

TITOLARE DEL DOCUMENTO:

AREN Green S.r.l.

Società soggetta alla direzione e coordinamento di AREN Electric Power S.p.A.
Sede legale e amministrativa: Via dell'Arrigoni n. 308 | 47522 Cesena (FC) | Ph. +39 0547 415245
Iscritta nel Registro delle Imprese della Romagna – Forlì-Cesena e Rimini | REA 326908 | C.F./P.Iva 04032170401

COMUNI DI SALEMI, MARSALA E TRAPANI (TP)
LOCALITÀ “CONTRADA MIRABILE”

PROGETTO PER LA REALIZZAZIONE DI **IMPIANTO EOLICO** **“MIRABILE”**

REDAZIONE / PROGETTISTA:

Ing. Angela Ottavia CUONZO
Via M. Iamele, n. 28
71029 Troia (FG)
P. IVA 04476030715
Ordine Ingegneri Prov. Foggia n. 2653

TIMBRO E FIRMA PROGETTISTA:



TITOLO ELABORATO:

**RELAZIONE EVOLUZIONE OMBRA - FENOMENO SHADOW
FLICKERING**

CODICE ELABORATO:

MIRDT_GENR02500_00

FORMATO:

A4

Nr. EL.:

/

FASE:

**PROGETTO
DEFINITIVO**

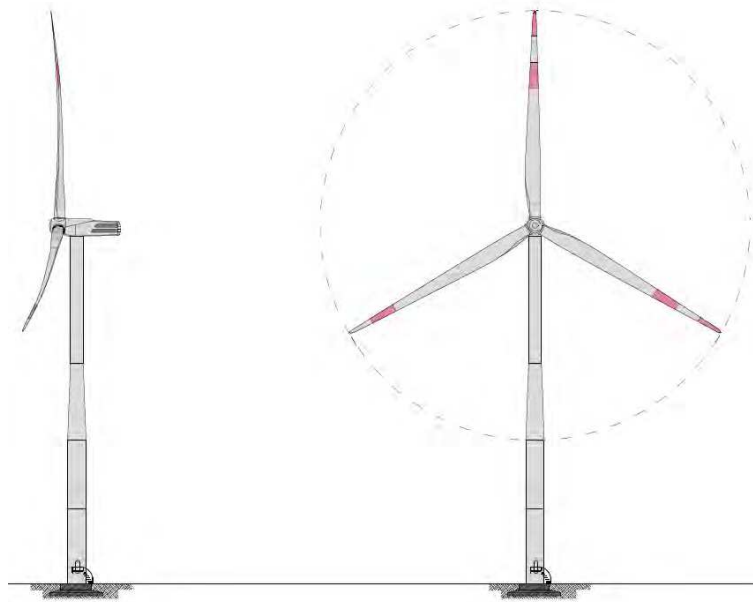
REV.	DESCRIZIONE	DATA	REDATTO	VERIFICATO	APPROVATO
00	Prima emissione	27/05/2024			
01					
02					
03					
04					

AEROGENERATORE DI PROGETTO

Il modello di aerogeneratore che si prevede di installare è la turbina eolica Vestas V150-6.0 EnVentus da 6.0MW di potenza nominale.

L'aerogeneratore è costituito da una torre di sostegno tubolare metallica a tronco di cono, sulla cui sommità è installata la navicella con il rotore tripala avente diametro di 150m, mentre l'altezza mozzo è di 105m dal suolo.

La direzione di rotazione delle pale è in senso orario vista frontalmente.



Technical specifications

Power regulation operational data

Rated power	6,000kW
Cut-out wind speed	3m/s
Cut-in wind speed	25m/s
Wind class	IEC 5
Standard operating temperature range	from -20°C ¹ to +45°C

Pitch regulated with variable speed

SOUND POWER

Maximum	104.9dB(A)**
---------	--------------

ROTOR

Rotor diameter	150m
Swept area	17,672m ²
Aerodynamic brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages
------	----------------------

TOWER

Hub heights	105 m (IEC 5), 125 m (IEC 5/DiBt 5), 148 m (DiBt 5), 155 m (IEC 5) and 166 m (DiBt 5)
-------------	---

SUSTAINABILITY METRICS

Carbon Footprint	5.6g CO ₂ e/kWh
Return on energy break-even	5.9 months
Lifetime return on energy	41 times
Recyclability rate	85%

Configuration: 155m hub height, Vavg=8.0m/s, k=2.48. Depending on site-specific conditions. Metrics are based on an externally reviewed Life Cycle Assessment available on vestas.com

INDICE

PREMESSA	pag. 2
NORMATIVA DI RIFERIMENTO	pag. 3
IL FENOMENO DI SHADOW FLICKERING	pag. 4
DESCRIZIONE DEL PROGETTO	pag. 7
AEROGENERATORE DI PROGETTO	pag. 9
ANALISI DEL FENOMENO PER L'IMPIANTO PROPOSTO	pag. 10
MODELLO DI CALCOLO	pag. 11
DATI METEO LOCALI	pag. 12
INDIVIDUAZIONE DEI RECETTORI	pag. 13
STRADE PRESENTI	pag. 15
ANALISI DEI RISULTATI OTTENUTI	pag. 16
CONSIDERAZIONI FINALI	pag. 18
ELENCO ALLEGATI	pag. 19

PREMESSA

Nella presente relazione sull'evoluzione dell'ombra generata dalla realizzazione di un impianto per la produzione di energia elettrica da fonte rinnovabile eolica viene verificata l'eventuale interferenza rispetto al campo visivo delle abitazioni presenti e alla viabilità circostante ed accertare che il fenomeno dell'ombreggiamento non abbia una durata eccessiva sulle carreggiate stradali, tale da prolungare il permanere del ghiaccio su di esse.

Il progetto, denominato “MIRABILE”, è costituito da n. 7 aerogeneratori della potenza nominale di 6.0MW ciascuno, per una potenza complessiva dell'impianto di 42MW, e sorgerà in agro del Comune di Salemi (TP), Località “Mirabile”, mentre le relative opere di connessione alla Rete Elettrica Nazionale attraverseranno i territori comunali di Salemi, Marsala e Trapani, fino alla Sottostazione Utente che sorgerà nei pressi della futura Stazione Terna in agro di Trapani.

Proponente l'iniziativa illustrata è la società AREN Green S.r.l. con sede legale e amministrativa in Cesena (FC) alla via dell'Arrigoni, n. 308 - P.IVA 04032170401.

NORMATIVA DI RIFERIMENTO

In riferimento al fenomeno che verrà analizzato, non sono state emanate in Italia norme specifiche o linee guida che regolamentino i limiti di esposizione al fenomeno di Shadow flicker generato dall'esercizio degli impianti eolici, né tanto meno è stata definita una distanza massima oltre la quale si ritiene improbabile il verificarsi del fenomeno.

La Germania è stata il primo stato europeo ad aver formulato delle linee guida dettagliate sui limiti e le condizioni per il calcolo dell'impatto dell'ombra, normate dalla “Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen” (WEA-Shattenwurf-Hinweise).

Secondo le linee guida tedesche, il limite per il quale si genera l'impatto è fissato da due fattori:

- L'angolo del sole sull'orizzonte deve essere di almeno 3 gradi
- Le pale dell'aerogeneratore devono coprire almeno il 20% del sole.

La maggior parte dei paesi europei che successivamente hanno adottato specifiche linee guida o regolamenti in materia si sono basati sulle norme di riferimento tedesche e sui limiti di accettabilità da esse introdotti.

In assenza di una specifica normativa o linea guida, si impiegano, come buona pratica, le indicazioni contenute nelle linee guida tedesche.

Nello specifico, tali linee guida sono state introdotte nel 2002 dal comitato statale per il controllo dell'inquinamento e, da allora, sono state adottate dalla maggior parte dei Länder e sono comunemente considerate buone pratiche nella valutazione dell'impatto prodotto da un parco eolico.

In particolare, tali linee guida, stabiliscono che lo shadow flickering deve essere valutato:

- fino ad una distanza tale che il rotore copra il 20% del disco solare; a distanze superiori il fenomeno è considerato troppo diffuso da poter produrre fastidio;
- per angoli del sole sull'orizzonte superiori a 3 gradi; per angoli inferiori il fenomeno si ritiene schermato dalla presenza di edifici e/o vegetazione;
- ad un'altezza di 2 metri dal suolo;

I valori limite di accettabilità stabiliti dalle suddette linee guida sono un massimo di:

- 30 minuti al giorno;
- 30 ore all'anno.

In Italia invece si fa riferimento all'esperienza e al buon senso.

Nel presente studio, considerando la modellazione cautelativa dei recettori, si è considerato come limite massimo di esposizione, per poter definire un recettore sensibile, quello di 30 ore/anno di massima ombra nella condizione Real Case.

IL FENOMENO DI SHADOW FLICKERING

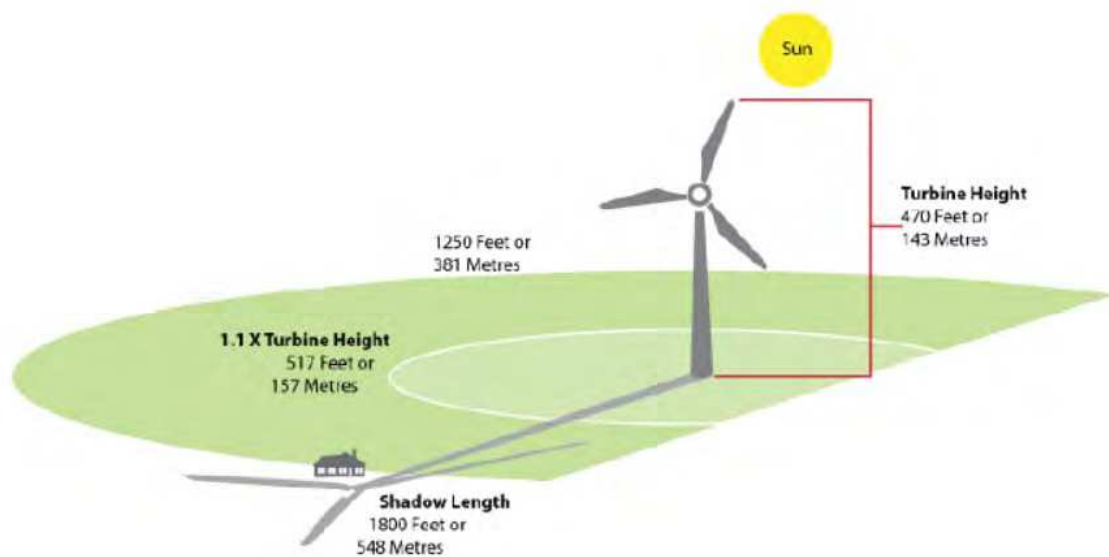
Gli aerogeneratori, al pari di tutte le altre strutture fortemente sviluppate in altezza, proiettano un'ombra sulle aree circostanti in presenza di irraggiamento solare diretto.

Lo *shadow flickering* (letteralmente *ombreggiamento intermittente*) consiste in una fluttuazione periodica dell'intensità luminosa osservata, causata dalla proiezione, su una superficie, dell'ombra indotta da oggetti in movimento.

Per un impianto eolico tale fenomeno è generato dalla proiezione, al suolo o su un ricevitore, dell'ombra generata dalle pale degli aerogeneratori in rotazione in presenza della luce solare.

Dal punto di vista di un ricevitore, lo *shadow flickering* si manifesta in una variazione ciclica dell'intensità luminosa; un lampeggiamento che si manifesta quando le pale del rotore tagliano la luce solare in maniera intermittente.

In presenza di luce solare diretta, un ricevitore localizzato nella zona d'ombra indotta dal rotore, sarà investito da un continuo alternarsi di luce diretta ed ombra, a causa delle pale in movimento.

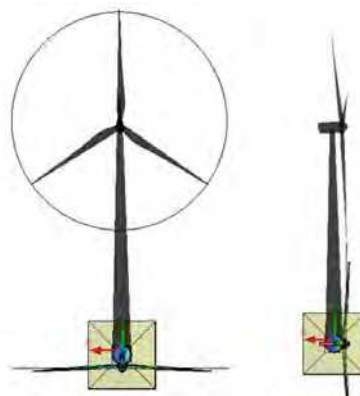


Tale fenomeno, se subito dal ricevitore per periodi di tempo prolungati, può generare un disturbo, se ci si trova nelle seguenti condizioni:

- si sia in presenza di un livello sufficiente di intensità luminosa, ossia in condizioni di cielo sereno sgombro da nubi ed in assenza di nebbia e con sole alto rispetto all'orizzonte;
- la linea ricevitore-aerogeneratore non incontri ostacoli: in presenza di vegetazione, promontori o edifici interposti l'ombra generata da questi ultimi annulla o attenua il fenomeno;
- le pale siano in movimento;
- turbina e ricevitore siano vicini: le ombre proiettate in prossimità dell'aerogeneratore risultano di maggiore intensità e nitidezza rispetto a quelle proiettate lontano. All'aumentare della distanza tra

turbina e recettore, le pale coprono una porzione sempre più piccola del sole, inducendo un flicker di minore entità. Inoltre il fenomeno risulta di bassa entità quando l'ombra proiettata sul recettore è indotta dall'estremità delle pale, mentre raggiunge il massimo dell'intensità in corrispondenza dell'attacco di pala all'hub;

- la turbina sia orientata in modo che il rotore risulti perpendicolare alla linea sole-recettore: quando il piano del rotore è perpendicolare alla linea sole-recettore, l'ombra proiettata dalle pale risulta muoversi all'interno di un “cerchio” che riferisce alla circonferenza del rotore inducendo uno shadow flickering non trascurabile; per situazioni in cui, dal punto di vista del recettore, il piano del rotore risulti essere in linea con il sole ed il recettore, l'ombra proiettata è sottile, di bassa intensità ed è caratterizzata da un rapido movimento, risultando pertanto lo shadow flickering di entità trascurabile.



L'intensità del fenomeno è definita come la differenza di luminosità che si percepisce in presenza ed in assenza di flickering in una data posizione. In definitiva, si può affermare che:

- avendo le pale una forma rastremata con lo spessore che cresce verso il mozzo; il fenomeno risulterà tanto più intenso quanto maggiore sarà la porzione di disco solare coperta dalla pala stessa e quanto minore la distanza dal ricettore;
- l'intensità del flickering sarà minima quando l'ombra prodotta è generata all'estremità delle pale;
- maggiori distanze tra generatore e ricettore determinano ombre meno nette; in tal caso l'effetto flickering risulterà meno intenso e distinto.

Rilievi sul campo hanno evidenziato che, per distanze superiori ai 400m tra un aerogeneratore di altezza paragonabile a quella di progetto ed il ricettore, il fenomeno è da rilevarsi solo all'alba ed al tramonto, momenti in cui la radiazione diretta è di minore intensità.

Al di là di una certa distanza l'ombra smette di essere un problema perché il rapporto tra lo spessore della pala ed il diametro apparente del sole diventa molto piccolo.

Sebbene il fenomeno possa essere percepito anche all'esterno, esso risulta evidente e fastidioso in quegli ambienti con finestrate rivolte verso le ombre. In generale, l'area soggetta a shadow flicker non si estende oltre i 500÷1000 m dall'aerogeneratore e le zone a maggiore impatto ricadono entro i 400 m di distanza dalle macchine con durata del fenomeno dell'ordine delle 200 ore all'anno.

Il flickering, se presente, non dovrebbe superare in genere i 30/40 minuti di durata potenziale nell'arco di una giornata.

Le linee guida di alcuni paesi esteri raccomandano una velocità di flicker non superiore a 3 tagli al secondo il che, per le normali turbine a 3 pale, corrisponde ad una rotazione completa del rotore in un secondo, ossia 60 giri al minuto (60 rpm).

Le moderne turbine hanno in genere velocità di rotazione ben al di sotto di tale limite, aggirandosi sui 18,20 rpm a pieno regime, corrispondente a frequenze di passaggio delle pale notevolmente inferiori a quella critica.

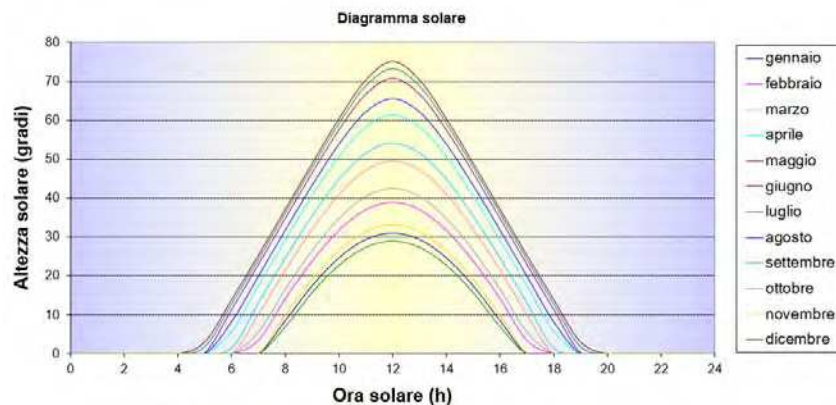
In particolare, il modello di aerogeneratore scelto per il presente progetto lavora nel range compreso fra 4,9 e 12,6 rpm, e quindi alla velocità massima lo sfarfallio risulterebbe di 37,8 giri al minuto, ossia quasi la metà di quello definito come accettabile.

Questo consente di affermare che, a queste condizioni di velocità, il fenomeno di shadow flickering possa non costituire un problema per la salute umana.

In ogni caso, una progettazione attenta a questa problematica permette di evitare lo spiacevole fenomeno di flickering semplicemente prevedendo il luogo di incidenza dell'ombra e disponendo le turbine in maniera tale che l'ombra sulle zone sensibili non superi un certo numero di ore all'anno.

A tal proposito è stato prodotto lo studio dell'evoluzione dell'ombra generata dagli aerogeneratori, eseguito grazie all'ausilio di un software che effettua analisi informative territoriali sulla base di cartografie digitali in 3D.

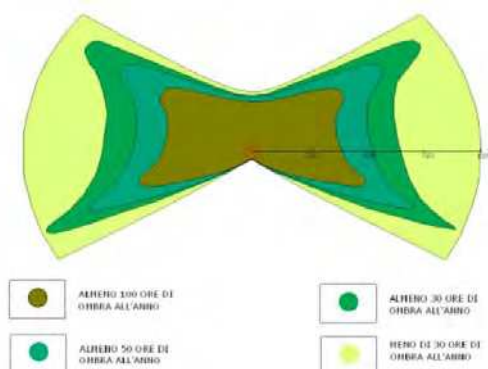
Il software ha permesso l'esecuzione dei calcoli della proiezione dell'ombra nell'arco di un intero anno solare nell'area d'impianto.



Di seguito si riporta l'evoluzione annuale dell'ombra di una turbina nel caso peggiore, ossia considerando le pale sempre in rotazione e orientate sempre ortogonalmente al sole durante la sua evoluzione giornaliera.

Le ore annue di ombra sono sempre minori con l'aumentare della distanza dalla torre secondo una particolare geometria rinveniente dalla posizione geografica.

In casi particolari l'ombra arriva a proiettarsi anche a distanza di 1 km ma unicamente per pochi minuti all'anno.

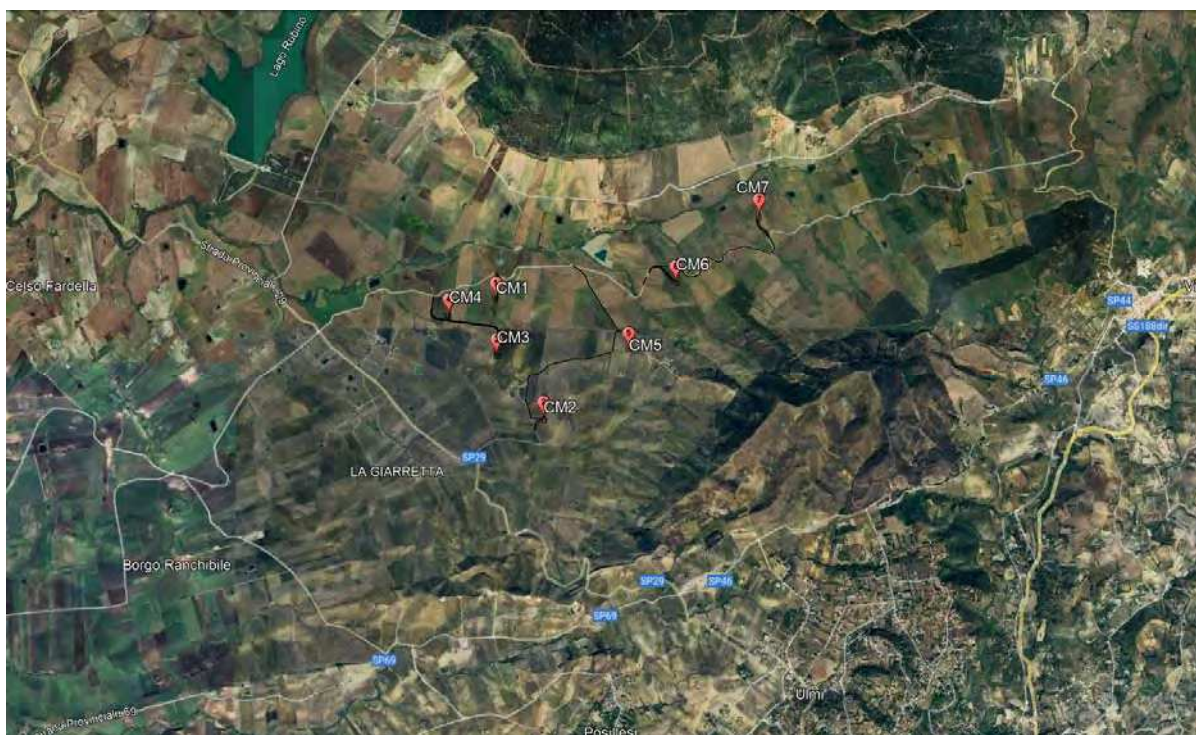


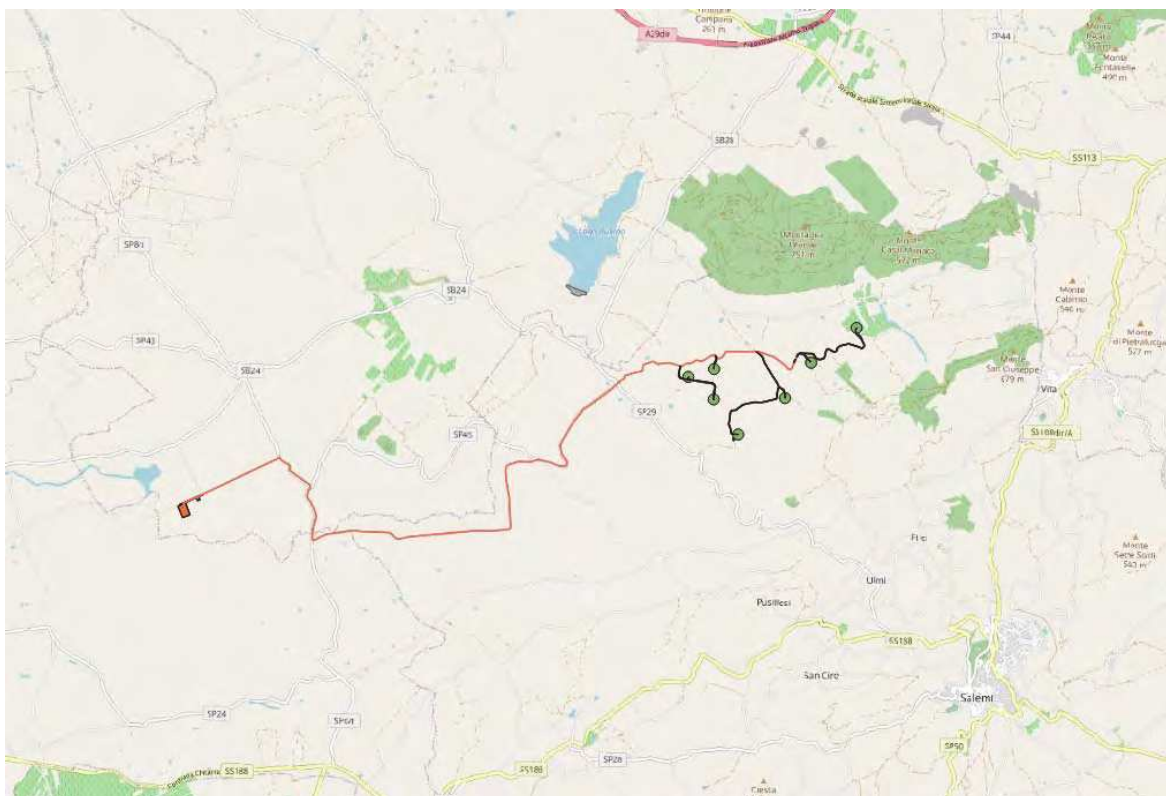
Lo studio dell'ombreggiamento è finalizzato alla verifica dell'effetto flickering sui ricettori sensibili presenti nei pressi del parco eolico, considerando una distanza d'indagine superiore ai 500m da ogni aerogeneratore.

DESCRIZIONE DEL PROGETTO

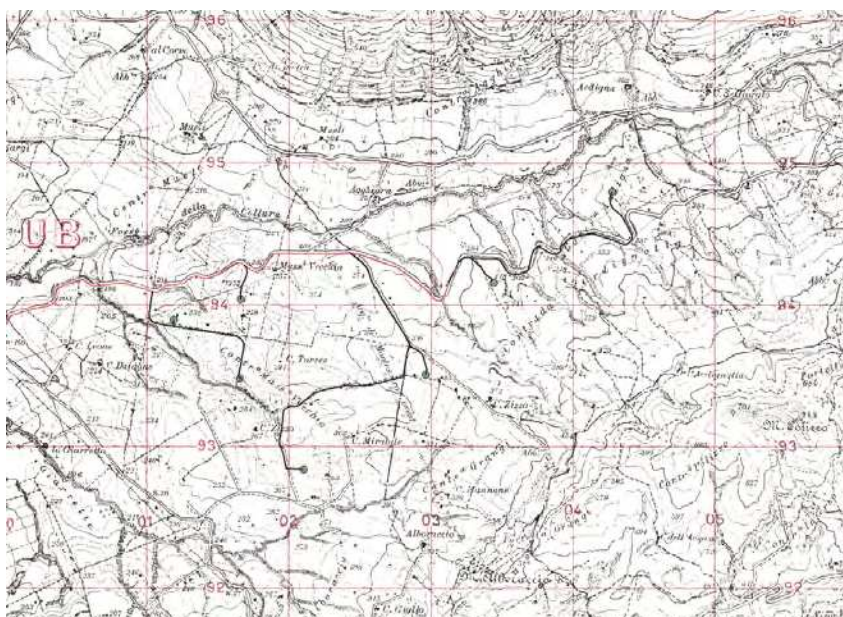
L'impianto eolico oggetto del presente studio prevede l'installazione di n. 7 aerogeneratori da 6.0MW cadauno, per una potenza complessiva di 42 MWe e le relative opere di connessione alla Rete Elettrica Nazionale.

L'impianto denominato "MIRABILE" sorgerà nel comune di Salemi (TP), in località "Contrada Mirabile, Contrada Masseria Vecchia e Contrada Ardigna", mentre il tracciato del cavidotto di collegamento attraverserà i comune di Salemi e Trapani fino all'area di realizzazione della Stazione Utente, a circa 20 km di distanza, nei pressi della Stazione Elettrica Terna di prossima realizzazione.





Di seguito vengono riportate le coordinate degli aerogeneratori nel sistema di riferimento UTM – WGS84 Fuso 33N:



WTG	X	Y
CM1	301600	4193852
CM2	302044	4192652
CM3	301593	4193295
CM4	301127	4193707
CM5	302905	4193320
CM6	303386	4193968
CM7	304221	4194607

Il territorio è prettamente collinare, con quote che variano dai 200m ai 400m slm e dominato da seminativi, vigneti e boschi.

