08/36 16:33	07:15 15:47-16:04/17 13:46-13:57/11 16:30 07:38-07:55/17
22	05:41 19:37-19:56/19 20:21	06:11 19:44 19:44	06:41 18:53 18:53	07:12 18:05 18:05	06:49 15:33-16:08/35 16:32	07:15 15:48-16:05/17 13:47-13:58/11 16:30 07:39-07:56/17
23	05:42 19:37-19:56/19 20:20	06:12 19:42 19:42	06:42 18:52 18:52	07:14 18:04 18:04	06:50 15:33-16:07/34 16:31	07:16 15:48-16:05/17 13:47-13:58/11 16:31 07:39-07:56/17
24	05:43 19:37-19:55/18 20:19	06:13 19:41 19:41	06:43 18:50 18:50	07:15 18:02 18:02	06:51 15:33-16:06/33 16:31	07:16 15:48-16:05/17 13:48-13:57/9 16:31 07:40-07:57/17
25	05:43 19:37-19:54/17 20:18	06:13 19:39 19:39	06:44 18:48 18:48	07:16 17:01 17:01	06:52 15:33-16:05/32 16:30	07:17 15:49-16:06/17 13:50-13:57/7 16:32 07:40-07:57/17
26	05:44 19:37-19:53/16 20:17	06:14 19:38 19:38	06:45 18:47 18:47	07:17 17:00 17:00	06:53 15:33-16:05/32 16:30	07:17 15:49-16:06/17 13:52-13:55/3 16:32 07:40-07:57/17
27	05:45 19:37-19:52/15 20:16	06:15 19:36 19:36	06:46 18:45 18:45	07:18 16:58 16:58	06:54 15:34-16:05/31 16:29	07:18 15:49-16:07/18 16:33 07:40-07:57/17
28	05:46 19:37-19:51/14 20:15	06:16 19:35 19:35	06:47 18:43 18:43	07:19 16:57 16:57	06:55 15:35-16:04/29 16:29	07:18 15:50-16:08/18 16:34 07:41-07:58/17
29	05:47 19:38-19:50/12 20:14	06:17 19:33 19:33	06:48 18:42 18:42	07:20 16:56 16:56	06:56 15:35-16:04/29 16:29	07:18 15:50-16:09/19 16:34 07:41-07:59/18
30	05:48 19:38-19:49/11 20:13	06:18 19:32 19:32	06:49 18:40 18:40	07:21 16:54 16:54	06:57 15:35-16:03/28 16:28	07:18 15:50-16:09/19 16:35 07:41-07:59/18
31	05:49 19:39-19:49/10 20:12	06:19 19:30 19:30	06:23 15:55-16:01/6 16:53	06:23 15:55-16:01/6 16:53	06:23 15:55-16:01/6 16:53	07:19 15:51-16:10/19 16:36 07:41-07:59/18
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	555	20	0	6	1000	1220

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S4 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (46)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 16:37	07:06 17:11	06:30 17:45	06:40 19:18	06:58-07:16/18 19:50	05:54 20:19
2	07:19 16:38	07:05 17:12	06:29 17:46	06:38 19:19	06:57-07:16/19 19:51	05:53 20:20
3	07:19 16:39	07:04 17:13	06:27 17:47	06:36 19:20	06:55-07:14/19 19:52	05:52 20:20
4	07:19 16:39	07:03 17:15	06:25 17:48	06:35 19:21	06:54-07:12/18 19:21	05:50 20:21
5	07:19 16:40	07:02 17:16	06:24 17:49	06:33 19:23	06:56-07:11/15 19:54	05:49 20:22
6	07:19 16:41	07:01 17:17	06:22 17:50	06:32 19:24	06:57-07:08/11 19:55	05:48 20:23
7	07:19 16:42	07:00 17:18	06:21 17:51	06:30 19:25	06:06-06:32/26 19:56	05:47 20:23
8	07:19 16:43	06:58 17:20	06:19 17:53	06:28 19:26	06:05-06:33/28 19:57	05:46 20:24
9	07:19 16:44	06:57 17:21	06:18 17:54	06:27 19:27	06:04-06:34/30 19:58	05:45 20:24
10	07:19 16:45	06:56 17:22	06:16 17:55	06:25 19:28	06:03-06:35/32 19:59	05:43 20:25
11	07:18 16:46	06:55 17:23	06:14 17:56	06:23 19:29	06:02-06:36/34 20:00	05:42 20:25
12	07:18 16:47	06:54 17:24	06:13 17:57	06:22 19:30	06:01-06:36/35 20:01	05:41 20:26
13	07:18 16:48	06:52 17:26	06:11 17:58	06:20 19:31	06:00-06:37/37 20:02	05:40 20:26
14	07:18 16:49	06:51 17:27	06:09 17:59	06:19 19:32	05:59-06:37/38 20:03	05:39 20:27
15	07:17 16:51	06:50 17:28	06:08 18:00	06:17 19:33	05:58-06:38/40 20:04	05:38 20:27
16	07:17 16:52	06:49 17:29	06:06 18:01	06:16 19:34	05:57-06:38/41 20:05	05:37 20:28
17	07:16 16:53	06:47 17:31	06:05 18:02	06:14 19:35	05:57-06:39/42 20:06	05:36 20:28
18	07:16 16:54	06:46 17:32	06:03 18:03	06:13 19:36	05:56-06:40/44 20:07	05:35 20:28
19	07:15 16:55	06:45 17:33	06:01 18:05	06:11 19:37	05:55-06:40/45 20:08	05:34 20:29
20	07:15 16:56	06:43 17:34	06:00 18:06	06:10 19:38	05:54-06:40/46 20:09	05:33 20:29
21	07:14 16:57	06:42 17:35	05:58 18:07	06:08 19:39	05:53-06:40/47 20:10	05:32 20:29
22	07:14 16:59	06:40 17:36	05:56 18:08	06:07 19:40	05:53-06:41/48 20:11	05:32 20:29
23	07:13 17:00	06:39 17:38	05:55 18:09	06:05 19:41	06:24-06:26/2 19:41	05:31 20:12
24	07:12 17:01	06:38 17:39	05:53 18:10	06:04 19:42	06:23-06:28/5 19:42	05:30 20:12
25	07:12 17:02	06:36 17:40	05:51 18:11	06:02 19:44	06:21-06:28/7 19:44	05:30 20:13
26	07:11 17:03	06:35 17:41	05:50 18:12	06:01 19:45	06:20-06:29/9 19:45	05:29 20:14
27	07:10 17:05	06:33 17:42	05:48 18:13	06:00 19:46	06:19-06:30/11 19:46	05:28 20:15
28	07:09 17:06	06:32 17:43	05:46 18:14	05:58 19:47	06:17-06:30/13 19:47	05:28 20:16
29	07:08 17:07		06:45 19:15	05:57 19:48	06:16-06:30/14 19:48	05:27 20:17
30	07:08 17:08		06:43 19:16	05:56 19:49	06:15-06:30/15 19:49	05:27 20:17
31	07:07 17:10		06:41 19:17		07:00-07:17/17 19:17	05:26 20:18
Potential sun hours	298	298	369	398	448	451
Sum of minutes with flicker	0	0	91	176	1195	2333

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S4 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (46)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 05:49-06:47/58 20:30 19:40-20:03/23	05:50 06:12-06:47/35 20:11	06:20 19:28	06:50 18:38	06:24 16:52	06:58 16:28
2	05:27 05:49-06:47/58 20:30 19:41-20:01/20	05:51 06:13-06:46/33 20:10	06:21 19:27	06:51 18:37	06:25 16:51	06:59 16:28
3	05:27 05:50-06:47/57 20:30 19:43-20:01/18	05:52 06:14-06:45/31 20:09	06:22 19:25	06:52 18:35	06:26 16:49	07:00 16:27
4	05:28 05:50-06:47/57 20:29 19:43-20:00/17	05:53 06:15-06:44/29 20:08	06:23 19:24	06:53 18:33	06:27 16:48	07:01 16:27
5	05:28 05:51-06:48/57 20:29 19:46-19:59/13	05:54 06:16-06:43/27 20:07	06:24 19:22	06:54 18:32	06:29 16:47	07:02 16:27
6	05:29 05:51-06:48/57 20:29 19:47-19:56/9	05:55 06:17-06:42/25 20:06	06:25 06:53-07:04/11 19:20	06:55 18:30	06:30 16:46	07:03 16:27
7	05:29 05:52-06:48/56 20:29	05:56 06:18-06:41/23 20:04	06:26 06:51-07:06/15 19:19	06:56 18:28	06:31 16:45	07:04 16:27
8	05:30 05:53-06:49/56 20:28	05:57 06:18-06:39/21 20:03	06:27 06:49-07:07/18 19:17	06:57 18:27	06:32 16:44	07:05 16:27
9	05:31 05:53-06:48/55 20:28	05:58 06:19-06:39/20 20:02	06:28 06:49-07:08/19 19:15	06:58 18:25	06:33 16:43	07:06 16:27
10	05:31 05:54-06:49/55 20:28	05:59 06:20-06:39/19 20:01	06:29 06:50-07:09/19 19:14	06:59 18:24	06:34 16:42	07:07 16:27
11	05:32 05:55-06:50/55 20:27	06:00 06:21-06:39/18 19:59	06:30 06:51-07:09/18 19:12	07:00 18:22	06:36 16:41	07:08 16:27
12	05:33 05:55-06:49/54 20:27	06:01 06:22-06:38/16 19:58	06:31 06:51-07:08/17 19:10	07:01 18:20	06:37 16:40	07:09 16:27
13	05:34 05:56-06:50/54 20:26	06:02 06:23-06:38/15 19:57	06:32 06:52-07:08/16 19:09	07:02 18:19	06:38 16:39	07:09 16:27
14	05:34 05:57-06:50/53 20:26	06:03 06:24-06:38/14 19:55	06:33 06:53-07:08/15 19:07	07:04 18:17	06:39 16:38	07:10 16:27
15	05:35 05:58-06:50/52 20:25	06:04 06:25-06:37/12 19:54	06:34 06:54-07:07/13 19:05	07:05 18:16	06:40 16:37	07:11 16:27
16	05:36 05:58-06:50/52 20:25	06:05 06:26-06:36/10 19:53	06:35 06:55-07:06/11 19:04	07:06 18:14	06:42 16:36	07:12 16:28
17	05:37 05:59-06:50/51 20:24	06:06 06:27-06:36/9 19:51	06:36 06:56-07:05/9 19:02	07:07 18:13	06:43 16:36	07:12 16:28
18	05:37 06:00-06:50/50 20:23	06:07 06:28-06:35/7 19:50	06:37 06:57-07:04/7 19:00	07:08 18:11	06:44 16:35	07:13 16:28
19	05:38 06:01-06:51/50 20:23	06:08 06:29-06:33/4 19:48	06:38 06:58-07:03/5 18:58	07:09 18:10	06:45 16:34	07:14 16:29
20	05:39 06:01-06:50/49 20:22	06:09 06:30-06:32/2 19:47	06:39 06:59-07:00/1 18:57	07:10 18:08	06:46 16:33	07:14 16:29
21	05:40 06:02-06:50/48 20:21	06:09 19:45	06:40 18:55	07:11 18:07	06:47 16:33	07:15 16:30
22	05:41 06:03-06:50/47 20:20	06:10 19:44	06:41 18:53	07:12 18:05	06:49 16:32	07:15 16:30
23	05:42 06:04-06:50/46 20:20	06:11 19:42	06:42 18:52	07:13 18:04	06:50 16:31	07:16 16:31
24	05:43 06:05-06:50/45 20:19	06:12 19:41	06:43 18:50	07:15 18:02	06:51 16:31	07:16 16:31
25	05:43 06:06-06:50/44 20:18	06:13 19:39	06:44 18:48	07:16 17:01	06:52 16:30	07:17 16:32
26	05:44 06:07-06:50/43 20:17	06:14 19:38	06:45 18:47	07:17 17:00	06:53 16:30	07:17 16:32
27	05:45 06:07-06:49/42 20:16	06:15 19:36	06:46 18:45	07:18 16:58	06:54 16:29	07:17 16:33
28	05:46 06:08-06:49/41 20:15	06:16 19:35	06:47 18:43	07:19 16:57	06:55 16:29	07:18 16:34
29	05:47 06:09-06:48/39 20:14	06:17 19:33	06:48 18:42	07:20 16:56	06:56 16:28	07:18 16:34
30	05:48 06:10-06:48/38 20:13	06:18 19:32	06:49 18:40	07:21 16:54	06:57 16:28	07:18 16:35
31	05:49 06:11-06:47/36 20:12	06:19 19:30		06:23 16:53		07:19 16:36
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	1655	370	194	0	0	0