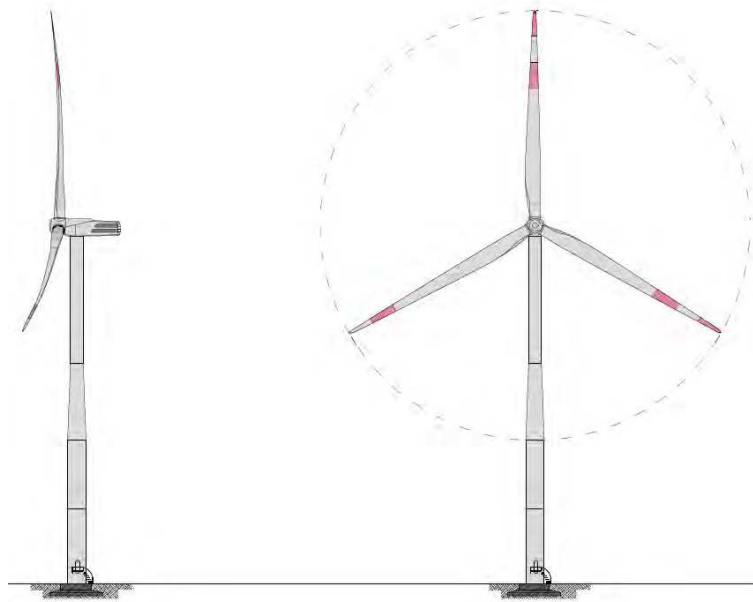
L'area d'intervento è attraversata da strade poderali e comunali, con la presenza anche di alcune Strada Provinciali, quali la SP 29, 44 e 45, mentre il cavidotto correrà lungo la Strada Provinciale n. 29, la SP n. 45, la Strada Agricola Borgo Fazio – Ricalcata, Strada Castelvetro, Strada di Bonifica 25 e 26.

AEROGENERATORE DI PROGETTO

Il modello di aerogeneratore che si prevede di installare è la turbina eolica Vestas V150-6.0 EnVentus da 6.0MW di potenza nominale.

L'aerogeneratore è costituito da una torre di sostegno tubolare metallica a tronco di cono, sulla cui sommità è installata la navicella con il rotore tripala avente diametro di 150m, mentre l'altezza mozzo è di 105m dal suolo.

La direzione di rotazione delle pale è in senso orario vista frontalmente.



Technical specifications

Power regulation operational data

Rated power	6,000kW
Cut-out wind speed	3m/s
Cut-in wind speed	25m/s
Wind class	IEC 5
Standard operating temperature range	from -20°C ¹ to +45°C

Pitch regulated with variable speed

SOUND POWER

Maximum	104.9dB(A)**
---------	--------------

ROTOR

Rotor diameter	150m
Swept area	17,672m ²
Aerodynamic brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages
------	----------------------

TOWER

Hub heights	105 m (IEC 5), 125 m (IEC 5/DiBt 5), 148 m (DiBt 5), 155 m (IEC 5) and 166 m (DiBt 5)
-------------	---

SUSTAINABILITY METRICS

Carbon Footprint	5.6g CO ₂ e/kWh
Return on energy break-even	5.9 months
Lifetime return on energy	41 times
Recyclability rate	85%

Configuration: 155m hub height; Vavg=8.0m/s; k=2.48. Depending on site-specific conditions. Metrics are based on an externally reviewed Life Cycle Assessment available on vestas.com

La macchina risponde ai più alti standard qualitativi in fatto di produzione, riduzione della velocità di rotazione ed emissione di rumore (IEC 60076-1, IEC 60076-16, IEC 61936-1, IEC 62271-103, IEC 62271-1, 62271-100, 62271-102, 62271-200).

La velocità operativa va infatti da 4,9 a 12,6 rpm con una frequenza massima di 0,21 Hz e un livello di potenza sonora inferiore agli 80dB(A).

ANALISI DEL FENOMENO PER L'IMPIANTO PROPOSTO

Le simulazioni volte a verificare l'entità del fenomeno dello *shadow flickering* indotto dagli aerogeneratori che si intende installare sono state effettuate in considerazione:

- ✓ del diagramma solare riferito alla latitudine di installazione del parco;
- ✓ dell'altezza complessiva di macchina, intesa quale somma tra l'altezza del mozzo e la lunghezza di pala;
- ✓ dall'orientamento del rotore rispetto al recettore;
- ✓ della posizione del sole e quindi della proiezione dell'ombra rispetto ai ricettori;
- ✓ della posizione dei possibili recettori.

Le simulazioni inoltre sono state condotte sia in condizioni reali che in condizioni conservative, assumendo cioè:

- il cielo completamente sgombro da nubi, foschia, ecc..;
- i rotori in rotazione continua;
- l'orientamento dei rotori sempre tale da essere frontale ad i ricettori;
- il terreno piatto, privo di ostacoli;
- il sole ad un'altezza minima pari a 20° sopra l'orizzonte;
- nessun ostacolo interposto tra il recettore e la turbina eolica.

L'intensità del fenomeno è definita come la differenza di luminosità che si percepisce in presenza ed in assenza di flickering in una data posizione.

Avendo le pale una forma rastremata con lo spessore che cresce verso il mozzo, il fenomeno sarà più intenso quanto maggiore sarà la porzione di disco solare coperta dalla pala stessa e quanto minore la distanza dal ricettore. Viceversa, l'intensità del flickering sarà minima quando l'ombra prodotta è generata all'estremità delle pale.

Maggiori distanze tra generatore e ricettore determinano ombre meno nette, e pertanto l'effetto flickering risulterà meno intenso e distinto.

Il fenomeno ovviamente risulta assente sia quando il sole è oscurato da nuvole o nebbia, sia quando, in assenza di vento, le pale del generatore non sono in rotazione.

MODELLO DI CALCOLO

L'analisi dell'impatto da Shadow Flickering prodotto dal parco eolico è realizzata attraverso l'impiego di specifici applicativi che modellano il fenomeno in esame.

I pacchetti software impiegati per la progettazione di impianti eolici contengono moduli specifici per il calcolo e l'analisi del fenomeno di flickering.

L'analisi si basa sull'impiego di un modello digitale del terreno (DTM) dell'area oggetto di progettazione, sulle posizioni degli aerogeneratori con le loro effettive caratteristiche dimensionali e dei ricettori sensibili, nonché sui dati che correlano la posizione del sole nell'arco dell'anno con le condizioni operative delle turbine nello stesso arco di tempo.

Allo scopo è stato impiegato il modulo “Shadow” del software WindPRO che consente di analizzare la posizione del sole nell'arco di un anno per identificare i tempi in cui ogni turbina può proiettare ombre sulle finestre delle abitazioni vicine.

In particolare, il modello permette di:

- calcolare il potenziale per le ombre intermittenti alle finestre delle abitazioni;
- mostrare un calendario grafico degli eventi di flickering;
- mostrare un elenco dettagliato di ciascun evento di ombreggiamento (ora di inizio, di fine, durata del fenomeno, aerogeneratori coinvolti ecc...);
- creare mappe di impatto potenziale che mostrano le ore d'ombra intermittente per l'intero parco eolico o per le singole macchine (curve di isodurata) nell'arco dell'anno.

Al di là di una certa distanza, l'ombra smette di essere un problema perché il rapporto tra lo spessore della pala e il diametro del sole diminuisce considerevolmente.

In genere, l'area soggetta a shadow flicker non si estende oltre i 500m dall'aerogeneratore e le zone a maggiore impatto ricadono entro i 400 m di distanza dalle macchine, con una durata del fenomeno dell'ordine delle 200 ore all'anno.

Il flickering, se presente, per non arrecare eccessivo disturbo non dovrebbe superare in genere i 30 minuti nell'arco di una giornata.

La presente relazione ha lo scopo di stimare le aree potenzialmente interessate dal fenomeno in relazione agli aerogeneratori del presente progetto.

In particolare, la valutazione dell'impatto di shadow flickering può essere condotta attraverso l'analisi di due casi specifici:

- il *worst case*, in cui viene valutata la massima durata del fenomeno, ossia quella astronomica, che corrisponde alle condizioni di cielo sempre sgombro da nubi, di rotore in movimento continuo e di perpendicolarità tra quest'ultimo ed il potenziale ricettore;

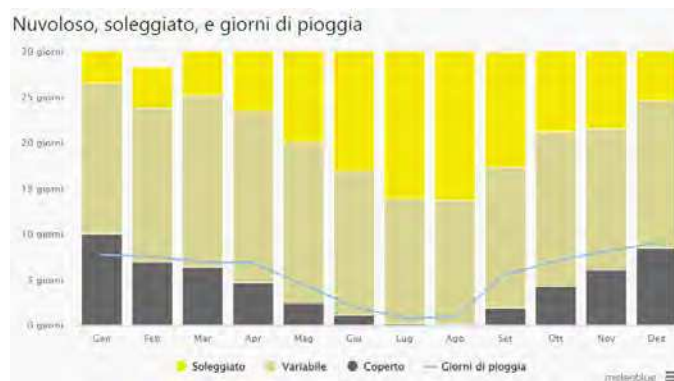
- il *real case*, in cui viene valutata la durata realistica del fenomeno, tenendo conto del soleggiamento effettivo dell'area e delle specifiche condizioni anemologiche che determinano la reale operabilità degli aerogeneratori.

Rispetto al WORST CASE, la probabilità di occorrenza del fenomeno di shadow flickering nel caso reale si riduce di circa il 50% per l'area in esame.

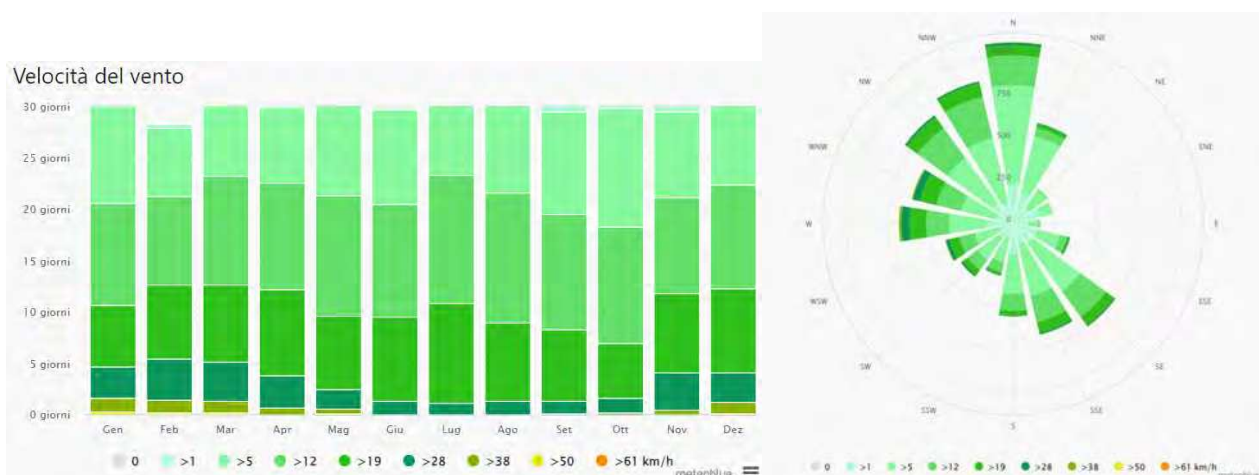
DATI METEO LOCALI

Allo scopo di effettuare un'analisi accurata e finalizzata al sito in questione, per la simulazione del fenomeno di Shadow Flickering sono stati utilizzati i dati meteorologici ottenuti dall'archivio storico del sito Meteoblue.

In particolare si è fatto riferimento ai periodi di tempo soleggiato o nuvoloso nei vari mesi dell'anno, al fine di determinare l'intensità dell'ombreggiamento.



La conoscenza dell'intensità e direzione dei venti rilevati in sito è invece necessaria per simulare la velocità di rotazione della macchina, la direzione del rotore e i tempi di fermo dovuti a venti troppo deboli.



I dati raccolti sono stati inseriti nel software di simulazione per il calcolo dell'intensità del fenomeno di Shadow flickering.

INDIVIDUAZIONE DEI RECETTORI

In Italia non esiste una normativa nazionale, né regionale, che definisca con esattezza la corretta interpretazione da attribuire al termine recettore sensibile, con riferimento alla classificazione catastale degli stessi.

Per quanto previsto in altre norme locali, presenti sul territorio italiano, si assumono come recettori sensibili, ai fini della valutazione, rispettivamente:

– "abitazioni": i fabbricati o porzioni di fabbricati che risultino registrati al catasto Fabbricati alle categorie da A/1 a A/10 o al Catasto Terreni quali fabbricati adibiti ad abitazione e dunque provvisti dei requisiti di cui all'art. 9, comma 3 della legge 133/94 "in ogni caso tali unità immobiliari devono risultare anagraficamente sede di residenza e conformi allo strumento vigente alla data di entrata in vigore della L.R. 19 gennaio 2010 n. 1 e s.m.i.;

– "edifici": i fabbricati o porzioni di fabbricati che risultino conformi allo strumento urbanistico vigente e registrati al catasto Fabbricati alle Categorie:

- B/1 Collegi e convitti, educandati; ricoveri; orfanotrofi; ospizi; conventi; seminari; caserme;
- B/2 Case di cura ed ospedali (senza fine di lucro);
- B/5 Scuole e laboratori scientifici;
- D/4 Case di cura ed ospedali (con fine di lucro);
- D/10 Fabbricati per funzioni produttive connesse alle attività agricole, nel caso in cui essi siano e risultino sede di residenza dell'imprenditore. Tali edifici debbano risultare effettivamente sede delle suddette attività.

L'analisi è stata condotta confrontando gli edifici presenti su ortofoto con quelli accatastrati e valutandone lo stato di agibilità e le condizioni di utilizzo.

Su un campione di 27 fabbricati, la maggior parte risulta disabitata o adibita a ricovero per le attività agricole; sono presenti anche alcuni capannoni, mentre gli edifici diruti o collabenti sono stati trascurati a vantaggio di quelli agibili.

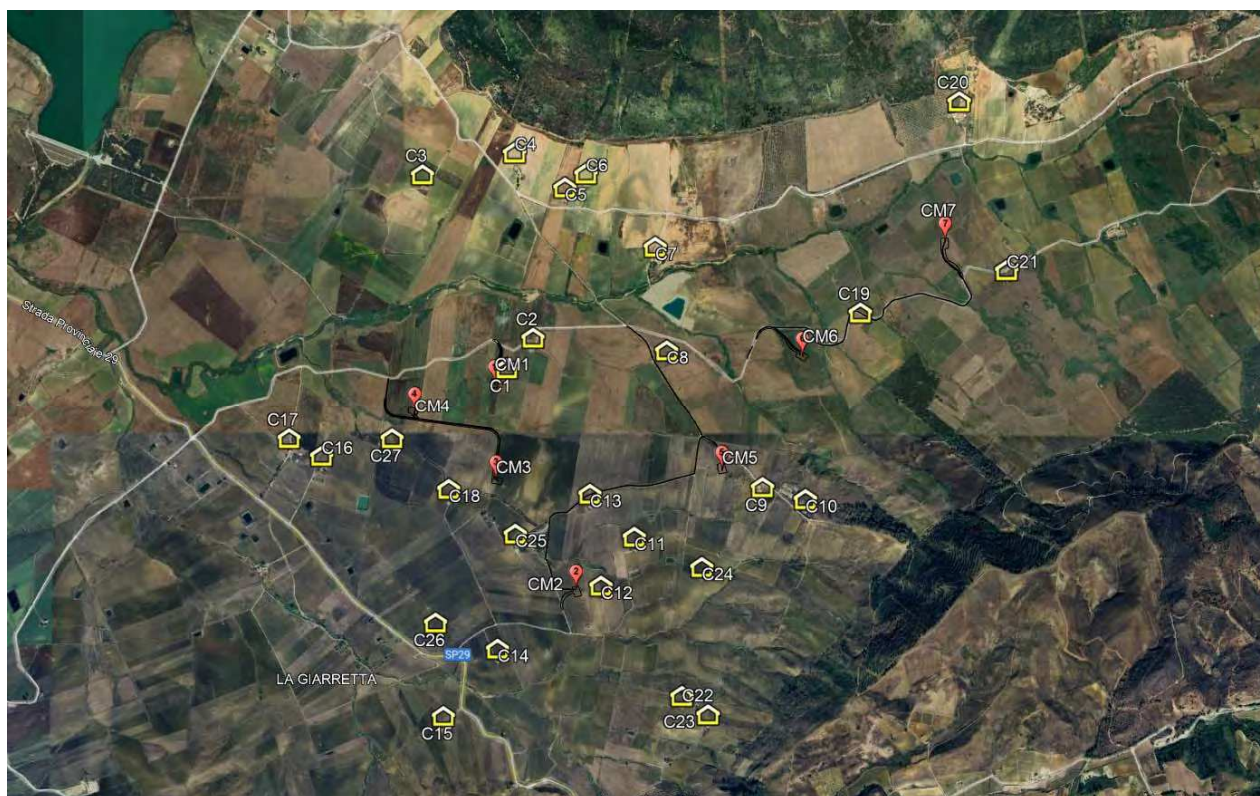
Non tutti gli edifici sono risultati accessibili.

Tra quelli esistenti sono stati considerati come "abitati" quelli serviti da energia elettrica, sebbene questo non sia garanzia di residenza, cosa che invece appare certa per il recettore n. 10.

Da notare inoltre la presenza di alcune strutture ricettive, quali il Ristorante Ardigna, la Casa vacanze "Mueli" e l'Azienda agricola Mirlocca.

Non sono presenti attività statiche tipo ufficio che comportino la permanenza a lungo termine di una persona in una stanza.

Di seguito si riporta l'ortofoto con l'indicazione degli edifici analizzati (le cui singole schede sono riportate nell'allegato 1) e la tabella con le caratteristiche di ognuno di essi.



PROGETTO EOLICO "MIRABILE" - 42MW					
Comune di SALEMI (TP)					
AREN Green S.r.l.					
RECETTORE	X (EST)	Y (NORD)	Z [m]	ACCATASTATO	STATO
C01	301672	4193870	263,8	NO	Non accessibile
C02	301827	4194044	251,4	SI	Esistente
C03	301208	4195003	256,9	SI	Collabente
C04	301758	4195091	279,3	SI	Esistente
C05	302035	4194904	277,6	SI	Casa vacanze "Mueli"
C06	302159	4194979	293,5	SI	Azienda agricola Mirlocca
C07	302550	4194553	252,3	SI	Capannoni
C08	302602	4193950	274,5	SI	Esistente
C09	303134	4193145	343,2	SI	Esistente
C10	303376	4193072	370,9	SI	Esistente / Abitato
C11	302389	4192876	290,8	SI	Esistente
C12	302189	4192598	278,6	SI	Esistente
C13	302137	4193128	271,0	SI	Collabente
C14	301577	4192244	246,2	SI	Esistente
C15	301252	4191861	243,8	SI	Esistente / Abitato
C16	300574	4193384	219,3	SI	Esistente / Abitato
C17	300386	4193492	211,0	SI	Esistente / Abitato
C18	301314	4193175	237,0	SI	Esistente / Abitato
C19	303724	4194138	320,2	NO	Esistente
C20	304312	4195324	328,0	SI	Ristorante Ardigna
C21	304562	4194356	370,4	SI	Deposito
C22	302642	4191955	307,0	SI	Esistente
C23	302790	4191849	330,0	NO	Esistente / Abitato
C24	302775	4192693	304,6	SI	Esistente
C25	301698	4192908	254,3	SI	Esistente / Abitato
C26	301219	4192403	241,4	NO	Esistente
C27	300989	4193477	222,1	SI	Esistente / Abitato

Tra i vari ricettori analizzati sono state prese in considerazione le diverse situazioni esistenti, quali edifici abitati o no, accatastati o no, collabenti o totalmente diruti.

Nella valutazione dell'impatto viene indicata la probabilità che un recettore sia interessato dal fenomeno, in termini di h (ore/anno e giorni/anno).

Nell'allegato 2 si riportano:

1. i risultati generali (Shadow_Main result);
2. il calendario con i risultati specifici mese per mese per area e per ricettore;
3. il calendario grafico di sintesi degli impatti attesi;
4. la mappa delle ore attese per anno;
5. la mappa dei giorni attesi per anno;
6. la mappa dei massimi minuti attesi al giorno.

Si precisa che le determinazioni sono state valutate sia in **condizioni limite** (worst case calculation), al fine di valutare le condizioni peggiori possibili, a tutela delle valutazioni eseguite, che in **condizioni prossime alla realtà** (real case), al fine di analizzare coerentemente le situazioni al limite o quelle i cui risultati fossero particolarmente critici col metodo precedente.

STRADE PRESENTI

L'ombreggiamento prolungato di parte della carreggiata stradale può ritardare lo scioglimento del ghiaccio in caso di forte freddo invernale.

Questo porterebbe alla formazione di isolate lenti di ghiaccio che rappresentano un pericolo per la circolazione.

Si è pertanto valutata la presenza del fenomeno di shadow flickering rispetto alle strade più vicine all'impianto.

Per la maggior parte si tratta di strade comunali o vicinali con scarso traffico veicolare, mentre quelle a maggiore percorrenza situate nei pressi sono:

- Strada Provinciale n. 29 Trapani – Salemi,
- Strada di Bonifica 41 n. 8 Allacciamento SP29 con SP44,
- Strada di Bonifica 54 n. 60 Agghiara – Ardignotta.

ANALISI DEI RISULTATI OTTENUTI

Per la simulazione del fenomeno di shadow flickering sono state considerate le varie componenti che influenzano i risultati, ossia l'orografia del territorio, le caratteristiche dell'aerogeneratore (dimensionali e tecnologiche) e le condizioni meteo.

Dall'analisi dei risultati è emerso che rispetto ai recettori sensibili individuati, circa un terzo viene interessato in maniera marginale dal fenomeno rimanendo al di sotto del limite convenzionale delle 30 ore annue, un terzo resta al di sotto del doppio e un terzo supera del doppio il valore convenzionale.

Di seguito si riporta la tabella di sintesi dei risultati ottenuti dalle simulazioni in worst case e in real case, evidenziando:

in arancio i casi in cui si superano le 100 ore annue;

in giallo i casi in cui si superano le 60 ore annue, rimanendo sotto le 100;

in celeste i casi compresi fra le 30 ore annue e le 60.

Calculation Results					
No.	Name	Shadow, worst case		Max shadow hours per day	Shadow, expected values
		Shadow hours per year [h/year]	Shadow days per year [days/year]		Shadow hours per year [h/year]
A	R01	1057:28	282	5:00	504:59
B	R02	321:52	163	2:56	128:07
C	R03	0:00	0	0:00	0:00
D	R04	0:00	0	0:00	0:00
E	R05	0:00	0	0:00	0:00
F	R06	0:00	0	0:00	0:00
G	R07	56:16	96	0:46	25:41
H	R08	33:50	60	0:44	17:28
I	R09	4:44	34	0:12	1:51
J	R10	54:06	90	0:50	34:39
K	R11	164:06	136	1:28	61:30
L	R12	278:42	138	2:54	172:01
M	R13	175:58	134	1:46	99:35
N	R14	0:00	0	0:00	0:00
O	R15	0:00	0	0:00	0:00
P	R16	41:32	97	0:34	21:02
Q	R17	83:52	148	0:48	42:03
R	R18	94:06	76	1:32	46:53
S	R19	160:30	146	1:30	64:44
T	R20	0:00	0	0:00	0:00
U	R21	10:24	60	0:16	5:31
V	R22	0:00	0	0:00	0:00
W	R23	0:00	0	0:00	0:00
X	R24	38:02	124	0:40	19:57
Y	R25	0:00	0	0:00	0:00
Z	R26	59:48	105	0:42	29:52
AA	R27	71:40	128	0:54	36:55

I recettori che non sono stati evidenziati rappresentano quelli che non sono degni di nota, ossia debolmente o per nulla interessati dal fenomeno di shadow flickering.

Nello specifico, considerando il limite delle 30 ore all'anno e il caso reale, il fenomeno risulta essere:

- completamente assente su **n. 10** recettori,
- al di sotto del limite indicato per **n. 7** recettori,
- compreso fra le 30 e le 60 ore annue su **n. 4** recettori,
- oltre il doppio delle 30 ore annue su **n. 3** recettori,
- solo **n. 3** recettori superano le 100 ore annue.

Dei tre recettori che hanno dato il risultato peggiore (R01, R02 e R12) il primo è un piccolo ricovero non accessibile, mentre gli altri due hanno caratteristiche di edifici rurali disabitati o abitati saltuariamente.

Anche per gli edifici in cui si è ottenuto un valore oltre le 60 ore, non sembrano esserci abitazioni e anzi uno dei tre fabbricati risulta collabente.

Nel complesso quindi si ha una situazione abbastanza accettabile, considerata la scarsa permanenza di utenti all'interno degli edifici analizzati e soprattutto di quelli critici.

L'ombreggiamento indotto dalla realizzazione degli aerogeneratori previsti nel progetto proposto sui recettori individuati nell'area d'influenza del parco eolico può quindi ritenersi trascurabile e non produce un impatto considerevole in considerazione:

- delle condizioni di illuminazione esistenti negli orari in cui si manifesterebbe il fenomeno (dominanza di radiazione diffusa rispetto a quella diretta);
- della breve durata di accadimento del fenomeno;
- delle condizioni non reali considerate per l'analisi del fenomeno, ossia il verificarsi contemporaneo delle situazioni più sfavorevoli per un recettore soggetto a *shadow flickering* (concomitanza di assenza di nuvole o nebbia, rotore frontale ai recettori, rotore in movimento continuo, assenza di ostacoli, luce diretta, ecc.);
- della assenza nell'area analizzata di recettori sensibili quali scuole, ospedali, uffici.

In merito alla viabilità, rispetto alle strade indicate che delimitano il parco eolico, la simulazione ha rilevato che la Strada Provinciale n. 29 non è interessata dal fenomeno, essendo questo presente al di sotto delle 30 ore annue.

Stessa cosa dicasi per la Strada di Bonifica 41 n. 8 Allacciamento SP29 con SP44, in cui il limite delle 100 ore annue è superato leggermente per un tratto di circa di 700m.

Per le altre stradine di campagna il fenomeno è più o meno intenso, anche se alcune di queste non risultano nemmeno asfaltate.

Per fronteggiare il pericolo di imbattersi in lenti di ghiaccio sulla carreggiata sarebbe sufficiente mantenere una velocità di percorrenza ridotta soprattutto a seguito di gelate notturne.

D'altronde si tratta di strade di campagna con carreggiate strette e spesso dissestate, e quindi non sarà difficile mantenere velocità moderate, adeguate al tipo di sottofondo che si andrà ad incontrare.

Va precisato comunque che l'ombreggiamento è presente se c'è sole, e questo favorirà lo sciogliersi delle lenti di ghiaccio.

Inoltre l'area geografica di progetto è raramente interessata da fenomeni di gelo intenso che, rappresentando un'insolita situazione di disagio, porterà gli utenti della strada a prestare maggiore attenzione.

CONSIDERAZIONI FINALI

Alla luce dell'analisi effettuata, è risultato che il fenomeno di Shadow Flickering si presenta con un'intensità superiore al valore convenzionale di 30 ore annue su un terzo circa degli edifici presenti, molti dei quali comunque risultano essere capannoni o edifici disabitati o collabenti.

Prendendo in considerazione gli edifici apparentemente abitati, il fenomeno risulta inferiore alle 60 ore annue e si tratta per lo più di aziende agricole o edifici circondati da alberature.

Per gli altri recettori presi in considerazione il fenomeno è irrilevante o gli edifici sono ormai disabitati o inagibili.

Le strutture ricettive presenti (R05, R06, R20) non sono assolutamente interessate dal fenomeno, avendo restituito un valore nullo nella simulazione.

E' importante sottolineare che anche il caso realistico della simulazione del fenomeno, calcolato tenendo conto dell'eliofania locale e delle ore di funzionamento dell'impianto, rappresenta un valore cautelativo, in quanto nella stima non si è tenuto conto degli effetti di mitigazione generati dal fatto che il piano di rotazione delle pale non sempre risulta ortogonale alla direttrice sole-ricettore ed è stata trascurata l'eventuale presenza di ostacoli e/o vegetazione interposti tra il sole ed il singolo ricettore.

Il modello di aerogeneratore scelto per il presente progetto lavora nel range fra i 4,9 e i 12,6 rpm, cui corrisponde una frequenza massima di 0,21Hz, e pertanto la raccomandazione di far lavorare le macchine a velocità di rotazione inferiore ai 20 giri al minuto, equivalente ad una frequenza di molto inferiore ai 2,5Hz in cui si inizia a percepire un senso di fastidio, risulta soddisfatta a prescindere.

Questo comporterà una frequenza di passaggio dell'ombra delle pale notevolmente inferiore a quella ritenuta fastidiosa per la maggior parte degli individui e pertanto l'ombreggiamento indotto dagli aerogeneratori di progetto sui recettori potenzialmente sensibili individuati nell'area d'influenza del parco eolico è da ritenersi trascurabile e tale da non produrre un impatto considerevole.

Si rimarca inoltre che il limite della 30 ore annue è stato assunto dalla scrivente sulla base delle buone norme applicate nelle altre Nazioni europee, ma allo stato attuale non esiste ancora in Italia una legge che regoli di fatto le modalità di misura e i limiti di riferimento per l'analisi dell'impatto del fenomeno di Shadow Flickering.

Foggia, 27/05/2024

Ing. Angela O. CUONZO



ELENCO ALLEGATI

1. REPORT FOTOGRAFICO RECETTORI SENSIBILI
2. SHADOW_MAIN RESULT
 - SINTESI DEGLI IMPATTI ATTESI
 - CALENDARIO CON RISULTATI ANALITICI GIORNALIERI SU OGNI RICETTORE
 - CALENDARIO GRAFICO CON INDICAZIONE DELLE WTG CHE INTERFERISCONO SU OGNI RECETTORE
 - MAPPA ORE ATTESE PER ANNO (RASTER)
 - MAPPA ORE ATTESE PER ANNO
 - MAPPA GIORNI ATTESI PER ANNO
 - MAPPA MASSIMI MINUTI ATTESI AL GIORNO

REPORT FOTOGRAFICO RECETTORI SENSIBILI

PROGETTO EOLICO "MIRABILE" - 42MW

Comune di SALEMI (TP)

AREN Green S.r.l.

RECETTORE	X (EST)	Y (NORD)	Z [m]	ACCATASTATO	STATO
C01	301672	4193870	263,8	NO	Non accessibile
C02	301827	4194044	251,4	SI	Esistente
C03	301208	4195003	256,9	SI	Collabente
C04	301758	4195091	279,3	SI	Esistente
C05	302035	4194904	277,6	SI	Casa vacanze "Mueli"
C06	302159	4194979	293,5	SI	Azienda agricola Mirlocca
C07	302550	4194553	252,3	SI	Capannoni
C08	302602	4193950	274,5	SI	Esistente
C09	303134	4193145	343,2	SI	Esistente
C10	303376	4193072	370,9	SI	Esistente / Abitato
C11	302389	4192876	290,8	SI	Esistente
C12	302189	4192598	278,6	SI	Esistente
C13	302137	4193128	271,0	SI	Collabente
C14	301577	4192244	246,2	SI	Esistente
C15	301252	4191861	243,8	SI	Esistente / Abitato
C16	300574	4193384	219,3	SI	Esistente / Abitato
C17	300386	4193492	211,0	SI	Esistente / Abitato
C18	301314	4193175	237,0	SI	Esistente / Abitato
C19	303724	4194138	320,2	NO	Esistente
C20	304312	4195324	328,0	SI	Ristorante Ardigna
C21	304562	4194356	370,4	SI	Deposito
C22	302642	4191955	307,0	SI	Esistente
C23	302790	4191849	330,0	NO	Esistente / Abitato
C24	302775	4192693	304,6	SI	Esistente
C25	301698	4192908	254,3	SI	Esistente / Abitato
C26	301219	4192403	241,4	NO	Esistente
C27	300989	4193477	222,1	SI	Esistente / Abitato

IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C01

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301672	4193870	263,8
ACCATASTATO	STATO	NOTE
NO	ESISTENTE	NON ACCESSIBILE



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C02

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301827	4194044	251,4
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C03

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301208	4195003	256,9
ACCATASTATO	STATO	NOTE
SI	COLLABENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C04

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301758	4195091	279,3
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C05

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302035	4194904	277,6
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	Casa vacanze "Mueli"



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C06

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302159	4194979	293,5
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	Azienda agricola Mirlocca



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C07

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302550	4194553	252,3
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	CAPANNONI



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C08

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302602	4193950	274,5
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C09

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
303134	4193145	343,2
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C10

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
303376	4193072	370,9
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C11

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302389	4192876	290,8
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C12

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302189	4192598	278,6
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C13

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302137	4193128	271,0
ACCATASTATO	STATO	NOTE
SI	COLLABENTE	--



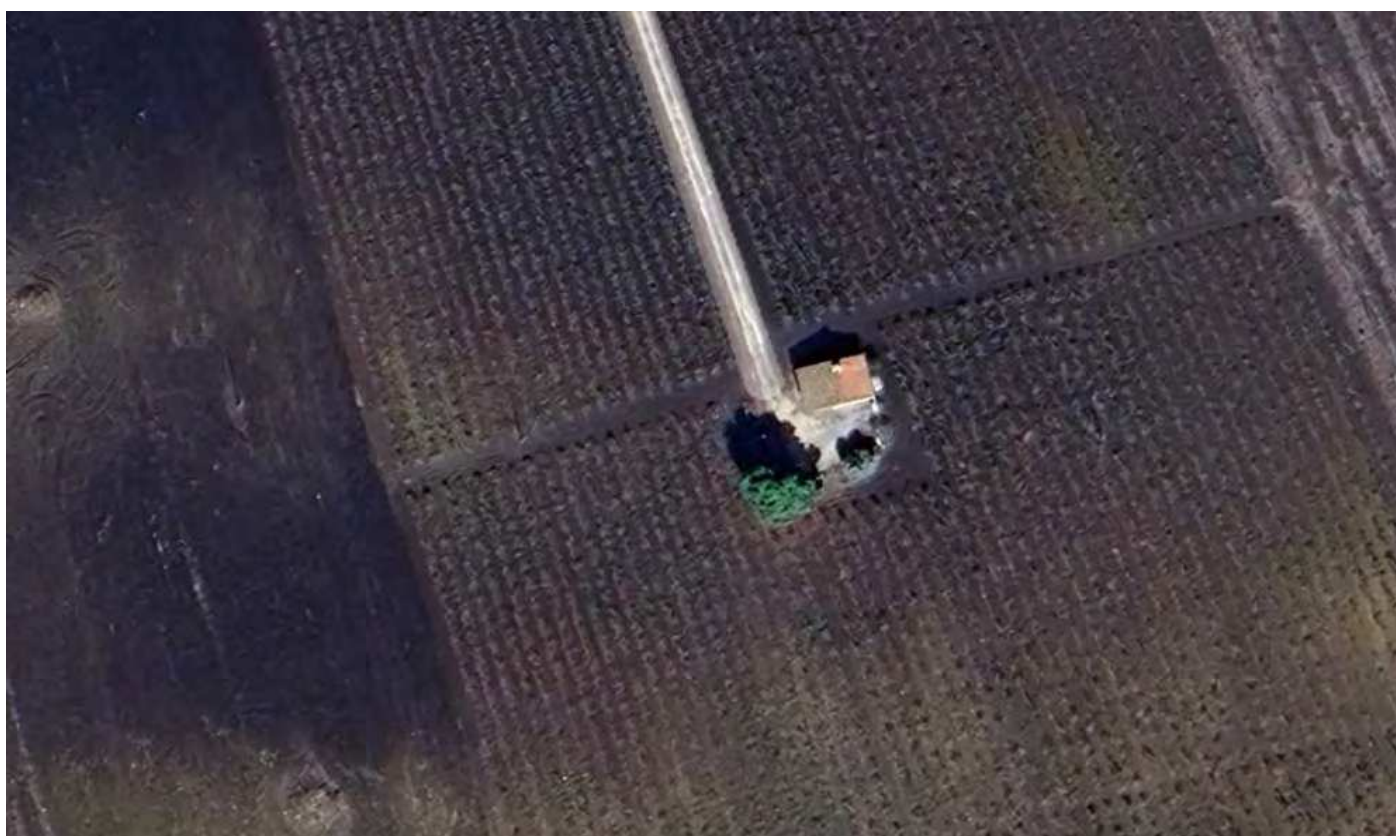
IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C14

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301577	4192244	246,2
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C15

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301252	4191861	243,8
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C16

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
300574	4193384	219,3
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C17

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
300386	4193492	211,0
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



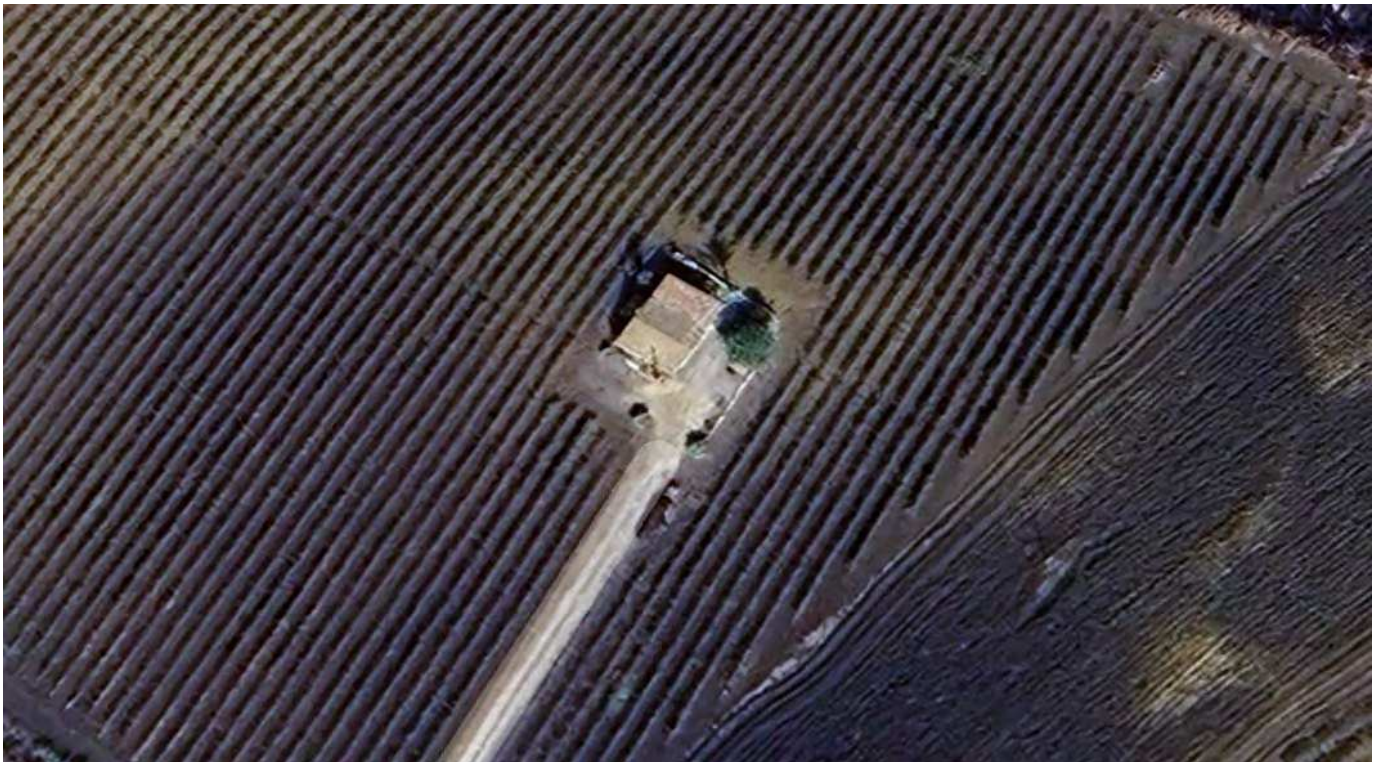
IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C18

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301314	4193175	237,0
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C19

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
303724	4194138	320,2
ACCATASTATO	STATO	NOTE
NO	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C20

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
304312	4195324	328,0
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	Ristorante Ardigna



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C21

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
304562	4194356	370,4
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	DEPOSITO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C22

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302642	4191955	307,0
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C23

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302790	4191849	330,0
ACCATASTATO	STATO	NOTE
NO	ESISTENTE	ABITATO



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C24

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
302775	4192693	304,6
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C25

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301698	4192908	254,3
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



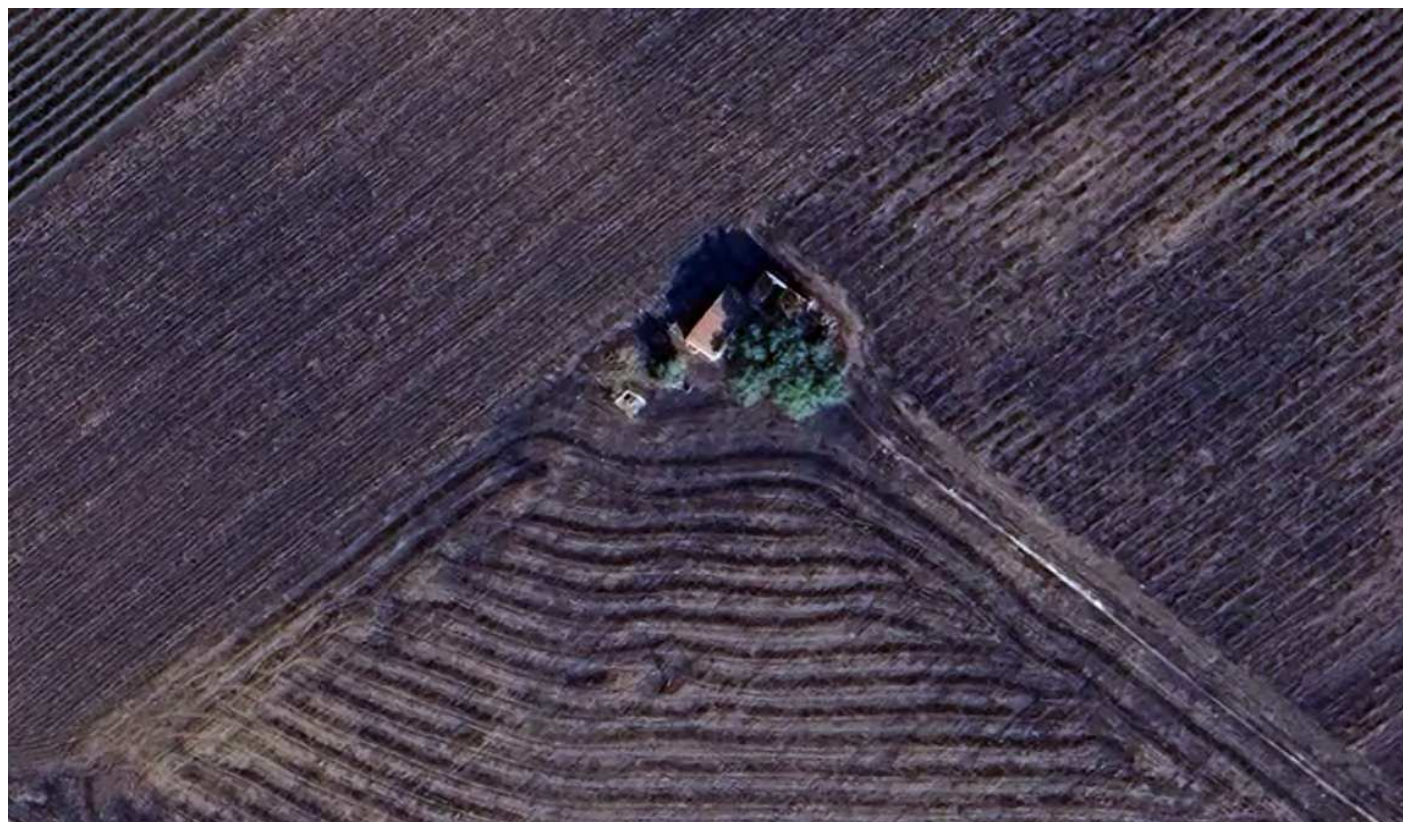
IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE C26

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
301219	4192403	241,4
ACCATASTATO	STATO	NOTE
NO	ESISTENTE	--



IMPIANTO EOLICO "MIRABILE" - 42MW

AREN Green S.r.l.

RECETTORE R27

COMUNE DI SALEMI (TP)

X (EST) [UTM - WGS84]	Y (NORD) [UTM - WGS84]	Z [m]
300989	4193477	222,1
ACCATASTATO	STATO	NOTE
SI	ESISTENTE	ABITATO



ANALISI DEL FENOMENO DI SHADOW FLICKERING

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 1

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Main Result

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Assumptions for shadow calculations

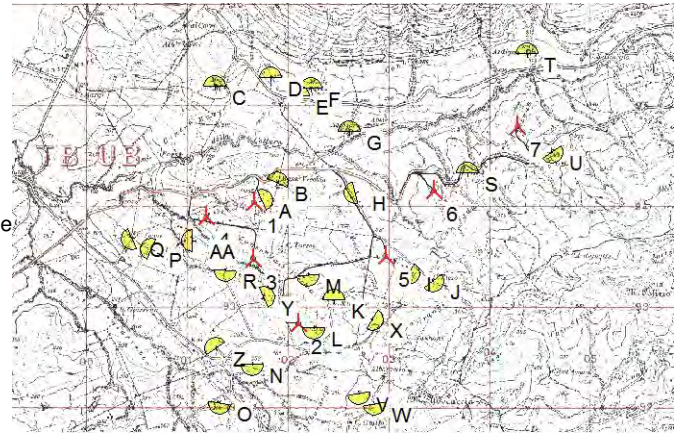
Maximum distance for influence
 Calculate only when more than 20 % of sun is covered by the blade
 Please look in WTG table

Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)
 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	
1	100	620	250	240	160	330	750	680	530	300	380	420
W	WNW	NW	NNW	Sum								
670	610	790	870	8700								



Scale 1:75 000

New WTG

Shadow receptor

WTGs

UTM WGS84 Zone: 33				WTG type			Shadow data				
East	North	Z	Row data/Description	Valid	Manufact.	Type	Power [kW]	Diam. [m]	Height [m]	Calculation distance [m]	RPM [RPM]
1	301 600	4 193 852	259 CM1	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
2	302 044	4 192 652	271 CM2	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
3	301 593	4 193 295	250 CM3	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
4	301 127	4 193 707	227 CM4	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
5	302 905	4 193 320	330 CM5	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
6	303 386	4 193 968	317 CM6	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0
7	304 221	4 194 607	332 CM7	Yes	VESTAS	V150-6.0	6 000	150,0	105,0	1 498	0,0

Shadow receptor-Input

UTM WGS84 Zone: 33											
No.	Name	East	North	Z	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]		
A	R01	301 672	4 193 870	263	0,5	1,0	1,0	62,3	90,0		
B	R02	301 827	4 194 044	251	2,0	1,0	1,0	24,1	90,0		
C	R03	301 208	4 195 003	257	2,0	1,0	1,0	0,0	90,0		
D	R04	301 758	4 195 091	279	3,0	1,0	1,0	0,0	90,0		
E	R05	302 035	4 194 904	278	1,5	1,0	1,0	0,0	90,0		
F	R06	302 159	4 194 979	293	1,0	1,0	1,0	0,0	90,0		
G	R07	302 550	4 194 553	252	2,0	1,0	1,0	0,0	90,0		
H	R08	302 602	4 193 950	274	0,5	1,0	1,0	-103,6	90,0		
I	R09	303 134	4 193 145	343	0,5	1,0	1,0	-241,6	90,0		
J	R10	303 376	4 193 072	371	3,0	1,0	4,0	-219,6	90,0		
K	R11	302 389	4 192 876	291	2,0	1,0	1,0	0,0	90,0		
L	R12	302 189	4 192 598	278	1,5	1,0	1,0	-179,4	90,0		
M	R13	302 137	4 193 128	271	0,5	1,0	1,0	-184,4	90,0		
N	R14	301 577	4 192 244	246	0,5	1,0	1,0	-183,5	90,0		
O	R15	301 252	4 191 861	244	1,0	1,0	1,0	-173,7	90,0		
P	R16	300 574	4 193 384	219	1,5	1,0	1,0	-65,5	90,0		
Q	R17	300 386	4 193 492	211	2,0	1,0	4,0	-115,4	90,0		
R	R18	301 314	4 193 175	237	1,0	1,0	1,0	-174,2	90,0		
S	R19	303 724	4 194 138	320	1,0	1,0	1,0	0,0	90,0		
T	R20	304 312	4 195 324	328	3,0	1,0	4,0	0,0	90,0		
U	R21	304 562	4 194 356	370	1,0	1,0	1,0	-216,0	90,0		
V	R22	302 642	4 191 955	307	1,0	1,0	1,0	-192,4	90,0		
W	R23	302 790	4 191 849	330	1,0	1,0	1,0	-192,4	90,0		

Continued on next page...

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 2

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Main Result**Calculation:** IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

...continued from previous page

UTM WGS84 Zone: 33

No.	Name	East	North	Z	Width	Height	Height	Degrees from	Slope of
					[m]	[m]	a.g.l.	south cw	window
					[m]	[m]	[m]	[°]	[°]
X R24		302 775	4 192 693	305	0,5	1,0	1,0	-240,8	90,0
Y R25		301 698	4 192 908	254	2,0	1,0	1,0	63,4	90,0
Z R26		301 219	4 192 403	241	2,0	1,0	1,0	-37,3	90,0
AA R27		300 989	4 193 477	222	2,0	1,0	1,0	-91,9	90,0

Calculation Results

No.	Name	Shadow, worst case			Shadow, expected values
		Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow hours per year [h/year]
A R01		1057:28	282	5:00	504:59
B R02		321:52	163	2:56	128:07
C R03		0:00	0	0:00	0:00
D R04		0:00	0	0:00	0:00
E R05		0:00	0	0:00	0:00
F R06		0:00	0	0:00	0:00
G R07		56:16	96	0:46	25:41
H R08		33:50	60	0:44	17:28
I R09		4:44	34	0:12	1:51
J R10		54:06	90	0:50	34:39
K R11		164:06	136	1:28	61:30
L R12		278:42	138	2:54	172:01
M R13		175:58	134	1:46	99:35
N R14		0:00	0	0:00	0:00
O R15		0:00	0	0:00	0:00
P R16		41:32	97	0:34	21:02
Q R17		83:52	148	0:48	42:03
R R18		94:06	76	1:32	46:53
S R19		160:30	146	1:30	64:44
T R20		0:00	0	0:00	0:00
U R21		10:24	60	0:16	5:31
V R22		0:00	0	0:00	0:00
W R23		0:00	0	0:00	0:00
X R24		38:02	124	0:40	19:57
Y R25		0:00	0	0:00	0:00
Z R26		59:48	105	0:42	29:52
AA R27		71:40	128	0:54	36:55

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 3

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: A - R01

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June
1	07:25	07:15	17:08 (4) 06:43	13:59 (1) 06:56	13:52 (1) 06:15	13:17 (1) 05:49
17:01	17:32	4	17:12 (4) 18:02	17:41 (4) 19:32	17:50 (1) 19:59	18:01 (1) 20:25
2	07:25	07:14	17:05 (4) 06:41	13:55 (1) 06:55	13:51 (1) 06:14	13:18 (1) 05:49
17:01	17:33	6	17:11 (4) 18:03	17:41 (4) 19:33	17:51 (1) 20:00	18:00 (1) 20:26
3	07:26	07:13	17:02 (4) 06:40	13:52 (1) 06:53	13:49 (1) 06:13	13:17 (1) 05:49
17:02	17:34	10	17:12 (4) 18:04	17:42 (4) 19:33	17:51 (1) 20:01	18:01 (1) 20:27
4	07:26	07:12	16:59 (4) 06:38	13:48 (1) 06:52	13:47 (1) 06:11	13:16 (1) 05:48
17:03	17:35	14	17:13 (4) 18:05	17:42 (4) 19:34	17:51 (1) 20:02	18:00 (1) 20:27
5	07:26	07:11	16:58 (4) 06:37	13:47 (1) 06:50	13:46 (1) 06:10	13:15 (1) 05:48
17:04	17:36	16	17:14 (4) 18:06	17:41 (4) 19:35	17:52 (1) 20:03	18:01 (1) 20:28
6	07:26	07:10	16:57 (4) 06:36	13:44 (1) 06:49	13:45 (1) 06:09	13:14 (1) 05:48
17:05	17:38	18	17:15 (4) 18:07	17:40 (4) 19:36	17:53 (1) 20:04	18:02 (1) 20:29
7	07:26	07:09	16:56 (4) 06:34	13:42 (1) 06:47	13:43 (1) 06:08	13:15 (1) 05:48
17:06	17:39	20	17:16 (4) 18:08	17:38 (4) 19:37	17:53 (1) 20:05	18:01 (1) 20:29
8	07:26	07:08	16:53 (4) 06:33	13:39 (1) 06:46	13:42 (1) 06:07	13:14 (1) 05:47
17:07	17:40	24	17:17 (4) 18:09	17:37 (4) 19:38	17:54 (1) 20:06	18:02 (1) 20:30
9	07:26	07:07	16:52 (4) 06:31	13:37 (1) 06:44	13:40 (1) 06:06	13:13 (1) 05:47
17:07	17:41	26	17:18 (4) 18:10	17:35 (4) 19:39	17:54 (1) 20:07	18:01 (1) 20:30
10	07:26	07:06	16:51 (4) 06:30	13:34 (1) 06:43	13:39 (1) 06:05	13:12 (1) 05:47
17:08	17:42	28	17:19 (4) 18:11	17:34 (4) 19:40	17:55 (1) 20:07	18:02 (1) 20:31
11	07:25	07:05	16:52 (4) 06:28	13:32 (1) 06:42	13:37 (1) 06:04	13:13 (1) 05:47
17:09	17:43	30	17:22 (4) 18:12	17:30 (4) 19:41	17:55 (1) 20:08	18:01 (1) 20:31
12	07:25	07:04	16:51 (4) 06:27	13:29 (1) 06:40	13:36 (1) 06:03	13:12 (1) 05:47
17:10	17:44	32	17:23 (4) 18:13	17:29 (4) 19:42	17:56 (1) 20:09	18:02 (1) 20:32
13	07:25	07:03	16:49 (4) 06:25	13:27 (1) 06:39	13:34 (1) 06:02	13:11 (1) 05:47
17:11	17:45	34	17:23 (4) 18:14	17:25 (4) 19:43	17:56 (1) 20:10	18:01 (1) 20:32
14	07:25	07:02	16:48 (4) 06:24	13:26 (1) 06:37	13:33 (1) 06:01	13:10 (1) 05:47
17:12	17:46	36	17:24 (4) 18:15	17:24 (4) 19:44	17:57 (1) 20:11	18:02 (1) 20:33
15	07:24	07:01	16:47 (4) 06:22	13:22 (1) 06:36	13:34 (1) 06:00	13:09 (1) 05:47
17:13	17:48	38	17:25 (4) 18:16	16:36 (1) 19:45	17:58 (1) 20:12	18:01 (1) 20:33
16	07:24	06:59	16:48 (4) 06:21	13:21 (1) 06:34	13:32 (1) 05:59	13:11 (1) 05:47
17:14	17:49	38	17:26 (4) 18:17	16:37 (1) 19:45	17:58 (1) 20:13	18:03 (1) 20:33
17	07:24	06:58	16:47 (4) 06:19	13:19 (1) 06:33	13:31 (1) 05:59	13:10 (1) 05:47
17:16	17:50	42	17:29 (4) 18:18	16:37 (1) 19:46	17:57 (1) 20:14	18:02 (1) 20:34
18	07:23	06:57	14:51 (1) 06:18	13:16 (1) 06:32	13:29 (1) 05:58	13:09 (1) 05:47
17:17	17:51	72	17:29 (4) 18:19	16:40 (1) 19:47	17:57 (1) 20:15	18:03 (1) 20:34
19	07:23	06:56	14:42 (1) 06:16	13:14 (1) 06:30	13:28 (1) 05:57	13:08 (1) 05:47
17:18	17:52	92	17:30 (4) 18:20	16:40 (1) 19:48	17:58 (1) 20:15	18:02 (1) 20:34
20	07:23	06:55	14:35 (1) 06:15	13:12 (1) 06:29	13:27 (1) 05:56	13:10 (1) 05:47
17:19	17:53	106	17:31 (4) 18:21	16:40 (1) 19:49	17:59 (1) 20:16	18:04 (1) 20:35
21	07:22	06:53	14:30 (1) 06:13	13:11 (1) 06:27	13:25 (1) 05:56	13:09 (1) 05:47
17:20	17:54	120	17:32 (4) 18:22	16:43 (1) 19:50	17:59 (1) 20:17	18:03 (1) 20:35
22	07:22	06:52	14:24 (1) 06:12	13:09 (1) 06:26	13:26 (1) 05:55	13:08 (1) 05:48
17:21	17:55	132	17:34 (4) 18:22	16:43 (1) 19:51	17:58 (1) 20:18	18:02 (1) 20:35
23	07:21	06:51	14:19 (1) 06:10	13:06 (1) 06:25	13:25 (1) 05:54	13:08 (1) 05:48
17:22	17:56	142	17:35 (4) 18:23	16:44 (1) 19:52	17:59 (1) 20:19	18:04 (1) 20:35
24	07:20	06:49	14:16 (1) 06:09	13:04 (1) 06:24	13:24 (1) 05:54	13:07 (1) 05:48
17:23	17:57	150	17:36 (4) 18:24	16:44 (1) 19:53	18:00 (1) 20:19	18:03 (1) 20:35
25	07:20	06:48	14:12 (1) 06:07	13:03 (1) 06:22	13:22 (1) 05:53	13:09 (1) 05:48
17:24	17:58	156	17:36 (4) 18:25	16:47 (1) 19:54	18:00 (1) 20:20	18:03 (1) 20:36
26	07:19	06:47	14:09 (1) 06:06	13:01 (1) 06:21	13:21 (1) 05:52	13:08 (1) 05:49
17:25	17:59	168	17:39 (4) 18:26	16:47 (1) 19:55	17:59 (1) 20:21	18:04 (1) 20:36
27	07:18	06:45	14:04 (1) 06:04	13:00 (1) 06:20	13:22 (1) 05:52	13:08 (1) 05:49
17:26	18:00	176	17:40 (4) 18:27	16:48 (1) 19:56	18:00 (1) 20:22	18:04 (1) 20:36
28	07:18	06:44	14:02 (1) 06:02	12:58 (1) 06:18	13:21 (1) 05:51	13:07 (1) 05:49
17:27	18:01	180	17:40 (4) 18:28	16:48 (1) 19:56	18:01 (1) 20:23	18:03 (1) 20:36
29	07:17		07:01	13:57 (1) 06:17	13:19 (1) 05:51	13:07 (1) 05:50
17:29			19:29	17:49 (1) 19:57	17:59 (1) 20:23	18:05 (1) 20:36
30	07:16		06:59	13:55 (1) 06:16	13:18 (1) 05:50	13:08 (1) 05:50
17:30			19:30	17:49 (1) 19:58	18:00 (1) 20:24	18:04 (1) 20:36
31	07:15		06:58	13:54 (1)	05:50	13:08 (1)
17:31			19:31	17:50 (1)	20:25	18:04 (1)
Potential sun hours	306	302	370	395	440	442
Total, worst case		1910	6552	7892	9030	8946
Sun reduction		0,75	0,77	0,81	0,84	0,92
Oper. time red.		0,99	0,99	0,99	0,99	0,99
Wind dir. red.		0,55	0,55	0,55	0,55	0,55
Total reduction		0,41	0,42	0,44	0,46	0,50
Total, real		784	2762	3500	4153	4507