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S5 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (49)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 13:13-14:48/95 16:37	07:06 13:56-14:35/39 17:11	06:30 06:49-06:57/8 17:45	06:40 18:13-18:57/44 19:18	05:54 19:50	05:26 05:47-06:08/21 20:19
2	07:19 13:13-14:48/95 16:38	07:05 14:00-14:32/32 17:12	06:29 06:47-06:57/10 17:46	06:38 18:12-18:58/46 19:19	05:53 19:51	05:25 05:47-06:08/21 20:20
3	07:19 13:14-14:49/95 16:39	07:04 07:24-07:26/2 17:13 14:05-14:28/23	06:27 06:46-06:57/11 17:47	06:36 18:12-18:59/47 19:20	05:52 19:52	05:25 05:46-06:07/21 20:20
4	07:19 13:15-14:49/94 16:39	07:03 07:23-07:28/5 17:15	06:25 06:44-06:55/11 17:48	06:35 18:11-18:59/48 19:21	05:50 19:53	05:24 05:46-06:08/22 20:21
5	07:19 13:16-14:49/93 16:40	07:02 07:21-07:29/8 17:16	06:24 06:43-06:55/12 17:49	06:33 18:10-18:59/49 19:22	05:49 19:54	05:24 05:46-06:08/22 20:22
6	07:19 13:16-14:49/93 16:41	07:01 07:20-07:30/10 17:17	06:22 06:41-06:53/12 17:50	06:32 18:10-18:59/49 19:24	05:48 19:55	05:24 05:45-06:07/22 20:22
7	07:19 13:17-14:50/93 16:42	06:59 07:19-07:31/12 17:18	06:21 06:40-06:53/13 17:51	06:30 18:10-18:58/48 19:25	05:47 19:56	05:23 05:45-06:08/23 20:23
8	07:19 13:18-14:50/92 16:43	06:58 07:18-07:32/14 17:20	06:19 06:38-06:51/13 17:53	06:28 18:10-18:59/49 19:26	05:46 19:57	05:23 05:45-06:08/23 20:24
9	07:19 13:18-14:49/91 16:44	06:57 07:17-07:33/16 17:21	06:18 06:36-06:48/12 17:54	06:27 18:10-18:58/48 19:27	05:45 19:58	05:23 05:45-06:08/23 20:24
10	07:19 13:20-14:50/90 16:45	06:56 07:16-07:34/18 17:22	06:16 06:37-06:46/9 17:55	06:25 18:09-18:57/48 19:28	05:43 19:59	05:23 05:45-06:08/23 20:25
11	07:18 13:21-14:50/89 16:46	06:55 07:14-07:33/19 17:23	06:14 17:56	06:23 18:10-18:57/47 19:29	05:42 20:00	05:23 05:45-06:08/23 20:25
12	07:18 13:22-14:50/88 16:47	06:54 07:13-07:34/21 17:24	06:13 17:57	06:22 18:10-18:55/45 19:30	05:41 20:01	05:23 05:45-06:08/23 20:26
13	07:18 13:22-14:50/88 16:48	06:52 07:12-07:34/22 17:26	06:11 17:58	06:20 18:11-18:55/44 19:31	05:40 06:00-06:02/2 20:02	05:22 05:45-06:08/23 20:26
14	07:17 13:24-14:50/86 16:49	06:51 07:11-07:35/24 17:27	06:09 06:28-06:29/1 17:59	06:19 18:11-18:54/43 19:32	05:39 05:59-06:03/4 20:03	05:22 05:44-06:07/23 20:27
15	07:17 13:24-14:49/85 16:51	06:50 07:09-07:34/25 17:28	06:08 06:26-06:29/3 18:00	06:17 18:12-18:53/41 19:33	05:38 05:58-06:03/5 20:04	05:22 05:45-06:08/23 20:27
16	07:17 13:26-14:50/84 16:52	06:49 07:08-07:34/26 17:29	06:06 06:25-06:30/5 18:01	06:16 18:12-18:52/40 19:34	05:37 05:57-06:04/7 20:05	05:22 05:45-06:08/23 20:28
17	07:16 13:27-14:49/82 16:53	06:47 07:07-07:34/27 17:31	06:05 06:23-06:29/6 18:02	06:14 18:14-18:51/37 19:35	05:36 05:57-06:05/8 20:06	05:22 05:45-06:08/23 20:28
18	07:16 13:28-14:49/81 16:54	06:46 07:05-07:33/28 17:32	06:03 06:22-06:30/8 18:03	06:13 18:14-18:49/35 19:36	05:35 05:56-06:06/10 20:07	05:22 05:45-06:09/24 20:28
19	07:15 13:29-14:48/79 16:55	06:45 07:04-07:32/28 17:33	06:01 06:20-06:29/9 18:05	06:11 18:16-18:47/31 19:37	05:34 05:55-06:06/11 20:08	05:23 05:45-06:09/24 20:29
20	07:15 13:31-14:49/78 16:56	06:43 07:04-07:31/27 17:34	06:00 06:18-06:28/10 18:06	06:10 18:17-18:45/28 19:38	05:34 05:54-06:06/12 20:09	05:23 05:45-06:09/24 20:29
21	07:14 13:32-14:48/76 16:57	06:42 07:06-07:30/24 17:35	05:58 06:16-06:26/10 18:07	06:08 18:19-18:43/24 19:39	05:33 05:53-06:06/13 20:10	05:23 05:45-06:09/24 20:29
22	07:14 13:33-14:47/74 16:59	06:40 07:07-07:28/21 17:36	05:56 17:36-17:44/8 18:08 06:15-06:25/10	06:07 18:21-18:40/19 19:40	05:32 05:53-06:07/14 20:11	05:23 05:45-06:09/24 20:29
23	07:13 13:35-14:46/71 17:00	06:39 07:09-07:26/17 17:38	05:55 17:29-17:48/19 18:09 06:13-06:23/10	06:05 18:26-18:36/10 19:41	05:31 05:52-06:07/15 20:12	05:23 05:46-06:10/24 20:30
24	07:12 13:37-14:46/69 17:01	06:37 07:12-07:23/11 17:39	05:53 17:26-17:49/23 18:10 06:11-06:21/10	06:04 19:42	05:30 05:51-06:07/16 20:12	05:24 05:46-06:10/24 20:30
25	07:12 13:39-14:45/66 17:02	06:36 06:55-06:56/1 17:40	05:51 17:24-17:50/26 18:11 06:13-06:17/4	06:02 19:43	05:30 05:51-06:08/17 20:13	05:24 05:46-06:10/24 20:30
26	07:11 13:40-14:44/64 17:03	06:35 06:54-06:58/4 17:41	05:50 17:21-17:51/30 18:12	06:01 19:45	05:29 05:50-06:08/18 20:14	05:24 05:47-06:10/23 20:30
27	07:10 13:42-14:43/61 17:05	06:33 06:52-06:57/5 17:42	05:48 17:19-17:52/33 18:13	06:00 19:46	05:28 05:49-06:07/18 20:15	05:25 05:47-06:10/23 20:30
28	07:09 13:44-14:41/57 17:06	06:32 06:51-06:58/7 17:43	05:46 17:18-17:53/35 18:14	05:58 19:47	05:28 05:49-06:08/19 20:16	05:25 05:47-06:10/23 20:30
29	07:08 13:46-14:40/54 17:07		06:45 18:16-18:54/38 19:15	05:57 19:48	05:27 05:48-06:07/19 20:17	05:25 05:48-06:11/23 20:30
30	07:07 13:50-14:39/49 17:08		06:43 18:15-18:55/40 19:16	05:56 19:49	05:27 05:48-06:08/20 20:17	05:26 05:48-06:11/23 20:30
31	07:07 13:53-14:37/44 17:10		06:41 18:14-18:56/42 19:17		05:26 05:48-06:08/20 20:18	
Potential sun hours	298	298	369	398	448	451
Sum of minutes with flicker	2456	516	491	920	248	689

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S5 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (49)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 05:49-06:12/23 20:30	05:50 20:11	06:20 18:09-18:56/47 19:28	06:50 18:38	06:24 06:45-07:03/18 16:52	06:58 13:03-14:32/89 16:28
2	05:27 05:49-06:12/23 20:30	05:51 20:10	06:21 18:08-18:56/48 19:27	06:51 18:37	06:25 06:47-07:03/16 16:51	06:59 13:03-14:33/90 16:28
3	05:27 05:50-06:13/23 20:30	05:52 20:09	06:22 18:08-18:56/48 19:25	06:52 07:17-07:21/4 18:35	06:26 06:48-07:02/14 16:49	07:00 13:03-14:33/90 16:27
4	05:28 05:50-06:13/23 20:29	05:53 20:08	06:23 18:07-18:56/49 19:24	06:53 07:13-07:25/12 18:33	06:27 06:49-07:01/12 16:48	07:01 13:02-14:34/92 16:27
5	05:28 05:51-06:14/23 20:29	05:54 20:07	06:24 18:07-18:55/48 19:22	06:54 07:14-07:27/13 18:32	06:28 06:50-07:00/10 16:47	07:02 13:02-14:35/93 16:27
6	05:29 05:51-06:13/22 20:29	05:55 20:05	06:25 18:07-18:55/48 19:20	06:55 07:15-07:28/13 18:30	06:30 06:52-06:59/7 16:46	07:03 13:03-14:35/92 16:27
7	05:29 05:52-06:14/22 20:29	05:56 20:04	06:26 18:06-18:55/49 19:19	06:56 07:16-07:28/12 18:28	06:31 06:53-06:58/5 16:45	07:04 13:03-14:36/93 16:27
8	05:30 05:53-06:15/22 20:28	05:57 20:03	06:27 18:06-18:54/48 19:17	06:57 07:17-07:29/12 18:27	06:32 06:54-06:56/2 16:44	07:05 13:03-14:37/94 16:27
9	05:31 05:53-06:15/22 20:28	05:58 20:02	06:28 18:06-18:54/48 19:15	06:58 07:18-07:30/12 18:25	06:33 13:30-14:02/32 16:43	07:06 13:03-14:38/95 16:27
10	05:31 05:54-06:15/21 20:28	05:59 20:01	06:29 18:05-18:51/46 19:14	06:59 07:19-07:30/11 18:23	06:34 13:27-14:06/39 16:42	07:07 13:03-14:38/95 16:27
11	05:32 05:55-06:16/21 20:27	06:00 19:59	06:30 18:05-18:49/44 19:12	07:00 07:21-07:31/10 18:22	06:36 13:24-14:08/44 16:41	07:08 13:03-14:38/95 16:27
12	05:33 05:55-06:16/21 20:27	06:01 19:58	06:31 18:06-18:48/42 19:10	07:01 07:22-07:31/9 18:20	06:37 13:21-14:10/49 16:40	07:09 13:03-14:39/96 16:27
13	05:34 05:56-06:16/20 20:26	06:02 19:57	06:32 18:06-18:46/40 19:09	07:02 07:23-07:31/8 18:19	06:38 13:18-14:12/54 16:39	07:09 13:04-14:40/96 16:27
14	05:34 05:57-06:17/20 20:26	06:03 19:55	06:33 18:06-18:44/38 19:07	07:04 07:24-07:30/6 18:17	06:39 13:17-14:14/57 16:38	07:10 13:04-14:40/96 16:27
15	05:35 05:58-06:17/19 20:25	06:04 19:54	06:34 18:07-18:43/36 19:05	07:05 07:25-07:30/5 18:16	06:40 13:15-14:16/61 16:37	07:11 13:04-14:40/96 16:27
16	05:36 05:58-06:16/18 20:25	06:05 19:53	06:35 18:08-18:41/33 19:03	07:06 07:26-07:29/3 18:14	06:41 13:13-14:17/64 16:36	07:12 13:05-14:41/96 16:28
17	05:37 05:59-06:17/18 20:24	06:06 19:51	06:36 18:09-18:39/30 19:02	07:07 07:27-07:28/1 18:13	06:43 13:11-14:18/67 16:35	07:12 13:05-14:42/97 16:28
18	05:37 06:00-06:17/17 20:23	06:07 19:50	06:37 18:11-18:38/27 19:00	07:08 07:41-07:55/14 18:11	06:44 13:11-14:20/69 16:35	07:13 13:05-14:42/97 16:28
19	05:38 06:01-06:17/16 20:23	06:08 19:48	06:38 18:12-18:36/24 18:58	07:09 07:40-07:58/18 18:10	06:45 13:10-14:21/71 16:34	07:14 13:06-14:43/97 16:29
20	05:39 06:01-06:17/16 20:22	06:08 18:30-18:42/12 19:47	06:39 18:15-18:34/19 18:57	07:10 07:38-08:00/22 18:08	06:46 13:08-14:22/74 16:33	07:14 13:06-14:43/97 16:29
21	05:40 06:02-06:17/15 20:21	06:09 18:26-18:46/20 19:45	06:40 18:19-18:31/12 18:55	07:11 07:36-08:01/25 18:07	06:47 13:07-14:23/76 16:33	07:15 13:07-14:44/97 16:30
22	05:41 06:03-06:17/14 20:20	06:10 18:24-18:48/24 19:44	06:41 07:01-07:11/10 18:53	07:12 07:34-08:01/27 18:05	06:48 13:07-14:25/78 16:32	07:15 13:07-14:44/97 16:30
23	05:42 06:04-06:17/13 20:20	06:11 18:21-18:50/29 19:42	06:42 07:02-07:12/10 18:52	07:13 07:34-08:02/28 18:04	06:50 13:06-14:25/79 16:31	07:16 13:08-14:45/97 16:31
24	05:43 06:05-06:17/12 20:19	06:12 18:19-18:51/32 19:41	06:43 07:03-07:12/9 18:50	07:15 07:36-08:03/27 18:02	06:51 13:05-14:26/81 16:31	07:16 13:08-14:45/97 16:31
25	05:43 06:06-06:16/10 20:18	06:13 18:17-18:52/35 19:39	06:44 07:04-07:12/8 18:48	06:16 06:37-07:04/27 17:01	06:52 13:05-14:27/82 16:30	07:17 13:09-14:46/97 16:32
26	05:44 06:07-06:16/9 20:17	06:14 18:15-18:53/38 19:38	06:45 07:05-07:12/7 18:47	06:17 06:38-07:04/26 17:00	06:53 13:04-14:28/84 16:30	07:17 13:09-14:46/97 16:32
27	05:45 06:07-06:15/8 20:16	06:15 18:14-18:54/40 19:36	06:46 07:06-07:11/5 18:45	06:18 06:39-07:04/25 16:58	06:54 13:03-14:28/85 16:29	07:17 13:09-14:46/97 16:33
28	05:46 06:08-06:14/6 20:15	06:16 18:13-18:54/41 19:35	06:47 07:07-07:11/4 18:43	06:19 06:40-07:03/23 16:57	06:55 13:04-14:30/86 16:29	07:18 13:11-14:47/96 16:34
29	05:47 06:09-06:14/5 20:14	06:17 18:12-18:55/43 19:33	06:48 07:08-07:10/2 18:42	06:20 06:42-07:04/22 16:56	06:56 13:03-14:31/88 16:28	07:18 13:11-14:47/96 16:34
30	05:48 06:10-06:13/3 20:13	06:18 18:11-18:55/44 19:32	06:49 18:40	06:21 06:43-07:04/21 16:54	06:57 13:03-14:31/88 16:28	07:18 13:12-14:48/96 16:35
31	05:49 06:11-06:12/1 20:12	06:19 18:10-18:55/45 19:30	06:19 19:30	06:23 06:44-07:03/19 16:53	06:58 13:03-14:31/88 16:28	07:19 13:12-14:48/96 16:36
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	506	403	908	455	1621	2949