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)

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 4

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: A - R01

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum	
1	100	620	250	240	160	330	750	680	530	300	380	420	670	610	790	870	8700

	July	August	September	October	November	December					
1	05:51 20:36	13:12 (1) 18:12 (1)	06:12 20:19	13:23 (1) 19:40	06:39 19:40	13:36 (1) 18:54	07:04 210	14:07 (1) 18:05 (4)	06:34 17:12	16:20 (4) 16:51	07:05 16:51
2	05:51 20:36	13:12 (1) 18:10 (1)	06:13 20:18	13:22 (1) 19:39	06:39 256	13:37 (1) 18:53	07:05 212	14:08 (1) 18:08 (4)	06:35 17:11	16:22 (4) 16:48 (4)	07:06 16:51
3	05:51 20:36	13:13 (1) 18:11 (1)	06:14 20:17	13:22 (1) 19:37	06:40 254	13:38 (1) 18:51	07:06 214	14:11 (1) 18:11 (4)	06:36 17:10	16:23 (4) 16:47 (4)	07:07 16:50
4	05:52 20:35	13:13 (1) 18:11 (1)	06:14 20:16	13:23 (1) 19:36	06:41 252	13:39 (1) 18:50	07:07 212	14:12 (1) 18:12 (4)	06:37 17:09	16:26 (4) 16:46 (4)	07:08 16:50
5	05:52 20:35	13:14 (1) 18:12 (1)	06:15 20:15	13:24 (1) 19:34	06:42 250	13:40 (1) 18:48	07:08 212	14:15 (1) 18:13 (4)	06:38 17:08	16:27 (4) 16:45 (4)	07:09 16:50
6	05:53 20:35	13:14 (1) 18:12 (1)	06:16 20:14	13:25 (1) 19:33	06:43 250	13:40 (1) 18:47	07:09 210	14:16 (1) 18:14 (4)	06:39 17:07	16:28 (4) 16:44 (4)	07:10 16:50
7	05:54 20:35	13:15 (1) 18:13 (1)	06:17 20:13	13:24 (1) 19:31	06:44 248	13:41 (1) 18:45	07:10 208	14:19 (1) 18:15 (4)	06:40 17:06	16:29 (4) 16:43 (4)	07:11 16:50
8	05:54 20:35	13:15 (1) 18:11 (1)	06:18 20:12	13:25 (1) 19:30	06:45 246	13:42 (1) 18:44	07:11 208	14:20 (1) 18:16 (4)	06:41 17:05	16:32 (4) 16:42 (4)	07:12 16:50
9	05:55 20:34	13:14 (1) 18:12 (1)	06:19 20:11	13:25 (1) 19:28	06:45 244	13:43 (1) 18:42	07:11 204	14:23 (1) 18:17 (4)	06:43 17:04	16:35 (4) 16:41 (4)	07:13 16:50
10	05:55 20:34	13:15 (1) 18:13 (1)	06:20 20:10	13:26 (1) 19:27	06:46 242	13:44 (1) 18:41	07:12 202	14:25 (1) 18:17 (4)	06:44 17:03	16:36 (4) 16:42 (4)	07:14 16:50
11	05:56 20:34	13:15 (1) 18:13 (1)	06:21 20:09	13:25 (1) 19:25	06:47 238	13:44 (1) 18:39	07:13 198	14:26 (1) 18:16 (4)	06:45 17:02	16:37 (4) 16:43 (4)	07:14 16:50
12	05:57 20:33	13:16 (1) 18:12 (1)	06:21 20:07	13:26 (1) 19:24	06:48 236	13:45 (1) 18:38	07:14 192	14:29 (1) 18:15 (4)	06:46 17:01	16:38 (4) 16:44 (4)	07:15 16:51
13	05:57 20:33	13:16 (1) 18:12 (1)	06:22 20:06	13:27 (1) 19:22	06:49 234	13:46 (1) 18:36	07:15 184	14:32 (1) 18:14 (4)	06:47 17:00	16:39 (4) 16:44 (4)	07:16 16:51
14	05:58 20:32	13:17 (1) 18:13 (1)	06:23 20:05	13:28 (1) 19:21	06:50 232	13:47 (1) 18:35	07:16 176	14:35 (1) 18:11 (4)	06:48 16:59	16:40 (4) 16:45 (4)	07:17 16:51
15	05:59 20:32	13:16 (1) 18:14 (1)	06:24 20:04	13:28 (1) 19:19	06:50 230	13:48 (1) 18:33	07:17 170	14:38 (1) 18:10 (4)	06:49 16:59	16:41 (4) 16:46 (4)	07:17 16:51
16	05:59 20:31	13:16 (1) 18:12 (1)	06:25 20:02	13:27 (1) 19:17	06:51 228	13:48 (1) 18:32	07:18 164	14:41 (1) 18:09 (4)	06:50 16:58	16:42 (4) 16:47 (4)	07:18 16:51
17	06:00 20:31	13:17 (1) 18:13 (1)	06:26 20:01	13:28 (1) 19:16	06:52 226	13:49 (1) 18:31	07:19 158	14:44 (1) 18:08 (4)	06:51 16:57	16:43 (4) 16:48 (4)	07:19 16:52
18	06:01 20:30	13:18 (1) 18:14 (1)	06:27 20:00	13:29 (1) 19:14	06:53 224	13:50 (1) 18:29	07:20 148	14:47 (1) 18:07 (4)	06:52 16:57	16:44 (4) 16:49 (4)	07:19 16:52
19	06:01 20:30	13:19 (1) 18:13 (1)	06:27 19:59	13:30 (1) 19:13	06:54 222	13:51 (1) 18:28	07:21 138	14:52 (1) 18:04 (4)	06:53 16:56	16:45 (4) 16:50 (4)	07:20 16:53
20	06:02 20:29	13:17 (1) 18:13 (1)	06:28 19:57	13:30 (1) 19:11	06:55 218	13:52 (1) 18:27	07:22 126	14:57 (1) 18:03 (4)	06:54 16:55	16:46 (4) 16:51 (4)	07:21 16:53
21	06:03 20:28	13:18 (1) 18:14 (1)	06:29 19:56	13:31 (1) 19:10	06:56 214	13:55 (1) 18:25	07:23 118	15:00 (1) 18:02 (4)	06:55 16:55	16:47 (4) 16:50 (4)	07:21 16:53
22	06:04 20:28	13:19 (1) 18:13 (1)	06:30 19:55	13:30 (1) 19:08	06:56 212	13:55 (1) 18:24	07:24 104	15:08 (1) 18:02 (4)	06:56 16:54	16:48 (4) 16:51 (4)	07:22 16:54
23	06:05 20:27	13:20 (1) 18:14 (1)	06:31 19:53	13:31 (1) 19:06	06:57 210	13:56 (1) 18:23	07:25 88	15:15 (1) 18:01 (4)	06:57 16:54	16:49 (4) 16:52 (4)	07:22 16:54
24	06:05 20:26	13:20 (1) 18:12 (1)	06:32 19:52	13:32 (1) 19:05	06:58 206	13:57 (1) 18:21	07:26 62	15:26 (1) 17:58 (4)	06:58 16:53	16:50 (4) 16:53 (4)	07:23 16:55
25	06:06 20:25	13:19 (1) 18:13 (1)	06:33 19:50	13:33 (1) 19:03	06:59 204	13:58 (1) 18:20	07:27 40	16:17 (4) 16:57 (4)	06:59 16:53	16:51 (4) 16:56 (4)	07:23 16:56
26	06:07 20:25	13:20 (1) 18:14 (1)	06:33 19:49	13:33 (1) 19:02	07:00 200	14:01 (1) 17:19	06:28 38	16:18 (4) 16:56 (4)	07:01 16:52	16:52 (4) 16:57 (4)	07:23 16:56
27	06:08 20:24	13:21 (1) 18:13 (1)	06:34 19:48	13:34 (1) 19:00	07:01 198	14:02 (1) 17:18	06:29 38	16:17 (4) 16:55 (4)	07:02 16:52	16:53 (4) 16:57 (4)	07:24 16:57
28	06:09 20:23	13:22 (1) 18:14 (1)	06:35 19:46	13:35 (1) 18:59	07:02 194	14:03 (1) 17:16	06:30 36	16:18 (4) 16:54 (4)	07:03 16:52	16:54 (4) 16:57 (4)	07:24 16:57
29	06:09 20:22	13:20 (1) 18:12 (1)	06:36 19:45	13:34 (1) 18:57	07:02 200	14:03 (1) 17:15	06:31 34	16:19 (4) 16:53 (4)	07:04 16:51	16:55 (4) 16:58 (4)	07:24 16:58
30	06:10 20:21	13:21 (1) 18:13 (1)	06:37 19:43	13:35 (1) 18:56	07:03 206	14:06 (1) 17:14	06:32 32	16:20 (4) 16:52 (4)	07:05 16:51	16:56 (4) 16:59 (4)	07:25 16:59
31	06:11 20:20	13:22 (1) 18:12 (1)	06:38 19:42	13:35 (1) 17:55 (1)	07:04 260	14:07 (1) 17:13	06:33 28	16:21 (4) 16:49 (4)	07:06 17:00	16:60 (4) 16:63 (4)	07:25 17:00
Potential sun hours	450	422	374	348	305	297					
Total, worst case	9164	8596	6832	4364	162	726					
Sun reduction	0,96	0,97	0,87	0,79	0,99	0,55					
Oper. time red.	0,99	0,99	0,99	0,99	0,99	0,55					
Wind dir. red.	0,55	0,55	0,55	0,55	0,55	0,42					
Total reduction	0,53	0,53	0,48	0,43	0,42	0,42					
Total, real	4817	4566	3255	1887	67	297					

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 5

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: B - R02

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time
 N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June
1	07:25 17:01 100	14:28 (1) 16:08 (1) 17:32	07:15 17:10 (4) 18:02	08:04 (5) 17:10 (4) 18:02	06:43 16:13 (1) 19:32	05:49 19:59 20:25
2	07:25 17:01 100	14:28 (1) 16:08 (1) 17:33	07:14 17:11 (4) 18:03	08:05 (5) 17:11 (4) 18:03	06:41 16:11 (1) 19:33	05:49 20:00 20:26
3	07:26 17:02 104	08:00 (5) 16:08 (1) 17:34	07:13 17:12 (4) 18:04	08:06 (5) 17:12 (4) 18:04	06:40 16:10 (1) 19:33	05:49 20:01 20:27
4	07:26 17:03 106	08:00 (5) 16:08 (1) 17:35	07:12 17:13 (4) 18:05	14:33 (1) 17:13 (4) 18:05	06:38 16:08 (1) 19:34	05:48 20:02 20:27
5	07:26 17:04 112	07:58 (5) 16:10 (1) 17:36	07:11 17:14 (4) 18:06	14:34 (1) 17:14 (4) 18:06	06:37 16:07 (1) 19:35	05:48 20:03 20:28
6	07:26 17:05 114	07:58 (5) 16:10 (1) 17:38	07:10 17:15 (4) 18:07	14:35 (1) 17:15 (4) 18:07	06:36 16:04 (1) 19:36	05:48 20:04 20:29
7	07:26 17:06 120	07:58 (5) 16:42 (4) 17:39	07:09 17:16 (4) 18:08	14:34 (1) 17:16 (4) 18:08	06:34 16:02 (1) 19:37	05:48 20:05 20:29
8	07:26 17:07 122	07:56 (5) 16:42 (4) 17:40	07:08 17:15 (4) 18:09	14:35 (1) 17:15 (4) 18:09	06:33 15:09 (1) 19:38	05:47 20:06 20:30
9	07:26 17:07 126	07:56 (5) 16:42 (4) 17:41	07:07 17:16 (4) 18:10	14:36 (1) 17:16 (4) 18:10	06:31 15:13 (1) 19:39	05:47 20:07 20:30
10	07:26 17:08 132	07:56 (5) 16:44 (4) 17:42	07:06 17:15 (4) 18:11	14:37 (1) 17:15 (4) 18:11	06:30 15:16 (1) 19:40	05:47 20:07 20:31
11	07:25 17:09 134	07:56 (5) 16:46 (4) 17:43	07:05 17:14 (4) 18:12	14:36 (1) 17:14 (4) 18:12	06:28 15:20 (1) 19:41	05:47 20:08 20:31
12	07:25 17:10 140	07:55 (5) 16:45 (4) 17:44	07:04 17:13 (4) 18:13	14:37 (1) 17:13 (4) 18:13	06:27 15:27 (1) 19:42	05:47 20:09 20:32
13	07:25 17:11 142	07:55 (5) 16:47 (4) 17:45	07:03 17:11 (4) 18:14	14:37 (1) 17:11 (4) 18:14	06:25 19:43 20:10	05:47 20:32 20:32
14	07:25 17:12 146	07:55 (5) 16:49 (4) 17:46	07:02 17:10 (4) 18:15	14:38 (1) 17:10 (4) 18:15	06:24 19:44 20:11	05:47 20:33 20:33
15	07:24 17:13 148	07:54 (5) 16:48 (4) 17:47	07:01 17:07 (4) 18:16	14:39 (1) 17:07 (4) 18:16	06:22 19:45 20:12	05:47 20:33 20:33
16	07:24 17:14 150	07:56 (5) 16:50 (4) 17:49	06:59 17:06 (4) 18:17	14:40 (1) 17:06 (4) 18:17	06:21 19:45 20:13	05:47 20:33 20:33
17	07:24 17:15 154	07:56 (5) 16:52 (4) 17:50	06:58 17:03 (4) 18:18	14:41 (1) 17:03 (4) 18:18	06:19 19:46 20:14	05:47 20:34 20:34
18	07:23 17:17 156	07:55 (5) 16:53 (4) 17:51	06:57 16:23 (1) 18:19	14:41 (1) 17:04 (1) 18:19	06:18 19:47 20:15	05:47 20:34 20:34
19	07:23 17:18 158	07:55 (5) 16:53 (4) 17:52	06:56 16:22 (1) 18:20	14:42 (1) 17:05 (1) 18:20	06:16 19:48 20:15	05:47 20:34 20:34
20	07:23 17:19 160	07:56 (5) 16:54 (4) 17:53	06:55 16:21 (1) 18:21	14:43 (1) 17:06 (1) 18:21	06:15 19:49 20:16	05:47 20:35 20:35
21	07:22 17:20 160	07:56 (5) 16:56 (4) 17:54	06:53 16:22 (1) 18:22	14:44 (1) 17:07 (1) 18:22	06:13 19:50 20:17	05:47 20:35 20:35
22	07:21 17:21 164	07:55 (5) 16:57 (4) 17:55	06:52 14:46 (1) 18:22	14:46 (1) 16:20 (1) 18:22	06:12 19:51 20:18	05:48 20:35 20:35
23	07:21 17:22 168	07:56 (5) 16:58 (4) 17:56	06:51 16:19 (1) 18:23	14:47 (1) 17:08 (1) 18:23	06:10 19:52 20:19	05:48 20:35 20:35
24	07:20 17:23 168	07:56 (5) 17:00 (4) 17:57	06:49 14:48 (1) 18:24	14:48 (1) 16:18 (1) 18:24	06:09 19:53 20:19	05:48 20:35 20:35
25	07:20 17:24 170	07:57 (5) 17:01 (4) 17:58	06:48 14:48 (1) 18:25	14:48 (1) 16:16 (1) 18:25	06:07 19:54 20:20	05:48 20:36 20:36
26	07:19 17:25 170	07:56 (5) 17:02 (4) 17:59	06:47 16:17 (1) 18:26	14:51 (1) 14:51 (1) 18:26	06:05 19:55 20:21	05:49 20:36 20:36
27	07:18 17:26 172	07:58 (5) 17:04 (4) 18:00	06:45 16:16 (1) 18:27	14:52 (1) 16:16 (1) 18:27	06:04 19:56 20:22	05:49 20:36 20:36
28	07:18 17:27 170	07:59 (5) 17:05 (4) 18:01	06:44 16:14 (1) 18:28	14:54 (1) 16:14 (1) 18:28	06:02 19:56 20:23	05:49 20:36 20:36
29	07:17 17:29 172	08:00 (5) 17:06 (4) 18:02	07:01 19:29 20:23	07:01 19:29 20:23	06:17 19:57 20:23	05:50 20:36 20:36
30	07:16 17:30 176	07:59 (5) 17:07 (4) 18:03	06:59 19:30 20:24	06:59 19:30 20:24	06:16 19:58 20:24	05:50 20:36 20:36
31	07:15 17:31 172	08:00 (5) 17:08 (4) 18:04	06:58 19:31 20:25	06:58 19:31 20:25	05:50 20:25 20:25	05:50 442 442
Potential sun hours	306	302	370	395	440	442
Total, worst case	4486	3522	650			
Sun reduction	0,66	0,75	0,77			
Oper. time red.	0,99	0,99	0,99			
Wind dir. red.	0,56	0,54	0,54			
Total reduction	0,37	0,40	0,41			
Total, real	1657	1420	268			

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 6

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: B - R02

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	July	August	September	October	November	December
1	05:51	06:12	06:39	07:04	16:11 (1)	06:34
	20:36	20:19	19:40	18:54	6 16:17 (1)	17:12
2	05:51	06:13	06:39	07:05	16:00 (1)	06:35
	20:36	20:18	19:39	18:53	26 16:26 (1)	17:11
3	05:51	06:14	06:40	07:06	15:55 (1)	06:36
	20:36	20:17	19:37	18:51	34 16:29 (1)	17:10
4	05:52	06:14	06:41	07:07	15:52 (1)	06:37
	20:35	20:16	19:36	18:50	40 16:32 (1)	17:09
5	05:52	06:15	06:42	07:08	15:47 (1)	06:38
	20:35	20:15	19:34	18:48	48 16:35 (1)	17:08
6	05:53	06:16	06:43	07:09	15:44 (1)	06:39
	20:35	20:14	19:33	18:47	54 16:38 (1)	17:07
7	05:54	06:17	06:44	07:10	15:41 (1)	06:40
	20:35	20:13	19:31	18:45	58 16:39 (1)	17:06
8	05:54	06:18	06:45	07:11	15:40 (1)	06:41
	20:35	20:12	19:30	18:44	60 16:40 (1)	17:05
9	05:55	06:19	06:45	07:11	15:37 (1)	06:43
	20:34	20:11	19:28	18:42	66 16:43 (1)	17:04
10	05:55	06:20	06:46	07:12	15:33 (1)	06:44
	20:34	20:10	19:27	18:41	70 16:43 (1)	17:03
11	05:56	06:20	06:47	07:13	15:30 (1)	06:45
	20:34	20:09	19:25	18:39	74 16:44 (1)	17:02
12	05:57	06:21	06:48	07:14	15:29 (1)	06:46
	20:33	20:07	19:24	18:38	76 16:45 (1)	17:01
13	05:57	06:22	06:49	07:15	15:26 (1)	06:47
	20:33	20:06	19:22	18:36	80 16:46 (1)	17:00
14	05:58	06:23	06:50	07:16	15:25 (1)	06:48
	20:32	20:05	19:21	18:35	82 16:47 (1)	16:59
15	05:59	06:24	06:50	07:17	15:24 (1)	06:49
	20:32	20:04	19:19	18:33	84 16:48 (1)	16:59
16	05:59	06:25	06:51	07:18	15:21 (1)	06:50
	20:31	20:02	19:17	18:32	88 16:49 (1)	16:58
17	06:00	06:26	06:52	07:19	15:20 (1)	06:51
	20:31	20:01	19:16	18:31	88 16:48 (1)	16:57
18	06:01	06:27	06:53	07:20	15:19 (1)	06:52
	20:30	20:00	19:14	18:29	90 16:49 (1)	16:57
19	06:01	06:27	06:54	07:21	15:16 (1)	06:53
	20:30	19:59	19:13	18:28	94 16:50 (1)	16:56
20	06:02	06:28	06:55	07:22	15:15 (1)	06:54
	20:29	19:57	19:11	18:27	96 16:51 (1)	16:55
21	06:03	06:29	06:56	07:23	15:14 (1)	06:55
	20:28	19:56	19:10	18:25	96 16:50 (1)	16:55
22	06:04	06:30	06:56	07:24	15:14 (1)	06:56
	20:28	19:55	19:08	18:24	98 16:52 (1)	16:54
23	06:05	06:31	06:57	07:25	15:13 (1)	06:57
	20:27	19:53	19:06	18:23	100 16:53 (1)	16:54
24	06:05	06:32	06:58	07:26	15:12 (1)	06:58
	20:26	19:52	19:05	18:21	108 17:28 (4)	16:53
25	06:06	06:33	06:59	06:27	14:11 (1)	06:59
	20:25	19:50	19:03	17:20	118 16:33 (4)	16:53
26	06:07	06:33	07:00	06:28	14:10 (1)	07:01
	20:25	19:49	19:02	17:19	126 16:36 (4)	16:52
27	06:08	06:34	07:01	06:29	14:09 (1)	07:02
	20:24	19:48	19:00	17:18	132 16:39 (4)	16:52
28	06:09	06:35	07:02	06:30	14:08 (1)	07:03
	20:23	19:46	18:59	17:16	136 16:40 (4)	16:52
29	06:09	06:36	07:02	06:31	14:07 (1)	07:04
	20:22	19:45	18:57	17:15	142 16:41 (4)	16:51
30	06:10	06:37	07:03	06:32	14:06 (1)	07:05
	20:21	19:43	18:56	17:14	144 16:42 (4)	16:51
31	06:11	06:38	06:33	06:33	14:05 (1)	07:05
	20:20	19:42	17:13	14:05 (1)	148 16:43 (4)	17:00
Potential sun hours	450	422	374	348	305	297
Total, worst case				2662	4776	3216
Sun reduction				0,79	0,76	0,69
Oper. time red.				0,99	0,99	0,99
Wind dir. red.				0,54	0,56	0,54
Total reduction				0,42	0,42	0,37
Total, real				1125	2017	1202

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 7

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: C - R03

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:06
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:07
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:13	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:34	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:43	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:26	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:08	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:42	06:04	05:47	05:56	06:21	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:48	18:16	19:45	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:03	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:15	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:23	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:21
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:22	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:07	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	05:54	05:48	06:05	06:32	06:58	07:26	06:59	07:23
	17:23	17:57	18:24	19:53	20:20	20:36	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	07:00	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:06	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:01	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:27	18:01	18:28	19:57	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:03	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:05	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:16		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 8

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: D - R04

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:50	06:12	06:39	07:04	06:34	07:06
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:12	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:34	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:47	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:43	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:26	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:08	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:45	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:03	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:15	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:23	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:21
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:22	06:52	06:12	06:26	05:55	05:47	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	05:53	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	07:00	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:01	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:27	18:01	18:28	19:57	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:05	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 9

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: E - R05

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:50	06:12	06:39	07:04	06:34	07:06
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:12	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:47	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:43	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:26	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:08	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:37	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:45	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:15	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:52
20	07:23	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:21
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:22	06:52	06:12	06:26	05:55	05:47	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	05:53	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:01	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:27	18:01	18:28	19:56	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:05	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker
			(WTG causing flicker last time)

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 10

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: F - R06

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:50	06:12	06:39	07:04	06:34	07:06
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:12	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:47	05:53	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:43	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:26	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:37	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:15	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:52
20	07:23	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:21
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:22	06:52	06:12	06:26	05:55	05:47	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	05:53	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:01	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:27	18:01	18:28	19:56	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:05	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		16:59
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 11