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S6 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (47)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	January	February	March	April	May	June
1	07:19 07:41-07:54/13 16:37	07:06 16:06-16:38/32 17:11 07:26-07:37/11	06:30 17:45	06:40 07:23-07:31/8 19:18 18:26-18:55/29	05:54 18:23-18:43/20 19:50	05:26 20:19
2	07:19 07:41-07:55/14 16:38	07:05 16:07-16:38/31 17:12 07:25-07:37/12	06:29 17:46	06:38 18:23-18:56/33 19:19	05:53 18:27-18:40/13 19:51	05:25 05:47-05:49/2 20:20
3	07:19 07:41-07:55/14 16:39	07:04 16:07-16:37/30 17:13 07:24-07:37/13	06:27 17:47	06:36 18:22-18:58/36 19:20	05:52 19:52	05:25 05:46-05:50/4 20:20
4	07:19 07:41-07:55/14 16:39	07:03 16:07-16:36/29 17:15 07:23-07:36/13	06:25 17:48	06:35 18:20-18:59/39 19:21	05:50 19:53	05:24 05:46-05:51/5 20:21
5	07:19 07:41-07:56/15 16:40	07:02 16:09-16:35/26 17:16 07:21-07:35/14	06:24 17:49	06:33 18:18-18:59/41 19:22	05:49 19:54	05:24 05:46-05:52/6 20:22
6	07:19 07:41-07:56/15 16:41 16:10-16:16/6	07:01 16:10-16:34/24 17:17 07:20-07:35/15	06:22 17:50	06:32 18:17-19:01/44 19:24	05:48 19:55	05:24 05:45-05:52/7 20:22
7	07:19 07:41-07:56/15 16:42 16:09-16:17/8	06:59 16:12-16:33/21 17:18 07:19-07:34/15	06:21 17:51	06:30 18:16-19:01/45 19:25	05:47 19:56	05:24 05:45-05:53/8 20:23
8	07:19 07:41-07:57/16 16:43 16:08-16:18/10	06:58 16:14-16:32/18 17:20 07:18-07:33/15	06:19 17:53	06:28 18:16-19:02/46 19:26	05:46 19:57	05:23 05:45-05:54/9 20:24
9	07:19 07:40-07:56/16 16:44 16:06-16:18/12	06:57 16:17-16:29/12 17:21 07:17-07:32/15	06:18 17:54	06:27 18:14-19:02/48 19:27	05:45 19:58	05:23 05:45-05:55/10 20:24
10	07:19 07:40-07:56/16 16:45 16:06-16:20/14	06:56 07:17-07:30/13 17:22	06:16 17:55	06:25 18:13-19:01/48 19:28	05:43 19:59	05:23 05:45-05:56/11 20:25
11	07:18 07:40-07:56/16 16:46 16:06-16:21/15	06:55 07:19-07:27/8 17:23	06:14 17:56	06:24 18:13-19:02/49 19:29	05:42 20:00	05:23 05:45-05:56/11 20:25
12	07:18 07:40-07:57/17 16:47 16:04-16:21/17	06:54 17:24	06:13 17:57	06:22 18:12-19:02/50 19:30	05:41 20:01	05:23 05:45-05:57/12 20:26
13	07:18 07:39-07:56/17 16:48 16:04-16:23/19	06:52 17:26	06:11 17:58	06:20 18:12-19:02/50 19:31	05:40 20:02	05:22 05:45-05:57/12 20:26
14	07:17 07:39-07:56/17 16:50 16:04-16:24/20	06:51 17:27	06:09 17:59	06:28-06:52/24 19:32	05:39 20:03	05:22 05:45-05:58/13 20:27
15	07:17 07:39-07:55/16 16:51 16:03-16:25/22	06:50 17:28	06:08 18:00	06:26-06:52/26 19:33	05:38 20:04	05:22 05:45-05:58/13 20:27
16	07:17 07:41-07:55/14 16:52 16:04-16:27/23	06:49 17:29	06:06 18:01	06:25-06:52/27 19:34	05:37 20:05	05:22 05:45-05:58/13 20:28
17	07:16 16:03-16:27/24 16:53 07:42-07:53/11	06:47 17:31	06:05 18:02	06:23-06:52/29 19:35	05:36 20:06	05:22 05:45-05:59/14 20:28
18	07:16 16:03-16:29/26 16:54 07:45-07:52/7	06:46 17:32	06:03 18:03	06:21-06:52/31 19:36	05:35 20:07	05:23 05:45-05:59/14 20:28
19	07:15 16:03-16:30/27 16:55	06:45 17:33	06:01 18:05	06:20-06:52/32 19:37	05:34 20:08	05:23 05:45-05:59/14 20:29
20	07:15 16:02-16:31/29 16:56	06:43 17:34	06:00 18:06	06:18-06:51/33 19:38	05:34 20:09	05:23 05:45-05:59/14 20:29
21	07:14 16:03-16:33/30 16:58	06:42 17:35	05:58 18:07	06:16-06:51/35 19:39	05:33 20:10	05:23 05:45-05:59/14 20:29
22	07:14 16:02-16:34/32 16:59	06:40 17:36	05:56 18:08	06:15-06:51/36 19:40	05:32 20:11	05:23 05:46-06:00/14 20:29
23	07:13 16:02-16:35/33 17:00	06:39 17:38	05:55 18:09	06:13-06:50/37 19:41	05:31 20:12	05:23 05:46-06:00/14 20:30
24	07:12 16:03-16:37/34 17:01	06:38 17:39	05:53 18:10	06:11-06:48/37 19:42	05:31 20:12	05:24 05:46-06:00/14 20:30
25	07:12 16:03-16:37/34 17:02	06:36 17:40	05:51 18:11	06:11-06:48/37 19:43	05:30 20:13	05:24 05:46-06:00/14 20:30
26	07:11 16:03-16:37/34 17:04 07:31-07:33/2	06:35 17:41	05:50 18:12	06:11-06:46/35 19:45	05:29 20:14	05:24 05:47-06:01/14 20:30
27	07:10 16:03-16:38/35 17:05 07:30-07:34/4	06:33 17:42	05:48 18:13	06:12-06:45/33 19:46	05:28 20:15	05:25 05:47-06:00/13 20:30
28	07:09 16:03-16:38/35 17:06 07:29-07:34/5	06:32 17:43	05:46 18:14	06:14-06:44/30 19:47	05:28 20:16	05:25 05:47-06:00/13 20:30
29	07:08 16:03-16:38/35 17:07 07:29-07:36/7		06:45 19:15	07:15-07:41/26 18:38-18:45/7	05:27 19:48	05:25 05:48-06:01/13 20:30
30	07:07 16:05-16:39/34 17:08 07:28-07:36/8		06:43 19:16	07:16-07:39/23 18:32-18:50/18	05:27 19:49	05:26 05:48-06:00/12 20:30
31	07:07 16:05-16:38/33 17:10 07:27-07:36/9		06:41 19:17	07:19-07:36/17 18:29-18:53/24	05:26 20:18	
Potential sun hours	298	298	369	398	448	451
Sum of minutes with flicker	939	367	690	1274	33	327

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

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

## SHADOW - Calendar per WTG

Calculation: Real\_case\_Progetto\_20231218WTG: S6 - Siemens Gamesa SG 6.6-170! 6600 170.0 IO! hub: 115,0 m (TOT: 200,0 m) (47)  
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

### Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum  
607 505 420 506 599 570 495 488 555 624 686 669 6.724

	July	August	September	October	November	December
1	05:26 05:49-06:01/12 20:30	05:50 20:11	06:20 18:12-19:01/49 19:28	06:50 07:10-07:30/20 18:38	06:24 15:50-15:54/4 16:52 06:46-06:59/13	06:58 07:22-07:39/17 16:28 15:48-16:03/15
2	05:27 05:49-06:00/11 20:30	05:51 20:10	06:21 18:12-19:00/48 19:27	06:51 07:11-07:29/18 18:37	06:25 15:45-15:59/14 16:51 06:47-07:02/15	06:59 07:23-07:39/16 16:28 15:49-16:03/14
3	05:27 05:50-06:00/10 20:30	05:52 20:09	06:22 18:12-19:00/48 19:25	06:52 07:12-07:27/15 18:35	06:26 15:43-16:02/19 16:49 06:48-07:03/15	07:00 07:24-07:40/16 16:27 15:50-16:02/12
4	05:28 05:50-05:59/9 20:29	05:53 20:08	06:23 18:13-18:59/46 19:24	06:53 07:13-07:25/12 18:33	06:27 15:41-16:03/22 16:48 06:49-07:04/15	07:01 07:25-07:41/16 16:27 15:52-16:02/10
5	05:28 05:51-06:00/9 20:29	05:54 20:07	06:24 18:13-18:58/45 19:22	06:54 07:14-07:23/9 18:32	06:28 15:40-16:04/24 16:47 06:50-07:05/15	07:02 07:26-07:41/15 16:27 15:54-16:02/8
6	05:29 05:51-05:59/8 20:29	05:55 20:05	06:25 18:13-18:57/44 19:20	06:55 07:15-07:20/5 18:30	06:30 15:39-16:06/27 16:46 06:52-07:06/14	07:03 07:27-07:42/15 16:27 15:56-16:02/6
7	05:30 05:52-05:59/7 20:29	05:56 20:04	06:26 18:14-18:56/42 19:19	06:56 18:28	06:31 15:38-16:07/29 16:45 06:53-07:06/13	07:04 07:28-07:43/15 16:27
8	05:30 05:53-05:59/6 20:28	05:57 20:03	06:27 18:15-18:54/39 19:17	06:57 18:27	06:32 15:37-16:07/30 16:44 06:54-07:07/13	07:05 07:29-07:43/14 16:27
9	05:31 05:53-05:57/4 20:28	05:58 20:02	06:28 18:16-18:53/37 19:15	06:58 18:25	06:33 15:36-16:08/32 16:43 06:55-07:07/12	07:06 07:30-07:44/14 16:27
10	05:31 05:54-05:57/3 20:28	05:59 18:41-18:44/3 20:01	06:29 18:16-18:50/34 19:14	06:59 18:24	06:34 15:37-16:09/32 16:42 06:57-07:07/10	07:07 07:31-07:45/14 16:27
11	05:32 05:55-05:56/1 20:27	06:00 18:34-18:50/16 19:59	06:30 07:16-07:22/6 19:12 18:18-18:48/30	07:00 18:22	06:36 15:36-16:09/33 16:41 06:58-07:07/9	07:08 07:31-07:44/13 16:27
12	05:33 20:27	06:01 18:31-18:53/22 19:58	06:31 07:11-07:27/16 19:10 18:19-18:45/26	07:01 18:20	06:37 15:36-16:09/33 16:40 06:59-07:07/8	07:09 07:32-07:45/13 16:27
13	05:34 20:26	06:02 18:29-18:55/26 19:57	06:32 07:07-07:29/22 19:09 18:22-18:42/20	07:02 18:19	06:38 15:35-16:10/35 16:39 07:01-07:08/7	07:09 07:33-07:46/13 16:27