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: G - R07

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:25 17:00	08:00 (6) 16:26 (1)	07:15 17:32	08:04 (6) 18:02	06:43 19:32	06:56 19:59	05:49 20:25	05:50 20:36	06:12 20:19	06:39 19:40	06:34 18:54	07:05 17:12	07:42 (6) 16:06 (1)
2	07:25 17:01	08:00 (6) 16:26 (1)	07:14 17:33	08:05 (6) 18:03	06:41 19:33	06:55 20:00	06:14 20:26	05:51 20:36	06:13 20:18	06:39 19:39	06:35 18:53	07:11 17:11	07:43 (6) 16:07 (1)
3	07:26 17:02	08:00 (6) 16:26 (1)	07:13 17:34	08:06 (6) 18:04	06:40 19:33	06:53 20:01	06:12 20:27	05:49 20:36	06:14 20:17	06:40 19:37	06:36 18:51	07:06 17:10	07:44 (6) 16:10 (1)
4	07:26 17:03	08:00 (6) 16:26 (1)	07:12 17:35	08:09 (6) 18:05	06:38 19:34	06:52 20:02	06:11 20:27	05:48 20:35	06:14 20:16	06:41 19:36	06:37 18:50	07:07 17:09	07:45 (6) 16:11 (1)
5	07:26 17:04	08:00 (6) 16:26 (1)	07:11 17:36	08:10 (6) 18:06	06:37 19:35	06:50 20:03	06:10 20:28	05:52 20:35	06:15 20:15	06:42 19:34	06:38 18:48	07:08 17:08	07:46 (6) 16:12 (1)
6	07:26 17:05	08:00 (6) 16:26 (1)	07:10 17:38	08:13 (6) 18:07	06:35 19:36	06:49 20:04	06:09 20:29	05:48 20:35	06:16 20:14	06:43 19:33	06:39 18:46	07:09 17:07	07:46 (6) 16:12 (1)
7	07:26 17:06	08:00 (6) 16:26 (1)	07:09 17:39	08:27 (6) 18:08	06:34 19:37	06:47 20:05	06:08 20:29	05:47 20:35	06:17 20:13	06:44 19:31	07:10 18:45	07:37 (6) 17:05	07:47 (6) 16:13 (1)
8	07:26 17:07	08:00 (6) 16:26 (1)	07:08 17:40	08:24 (6) 18:09	06:33 19:38	06:46 20:06	06:07 20:30	05:47 20:35	06:18 20:12	06:44 19:30	07:11 18:44	07:36 (6) 17:05	07:48 (6) 16:14 (1)
9	07:26 17:07	08:00 (6) 16:26 (1)	07:07 17:41	06:31 18:10	06:44 19:39	06:06 20:07	05:47 20:30	05:55 20:34	06:19 20:11	06:45 19:28	07:11 18:42	07:35 (6) 17:04	07:49 (6) 16:15 (1)
10	07:25 17:08	08:00 (6) 16:24 (1)	07:06 17:42	06:30 18:11	06:43 19:40	06:05 20:07	05:47 20:31	05:55 20:34	06:20 20:10	06:46 19:27	07:12 18:41	07:36 (6) 17:03	07:50 (6) 16:16 (1)
11	07:25 17:09	08:00 (6) 16:24 (1)	07:05 17:43	06:28 18:12	06:41 19:41	06:04 20:08	05:47 20:31	05:56 20:34	06:20 20:09	06:47 19:25	07:13 18:39	07:36 (6) 17:02	07:51 (6) 16:17 (1)
12	07:25 17:10	08:00 (6) 16:21 (1)	07:04 17:44	06:27 18:13	06:40 19:42	06:03 20:09	05:47 20:32	05:57 20:33	06:21 20:07	06:48 19:24	07:14 18:38	07:35 (6) 17:01	07:51 (6) 16:17 (1)
13	07:25 17:11	08:00 (6) 16:21 (1)	07:03 17:45	06:25 18:14	06:39 19:43	06:02 20:10	05:47 20:32	05:57 20:33	06:22 20:06	06:49 19:22	07:15 18:36	07:34 (6) 17:00	07:54 (6) 16:18 (1)
14	07:25 17:12	08:00 (6) 16:21 (1)	07:02 17:46	06:24 18:15	06:37 19:44	06:01 20:11	05:47 20:33	05:58 20:32	06:23 20:05	06:50 19:21	07:16 18:35	07:33 (6) 16:59	07:55 (6) 16:19 (1)
15	07:24 17:13	08:00 (6) 16:21 (1)	07:01 17:47	06:22 18:16	06:36 19:44	06:00 20:12	05:47 20:33	05:59 20:32	06:24 20:04	06:50 19:19	07:17 18:33	07:34 (6) 16:59	07:56 (6) 16:20 (1)
16	07:24 17:14	08:00 (6) 16:21 (1)	07:00 17:49	06:21 18:17	06:34 19:45	05:59 20:13	05:47 20:33	05:59 20:31	06:25 20:02	06:51 19:17	07:18 18:32	07:33 (6) 16:58	07:56 (6) 16:20 (1)
17	07:24 17:15	08:00 (6) 16:21 (1)	06:58 17:50	06:19 18:18	06:33 19:46	05:59 20:14	05:47 20:34	06:00 20:31	06:26 20:01	06:52 19:16	07:19 18:31	07:35 (6) 16:57	07:59 (6) 16:19 (1)
18	07:23 17:17	08:00 (6) 16:21 (1)	06:57 17:51	06:18 18:19	06:32 19:47	05:58 20:14	05:47 20:34	06:01 20:30	06:27 20:00	06:53 19:14	07:20 18:29	07:36 (6) 16:57	07:59 (6) 16:19 (1)
19	07:23 17:18	08:00 (6) 16:21 (1)	06:56 17:52	06:16 18:20	06:30 19:48	05:57 20:15	05:47 20:34	06:01 20:30	06:27 19:59	06:54 19:13	07:21 18:28	07:35 (6) 16:56	08:00 (6) 16:20 (1)
20	07:22 17:19	08:00 (6) 16:21 (1)	06:54 17:53	06:15 18:21	06:29 19:49	05:56 20:16	05:47 20:35	06:02 20:29	06:28 19:57	06:55 19:11	07:22 18:27	07:34 (6) 16:55	08:00 (6) 16:20 (1)
21	07:22 17:20	08:00 (6) 16:21 (1)	06:53 17:54	06:13 18:21	06:27 19:50	05:56 20:17	05:47 20:35	06:03 20:28	06:29 19:56	06:56 19:10	07:23 18:25	07:35 (6) 16:55	08:01 (6) 16:21 (1)
22	07:21 17:21	08:00 (6) 16:21 (1)	06:52 17:55	06:12 18:22	06:26 19:51	05:55 20:18	05:47 20:35	06:04 20:28	06:30 19:55	06:56 19:08	07:24 18:24	07:36 (6) 16:54	08:01 (6) 16:21 (1)
23	07:21 17:22	08:00 (6) 16:21 (1)	06:51 17:56	06:10 18:23	06:25 19:52	05:54 20:19	05:48 20:35	06:04 20:27	06:31 19:53	06:57 19:06	07:25 18:23	07:36 (6) 16:54	08:02 (6) 16:22 (1)
24	07:20 17:23	08:00 (6) 16:21 (1)	06:49 17:57	06:09 18:24	06:23 19:53	05:53 20:19	05:48 20:35	06:05 20:26	06:32 19:52	06:58 19:05	07:26 18:21	07:36 (6) 16:53	08:02 (6) 16:22 (1)
25	07:20 17:24	08:00 (6) 16:21 (1)	06:48 17:58	06:07 18:25	06:22 19:54	05:53 20:20	05:48 20:36	06:06 20:25	06:33 19:50	06:59 19:03	07:27 18:20	07:37 (6) 16:53	08:03 (6) 16:23 (1)
26	07:19 17:25	08:00 (6) 16:21 (1)	06:47 17:59	06:05 18:26	06:21 19:55	05:52 20:21	05:49 20:36	06:07 20:25	06:33 19:49	07:00 19:02	07:28 18:19	07:37 (6) 16:52	08:03 (6) 16:23 (1)
27	07:18 17:26	08:00 (6) 16:21 (1)	06:45 18:00	06:04 18:27	06:20 19:56	05:52 20:22	05:49 20:36	06:08 20:24	06:34 19:48	07:01 19:00	07:29 18:18	07:38 (6) 16:52	08:04 (6) 16:24 (1)
28	07:18 17:27	08:00 (6) 16:21 (1)	06:44 18:01	06:02 18:28	06:18 19:56	05:51 20:23	05:49 20:36	06:09 20:23	06:35 19:46	07:02 18:59	07:30 18:16	07:39 (6) 16:52	08:04 (6) 16:24 (1)
29	07:17 17:29	08:00 (6) 16:21 (1)	06:43 18:02	06:01 19:29	06:17 19:57	05:51 20:23	05:50 20:36	06:09 20:22	06:36 19:45	07:02 18:57	07:31 17:15	07:40 (6) 16:51	08:04 (6) 16:24 (1)
30	07:16 17:30	08:00 (6) 16:21 (1)	06:42 18:03	06:00 19:30	06:16 19:58	05:50 20:24	05:50 20:36	06:10 20:21	06:37 19:43	07:03 18:56	07:32 17:14	07:41 (6) 16:51	08:04 (6) 16:25 (1)
31	07:15 17:31	08:00 (6) 16:21 (1)	06:41 18:04	06:00 19:31	06:15 20:25	05:50 20:25	05:50 20:36	06:11 20:20	06:38 19:42	07:03 18:56	07:33 17:13	07:42 (6) 16:50	08:04 (6) 16:26 (1)
Potential sun hours	306	302	302	370	395	440	442	450	422	374	348	305	297
Total, worst case	1164	148									828		1236
Sun reduction	0,66	0,75									0,76		0,69
Oper. time red.	0,99	0,99									0,99		0,99
Wind dir. red.	0,68	0,71									0,71		0,60
Total reduction	0,44	0,53									0,54		0,41
Total, real	514	79									445		504

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 12

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: H - R08

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:25	07:15	06:43	06:56	07:26 (6)	06:15	05:49	05:50	06:12	06:39	07:14 (6)	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	28 07:54 (6)	19:59	20:25	20:36	20:19	19:40	44 07:58 (6)	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	07:24 (6)	06:14	05:49	05:51	06:13	06:39	07:13 (6)	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	32 07:56 (6)	20:00	20:26	20:36	20:18	19:39	44 07:57 (6)	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	07:23 (6)	06:12	05:49	05:51	06:14	06:40	07:14 (6)	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	34 07:57 (6)	20:01	20:27	20:36	20:17	19:37	42 07:56 (6)	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	07:21 (6)	06:11	05:48	05:52	06:14	06:41	07:15 (6)	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	36 07:57 (6)	20:02	20:27	20:35	20:16	19:36	42 07:57 (6)	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	07:20 (6)	06:10	05:48	05:52	06:15	06:42	07:13 (6)	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	38 07:58 (6)	20:03	20:28	20:35	20:15	19:34	42 07:55 (6)	18:48	17:08	16:50
6	07:26	07:10	06:35	06:49	07:18 (6)	06:09	05:48	05:53	06:16	06:43	07:14 (6)	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	40 07:58 (6)	20:04	20:29	20:35	20:14	19:33	40 07:54 (6)	18:46	17:07	16:50
7	07:26	07:09	06:34	06:47	07:17 (6)	06:08	05:47	05:54	06:17	06:44	07:15 (6)	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	42 07:59 (6)	20:05	20:29	20:35	20:13	19:31	38 07:53 (6)	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	07:18 (6)	06:07	05:47	05:54	06:18	06:44	07:16 (6)	07:10	06:41	07:12
	17:07	17:40	18:09	19:38	42 08:00 (6)	20:06	20:30	20:35	20:12	19:30	36 07:52 (6)	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	07:16 (6)	06:06	05:47	05:55	06:19	06:45	07:17 (6)	07:11	06:42	07:13
	17:07	17:41	18:10	19:39	42 07:58 (6)	20:07	20:30	20:34	20:11	19:28	34 07:51 (6)	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	07:15 (6)	06:05	05:47	05:55	06:20	06:46	07:18 (6)	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	44 07:59 (6)	20:07	20:31	20:34	20:10	19:27	32 07:50 (6)	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	07:15 (6)	06:04	05:47	05:56	06:20	06:47	07:18 (6)	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	44 07:59 (6)	20:08	20:31	20:34	20:09	19:25	28 07:46 (6)	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	07:16 (6)	06:03	05:47	05:57	06:21	06:48	07:19 (6)	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	42 07:58 (6)	20:09	20:32	20:33	20:07	19:24	26 07:45 (6)	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	07:14 (6)	06:02	05:47	05:57	06:22	06:49	07:22 (6)	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	44 07:58 (6)	20:10	20:32	20:33	20:06	19:22	20 07:42 (6)	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	07:15 (6)	06:01	05:47	05:58	06:23	06:50	07:25 (6)	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	42 07:57 (6)	20:11	20:33	20:32	20:05	19:21	14 07:39 (6)	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	07:15 (6)	06:00	05:47	05:59	06:24	06:50	07:26 (6)	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	42 07:57 (6)	20:12	20:33	20:32	20:04	19:19	07:27 (6)	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	07:14 (6)	05:59	05:47	05:59	06:25	06:51	07:28 (6)	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	42 07:56 (6)	20:13	20:33	20:31	20:02	12 07:45 (6)	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	07:15 (6)	05:59	05:47	06:00	06:26	06:52	07:30 (6)	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	40 07:55 (6)	20:14	20:34	20:31	20:01	18 07:48 (6)	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	07:15 (6)	05:58	05:47	06:01	06:27	06:53	07:29 (6)	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	38 07:53 (6)	20:14	20:34	20:30	20:00	22 07:51 (6)	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	07:16 (6)	05:57	05:47	06:01	06:27	06:54	07:26 (6)	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	38 07:54 (6)	20:15	20:34	20:30	19:59	26 07:52 (6)	19:13	18:28	16:56	16:52
20	07:22	06:54	06:15	06:29	07:17 (6)	05:56	05:47	06:02	06:28	06:55	07:24 (6)	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	36 07:53 (6)	20:16	20:35	20:29	19:57	30 07:54 (6)	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	07:17 (6)	05:56	05:47	06:03	06:29	06:56	07:23 (6)	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	34 07:51 (6)	20:17	20:35	20:28	19:56	32 07:55 (6)	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	07:18 (6)	05:55	05:47	06:04	06:30	06:56	07:22 (6)	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	32 07:50 (6)	20:18	20:35	20:28	19:55	34 07:56 (6)	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	07:19 (6)	05:54	05:48	06:05	06:31	06:57	07:21 (6)	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	28 07:47 (6)	20:19	20:35	20:27	19:53	36 07:57 (6)	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	07:19 (6)	05:53	05:48	06:05	06:32	06:58	07:20 (6)	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	26 07:45 (6)	20:19	20:35	20:26	19:52	38 07:58 (6)	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	07:22 (6)	05:53	05:48	06:06	06:33	06:59	07:19 (6)	07:29	06:59	07:23
	17:24	17:58	18:25	19:54	22 07:44 (6)	20:20	20:36	20:25	19:50	38 07:57 (6)	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	07:25 (6)	05:52	05:49	06:07	06:33	06:57	07:17 (6)	07:30	06:58	07:23
	17:25	17:59	18:26	19:55	16 07:41 (6)	20:21	20:36	20:25	19:49	40 07:57 (6)	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	07:28 (6)	05:52	05:49	06:08	06:34	06:54	07:16 (6)	07:31	06:59	07:24
	17:26	18:00	18:27	19:56	8 07:36 (6)	20:22	20:36	20:24	19:48	42 07:58 (6)	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	05:49	06:09	06:35	06:57	07:15 (6)	07:32	06:30	07:03
	17:27	18:01	18:28	19:56	20:23	20:36	20:23	19:46	42 07:57 (6)	18:59	17:16	16:52	16:57	16:57
29	07:17	07:01	07:35 (6)	06:17	05:51	05:50	06:09	06:36	06:36	06:57	07:16 (6)	07:33	06:31	07:03
	17:29	19:29	12 07:47 (6)	19:57	20:23	20:36	20:22	19:45	42 07:58 (6)	18:57	17:15	16:51	16:58	16:58
30	07:16	06:59	07:31 (6)	06:16	05:50	05:50	06:10	06:37	06:37	06:58	07:15 (6)	07:34	06:32	07:04
	17:30	19:30	20 07:51 (6)	19:58	20:24	20:36	20:21	19:43	44 07:59 (6)	18:56	17:14	16:51	16:59	16:59
31	07:15	06:58	07:28 (6)	06:15	05:50	05:50	06:11	06:38	06:38	06:59	07:15 (6)	07:35	06:33	07:25
	17:31	19:31	26 07:54 (6)	19:58	20:25	20:36	20:20	19:42	42 07:57 (6)	18:57	17:13	16:51	16:59	17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297		
Total, worst case			58	952				538		482				
Sun reduction			0,77	0,81				0,97		0,87				
Oper. time red.			0,99	0,99				0,99		0,99				
Wind dir. red.			0,60	0,60				0,60		0,60				
Total reduction			0,46	0,48				0,58		0,52				
Total, real			27	460				311		250				

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 13

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: I - R09

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25 17:01	07:15 17:32	16:58 (2) 17:10 (2)	06:43 18:02	06:56 19:32	06:15 19:59	05:49 20:25	05:50 20:36	06:12 20:19	06:39 19:40	07:04 18:54	06:34 17:12
2	07:25 17:01	07:14 17:33	16:59 (2) 17:11 (2)	06:41 18:03	06:55 19:33	06:14 20:00	05:49 20:26	05:51 20:36	06:13 20:18	06:39 19:39	07:05 18:53	06:35 17:11
3	07:25 17:02	07:13 17:34	17:00 (2) 17:12 (2)	06:40 18:04	06:53 19:33	06:12 20:01	05:49 20:27	05:51 20:35	06:14 20:17	06:40 19:37	07:06 18:51	06:36 17:10
4	07:26 17:03	07:12 17:35	17:03 (2) 17:13 (2)	06:38 18:05	06:52 19:34	06:11 20:02	05:48 20:27	05:52 20:35	06:14 20:16	06:41 19:36	07:07 18:49	06:37 17:09
5	07:26 17:04	07:11 17:36	17:04 (2) 17:14 (2)	06:37 18:06	06:50 19:35	06:10 20:03	05:48 20:28	05:52 20:35	06:15 20:15	06:42 19:34	07:08 18:48	06:38 17:08
6	07:26 17:05	07:10 17:39	17:07 (2) 17:15 (2)	06:35 18:07	06:49 19:36	06:09 20:04	05:48 20:29	05:53 20:35	06:16 20:14	06:43 19:33	07:09 18:46	06:39 17:07
7	07:26 17:06	07:09 17:39	8 17:15 (2)	18:07	06:34 19:37	06:47 20:05	06:08 20:29	05:47 20:35	05:53 20:13	06:17 19:31	06:44 18:45	07:10 17:06
8	07:26 17:07	07:08 17:39	06:33 18:08	18:10	06:33 19:37	06:46 20:05	06:07 20:29	05:47 20:35	05:54 20:13	06:18 19:31	06:44 18:45	07:10 17:06
9	07:26 17:07	07:07 17:41	06:31 18:10	18:10	06:31 19:39	06:44 20:07	06:06 20:30	05:47 20:34	05:55 20:11	06:19 19:28	06:45 18:42	07:11 17:04
10	07:25 17:08	07:06 17:42	06:30 18:11	18:11	06:43 19:40	06:05 20:07	05:47 20:31	05:55 20:34	06:20 20:10	06:46 19:27	07:12 18:41	06:44 17:03
11	07:25 17:09	07:05 17:43	06:28 18:12	18:12	06:41 19:41	06:04 20:08	05:47 20:31	05:56 20:33	06:20 20:09	06:47 19:25	07:13 18:39	06:45 17:02
12	07:25 17:10	07:04 17:44	06:27 18:13	18:13	06:40 19:42	06:03 20:09	05:47 20:32	05:57 20:33	06:21 20:07	06:48 19:24	07:14 18:38	06:46 17:01
13	07:25 17:11	07:03 17:45	06:25 18:14	18:14	06:39 19:43	06:02 20:10	05:47 20:32	05:57 20:33	06:22 20:06	06:49 19:22	07:15 18:36	06:47 17:00
14	07:25 17:12	07:02 17:46	06:24 18:15	18:15	06:37 19:44	06:01 20:11	05:47 20:33	05:58 20:32	06:23 20:05	06:50 19:20	07:16 18:35	06:48 17:00
15	07:24 17:13	07:01 17:47	06:22 18:16	18:16	06:36 19:44	06:00 20:12	05:47 20:33	05:59 20:32	06:24 20:04	06:50 19:19	07:17 18:33	06:49 17:00
16	07:24 17:14	06:59 17:49	06:21 18:17	18:17	06:34 19:45	05:59 20:13	05:47 20:33	05:59 20:31	06:25 20:02	06:51 19:17	07:18 18:32	06:50 17:00
17	07:24 17:15	06:58 17:50	06:19 18:18	18:18	06:33 19:46	05:59 20:14	05:47 20:34	06:00 20:31	06:26 20:01	06:52 19:16	07:19 18:31	06:51 17:00
18	07:23 17:17	06:57 17:51	06:18 18:19	18:19	06:32 19:47	05:58 20:14	05:47 20:34	06:01 20:30	06:27 20:00	06:53 19:14	07:20 18:29	06:52 17:00
19	07:23 17:18	06:56 17:52	06:16 18:20	18:20	06:30 19:48	05:57 20:15	05:47 20:34	06:01 20:30	06:27 19:59	06:54 19:13	07:21 18:28	06:53 17:00
20	07:22 17:19	06:54 17:53	06:15 18:21	18:21	06:29 19:49	05:56 20:16	05:47 20:35	06:02 20:29	06:28 19:57	06:55 19:11	07:22 18:27	06:54 17:00
21	07:22 17:20	16:54 (2) 17:54	06:53 17:54	18:21	06:27 19:50	05:56 20:17	05:47 20:35	06:03 20:28	06:29 19:56	06:55 19:10	07:23 18:25	06:55 17:00
22	07:21 17:21	16:53 (2) 16:57 (2)	06:52 17:55	18:22	06:26 19:51	05:55 20:18	05:47 20:35	06:04 20:28	06:30 19:55	06:56 19:08	07:24 18:24	06:56 17:00
23	07:21 17:22	16:54 (2) 16:58 (2)	06:51 17:56	18:23	06:25 19:52	05:54 20:19	05:48 20:35	06:05 20:27	06:31 19:53	06:57 19:06	07:25 18:23	06:57 17:00
24	07:20 17:23	16:54 (2) 17:00 (2)	06:49 17:57	18:24	06:23 19:53	05:53 20:19	05:48 20:35	06:05 20:26	06:32 19:52	06:58 19:05	07:26 18:21	06:58 17:00
25	07:20 17:24	16:55 (2) 17:01 (2)	06:48 17:58	18:25	06:22 19:54	05:53 20:20	05:48 20:36	06:06 20:25	06:33 19:50	06:59 19:03	06:27 17:20	06:59 17:00
26	07:19 17:25	16:54 (2) 17:02 (2)	06:47 17:59	18:26	06:21 19:55	05:52 20:21	05:49 20:36	06:07 20:25	06:33 19:49	07:00 19:02	06:28 17:19	07:00 16:52
27	07:18 17:26	16:56 (2) 17:04 (2)	06:45 18:00	18:27	06:20 19:55	05:52 20:22	05:49 20:36	06:08 20:24	06:34 19:48	07:01 19:00	06:29 17:18	07:01 16:52
28	07:18 17:27	16:55 (2) 17:05 (2)	06:44 18:01	18:28	06:02 19:56	06:18 20:22	05:49 20:36	06:09 20:23	06:35 19:46	07:02 18:59	06:30 17:16	07:02 16:52
29	07:17 17:29	16:56 (2) 17:06 (2)	06:44 18:01	18:29	06:01 19:57	06:17 20:23	05:50 20:36	06:09 20:22	06:36 19:45	07:02 18:57	06:31 17:15	07:03 16:51
30	07:16 17:30	16:57 (2) 17:07 (2)	06:44 18:01	18:30	06:05 19:58	06:16 20:24	05:50 20:36	06:10 20:21	06:37 19:43	07:03 18:56	06:32 17:14	07:04 16:51
31	07:15 17:31	16:56 (2) 17:08 (2)	06:44 18:01	18:31	06:58 19:58	06:50 20:25	05:50 20:36	06:11 20:20	06:38 19:42	07:03 19:42	06:33 17:13	07:05 16:59
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
Total, worst case	82	64									138	
Sun reduction	0,66	0,75									0,76	
Oper. time red.	0,99	0,99									0,99	
Wind dir. red.	0,54	0,54									0,54	
Total reduction	0,36	0,41									0,41	
Total, real	29	26									57	

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 14

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: J - R10

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	19:20 (5) 05:50	19:24 (5) 06:12	19:41 (5) 06:39	07:04	06:34	07:05
	17:00	17:32	18:02	19:32	19:59	20:25	42 20:02 (5) 20:36	48 20:12 (5) 20:19	16 19:57 (5) 19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	19:19 (5) 05:51	19:24 (5) 06:13	19:44 (5) 06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:32	20:00	20:26	42 20:01 (5) 20:36	46 20:10 (5) 20:18	12 19:56 (5) 19:39	18:53	17:11	16:51
3	07:25	07:13	06:40	06:53	06:12	05:49	19:19 (5) 05:51	19:25 (5) 06:14	19:44 (5) 06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	44 20:03 (5) 20:35	46 20:11 (5) 20:17	10 19:54 (5) 19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	19:19 (5) 05:52	19:25 (5) 06:14	19:47 (5) 06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	44 20:03 (5) 20:35	46 20:11 (5) 20:16	6 19:53 (5) 19:36	18:49	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	19:18 (5) 05:52	19:26 (5) 06:15	19:50 (5) 06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	46 20:04 (5) 20:35	46 20:12 (5) 20:15	4 19:54 (5) 19:34	18:48	17:08	16:50
6	07:26	07:10	06:35	06:49	06:09	05:48	19:18 (5) 05:53	19:26 (5) 06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	46 20:04 (5) 20:35	44 20:10 (5) 20:14	19:33	18:46	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:47	19:20 (5) 05:53	19:25 (5) 06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	44 20:04 (5) 20:35	46 20:11 (5) 20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	19:40 (5) 05:47	19:20 (5) 05:54	19:25 (5) 06:18	06:44	07:10	06:41	07:12
	17:06	17:40	18:09	19:38	20:06	4 19:44 (5) 20:30	46 20:06 (5) 20:34	44 20:09 (5) 20:12	19:30	18:43	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	19:37 (5) 05:47	19:20 (5) 05:55	19:26 (5) 06:19	06:45	07:11	06:42	07:13
	17:07	17:41	18:10	19:39	20:07	6 19:43 (5) 20:30	46 20:06 (5) 20:34	44 20:10 (5) 20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	19:34 (5) 05:47	19:20 (5) 05:55	19:26 (5) 06:20	06:46	07:12	06:43	07:13
	17:08	17:42	18:11	19:40	20:07	10 19:44 (5) 20:31	46 20:06 (5) 20:34	44 20:10 (5) 20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	19:33 (5) 05:47	19:20 (5) 05:56	19:27 (5) 06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	12 19:45 (5) 20:31	48 20:08 (5) 20:33	42 20:09 (5) 20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	19:30 (5) 05:47	19:19 (5) 05:57	19:28 (5) 06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	16 19:46 (5) 20:32	48 20:07 (5) 20:33	42 20:10 (5) 20:07	19:24	18:38	17:01	16:50
13	07:25	07:03	06:25	06:39	06:02	19:29 (5) 05:47	19:19 (5) 05:57	19:28 (5) 06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	18 19:47 (5) 20:32	48 20:07 (5) 20:33	40 20:08 (5) 20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	19:28 (5) 05:47	19:19 (5) 05:58	19:27 (5) 06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20 19:48 (5) 20:33	48 20:07 (5) 20:32	42 20:09 (5) 20:05	19:20	18:35	16:59	16:51
15	07:24	07:00	06:22	06:36	06:00	19:27 (5) 05:47	19:20 (5) 05:59	19:28 (5) 06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	20:12	22 19:49 (5) 20:33	48 20:08 (5) 20:32	40 20:08 (5) 20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	19:25 (5) 05:47	19:20 (5) 05:59	19:28 (5) 06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	24 19:49 (5) 20:33	50 20:10 (5) 20:31	38 20:06 (5) 20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	19:24 (5) 05:47	19:20 (5) 06:00	19:29 (5) 06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	26 19:50 (5) 20:34	50 20:10 (5) 20:31	38 20:07 (5) 20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:31	05:58	19:23 (5) 05:47	19:20 (5) 06:01	19:30 (5) 06:26	06:53	07:20	06:52	07:19
	17:16	17:51	18:19	19:47	20:14	28 19:51 (5) 20:34	50 20:10 (5) 20:30	36 20:06 (5) 20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	19:22 (5) 05:47	19:22 (5) 06:01	19:31 (5) 06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	30 19:52 (5) 20:34	48 20:10 (5) 20:30	36 20:07 (5) 19:59	19:13	18:28	16:56	16:52
20	07:22	06:54	06:15	06:29	05:56	19:22 (5) 05:47	19:22 (5) 06:02	19:31 (5) 06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	30 19:52 (5) 20:35	48 20:10 (5) 20:29	34 20:05 (5) 19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:55	19:21 (5) 05:47	19:22 (5) 06:03	19:32 (5) 06:29	06:55	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	20:17	32 19:53 (5) 20:35	48 20:10 (5) 20:28	32 20:04 (5) 19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	19:22 (5) 05:47	19:23 (5) 06:04	19:33 (5) 06:30	06:56	07:24	06:56	07:21
	17:21	17:55	18:22	19:51	20:18	32 19:54 (5) 20:35	48 20:11 (5) 20:28	32 20:05 (5) 19:54	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	19:22 (5) 05:48	19:23 (5) 06:04	19:32 (5) 06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	34 19:56 (5) 20:35	48 20:11 (5) 20:27	32 20:04 (5) 19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:08	06:23	05:53	19:21 (5) 05:48	19:23 (5) 06:05	19:32 (5) 06:32	06:58	07:26	06:58	07:22
	17:23	17:57	18:24	19:53	20:19	34 19:55 (5) 20:35	48 20:11 (5) 20:26	30 20:02 (5) 19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	19:21 (5) 05:48	19:21 (5) 06:06	19:33 (5) 06:33	06:59	07:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	36 19:57 (5) 20:35	50 20:11 (5) 20:25	28 20:01 (5) 19:50	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	05:52	19:20 (5) 05:49	19:22 (5) 06:07	19:34 (5) 06:33	07:00	07:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	38 19:58 (5) 20:36	50 20:12 (5) 20:25	28 20:02 (5) 19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	19:20 (5) 05:49	19:22 (5) 06:08	19:35 (5) 06:34	07:01	07:29	07:01	07:24
	17:26	18:00	18:27	19:55	20:22	38 19:58 (5) 20:36	50 20:12 (5) 20:24	26 20:01 (5) 19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	19:19 (5) 05:49	19:22 (5) 06:09	19:37 (5) 06:35	07:02	07:30	07:02	07:24
	17:27	18:01	18:28	19:56	20:22	40 19:59 (5) 20:36	48 20:10 (5) 20:23	22 19:59 (5) 19:46	18:59	17:16	16:52	16:57
29	07:17	06:43	06:01	06:17	05:51	19:19 (5) 05:50	19:23 (5) 06:09	19:38 (5) 06:36	07:02	07:31	07:03	07:24
	17:29	18:03	18:30	19:57	20:23	40 19:59 (5) 20:36	48 20:11 (5) 20:22	20 19:58 (5) 19:45	18:57	17:15	16:51	16:58
30	07:16	06:42	06:00	06:16	05:50	19:18 (5) 05:50	19:23 (5) 06:10	19:39 (5) 06:37	07:03	07:32	07:04	07:25
	17:30	18:04	18:31	19:58	20:24	42 20:00 (5) 20:36	48 20:11 (5) 20:21	18 19:57 (5) 19:43	18:56	17:14	16:51	16:59
31	07:15	06:41	06:00	06:16	05:50	19:20 (5) 05:50	06:11	19:40 (5) 06:38	07:03	07:33	07:05	07:25
	17:31	18:05	18:32	19:59	20:25	40 20:00 (5) 20:36	20:20	18 19:58 (5) 19:42	18:56	17:13	16:51	16:59
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
Total, worst case					652	1418	1128	48				
Sun reduction					0,84	0,92	0,96	0,97				
Oper. time red.					0,99	0,99	0,99	0,99				
Wind dir. red.					0,70	0,70	0,70	0,70				
Total reduction					0,59	0,64	0,67	0,68				
Total, real					382	910	755	32				