14	05:34 20:26	06:03 18:27-18:56/29 19:55	06:33 07:05-07:31/26 19:07 18:27-18:36/9	07:04 18:17	06:39 15:36-16:11/35 16:38 07:02-07:07/5	07:10 07:34-07:47/13 16:27
15	05:35 20:25	06:04 18:25-18:58/33 19:54	06:34 07:03-07:32/29 19:05	07:05 18:16	06:40 15:36-16:11/35 16:37 07:03-07:07/4	07:11 07:35-07:47/12 16:27
16	05:36 20:25	06:05 18:24-18:59/35 19:53	06:35 07:01-07:34/33 19:04	07:06 18:14	06:41 15:36-16:10/34 16:36 07:04-07:06/2	07:12 07:35-07:47/12 16:28
17	05:37 20:24	06:06 18:23-19:00/37 19:51	06:36 07:00-07:34/34 19:02	07:07 18:13	06:43 15:36-16:10/34 16:36	07:12 07:36-07:48/12 16:28
18	05:37 20:23	06:07 18:21-19:01/40 19:50	06:37 06:59-07:35/36 19:00	07:08 18:11	06:44 15:37-16:11/34 16:35	07:13 07:36-07:48/12 16:28
19	05:38 20:23	06:08 18:20-19:02/42 19:48	06:38 06:58-07:35/37 18:58	07:09 18:10	06:45 15:37-16:10/33 16:34	07:14 07:37-07:49/12 16:29
20	05:39 20:22	06:09 18:19-19:02/43 19:47	06:39 06:59-07:36/37 18:57	07:10 18:08	06:46 15:37-16:09/32 16:33	07:14 07:38-07:50/12 16:29
21	05:40 20:21	06:10 18:18-19:03/45 19:45	06:40 07:00-07:36/36 18:55	07:11 18:07	06:47 15:38-16:08/30 16:33	07:15 07:38-07:50/12 16:30
22	05:41 20:20	06:10 18:17-19:03/46 19:44	06:41 07:01-07:36/35 18:53	07:12 18:05	06:48 15:39-16:08/29 16:32	07:15 07:39-07:51/12 16:30
23	05:42 20:20	06:11 18:17-19:03/46 19:42	06:42 07:02-07:36/34 18:52	07:13 18:04	06:50 15:40-16:07/27 16:31	07:16 07:39-07:51/12 16:31
24	05:43 20:19	06:12 18:16-19:04/48 19:41	06:43 07:03-07:36/33 18:50	07:15 18:02	06:51 15:40-16:06/26 16:31 07:22-07:29/7	07:16 07:39-07:51/12 16:31
25	05:43 20:18	06:13 18:14-19:03/49 19:39	06:44 07:04-07:35/31 18:48	06:16 17:01	06:52 15:41-16:06/25 16:30 07:20-07:31/11	07:17 07:40-07:52/12 16:32
26	05:44 20:17	06:14 18:14-19:03/49 19:38	06:45 07:05-07:35/30 18:47	06:17 17:00	06:53 07:19-07:33/14 16:30 15:42-16:05/23	07:17 07:40-07:52/12 16:32
27	05:45 20:16	06:15 18:13-19:03/50 19:36	06:46 07:06-07:34/28 18:45	06:18 16:58	06:54 07:19-07:35/16 16:29 15:42-16:04/22	07:17 07:40-07:52/12 16:33
28	05:46 20:15	06:16 18:13-19:02/49 19:35	06:47 07:07-07:33/26 18:43	06:19 16:57	06:55 07:19-07:36/17 16:29 15:44-16:05/21	07:18 07:41-07:53/12 16:34
29	05:47 20:14	06:17 18:13-19:02/49 19:33	06:48 07:08-07:32/24 18:42	06:20 16:56	06:56 07:20-07:37/17 16:29 15:45-16:04/19	07:18 07:41-07:54/13 16:34
30	05:48 20:13	06:18 18:12-19:02/50 19:32	06:49 07:09-07:31/22 18:40	06:21 16:54	06:57 07:21-07:38/17 16:28 15:46-16:04/18	07:18 07:41-07:54/13 16:35
31	05:49 20:12	06:19 18:12-19:01/49 19:30	06:23 16:53	06:48-06:57/9 16:53	299	07:18 07:41-07:54/13 16:36
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	80	856	1092	88	1080	476

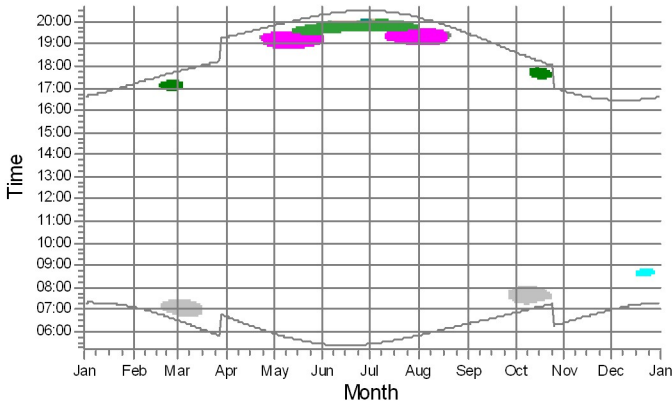
Table layout: For each day in each month the following matrix apply

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

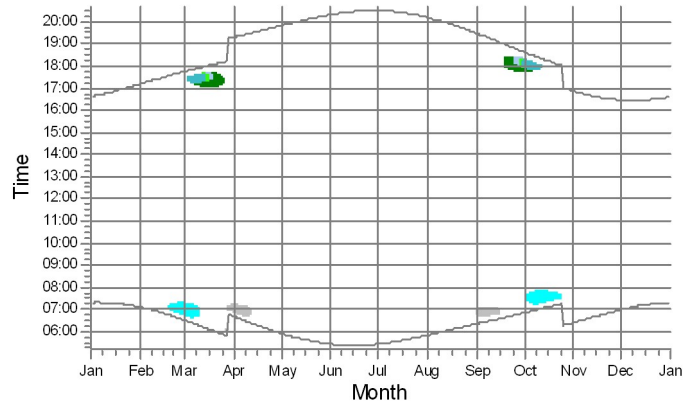
## SHADOW - Calendar per WTG, graphical

Calculation: Real\_case\_Progetto\_20231218

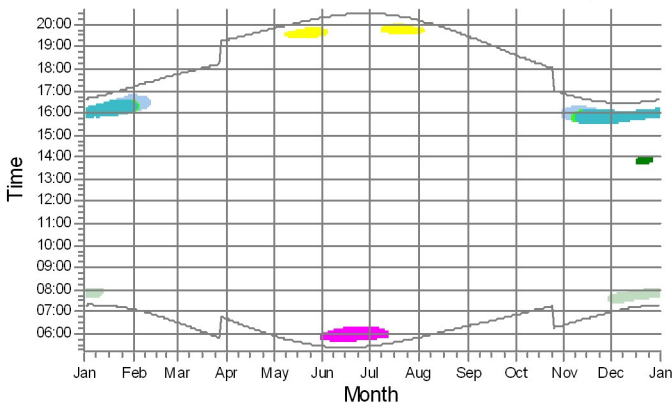
S1: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,



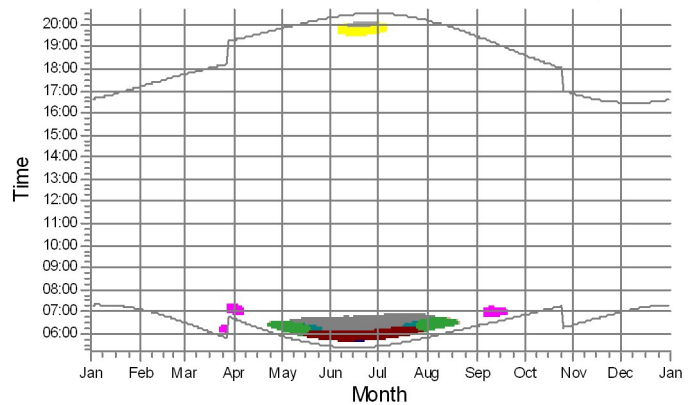
S2: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,



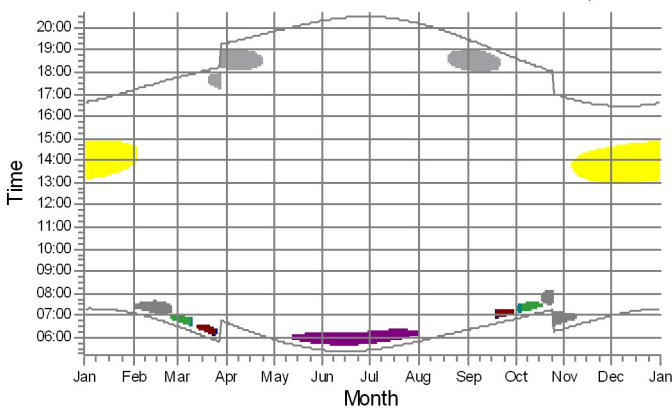
S3: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,



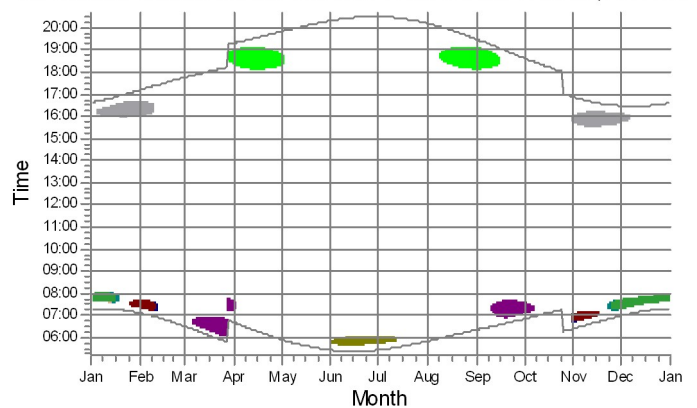
S4: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,






















S5: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,



S6: Siemens Gamesa SG 6.6-170!6600 170.0 !O!hub: 115,0 m (TOT: 200,



### Shadow receptors

	F130: A03		F137: A03		F142: A07_C02		F147: A03_F03
	F131: A07		F138: A04		F143: A07		F148: A04_D10
	F133: A03		F139: A04		F144: A04		F149: A04_D10
	F134: A04		F140: A07		F145: A04_D10		F150: A03_F03
	F136: A07		F141: A07_C02		F146: A03		