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 15

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: K - R11

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:25 17:01	15:26 (2) 07:15 17:32	15:34 (2) 06:43 18:02	06:56 19:32	06:15 19:59	05:49 20:25	05:51 20:36	06:12 20:19	06:39 19:40	07:04 18:54	06:34 17:12	15:08 (2) 16:51 16:28 (2)	07:05 15:11 (2)
2	07:25 17:01	15:26 (2) 07:13 17:33	15:34 (2) 06:40 18:03	06:53 19:33	06:12 20:00	05:49 20:26	05:51 20:36	06:13 20:18	06:39 19:39	07:06 18:53	06:35 17:11	15:07 (2) 16:51 16:27 (2)	07:06 15:12 (2)
3	07:25 17:02	15:26 (2) 07:12 17:34	15:34 (2) 06:38 18:04	06:52 19:33	06:11 20:01	05:48 20:27	05:52 20:36	06:14 20:17	06:41 19:37	07:07 18:51	06:37 17:10	15:06 (2) 16:50 16:26 (2)	07:08 15:13 (2)
4	07:26 17:03	15:26 (2) 07:11 17:35	15:36 (2) 06:37 18:05	06:50 19:34	06:10 20:02	05:48 20:27	05:52 20:35	06:15 20:16	06:42 19:36	07:08 18:50	06:38 17:09	15:05 (2) 16:50 16:27 (2)	07:09 15:11 (2)
5	07:26 17:04	15:26 (2) 07:10 17:36	15:36 (2) 06:35 18:06	06:49 19:35	06:09 20:03	05:48 20:28	05:53 20:35	06:15 20:15	06:43 19:34	07:09 18:48	06:39 17:08	15:06 (2) 16:50 16:25 (2)	07:10 15:12 (2)
6	07:26 17:05	15:26 (2) 07:09 17:38	15:36 (2) 06:34 18:07	06:47 19:36	06:08 20:04	05:48 20:29	05:54 20:35	06:17 20:14	06:44 19:33	07:10 18:47	06:40 17:07	15:05 (2) 16:50 16:26 (2)	07:11 15:13 (2)
7	07:26 17:06	15:26 (2) 07:08 17:39	15:37 (2) 06:33 18:08	06:46 19:37	06:07 20:05	05:47 20:29	05:54 20:35	06:18 20:13	06:45 19:31	07:11 18:45	06:41 17:06	15:04 (2) 16:50 16:25 (2)	07:12 15:14 (2)
8	07:26 17:07	15:26 (2) 07:07 17:40	15:38 (2) 06:31 18:09	06:44 19:38	06:06 20:06	05:47 20:30	05:55 20:34	06:19 20:12	06:46 19:30	07:11 18:44	06:42 17:05	15:05 (2) 16:50 16:26 (2)	07:13 15:15 (2)
9	07:26 17:07	15:26 (2) 07:06 17:41	15:38 (2) 06:30 18:10	06:43 19:39	06:05 20:07	05:47 20:30	05:55 20:34	06:20 20:11	06:46 19:28	07:12 18:42	06:44 17:04	15:05 (2) 16:50 16:25 (2)	07:13 15:16 (2)
10	07:25 17:08	15:26 (2) 07:05 17:42	15:40 (2) 06:28 18:11	06:41 19:40	06:04 20:07	05:47 20:31	05:56 20:34	06:20 20:10	06:47 19:27	07:13 18:41	06:45 17:03	15:04 (2) 16:50 16:26 (2)	07:14 15:17 (2)
11	07:25 17:09	15:26 (2) 07:04 17:43	15:40 (2) 06:27 18:12	06:40 19:41	06:03 20:08	05:47 20:31	05:57 20:34	06:21 20:09	06:48 19:25	07:14 18:39	06:46 17:02	15:05 (2) 16:50 16:27 (2)	07:15 15:18 (2)
12	07:25 17:10	15:26 (2) 07:03 17:44	15:41 (2) 06:25 18:13	06:39 19:42	06:02 20:09	05:47 20:32	05:57 20:33	06:22 20:07	06:49 19:24	07:15 18:38	06:47 17:01	15:04 (2) 16:51 16:25 (2)	07:16 15:19 (2)
13	07:25 17:11	15:26 (2) 07:02 17:45	15:41 (2) 06:24 18:14	06:39 19:43	06:02 20:10	05:47 20:32	05:57 20:33	06:22 20:06	06:49 19:22	07:16 18:36	06:47 17:02	15:04 (2) 16:51 16:26 (2)	07:17 15:20 (2)
14	07:25 17:12	15:26 (2) 07:01 17:46	15:42 (2) 06:22 18:15	06:37 19:44	06:01 20:11	05:47 20:33	05:58 20:32	06:23 20:05	06:50 19:21	07:16 18:35	06:48 16:59	15:03 (2) 16:51 16:27 (2)	07:17 15:21 (2)
15	07:24 17:13	15:26 (2) 06:59 17:47	15:43 (2) 06:21 18:16	06:36 19:44	06:00 20:12	05:47 20:33	05:59 20:32	06:24 20:04	06:50 19:19	07:17 18:33	16:42 (2) 16:59	15:02 (2) 16:50 16:27 (2)	07:18 15:22 (2)
16	07:24 17:14	15:26 (2) 06:58 17:48	15:43 (2) 06:20 18:17	06:36 19:45	06:00 20:13	05:47 20:33	05:59 20:31	06:25 20:02	06:51 19:17	07:18 18:32	16:37 (2) 16:58	15:03 (2) 16:51 16:28 (2)	07:19 15:23 (2)
17	07:24 17:15	15:26 (2) 06:57 17:49	15:44 (2) 06:19 18:18	06:35 19:46	06:00 20:14	05:47 20:34	05:59 20:31	06:26 20:01	06:52 19:16	07:19 18:31	16:32 (2) 16:57	15:04 (2) 16:52 16:29 (2)	07:20 15:24 (2)
18	07:23 17:17	15:26 (2) 06:56 17:50	15:44 (2) 06:18 18:19	06:34 19:47	06:00 20:15	05:47 20:34	05:59 20:30	06:27 20:00	06:53 19:14	07:20 18:29	16:29 (2) 16:57	15:05 (2) 16:52 16:28 (2)	07:21 15:25 (2)
19	07:23 17:18	15:26 (2) 06:55 17:51	15:44 (2) 06:17 18:20	06:34 19:48	06:00 20:16	05:47 20:35	05:59 20:29	06:28 19:57	06:54 19:11	07:21 18:27	16:28 (2) 16:55	15:05 (2) 16:53 16:29 (2)	07:22 15:26 (2)
20	07:22 17:19	15:26 (2) 06:54 17:52	15:45 (2) 06:16 18:21	06:33 19:49	06:00 20:17	05:47 20:35	05:59 20:28	06:29 19:57	06:55 19:11	07:22 18:27	16:27 (2) 16:55	15:05 (2) 16:54 16:30 (2)	07:23 15:27 (2)
21	07:22 17:20	15:26 (2) 06:53 17:53	15:45 (2) 06:15 18:22	06:33 19:50	06:00 20:18	05:47 20:35	05:59 20:27	06:30 19:53	06:56 19:06	07:23 18:23	16:26 (2) 16:54	15:05 (2) 16:55 16:31 (2)	07:24 15:28 (2)
22	07:21 17:21	15:26 (2) 06:52 17:54	15:46 (2) 06:14 18:23	06:32 19:51	06:00 20:19	05:47 20:35	05:59 20:26	06:31 19:52	06:57 19:05	07:24 18:24	16:25 (2) 16:53	15:05 (2) 16:56 16:32 (2)	07:25 15:29 (2)
23	07:21 17:22	15:26 (2) 06:51 17:55	15:46 (2) 06:13 18:24	06:32 19:52	06:00 20:20	05:47 20:35	05:59 20:25	06:32 19:50	06:58 19:03	07:25 18:23	16:24 (2) 16:53	15:05 (2) 16:57 16:33 (2)	07:26 15:30 (2)
24	07:20 17:23	15:26 (2) 06:50 17:56	15:47 (2) 06:12 18:25	06:31 19:53	06:00 20:21	05:47 20:35	05:59 20:24	06:33 19:52	06:59 19:05	07:26 18:22	16:23 (2) 16:53	15:05 (2) 16:58 16:34 (2)	07:27 15:31 (2)
25	07:20 17:24	15:26 (2) 06:49 17:57	15:47 (2) 06:11 18:26	06:31 19:54	06:00 20:22	05:47 20:36	05:59 20:23	06:34 19:50	06:59 19:03	07:27 18:22	16:22 (2) 16:53	15:05 (2) 16:59 16:35 (2)	07:28 15:32 (2)
26	07:19 17:25	15:26 (2) 06:48 17:58	15:48 (2) 06:10 18:27	06:30 19:55	06:00 20:23	05:47 20:36	05:59 20:22	06:35 19:49	06:59 19:02	07:28 18:21	16:21 (2) 16:54	15:05 (2) 16:59 16:36 (2)	07:29 15:33 (2)
27	07:18 17:26	15:26 (2) 06:47 17:59	15:48 (2) 06:09 18:28	06:30 19:56	06:00 20:24	05:47 20:36	05:59 20:21	06:36 19:48	06:59 19:01	07:29 18:20	16:20 (2) 16:55	15:05 (2) 16:59 16:37 (2)	07:30 15:34 (2)
28	07:18 17:27	15:26 (2) 06:46 18:00	15:49 (2) 06:08 18:29	06:30 19:57	06:00 20:25	05:47 20:36	05:59 20:20	06:37 19:48	06:59 19:00	07:30 18:19	16:19 (2) 16:56	15:05 (2) 16:59 16:38 (2)	07:31 15:35 (2)
29	07:17 17:28	15:26 (2) 06:45 18:01	15:49 (2) 06:07 18:30	06:30 19:58	06:00 20:26	05:47 20:36	05:59 20:19	06:38 19:48	06:59 19:00	07:31 18:18	16:18 (2) 16:56	15:05 (2) 16:59 16:39 (2)	07:32 15:36 (2)
30	07:16 17:30	15:26 (2) 06:44 18:02	15:50 (2) 06:06 18:31	06:30 19:59	06:00 20:27	05:47 20:36	05:59 20:18	06:39 19:48	06:59 19:00	07:32 18:17	16:17 (2) 16:56	15:05 (2) 16:59 16:40 (2)	07:33 15:37 (2)
31	07:15 17:31	15:26 (2) 06:43 18:03	15:50 (2) 06:05 18:32	06:30 19:59	06:00 20:28	05:47 20:36	05:59 20:17	06:40 19:48	06:59 19:00	07:33 18:16	16:16 (2) 16:56	15:05 (2) 16:59 16:41 (2)	07:34 15:38 (2)
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298	2174
Total, worst case	2488	1736								948	2500		2174
Sun reduction	0,66	0,75								0,79	0,76		0,69
Oper. time red.	0,99	0,99								0,99	0,99		0,99
Wind dir. red.	0,52	0,52								0,52	0,52		0,52
Total reduction	0,34	0,39								0,41	0,40		0,36
Total, real	854	677								390	988		780

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 16

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: L - R12

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December										
1	07:25	07:15	06:43	06:56	06:15	17:39 (2)	05:49	16:56 (2)	05:51	16:54 (2)	06:12	17:31 (2)	06:39	07:04	06:34	07:05						
	17:01	17:32	18:02	19:32	19:59	90	19:09 (2)	20:25	160	19:36 (2)	20:36	170	19:44 (2)	20:19	120	19:31 (2)	19:40	18:54	17:12	16:51		
2	07:25	07:14	06:41	06:55	06:14	06:14	17:38 (2)	05:49	06:14	17:38 (2)	05:49	16:52 (2)	05:51	16:54 (2)	06:13	17:32 (2)	06:39	07:05	06:35	07:06		
	17:01	17:33	18:03	19:33	20:00	92	19:10 (2)	20:26	160	19:35 (2)	20:36	170	19:44 (2)	20:18	118	19:30 (2)	19:39	18:53	17:11	16:51		
3	07:25	07:13	06:40	06:53	06:13	06:13	17:35 (2)	05:49	06:13	17:35 (2)	05:49	16:52 (2)	05:51	16:54 (2)	06:14	17:34 (2)	06:40	07:06	06:36	07:07		
	17:02	17:34	18:04	19:33	20:01	96	19:11 (2)	20:27	162	19:35 (2)	20:36	168	19:43 (2)	20:17	114	19:28 (2)	19:37	18:51	17:10	16:51		
4	07:26	07:12	06:38	06:52	06:11	06:11	17:34 (2)	05:48	06:11	17:34 (2)	05:48	16:52 (2)	05:52	16:55 (2)	06:14	17:35 (2)	06:41	07:07	06:37	07:08		
	17:03	17:35	18:05	19:34	20:02	98	19:12 (2)	20:27	164	19:37 (2)	20:35	168	19:43 (2)	20:16	112	19:27 (2)	19:36	18:50	17:09	16:50		
5	07:26	07:11	06:37	06:50	06:10	06:10	17:33 (2)	05:48	06:10	17:33 (2)	05:48	16:52 (2)	05:52	16:58 (2)	06:15	17:38 (2)	06:42	07:08	06:38	07:09		
	17:04	17:36	18:06	19:35	20:03	100	19:13 (2)	20:28	164	19:36 (2)	20:35	166	19:44 (2)	20:15	108	19:26 (2)	19:34	18:48	17:08	16:50		
6	07:26	07:10	06:36	06:49	06:09	06:09	17:30 (2)	05:48	06:09	17:30 (2)	05:48	16:52 (2)	05:53	16:58 (2)	06:16	17:39 (2)	06:43	07:09	06:39	07:10		
	17:05	17:38	18:07	19:36	20:04	106	19:16 (2)	20:29	166	19:38 (2)	20:35	166	19:44 (2)	20:14	106	19:25 (2)	19:33	18:47	17:07	16:50		
7	07:26	07:09	06:34	06:47	06:08	06:08	17:29 (2)	05:48	06:08	17:29 (2)	05:48	16:52 (2)	05:54	16:59 (2)	06:17	17:40 (2)	06:44	07:10	06:40	07:11		
	17:06	17:39	18:08	19:37	20:05	108	19:17 (2)	20:29	166	19:38 (2)	20:35	164	19:43 (2)	20:13	104	19:24 (2)	19:31	18:45	17:06	16:50		
8	07:26	07:08	06:33	06:46	06:07	06:07	17:26 (2)	05:47	06:07	17:26 (2)	05:47	16:50 (2)	05:54	16:59 (2)	06:18	17:43 (2)	06:45	07:11	06:41	07:12		
	17:07	17:40	18:09	19:38	20:06	112	19:18 (2)	20:30	168	19:38 (2)	20:34	164	19:43 (2)	20:12	100	19:23 (2)	19:30	18:44	17:05	16:50		
9	07:26	07:07	06:31	06:44	06:06	06:06	17:25 (2)	05:47	06:06	17:25 (2)	05:47	16:50 (2)	05:55	16:59 (2)	06:19	17:43 (2)	06:45	07:11	06:42	07:13		
	17:07	17:41	18:10	19:39	20:07	114	19:19 (2)	20:30	168	19:38 (2)	20:34	164	19:44 (2)	20:11	98	19:21 (2)	19:28	18:42	17:04	16:50		
10	07:25	07:06	06:30	06:43	06:05	06:05	17:24 (2)	05:47	06:05	17:24 (2)	05:47	16:50 (2)	05:55	16:59 (2)	06:20	17:44 (2)	06:46	07:12	06:44	07:13		
	17:08	17:42	18:11	19:40	20:07	116	19:20 (2)	20:31	170	19:40 (2)	20:34	160	19:43 (2)	20:10	96	19:20 (2)	19:27	18:41	17:03	16:50		
11	07:25	07:05	06:28	06:41	06:04	06:04	17:21 (2)	05:47	06:04	17:21 (2)	05:47	16:50 (2)	05:56	16:59 (2)	06:20	17:47 (2)	06:47	07:13	06:45	07:14		
	17:09	17:43	18:12	19:41	20:08	120	19:21 (2)	20:31	170	19:40 (2)	20:34	160	19:43 (2)	20:09	92	19:19 (2)	19:25	18:39	17:02	16:50		
12	07:25	07:04	06:27	06:40	06:03	06:03	17:20 (2)	05:47	06:03	17:20 (2)	05:47	16:50 (2)	05:57	16:59 (2)	06:21	17:48 (2)	06:48	07:14	06:46	07:15		
	17:10	17:44	18:13	19:42	20:09	122	19:22 (2)	20:32	170	19:40 (2)	20:33	158	19:42 (2)	20:07	88	19:16 (2)	19:24	18:38	17:01	16:51		
13	07:25	07:03	06:25	06:39	06:02	06:02	17:19 (2)	05:47	06:02	17:19 (2)	05:47	16:50 (2)	05:57	16:59 (2)	06:22	17:51 (2)	06:49	07:15	06:47	07:16		
	17:11	17:45	18:14	19:43	20:10	122	19:21 (2)	20:32	170	19:40 (2)	20:33	158	19:42 (2)	20:06	84	19:15 (2)	19:22	18:36	17:00	16:51		
14	07:25	07:02	06:24	06:37	18:15 (2)	06:01	17:16 (2)	05:47	06:01	17:16 (2)	05:47	16:50 (2)	05:58	16:59 (2)	06:23	17:51 (2)	06:50	07:16	06:48	07:17		
	17:12	17:46	18:15	19:44	4	18:19 (2)	20:11	126	19:22 (2)	20:33	170	19:40 (2)	20:32	158	19:43 (2)	20:05	82	19:13 (2)	19:21	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	18:14 (2)	06:00	17:15 (2)	05:47	06:00	17:15 (2)	05:47	16:50 (2)	05:59	16:59 (2)	06:24	17:52 (2)	06:50	07:17	06:49	07:17		
	17:13	17:47	18:16	19:44	12	18:26 (2)	20:12	128	19:23 (2)	20:33	172	19:42 (2)	20:32	154	19:10 (2)	19:19	18:33	16:59	16:51	16:51		
16	07:24	06:59	06:21	06:34	18:10 (2)	05:59	17:15 (2)	05:47	05:59	17:15 (2)	05:47	16:50 (2)	05:59	16:59 (2)	06:25	17:55 (2)	06:51	07:18	06:50	07:18		
	17:14	17:49	18:17	19:45	22	18:32 (2)	20:13	130	19:25 (2)	20:33	172	19:42 (2)	20:31	154	19:09 (2)	19:17	18:32	16:58	16:51	16:51		
17	07:24	06:58	06:19	06:33	18:09 (2)	05:59	17:12 (2)	05:47	05:59	17:12 (2)	05:47	16:50 (2)	06:00	16:59 (2)	06:26	17:09 (2)	06:52	07:19	06:51	07:19		
	17:16	17:50	18:18	19:46	28	18:37 (2)	20:14	134	19:26 (2)	20:34	172	19:42 (2)	20:31	152	19:41 (2)	20:01	18:31	16:57	16:52	16:52		
18	07:23	06:57	06:18	06:32	18:05 (2)	05:58	17:11 (2)	05:47	05:58	17:11 (2)	05:47	16:48 (2)	06:01	16:58 (2)	06:27	17:59 (2)	06:53	07:20	06:52	07:19		
	17:17	17:51	18:19	19:47	34	18:39 (2)	20:14	136	19:27 (2)	20:34	174	19:42 (2)	20:30	148	19:40 (2)	20:00	18:29	16:57	16:52	16:52		
19	07:23	06:56	06:16	06:30	18:04 (2)	05:57	17:10 (2)	05:47	05:57	17:10 (2)	05:47	16:48 (2)	06:01	16:58 (2)	06:27	17:13 (2)	06:54	07:21	06:53	07:20		
	17:18	17:52	18:20	19:48	40	18:44 (2)	20:15	136	19:26 (2)	20:34	174	19:42 (2)	20:30	148	19:41 (2)	19:59	18:28	16:56	16:53	16:53		
20	07:22	06:54	06:15	06:29	18:03 (2)	05:56	17:08 (2)	05:47	05:56	17:08 (2)	05:47	16:48 (2)	06:02	16:58 (2)	06:28	17:13 (2)	06:55	07:22	06:54	07:20		
	17:19	17:53	18:21	19:49	44	18:47 (2)	20:16	140	19:28 (2)	20:35	174	19:42 (2)	20:29	146	19:39 (2)	19:57	18:27	16:55	16:53	16:53		
21	07:22	06:53	06:13	06:27	17:59 (2)	05:56	17:07 (2)	05:47	05:56	17:07 (2)	05:47	16:48 (2)	06:03	16:58 (2)	06:29	17:14 (2)	06:56	07:23	06:55	07:21		
	17:20	17:54	18:21	19:50	50	18:49 (2)	20:17	142	19:29 (2)	20:35	174	19:42 (2)	20:28	146	19:40 (2)	19:56	18:25	16:55	16:53	16:53		
22	07:21	06:52	06:12	06:26	17:58 (2)	05:55	17:06 (2)	05:48	05:55	17:06 (2)	05:48	16:49 (2)	06:04	16:59 (2)	06:30	17:17 (2)	06:56	07:24	06:56	07:22		
	17:21	17:55	18:22	19:51	54	18:52 (2)	20:18	142	19:28 (2)	20:35	174	19:43 (2)	20:28	142	19:39 (2)	19:55	18:24	16:54	16:54	16:54		
23	07:21	06:51	06:10	06:25	17:55 (2)	05:54	17:04 (2)	05:48	05:54	17:04 (2)	05:48	16:49 (2)	06:05	16:59 (2)	06:31	18:07 (2)	06:57	07:25	06:57	07:22		
	17:22	17:56	18:23	19:52	60	18:55 (2)	20:19	146	19:30 (2)	20:35	174	19:43 (2)	20:27	140	19:38 (2)	19:53	18:23	16:54	16:54	16:54		
24	07:20	06:49	06:09	06:24	17:54 (2)	05:54	17:03 (2)	05:48	05:54	17:03 (2)	05:48	16:49 (2)	06:05	16:59 (2)	06:32	18:08 (2)	06:58	07:26	06:58	07:23		
	17:23	17:57	18:24	19:53	62	18:56 (2)	20:19	148	19:31 (2)	20:35	174	19:43 (2)	20:26	140	19:38 (2)	19:52	18:21	16:53	16:55	16:55		
25	07:20	06:48	06:07	06:22	17:52 (2)	05:53	17:03 (2)	05:48	05:53	17:03 (2)	05:48	16:49 (2)	06:06	16:59 (2)	06:33	18:09 (2)	06:59	06:27	06:59	07:23		
	17:24	17:58	18:25	19:54	66	18:58 (2)	20:20	148	19:31 (2)	20:36	174	19:43 (2)	20:25	136	19:37 (2)	19:50	18:20	16:53	16:56	16:56		
26	07:19	06:47	06:05	06:21	17:49 (2)	05:52	17:00 (2)	05:49	05:52	17:00 (2)	05:49	16:52 (2)	06:07	16:59 (2)	06:33	18:11 (2)	07:00	06:28	07:00	07:23		
	17:25	17:59	18:26	19:55	72	19:01 (2)	20:21	152	19:32 (2)	20:36	172	19:44 (2)	20:25	134	19:36 (2)	19:49	18:19	16:52	16:56	16:56		
27	07:18	06:45	06:04	06:20	17:48 (2)	05:52	17:00 (2)	05:49	05:52	17:00 (2)	05:49</											

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 17

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: M - R13

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December										
1	07:25	07:15	06:43	06:56	06:15	06:51 (5)	05:49	06:46 (5)	05:51	06:56 (5)	06:12	06:39	07:04	06:34	07:05							
	17:01	17:32	18:02	19:32	19:59	76	19:37 (3)	20:25	94	20:02 (4)	20:36	82	20:12 (4)	20:19	104	19:57 (3)	19:40	18:54	17:12	16:51		
2	07:25	07:14	06:41	06:55	06:14	06:50 (5)	05:49	06:47 (5)	05:51	06:56 (5)	06:13	06:54 (5)	06:39	07:05	06:35	07:06						
	17:01	17:33	18:03	19:33	20:00	80	19:38 (3)	20:26	90	20:01 (4)	20:36	82	20:10 (4)	20:18	102	19:56 (3)	19:39	18:53	17:11	16:51		
3	07:26	07:13	06:40	06:53	06:12	06:49 (5)	05:49	06:47 (5)	05:51	06:57 (5)	06:14	06:54 (5)	06:40	07:06	06:36	07:07						
	17:02	17:34	18:04	19:33	20:01	84	19:39 (3)	20:27	92	20:03 (4)	20:36	82	20:11 (4)	20:18	100	19:54 (3)	19:37	18:51	17:10	16:50		
4	07:26	07:12	06:38	06:52	06:11	06:48 (5)	05:48	06:49 (5)	05:52	06:55 (5)	06:14	06:53 (5)	06:41	07:07	06:37	07:08						
	17:03	17:35	18:05	19:34	20:02	86	19:40 (3)	20:27	86	20:03 (4)	20:35	84	20:11 (4)	20:16	100	19:53 (3)	19:36	18:50	17:09	16:50		
5	07:26	07:11	06:37	06:50	06:10	06:46 (5)	05:48	06:48 (5)	05:52	06:56 (5)	06:15	06:54 (5)	06:42	07:08	06:38	07:09						
	17:04	17:36	18:06	19:35	20:03	90	19:41 (3)	20:28	88	20:04 (4)	20:35	86	20:12 (4)	20:15	96	19:52 (3)	19:34	18:48	17:08	16:50		
6	07:26	07:10	06:36	06:49	06:09	06:46 (5)	05:48	06:48 (5)	05:53	06:56 (5)	06:16	06:55 (5)	06:43	07:09	06:39	07:10						
	17:05	17:38	18:07	19:36	20:04	94	19:42 (3)	20:29	86	20:04 (4)	20:35	84	20:10 (4)	20:14	94	19:51 (3)	19:33	18:47	17:07	16:50		
7	07:26	07:09	06:34	06:47	06:08	06:45 (5)	05:48	06:50 (5)	05:54	06:55 (5)	06:17	06:56 (5)	06:44	07:10	06:40	07:11						
	17:06	17:39	18:08	19:37	20:05	96	19:43 (3)	20:29	84	20:04 (4)	20:35	88	20:11 (4)	20:13	92	19:50 (3)	19:31	18:45	17:06	16:50		
8	07:26	07:08	06:33	06:46	06:07	06:44 (5)	05:47	06:50 (5)	05:54	06:55 (5)	06:18	06:56 (5)	06:45	07:11	06:41	07:12						
	17:07	17:40	18:09	19:38	20:06	100	19:44 (3)	20:30	86	20:06 (4)	20:35	86	20:09 (4)	20:12	88	19:49 (3)	19:30	18:44	17:05	16:50		
9	07:26	07:07	06:31	06:44	06:06	06:43 (5)	05:47	06:50 (5)	05:55	06:56 (5)	06:19	06:57 (5)	06:45	07:11	06:42	07:13						
	17:07	17:41	18:10	19:39	20:07	98	19:43 (3)	20:30	84	20:06 (4)	20:34	88	20:10 (4)	20:11	86	19:47 (3)	19:28	18:42	17:04	16:50		
10	07:25	07:06	06:30	06:43	06:05	06:44 (5)	05:47	06:52 (5)	05:55	06:55 (5)	06:20	06:58 (5)	06:46	07:12	06:44	07:14						
	17:08	17:42	18:11	19:40	20:07	100	19:44 (3)	20:31	82	20:06 (4)	20:34	84	19:48 (3)	19:27	18:41	17:03	16:50					
11	07:25	07:05	06:28	06:41	06:04	06:43 (5)	05:47	06:52 (5)	05:56	06:55 (5)	06:20	06:59 (5)	06:47	07:13	06:45	07:14						
	17:09	17:43	18:12	19:41	20:08	102	19:45 (3)	20:31	84	20:08 (4)	20:34	90	20:09 (4)	20:09	80	19:47 (3)	19:25	18:39	17:02	16:50		
12	07:25	07:04	06:27	06:40	06:03	06:42 (5)	05:47	06:52 (5)	05:57	06:54 (5)	06:21	06:57 (5)	06:48	07:14	06:46	07:15						
	17:10	17:44	18:13	19:42	20:09	104	19:46 (3)	20:32	82	20:08 (4)	20:33	94	20:10 (4)	20:07	78	19:46 (3)	19:24	18:38	17:01	16:51		
13	07:25	07:03	06:25	06:39	06:02	06:43 (5)	05:47	06:54 (5)	05:57	06:54 (5)	06:22	06:57 (5)	06:49	07:15	06:47	07:16						
	17:11	17:45	18:14	19:43	20:10	104	19:47 (3)	20:32	80	20:08 (4)	20:33	92	20:08 (4)	20:06	70	19:45 (3)	19:22	18:36	17:00	16:51		
14	07:25	07:02	06:24	06:37	06:01	06:42 (5)	05:47	06:54 (5)	05:58	06:53 (5)	06:23	07:05 (5)	06:50	07:16	06:48	07:17						
	17:12	17:46	18:15	19:44	20:11	106	19:48 (3)	20:33	80	20:08 (4)	20:32	96	20:09 (4)	20:05	64	19:43 (3)	19:21	18:35	16:59	16:51		
15	07:24	07:01	06:22	06:36	06:00	06:41 (5)	05:47	06:54 (5)	05:59	06:54 (5)	06:24	07:08 (5)	06:50	07:17	06:49	07:17						
	17:13	17:47	18:16	19:44	20:12	104	19:47 (3)	20:33	78	20:08 (4)	20:32	96	20:10 (4)	20:04	54	19:42 (3)	19:19	18:33	16:59	16:51		
16	07:24	06:59	06:21	06:34	06:00	06:42 (5)	05:47	06:54 (5)	05:59	06:54 (5)	06:25	07:08 (5)	06:50	07:18	06:50	07:18						
	17:14	17:49	18:17	19:45	10	19:24 (3)	20:13	104	19:47 (3)	20:33	76	20:10 (4)	20:31	94	19:54 (3)	20:02	42	19:41 (3)	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	06:03	06:42 (5)	05:47	06:54 (5)	06:00	06:53 (5)	06:26	07:08 (5)	06:52	07:19	06:51	07:19						
	17:15	17:50	18:18	19:46	16	19:25 (3)	20:14	104	19:48 (3)	20:34	76	20:10 (4)	20:31	94	19:53 (3)	20:01	42	19:40 (3)	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	06:02	06:41 (5)	05:47	06:54 (5)	06:01	06:54 (5)	06:27	07:08 (5)	06:53	07:20	06:52	07:19						
	17:17	17:51	18:19	19:47	20	19:25 (3)	20:14	106	19:47 (3)	20:34	76	20:10 (4)	20:30	94	19:54 (3)	20:00	38	19:37 (3)	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	06:02	06:42 (5)	05:47	06:56 (5)	06:01	06:53 (5)	06:27	07:08 (5)	06:54	07:21	06:53	07:20						
	17:18	17:52	18:20	19:48	24	19:26 (3)	20:15	102	19:46 (3)	20:34	74	20:10 (4)	20:30	96	19:55 (3)	19:59	36	19:36 (3)	19:13	18:28	16:56	16:53
20	07:22	06:54	06:15	06:29	06:01	06:42 (5)	05:47	06:56 (5)	06:02	06:53 (5)	06:28	07:08 (5)	06:55	07:22	06:54	07:20						
	17:19	17:53	18:21	19:49	26	19:27 (3)	20:16	102	19:46 (3)	20:35	74	20:10 (4)	20:29	98	19:55 (3)	19:57	34	19:34 (3)	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	06:00	06:43 (5)	05:47	06:56 (5)	06:03	06:52 (5)	06:29	07:08 (5)	06:56	07:23	06:55	07:21						
	17:20	17:54	18:21	19:50	28	19:27 (3)	20:17	102	19:47 (3)	20:35	74	20:10 (4)	20:28	100	19:56 (3)	19:56	30	19:33 (3)	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	06:02	06:42 (5)	05:48	06:57 (5)	06:04	06:53 (5)	06:30	07:08 (5)	06:56	07:24	06:56	07:22						
	17:21	17:55	18:22	19:51	32	19:28 (3)	20:18	102	19:46 (3)	20:35	74	20:11 (4)	20:28	102	19:57 (3)	19:55	28	19:32 (3)	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	06:01	06:44 (5)	05:48	06:57 (5)	06:05	06:52 (5)	06:31	07:08 (5)	06:57	07:25	06:57	07:22						
	17:22	17:56	18:23	19:52	36	19:31 (3)	20:19	98	19:46 (3)	20:35	74	20:11 (4)	20:27	104	19:58 (3)	19:53	26	19:31 (3)	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	06:00	06:43 (5)	05:48	06:57 (5)	06:05	06:52 (5)	06:32	07:08 (5)	06:58	07:26	06:58	07:23						
	17:23	17:57	18:24	19:53	38	19:32 (3)	20:19	98	19:45 (3)	20:35	74	20:11 (4)	20:26	102	19:56 (3)	19:52	22	19:30 (3)	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	06:00	06:43 (5)	05:48	06:55 (5)	06:06	06:53 (5)	06:33	07:08 (5)	06:59	07:27	06:59	07:23						
	17:24	17:58	18:25	19:54	40	19:32 (3)	20:20	96	19:45 (3)	20:36	76	20:11 (4)	20:25	104	19:57 (3)	19:50	20	19:29 (3)	19:03	18:20	16:53	16:56
26	07:19	06:47	06:05	06:21	06:00	06:44 (5)	05:49	06:56 (5)	06:07	06:52 (5)	06:33	07:08 (5)	06:59	07:28	07:00	07:23						
	17:25	17:59	18:26	19:55	42	19:33 (3)	20:21	96	19:44 (3)	20:36	76	20:12 (4)	20:25	104	19:58 (3)	19:49	16	19:27 (3)	19:02	18:19	16:52	16:56
27	07:18	06:45	06:04	06:20	06:00	06:44 (5)	05:49	06:56 (5)	06:08	06:53 (5)	06:34	07:08 (5)	06:59	07:29	07:01	07:24						
	17:26	18:00	18:27	19:56	42	19:34 (3)	20:22	96	19:46 (3)	20:36	80	20:12 (4)	20:24	106	19:59 (3)	19:48	10	19:26 (3)	19:00	18:18	16:52	16:57
28	07:18	06:44	06:02	06:18	06:00	06:45 (5)	05:49	06:56 (5)	06:09	06:54 (5)	06:35	07:08 (5)	06:59	07:30	07:03	07:24						
	17:27	18:01	18:28	19:56	58	19:35 (3)	20:23	98	20:01 (4)	20:36	80	20:10 (4)	20:23	104	19:58 (3)	19:46	18:59	17:16	16:52	16:57		
29	07:17	07:01	06:17	06:31	06:00	06:45 (5)	05:50	06:57 (5)	06:09	06:52 (5)	06:36	07:08 (5)	06:59	07:31	07:03	07:24						
	17:29	17:59	18:26	19:55	66	19:35 (3)	20:23	96	20:01 (4)	20:36	80	20:11 (4)	20:22	1								

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 18

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: N - R14

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:13	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:51
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:15	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:53	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:08	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:42	06:04	05:47	05:56	06:21	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	17:00	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:48	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	06:00	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:52
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:02	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:22	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:28	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	05:54	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:06	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:01	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:28	18:01	18:28	19:56	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 19

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: O - R15

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:13	05:49	05:52	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:34	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:51
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:15	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:53	06:15	06:42	07:08	06:38	07:09
	17:04	17:37	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:08	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:09	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:42	06:04	05:47	05:56	06:21	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	17:00	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:48	18:16	19:45	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	06:00	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:15	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:52
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:02	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:22	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:28	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:07	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	05:54	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:06	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:28	18:01	18:28	19:56	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker
			(WTG causing flicker last time)

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 20

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: P - R16

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June
1	07:25 17:01	07:15 17:32	06:43 18:02	06:56 19:32	07:32 (3) 19:59	05:49 20:25
2	07:25 17:01	07:14 17:33	06:41 18:03	06:55 19:33	07:35 (3) 20:00	05:49 20:26
3	07:26 17:02	07:13 17:34	06:40 18:04	06:53 19:34	07:35 (3) 20:01	05:49 20:27
4	07:26 17:03	07:12 17:35	06:38 18:05	06:52 19:34	07:38 (3) 20:02	05:48 20:27
5	07:26 17:04	07:11 17:37	06:37 18:06	06:50 19:35	06:10 20:03	05:48 20:28
6	07:26 17:05	07:10 17:38	06:36 18:07	06:49 19:36	06:09 20:04	05:48 20:29
7	07:26 17:06	07:09 17:39	06:34 18:08	06:47 19:37	06:08 20:05	05:48 20:29
8	07:26 17:07	07:08 17:40	06:33 18:09	06:46 19:38	06:07 20:06	05:47 20:30
9	07:26 17:08	07:07 17:41	06:31 18:10	06:44 19:39	06:06 20:07	05:47 20:30
10	07:26 17:09	07:06 17:42	06:30 18:11	06:43 19:40	06:05 20:08	05:47 20:31
11	07:25 17:09	07:05 17:43	06:28 18:12	06:42 19:41	06:04 20:08	05:47 20:31
12	07:25 17:10	07:04 17:44	06:27 18:13	06:40 19:42	06:03 20:09	05:47 20:32
13	07:25 17:11	07:03 17:45	06:25 18:14	06:39 19:43	06:02 20:10	05:47 20:32
14	07:25 17:12	07:02 17:46	06:24 18:15	06:37 19:44	06:01 20:11	05:47 20:33
15	07:24 17:13	07:01 17:48	06:22 18:16	06:44 (3) 19:45	06:36 20:12	05:47 20:33
16	07:24 17:15	06:59 17:49	06:21 18:17	06:41 (3) 19:45	06:34 20:13	05:47 20:33
17	07:24 17:16	06:58 17:50	06:19 18:18	06:39 (3) 19:46	06:33 20:14	05:59 20:34
18	07:23 17:17	06:57 17:51	06:18 18:19	06:38 (3) 19:47	06:32 20:15	05:58 20:34
19	07:23 17:18	06:56 17:52	06:16 18:20	06:36 (3) 19:48	06:30 20:15	05:57 20:34
20	07:23 17:19	06:55 17:53	06:15 18:21	06:34 (3) 19:49	06:29 20:16	05:56 20:35
21	07:22 17:20	06:53 17:54	06:13 18:22	06:33 (3) 19:50	06:28 20:17	05:56 20:35
22	07:22 17:21	06:52 17:55	06:12 18:22	06:33 (3) 19:51	06:26 20:18	05:55 20:35
23	07:21 17:22	06:51 17:56	06:10 18:23	06:32 (3) 19:52	06:25 20:19	05:54 20:35
24	07:20 17:23	06:49 17:57	06:09 18:24	06:30 (3) 19:53	06:24 20:20	05:54 20:35
25	07:20 17:24	06:48 17:58	06:07 18:25	06:31 (3) 19:54	06:22 20:20	05:53 20:36
26	07:19 17:25	06:47 17:59	06:06 18:26	06:31 (3) 19:55	06:21 20:21	05:52 20:36
27	07:18 17:26	06:45 18:00	06:04 18:27	06:30 (3) 19:56	06:20 20:22	05:52 20:36
28	07:18 17:28	06:44 18:01	06:03 18:28	06:30 (3) 19:57	06:19 20:23	05:51 20:36
29	07:17 17:29		07:01 19:29	07:31 (3) 19:57	06:17 20:23	05:50 20:36
30	07:16 17:30		06:59 19:30	07:31 (3) 19:58	06:16 20:24	05:50 20:36
31	07:16 17:31		06:58 19:31	07:32 (3) 08:00 (3)	06:14 (1) 20:25	05:49 20:36
Potential sun hours	306	302	370	395	440	442
Total, worst case			486	78		864
Sun reduction			0,77	0,81		0,92
Oper. time red.			0,99	0,99		0,99
Wind dir. red.			0,62	0,62		0,54
Total reduction			0,48	0,50		0,50
Total, real			233	39	42	431

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 21

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: P - R16

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum	
1	100	620	250	240	160	330	750	680	530	300	380	420	670	610	790	870	8700

	July	August	September	October	November	December		
1	05:51	06:16 (1)	06:12	06:39	07:04	06:34	07:06	
	20:36	28 06:44 (1)	20:19	19:40	18:54	17:12	16:51	
2	05:51	06:16 (1)	06:13	06:39	07:05	06:35	07:06	
	20:36	28 06:44 (1)	20:18	19:39	18:53	17:11	16:51	
3	05:52	06:17 (1)	06:14	06:40	07:06	06:36	07:07	
	20:36	28 06:45 (1)	20:17	19:37	18:51	17:10	16:51	
4	05:52	06:17 (1)	06:15	06:41	07:07	06:37	07:08	
	20:35	28 06:45 (1)	20:16	19:36	18:50	17:09	16:50	
5	05:53	06:16 (1)	06:15	06:42	07:08	06:38	07:09	
	20:35	28 06:44 (1)	20:15	19:34	18:48	17:08	16:50	
6	05:53	06:16 (1)	06:16	06:43	07:09	06:39	07:10	
	20:35	28 06:44 (1)	20:14	19:33	18:47	17:07	16:50	
7	05:54	06:17 (1)	06:17	06:44	07:10	06:40	07:11	
	20:35	28 06:45 (1)	20:13	19:31	18:45	17:06	16:50	
8	05:54	06:17 (1)	06:18	06:45	07:34 (3)	07:11	06:41	07:12
	20:35	26 06:43 (1)	20:12	19:30	07:44 (3)	18:44	17:05	16:50
9	05:55	06:18 (1)	06:19	06:45	07:29 (3)	07:12	06:43	07:13
	20:34	26 06:44 (1)	20:11	19:28	18 07:47 (3)	18:42	17:04	16:50
10	05:55	06:19 (1)	06:20	06:46	07:28 (3)	07:12	06:44	07:14
	20:34	26 06:45 (1)	20:10	19:27	22 07:50 (3)	18:41	17:03	16:50
11	05:56	06:19 (1)	06:21	06:47	07:24 (3)	07:13	06:45	07:14
	20:34	24 06:43 (1)	20:09	19:25	26 07:50 (3)	18:39	17:02	16:50
12	05:57	06:22 (1)	06:21	06:48	07:23 (3)	07:14	06:46	07:15
	20:33	22 06:44 (1)	20:07	19:24	28 07:51 (3)	18:38	17:01	16:51
13	05:57	06:23 (1)	06:22	06:49	07:22 (3)	07:15	06:47	07:16
	20:33	20 06:43 (1)	20:06	19:22	30 07:52 (3)	18:36	17:00	16:51
14	05:58	06:23 (1)	06:23	06:50	07:21 (3)	07:16	06:48	07:17
	20:32	18 06:41 (1)	20:05	19:21	30 07:51 (3)	18:35	17:00	16:51
15	05:59	06:24 (1)	06:24	06:51	07:20 (3)	07:17	06:49	07:17
	20:32	16 06:40 (1)	20:04	19:19	32 07:52 (3)	18:33	16:59	16:51
16	05:59	06:25 (1)	06:25	06:51	07:20 (3)	07:18	06:50	07:18
	20:31	14 06:39 (1)	20:03	19:17	32 07:52 (3)	18:32	16:58	16:52
17	06:00	06:27 (1)	06:26	06:52	07:19 (3)	07:19	06:51	07:19
	20:31	10 06:37 (1)	20:01	19:16	32 07:51 (3)	18:31	16:57	16:52
18	06:01	06:32 (1)	06:27	06:53	07:18 (3)	07:20	06:52	07:19
	20:30	4 06:36 (1)	20:00	19:14	34 07:52 (3)	18:29	16:57	16:52
19	06:02	06:27	06:54	07:19 (3)	07:21	06:53	07:20	
	20:30	19:59	19:13	32 07:51 (3)	18:28	16:56	16:53	
20	06:02	06:28	06:55	07:18 (3)	07:22	06:54	07:21	
	20:29	19:57	19:11	34 07:52 (3)	18:27	16:55	16:53	
21	06:03	06:29	06:56	07:19 (3)	07:23	06:55	07:21	
	20:28	19:56	19:10	32 07:51 (3)	18:25	16:55	16:53	
22	06:04	06:30	06:56	07:17 (3)	07:24	06:56	07:22	
	20:28	19:55	19:08	32 07:49 (3)	18:24	16:54	16:54	
23	06:05	06:31	06:57	07:18 (3)	07:25	06:57	07:22	
	20:27	19:53	19:07	30 07:48 (3)	18:23	16:54	16:54	
24	06:05	06:32	06:58	07:19 (3)	07:26	06:58	07:23	
	20:26	19:52	19:05	28 07:47 (3)	18:21	16:53	16:55	
25	06:06	06:33	06:59	07:20 (3)	06:27	07:00	07:23	
	20:25	19:50	19:03	26 07:46 (3)	17:20	16:53	16:56	
26	06:07	06:34	07:00	07:21 (3)	06:28	07:01	07:23	
	20:25	19:49	19:02	24 07:45 (3)	17:19	16:52	16:56	
27	06:08	06:34	07:01	07:22 (3)	06:29	07:02	07:24	
	20:24	19:48	19:00	20 07:42 (3)	17:18	16:52	16:57	
28	06:09	06:35	07:02	07:25 (3)	06:30	07:03	07:24	
	20:23	19:46	18:59	14 07:39 (3)	17:16	16:52	16:57	
29	06:09	06:36	07:03	07:29 (3)	06:31	07:04	07:24	
	20:22	19:45	18:57	4 07:33 (3)	17:15	16:51	16:58	
30	06:10	06:37	07:03	06:32	07:05	07:25		
	20:21	19:43	18:56	17:14	16:51	16:59		
31	06:11	06:38		06:33		07:25		
	20:20	19:42		17:13		17:00		
Potential sun hours	450	422	374	348	305	298		
Total, worst case	402		570					
Sun reduction	0,96		0,87					
Oper. time red.	0,99		0,99					
Wind dir. red.	0,54		0,62					
Total reduction	0,52		0,54					
Total, real	209		308					

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 22

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: Q - R17

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June
1	07:25 17:01	07:15 17:32	06:43 18:02	06:56 19:32	06:15 19:59	06:33 (4) 07:05 (4)
2	07:25 17:01	07:14 17:33	06:41 18:03	06:55 19:33	06:14 20:00	06:32 (4) 07:06 (4)
3	07:26 17:02	07:13 17:34	06:40 18:04	06:53 19:34	06:13 20:01	06:31 (4) 07:07 (4)
4	07:26 17:03	07:12 17:35	06:38 18:05	06:52 19:34	06:11 20:02	06:30 (4) 07:08 (4)
5	07:26 17:04	07:11 17:37	06:37 18:06	06:50 19:35	06:10 20:03	06:29 (4) 07:09 (4)
6	07:26 17:05	07:10 17:38	06:36 18:07	07:00 (3) 07:04 (3)	06:49 19:36	06:28 (4) 07:10 (4)
7	07:26 17:06	07:09 17:39	06:34 18:08	06:54 (3) 07:06 (3)	06:47 19:37	06:29 (4) 07:11 (4)
8	07:26 17:07	07:08 17:40	06:33 18:09	06:51 (3) 07:09 (3)	06:46 19:38	06:28 (4) 07:10 (4)
9	07:26 17:08	07:07 17:41	06:31 18:10	06:49 (3) 07:11 (3)	06:44 19:39	06:27 (4) 07:11 (4)
10	07:26 17:09	07:06 17:42	06:30 18:11	06:48 (3) 07:12 (3)	06:43 19:40	06:26 (4) 07:12 (4)
11	07:25 17:09	07:05 17:43	06:28 18:12	06:46 (3) 07:12 (3)	06:42 19:41	06:27 (4) 07:11 (4)
12	07:25 17:10	07:04 17:44	06:27 18:13	06:47 (3) 07:13 (3)	06:40 19:42	06:26 (4) 07:12 (4)
13	07:25 17:11	07:03 17:45	06:25 18:14	06:45 (3) 07:13 (3)	06:39 19:43	06:25 (4) 07:11 (4)
14	07:25 17:12	07:02 17:46	06:24 18:15	06:44 (3) 07:12 (3)	06:37 19:44	06:26 (4) 07:12 (4)
15	07:24 17:13	07:01 17:48	06:22 18:16	06:44 (3) 07:12 (3)	06:36 19:45	06:26 (4) 07:12 (4)
16	07:24 17:15	06:59 17:49	06:21 18:17	06:45 (3) 07:13 (3)	06:34 19:45	06:25 (4) 07:13 (4)
17	07:24 17:16	06:58 17:50	06:19 18:18	06:43 (3) 07:11 (3)	06:33 19:46	06:26 (4) 07:12 (4)
18	07:23 17:17	06:57 17:51	06:18 18:19	06:44 (3) 07:10 (3)	06:32 19:47	06:25 (4) 07:11 (4)
19	07:23 17:18	06:56 17:52	06:16 18:20	06:44 (3) 07:10 (3)	06:30 19:48	06:26 (4) 07:12 (4)
20	07:23 17:19	06:55 17:53	06:15 18:21	06:44 (3) 07:08 (3)	06:29 19:49	06:26 (4) 07:12 (4)
21	07:22 17:20	06:53 17:54	06:13 18:22	06:47 (3) 07:07 (3)	06:28 19:50	06:25 (4) 07:11 (4)
22	07:22 17:21	06:52 17:55	06:12 18:23	06:47 (3) 07:03 (3)	06:26 19:51	06:27 (4) 07:11 (4)
23	07:21 17:22	06:51 17:56	06:10 18:23	06:50 (3) 07:02 (3)	06:25 19:52	06:26 (4) 07:12 (4)
24	07:20 17:23	06:49 17:57	06:09 18:24	06:24 19:53	05:54 20:20	06:27 (4) 07:11 (4)
25	07:20 17:24	06:48 17:58	06:07 18:25	06:22 19:54	05:53 20:20	06:27 (4) 07:11 (4)
26	07:19 17:25	06:47 17:59	06:06 18:26	06:21 19:55	05:52 20:21	06:28 (4) 07:10 (4)
27	07:18 17:26	06:45 18:00	06:04 18:27	06:20 19:56	06:44 (4) 06:58 (4)	05:52 20:22
28	07:18 17:28	06:44 18:01	06:03 18:28	06:19 19:57	06:41 (4) 07:01 (4)	05:51 20:23
29	07:17 17:29		07:01 19:29	06:17 19:57	06:38 (4) 07:04 (4)	05:50 20:23
30	07:16 17:30		06:59 19:30	06:16 19:58	06:36 (4) 07:04 (4)	05:50 20:24
31	07:16 17:31		06:58 19:31		06:30 (4) 20:25	05:50 40 07:10 (4)
Potential sun hours	306	302	370	395	440	442
Total, worst case			396	88	1332	970
Sun reduction			0,77	0,81	0,84	0,92
Oper. time red.			0,99	0,99	0,99	0,99
Wind dir. red.			0,63	0,55	0,55	0,55
Total reduction			0,49	0,44	0,46	0,50
Total, real			193	39	614	490

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 23

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: Q - R17

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	July	August	September	October	November	December
1	05:51 20:36	06:40 (4) 20:19	06:12 19:40	06:37 (4) 19:40	07:04 18:54	07:25 (3) 17:12
2	05:51 20:36	06:40 (4) 20:18	06:13 19:39	06:36 (4) 19:39	07:05 18:53	07:24 (3) 17:11
3	05:52 20:36	06:39 (4) 20:17	06:14 19:37	06:36 (4) 19:37	07:06 18:51	07:25 (3) 17:10
4	05:52 20:35	06:39 (4) 20:16	06:15 19:36	06:37 (4) 19:36	07:07 18:50	07:26 (3) 17:09
5	05:53 20:35	06:40 (4) 20:15	06:15 19:34	06:38 (4) 19:34	07:08 18:48	07:27 (3) 17:08
6	05:53 20:35	06:38 (4) 20:14	06:16 19:33	06:39 (4) 19:33	07:09 18:47	07:30 (3) 17:07
7	05:54 20:35	06:39 (4) 20:13	06:17 19:31	06:38 (4) 19:31	07:10 18:45	07:31 (3) 17:06
8	05:54 20:35	06:39 (4) 20:12	06:18 19:30	06:39 (4) 19:30	07:11 18:44	07:32 (3) 17:05
9	05:55 20:34	06:38 (4) 20:11	06:19 19:28	06:39 (4) 19:28	07:12 18:42	07:33 (3) 17:04
10	05:55 20:34	06:39 (4) 20:10	06:20 19:27	06:40 (4) 19:27	07:12 18:41	07:34 (3) 17:03
11	05:56 20:34	06:37 (4) 20:09	06:21 19:25	06:41 (4) 19:25	07:13 18:39	07:35 (3) 17:02
12	05:57 20:33	06:38 (4) 20:07	06:21 19:24	06:44 (4) 19:24	07:14 18:38	07:36 (3) 17:01
13	05:57 20:33	06:39 (4) 20:06	06:22 19:22	06:45 (4) 19:22	07:15 18:36	07:37 (3) 17:00
14	05:58 20:32	06:37 (4) 20:05	06:23 19:21	06:46 (4) 19:21	07:16 18:35	07:38 (3) 17:00
15	05:59 20:32	06:38 (4) 20:04	06:24 19:19	06:48 (4) 19:19	07:17 18:33	07:39 (3) 16:59
16	05:59 20:31	06:37 (4) 20:03	06:25 19:17	06:51 (4) 19:17	07:18 18:32	07:40 (3) 16:58
17	06:00 20:31	06:37 (4) 20:01	06:26 19:16	06:52 19:16	07:19 18:31	07:41 (3) 16:57
18	06:01 20:30	06:36 (4) 20:00	06:27 19:14	06:53 19:14	07:20 18:29	07:42 (3) 16:57
19	06:02 20:30	06:37 (4) 19:59	06:27 19:13	06:54 19:13	07:21 18:28	07:43 (3) 16:56
20	06:02 20:29	06:35 (4) 19:57	06:28 19:11	06:55 19:11	07:22 18:27	07:44 (3) 16:55
21	06:03 20:28	06:36 (4) 19:56	06:29 19:10	06:56 19:10	07:23 18:25	07:45 (3) 16:55
22	06:04 20:28	06:37 (4) 19:55	06:30 19:08	06:56 19:08	07:24 18:24	07:46 (3) 16:54
23	06:05 20:27	06:36 (4) 19:53	06:31 19:07	06:57 19:07	07:25 18:23	07:47 (3) 16:54
24	06:05 20:26	06:36 (4) 19:52	06:32 19:05	06:58 19:05	07:26 18:21	07:48 (3) 16:53
25	06:06 20:25	06:35 (4) 19:50	06:33 19:03	06:59 19:03	07:27 18:20	07:49 (3) 16:53
26	06:07 20:25	06:36 (4) 19:49	06:34 19:02	07:00 19:02	07:28 18:19	07:50 (3) 16:52
27	06:08 20:24	06:37 (4) 19:48	06:34 19:00	07:01 19:00	07:29 18:18	07:51 (3) 16:52
28	06:09 20:23	06:36 (4) 19:46	06:35 18:59	07:02 18:59	07:30 18:17	07:52 (3) 16:52
29	06:09 20:22	06:36 (4) 19:45	06:36 18:57	07:03 18:57	07:31 18:15	07:53 (3) 16:51
30	06:10 20:21	06:35 (4) 19:43	06:37 18:56	07:03 18:56	07:32 18:14	07:54 (3) 16:51
31	06:11 20:20	06:36 (4) 19:42	06:38 19:42	07:04 19:42	07:33 18:13	07:55 (3) 17:00
Potential sun hours	450	422	374	348	305	298
Total, worst case	1280	570	254	142		
Sun reduction	0,96	0,97	0,87	0,79		
Oper. time red.	0,99	0,99	0,99	0,99		
Wind dir. red.	0,55	0,55	0,63	0,63		
Total reduction	0,53	0,53	0,55	0,50		
Total, real	674	303	140	71		

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 24

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: R - R18

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	06:38 (3) 05:51	06:40 (3) 06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	80 07:58 (3) 20:36	90 08:10 (3) 20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	06:37 (3) 05:51	06:40 (3) 06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	82 07:59 (3) 20:36	88 08:08 (3) 20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:13	05:49	06:37 (3) 05:51	06:41 (3) 06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:34	20:01	20:27	82 07:59 (3) 20:36	88 08:09 (3) 20:17	19:37	18:51	17:10	16:51
4	07:26	07:12	06:38	06:52	06:11	05:48	06:37 (3) 05:52	06:41 (3) 06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	84 08:01 (3) 20:35	88 08:09 (3) 20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	06:36 (3) 05:52	06:42 (3) 06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	84 08:00 (3) 20:35	86 08:08 (3) 20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	06:36 (3) 05:53	06:42 (3) 06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	86 08:02 (3) 20:35	86 08:08 (3) 20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	06:36 (3) 05:54	06:43 (3) 06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	86 08:02 (3) 20:35	86 08:09 (3) 20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	06:36 (3) 05:54	06:43 (3) 06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	88 08:04 (3) 20:35	84 08:07 (3) 20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	06:36 (3) 05:55	06:44 (3) 06:19	06:45	07:11	06:43	07:13
	17:08	17:41	18:10	19:39	20:07	20:30	88 08:04 (3) 20:34	84 08:08 (3) 20:11	19:28	18:42	17:04	16:50
10	07:26	07:06	06:30	06:43	06:05	05:47	06:36 (3) 05:55	06:45 (3) 06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:07	20:31	88 08:04 (3) 20:34	82 08:07 (3) 20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:42	06:04	05:47	06:36 (3) 05:56	06:45 (3) 06:21	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	88 08:04 (3) 20:34	82 08:07 (3) 20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	06:36 (3) 05:57	06:46 (3) 06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	90 08:06 (3) 20:33	80 08:06 (3) 20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	06:36 (3) 05:57	06:46 (3) 06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	90 08:06 (3) 20:33	78 08:04 (3) 20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	06:36 (3) 05:58	06:49 (3) 06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	90 08:06 (3) 20:32	76 08:05 (3) 20:05	19:21	18:35	17:00	16:51
15	07:24	07:01	06:22	06:36	06:00	07:05 (3) 05:47	06:36 (3) 05:59	06:50 (3) 06:24	06:50	07:17	06:49	07:17
	17:13	17:48	18:16	19:45	20:12	22 07:27 (3) 20:33	90 08:06 (3) 20:32	74 08:04 (3) 20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	06:00	07:01 (3) 05:47	06:36 (3) 05:59	06:51 (3) 06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	32 07:33 (3) 20:33	90 08:06 (3) 20:31	72 08:03 (3) 20:02	19:17	18:32	16:58	16:52
17	07:24	06:58	06:19	06:33	05:59	06:58 (3) 05:47	06:36 (3) 06:00	06:51 (3) 06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	38 07:36 (3) 20:34	92 08:08 (3) 20:31	72 08:03 (3) 20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	06:55 (3) 05:47	06:36 (3) 06:01	06:52 (3) 06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:15	44 07:39 (3) 20:34	92 08:08 (3) 20:30	70 08:02 (3) 20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	06:52 (3) 05:47	06:36 (3) 06:02	06:55 (3) 06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	50 07:42 (3) 20:34	92 08:08 (3) 20:30	66 08:01 (3) 19:59	19:13	18:28	16:56	16:53
20	07:23	06:55	06:15	06:29	05:56	06:52 (3) 05:47	06:36 (3) 06:02	06:55 (3) 06:28	06:55	07:22	06:54	07:21
	17:19	17:53	18:21	19:49	20:16	52 07:44 (3) 20:35	92 08:08 (3) 20:29	64 07:59 (3) 19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:28	05:56	06:49 (3) 05:47	06:36 (3) 06:03	06:56 (3) 06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	56 07:45 (3) 20:35	92 08:08 (3) 20:28	62 07:58 (3) 19:56	19:10	18:25	16:55	16:53
22	07:22	06:52	06:12	06:26	05:55	06:48 (3) 05:48	06:37 (3) 06:04	06:59 (3) 06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	58 07:46 (3) 20:35	92 08:09 (3) 20:28	58 07:57 (3) 19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	06:46 (3) 05:48	06:37 (3) 06:05	07:00 (3) 06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	62 07:48 (3) 20:35	92 08:09 (3) 20:27	56 07:56 (3) 19:53	19:07	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	05:54	06:45 (3) 05:48	06:37 (3) 06:05	07:02 (3) 06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	64 07:49 (3) 20:35	92 08:09 (3) 20:26	50 07:52 (3) 19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	06:45 (3) 05:48	06:37 (3) 06:06	07:05 (3) 06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	66 07:51 (3) 20:36	92 08:09 (3) 20:25	46 07:51 (3) 19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:06	06:21	05:52	06:42 (3) 05:49	06:38 (3) 06:07	07:08 (3) 06:33	07:00	06:28	07:01	07:23
	17:25	17:59	18:26	19:55	20:21	70 07:52 (3) 20:36	92 08:10 (3) 20:25	40 07:48 (3) 19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	06:42 (3) 05:49	06:38 (3) 06:08	07:11 (3) 06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	72 07:54 (3) 20:36	90 08:08 (3) 20:24	34 07:45 (3) 19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	06:41 (3) 05:49	06:39 (3) 06:09	07:14 (3) 06:35	07:02	06:30	07:03	07:24
	17:28	18:01	18:28	19:56	20:23	74 07:55 (3) 20:36	90 08:09 (3) 20:23	28 07:42 (3) 19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	06:41 (3) 05:50	06:39 (3) 06:09	07:20 (3) 06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	76 07:57 (3) 20:36	90 08:09 (3) 20:22	16 07:36 (3) 19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	06:38 (3) 05:50	06:39 (3) 06:10		06:37	07:03	07:05	07:25
	17:30		19:30	19:58	20:24	78 07:56 (3) 20:36	90 08:09 (3) 20:21		19:43	18:56	17:14	16:51
31	07:15		06:58		05:50	06:38 (3)			06:38		06:33	07:25
	17:31		19:31		20:25	80 07:58 (3)			19:42		17:13	17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
Total, worst case					994	2666	1986					
Sun reduction					0,84	0,92	0,96					
Oper. time red.					0,99	0,99	0,99					
Wind dir. red.					0,55	0,55	0,55					
Total reduction					0,45	0,50	0,52					
Total, real					452	1328	1033					

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 25

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: S - R19

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time
 N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June
1	07:25 17:00	07:15 17:32	15:44 (6) 17:04 (6)	06:43 18:02	15:45 (6) 17:05 (6)	06:56 19:32
2	07:25 17:01	07:14 17:33	15:43 (6) 17:05 (6)	06:41 18:03	15:45 (6) 17:05 (6)	06:55 19:32
3	07:25 17:02	07:13 17:34	15:44 (6) 17:04 (6)	06:40 18:04	15:46 (6) 17:04 (6)	06:53 19:33
4	07:26 17:03	07:12 17:35	15:43 (6) 17:05 (6)	06:38 18:05	15:48 (6) 17:02 (6)	06:52 19:34
5	07:26 17:04	16:12 (6) 17:36	15:42 (6) 17:06 (6)	06:37 18:06	15:49 (6) 17:01 (6)	06:50 19:35
6	07:26 17:05	16:08 (6) 17:37	15:43 (6) 17:07 (6)	06:35 18:07	15:49 (6) 16:59 (6)	06:49 19:36
7	07:26 17:06	16:06 (6) 17:39	15:42 (6) 17:08 (6)	06:34 18:08	15:50 (6) 16:58 (6)	06:47 19:37
8	07:26 17:06	16:26 (6) 17:40	15:41 (6) 17:07 (6)	06:33 18:09	15:53 (6) 16:59 (6)	06:46 19:38
9	07:26 17:07	16:04 (6) 17:41	15:42 (6) 17:08 (6)	06:31 18:10	15:53 (6) 16:57 (6)	06:44 19:39
10	07:26 17:08	16:02 (6) 17:42	15:41 (6) 17:09 (6)	06:30 18:11	15:54 (6) 16:54 (6)	06:43 19:40
11	07:26 17:09	16:34 (6) 17:43	15:42 (6) 17:10 (6)	06:28 18:12	15:56 (6) 16:52 (6)	06:41 19:41
12	07:26 17:10	16:00 (6) 17:44	15:40 (6) 17:08 (6)	06:27 18:13	15:59 (6) 16:51 (6)	06:40 19:42
13	07:26 17:11	15:59 (6) 17:45	15:40 (6) 17:09 (6)	06:27 18:14	15:59 (6) 16:49 (6)	06:40 19:43
14	07:26 17:12	15:57 (6) 17:46	15:41 (6) 17:10 (6)	06:25 18:15	15:59 (6) 16:46 (6)	06:39 19:44
15	07:26 17:13	15:57 (6) 17:47	15:41 (6) 17:09 (6)	06:24 18:16	16:02 (6) 16:44 (6)	06:37 19:44
16	07:26 17:14	16:41 (6) 17:48	15:41 (6) 17:10 (6)	06:22 18:17	16:04 (6) 16:40 (6)	06:36 19:45
17	07:26 17:15	15:56 (6) 17:49	15:41 (6) 17:11 (6)	06:22 18:18	16:04 (6) 16:35 (6)	06:36 19:46
18	07:26 17:16	16:42 (6) 17:51	15:42 (6) 17:09 (6)	06:21 18:19	16:44 (6) 16:19 (6)	20:12 19:47
19	07:26 17:18	15:54 (6) 17:52	15:42 (6) 17:10 (6)	06:21 18:20	16:08 (6) 16:27 (6)	05:59 19:47
20	07:26 17:19	15:54 (6) 17:53	15:42 (6) 17:09 (6)	06:21 18:21	16:11 (6) 16:27 (6)	05:59 19:47
21	07:26 17:20	15:53 (6) 17:54	15:41 (6) 17:09 (6)	06:20 18:22	16:11 (6) 16:27 (6)	05:58 19:47
22	07:26 17:21	15:53 (6) 17:55	15:42 (6) 17:08 (6)	06:20 18:23	16:19 (6) 16:26 (6)	05:57 19:47
23	07:26 17:22	15:53 (6) 17:56	15:42 (6) 17:08 (6)	06:20 18:24	16:26 (6) 16:26 (6)	05:57 19:47
24	07:26 17:23	15:52 (6) 17:57	15:41 (6) 17:08 (6)	06:19 18:25	16:26 (6) 16:26 (6)	05:56 19:47
25	07:26 17:24	16:52 (6) 17:58	15:42 (6) 17:08 (6)	06:19 18:26	16:26 (6) 16:26 (6)	05:55 19:47
26	07:26 17:25	15:47 (6) 17:59	15:42 (6) 17:07 (6)	06:18 18:27	16:26 (6) 16:26 (6)	05:55 19:47
27	07:26 17:26	15:46 (6) 18:00	15:43 (6) 17:07 (6)	06:18 18:28	16:26 (6) 16:26 (6)	05:54 19:47
28	07:26 17:27	15:48 (6) 18:01	15:43 (6) 17:06 (6)	06:18 18:29	16:26 (6) 16:26 (6)	05:54 19:47
29	07:26 17:29	15:48 (6) 18:01	15:43 (6) 17:06 (6)	06:18 18:30	16:26 (6) 16:26 (6)	05:54 19:47
30	07:26 17:30	15:46 (6) 18:01	15:43 (6) 17:06 (6)	06:18 18:31	16:26 (6) 16:26 (6)	05:54 19:47
31	07:26 17:31	15:46 (6) 18:01	15:43 (6) 17:06 (6)	06:18 18:32	16:26 (6) 16:26 (6)	05:54 19:47
Potential sun hours	306	302	370	395	440	442
Total, worst case	1368	2404	1018			
Sun reduction	0,66	0,75	0,77			
Oper. time red.	0,99	0,99	0,99			
Wind dir. red.	0,54	0,54	0,54			
Total reduction	0,35	0,40	0,41			
Total, real	484	966	420			

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 26

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: S - R19

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum	
1	100	620	250	240	160	330	750	680	530	300	380	420	670	610	790	870	8700

	July	August	September	October	November	December				
1	05:50	06:12	06:38	07:04	16:37 (6)	06:34	15:10 (6)	07:05		15:42 (6)
	20:36	20:19	19:40	18:54	52 17:29 (6)	17:12	88 16:38 (6)	16:51	36	16:18 (6)
2	05:51	06:13	06:39	07:05	16:36 (6)	06:35	15:11 (6)	07:06		15:45 (6)
	20:36	20:18	19:39	18:52	54 17:30 (6)	17:11	86 16:37 (6)	16:51	32	16:17 (6)
3	05:51	06:14	06:40	07:06	16:33 (6)	06:36	15:11 (6)	07:07		15:46 (6)
	20:35	20:17	19:37	18:51	58 17:31 (6)	17:10	86 16:37 (6)	16:50	30	16:16 (6)
4	05:52	06:14	06:41	07:07	16:32 (6)	06:37	15:12 (6)	07:08		15:49 (6)
	20:35	20:16	19:36	18:49	60 17:32 (6)	17:09	86 16:38 (6)	16:50	24	16:13 (6)
5	05:52	06:15	06:42	07:08	16:29 (6)	06:38	15:13 (6)	07:09		15:51 (6)
	20:35	20:15	19:34	18:48	66 17:35 (6)	17:07	84 16:37 (6)	16:50	20	16:11 (6)
6	05:53	06:16	06:43	07:09	16:28 (6)	06:39	15:12 (6)	07:10		15:54 (6)
	20:35	20:14	19:33	18:46	66 17:34 (6)	17:06	84 16:36 (6)	16:50	14	16:08 (6)
7	05:53	06:17	06:44	07:10	16:27 (6)	06:40	15:13 (6)	07:11		15:59 (6)
	20:35	20:13	19:31	18:45	68 17:35 (6)	17:06	82 16:35 (6)	16:50	6	16:05 (6)
8	05:54	06:18	06:44	07:10	16:23 (6)	06:41	15:14 (6)	07:12		
	20:34	20:12	19:30	18:43	72 17:35 (6)	17:05	80 16:34 (6)	16:50		
9	05:55	06:19	06:45	07:11	16:22 (6)	06:42	15:13 (6)	07:13		
	20:34	20:11	19:28	18:42	74 17:36 (6)	17:04	82 16:35 (6)	16:50		
10	05:55	06:20	06:46	07:12	16:21 (6)	06:43	15:15 (6)	07:13		
	20:34	20:10	19:27	18:41	76 17:37 (6)	17:03	80 16:35 (6)	16:50		
11	05:56	06:20	06:47	07:13	16:20 (6)	06:45	15:16 (6)	07:14		
	20:33	20:09	19:25	18:39	78 17:38 (6)	17:02	78 16:34 (6)	16:50		
12	05:56	06:21	06:48	07:14	16:19 (6)	06:46	15:17 (6)	07:15		
	20:33	20:07	19:24	18:38	78 17:37 (6)	17:01	76 16:33 (6)	16:50		
13	05:57	06:22	06:49	07:15	16:18 (6)	06:47	15:18 (6)	07:16		
	20:33	20:06	19:22	18:36	80 17:38 (6)	17:00	74 16:32 (6)	16:51		
14	05:58	06:23	06:50	07:16	16:17 (6)	06:48	15:19 (6)	07:17		
	20:32	20:05	19:20	18:35	82 17:39 (6)	16:59	72 16:31 (6)	16:51		
15	05:59	06:24	06:50	07:17	16:16 (6)	06:49	15:18 (6)	07:17		
	20:32	20:04	19:19	18:33	82 17:38 (6)	16:59	72 16:30 (6)	16:51		
16	05:59	06:25	06:51	07:18	16:15 (6)	06:50	15:19 (6)	07:18		
	20:31	20:02	19:17	18:32	84 17:39 (6)	16:58	72 16:31 (6)	16:51		
17	06:00	06:26	06:52	07:19	16:14 (6)	06:51	15:21 (6)	07:19		
	20:31	20:01	19:16	18:31	86 17:40 (6)	16:57	70 16:31 (6)	16:52		
18	06:01	06:26	06:53	07:20	16:13 (6)	06:52	15:22 (6)	07:19		
	20:30	20:00	19:14	18:29	86 17:39 (6)	16:57	68 16:30 (6)	16:52		
19	06:01	06:27	06:54	07:21	16:12 (6)	06:53	15:23 (6)	07:20		
	20:30	19:59	19:13	18:28	88 17:40 (6)	16:56	66 16:29 (6)	16:52		
20	06:02	06:28	06:55	07:22	16:13 (6)	06:54	15:24 (6)	07:20		
	20:29	19:57	19:11	18:26	86 17:39 (6)	16:55	64 16:28 (6)	16:53		
21	06:03	06:29	06:55	07:23	16:12 (6)	06:55	15:27 (6)	07:21		
	20:28	19:56	19:10	18:25	88 17:40 (6)	16:55	60 16:27 (6)	16:53		
22	06:04	06:30	06:56	07:24	16:11 (6)	06:56	15:28 (6)	07:22		
	20:28	19:54	19:08	18:24	88 17:39 (6)	16:54	58 16:26 (6)	16:54		
23	06:04	06:31	06:57	07:25	16:10 (6)	06:57	15:29 (6)	07:22		
	20:27	19:53	19:06	18:23	90 17:40 (6)	16:54	56 16:25 (6)	16:54		
24	06:05	06:32	06:58	07:26	16:12 (6)	06:58	15:30 (6)	07:22		
	20:26	19:52	19:05	18:21	88 17:40 (6)	16:53	54 16:24 (6)	16:55		
25	06:06	06:32	06:59	06:27	15:11 (6)	06:59	15:31 (6)	07:23		
	20:25	19:50	19:03	17:20	88 16:39 (6)	16:53	52 16:23 (6)	16:55		
26	06:07	06:33	07:00	16:55 (6)	06:28	15:10 (6)	07:00	15:33 (6)	07:23	
	20:25	19:49	19:02	22 17:17 (6)	17:19	90 16:40 (6)	16:52	50 16:23 (6)	16:56	
27	06:08	06:34	07:01	16:50 (6)	06:29	15:11 (6)	07:01	15:36 (6)	07:24	
	20:24	19:48	19:00	30 17:20 (6)	17:18	88 16:39 (6)	16:52	46 16:22 (6)	16:57	
28	06:08	06:35	07:02	16:46 (6)	06:30	15:10 (6)	07:02	15:37 (6)	07:24	
	20:23	19:46	18:59	36 17:22 (6)	17:16	90 16:40 (6)	16:52	44 16:21 (6)	16:57	
29	06:09	06:36	07:02	16:43 (6)	06:31	15:11 (6)	07:03	15:38 (6)	07:24	
	20:22	19:45	18:57	42 17:25 (6)	17:15	88 16:39 (6)	16:51	42 16:20 (6)	16:58	
30	06:10	06:37	07:03	16:40 (6)	06:32	15:10 (6)	07:04	15:41 (6)	07:25	
	20:21	19:43	18:56	48 17:28 (6)	17:14	88 16:38 (6)	16:51	38 16:19 (6)	16:59	
31	06:11	06:38		06:33	15:11 (6)			07:25		
	20:20	19:42		17:13	88 16:39 (6)			16:59		
Potential sun hours	450	422	374	348	305			297		
Total, worst case			178	2450	2050			162		
Sun reduction			0,87	0,79	0,76			0,69		
Oper. time red.			0,99	0,99	0,99			0,99		
Wind dir. red.			0,54	0,54	0,54			0,54		
Total reduction			0,47	0,42	0,41			0,37		
Total, real			83	1037	835			60		

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 27

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: T - R20

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:42	06:56	06:15	05:49	05:50	06:12	06:38	07:04	06:34	07:05
	17:00	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:32	20:00	20:26	20:36	20:18	19:39	18:52	17:11	16:51
3	07:25	07:13	06:40	06:53	06:12	05:48	05:51	06:13	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:35	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:49	17:08	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:07	16:50
6	07:26	07:10	06:35	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:37	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:46	17:06	16:50
7	07:26	07:09	06:34	06:47	06:08	05:47	05:53	06:17	06:44	07:10	06:40	07:11
	17:05	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:05	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:44	07:10	06:41	07:12
	17:06	17:40	18:09	19:38	20:06	20:30	20:34	20:12	19:30	18:43	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:19	06:46	07:12	06:43	07:13
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:40	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:33	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:56	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:50
13	07:25	07:03	06:25	06:38	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:49	07:16	06:48	07:17
	17:12	17:46	18:15	19:43	20:11	20:33	20:32	20:05	19:20	18:35	16:59	16:51
15	07:24	07:00	06:22	06:36	06:00	05:47	05:58	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:48	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:58	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:31	05:58	05:47	06:01	06:26	06:53	07:20	06:52	07:19
	17:16	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:56	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:17	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:52
20	07:22	06:54	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:20	19:49	20:16	20:35	20:29	19:57	19:11	18:26	16:55	16:53
21	07:22	06:53	06:13	06:27	05:55	05:47	06:03	06:29	06:55	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:11	06:26	05:55	05:47	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:54	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:04	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:08	06:23	05:53	05:48	06:05	06:32	06:58	07:26	06:58	07:22
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:32	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:55
26	07:19	06:47	06:05	06:21	05:52	05:48	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:01	07:24
	17:26	18:00	18:27	19:55	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:08	06:35	07:01	06:30	07:02	07:24
	17:27	18:01	18:28	19:56	20:22	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:03	07:24
	17:28		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		16:59
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
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)

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 28

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: U - R21

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:42	06:56	06:15	05:49	05:50					
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	20:02 (7)	06:12	06:38	07:04	06:34
3	07:25	07:13	06:40	06:53	06:12	05:48	05:51	20:04 (7)	06:13	06:39	07:05	06:35
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	20:10 (7)	06:13	06:40	07:06	06:36
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	20:11 (7)	06:14	06:41	07:07	06:37
6	07:26	07:10	17:13 (6)	06:35	06:49	06:09	05:48	20:12 (7)	06:12	06:38	07:04	06:34
7	07:26	07:09	17:12 (6)	06:34	06:47	06:08	05:47	20:13 (7)	06:12	06:38	07:04	06:34
8	07:26	07:08	17:16 (6)	06:32	06:46	06:07	05:47	20:14 (7)	06:13	06:39	07:05	06:35
9	07:25	07:07	17:12 (6)	06:31	06:44	06:06	05:47	20:15 (7)	06:13	06:39	07:05	06:35
10	07:25	07:06	17:11 (6)	06:30	06:43	06:05	05:47	20:16 (7)	06:13	06:39	07:05	06:35
11	07:25	07:05	17:12 (6)	06:28	06:41	06:04	05:47	20:17 (7)	06:14	06:40	07:06	06:36
12	07:25	07:04	17:12 (6)	06:27	06:40	06:03	05:47	20:18 (7)	06:14	06:40	07:06	06:36
13	07:25	07:03	17:11 (6)	06:25	06:38	06:02	05:47	20:19 (7)	06:14	06:40	07:06	06:36
14	07:25	07:02	17:12 (6)	06:24	06:37	06:01	05:47	20:20 (7)	06:14	06:40	07:06	06:36
15	07:24	07:00	17:13 (6)	06:22	06:36	06:00	05:47	20:21 (7)	06:14	06:40	07:06	06:36
16	07:24	06:59	17:14 (6)	06:21	06:34	05:59	05:47	20:22 (7)	06:14	06:40	07:06	06:36
17	07:24	06:58	17:14 (6)	06:19	06:33	05:59	05:47	20:23 (7)	06:14	06:40	07:06	06:36
18	07:23	06:57	17:15 (6)	06:18	06:31	05:58	05:47	20:24 (7)	06:14	06:40	07:06	06:36
19	07:23	06:56	17:16 (6)	06:16	06:30	05:57	05:47	20:25 (7)	06:14	06:40	07:06	06:36
20	07:22	06:54	17:19 (6)	06:15	06:29	05:56	05:47	20:26 (7)	06:14	06:40	07:06	06:36
21	07:22	06:53	17:21 (6)	06:13	06:27	05:55	05:47	20:27 (7)	06:14	06:40	07:06	06:36
22	07:21	06:52	17:29 (6)	06:11	06:26	05:55	05:47	20:28 (7)	06:14	06:40	07:06	06:36
23	07:21	06:51	17:28 (6)	06:10	06:25	05:54	05:48	20:29 (7)	06:14	06:40	07:06	06:36
24	07:20	06:49	17:28 (6)	06:08	06:23	05:53	05:48	20:30 (7)	06:14	06:40	07:06	06:36
25	07:20	06:48	17:27 (6)	06:07	06:22	05:53	05:48	20:31 (7)	06:14	06:40	07:06	06:36
26	07:19	06:47	17:26 (6)	06:05	06:21	05:52	05:48	20:32 (7)	06:14	06:40	07:06	06:36
27	07:18	06:45	17:25 (6)	06:04	06:20	05:52	05:49	20:33 (7)	06:14	06:40	07:06	06:36
28	07:18	06:44	17:24 (6)	06:02	06:18	05:51	05:49	20:34 (7)	06:14	06:40	07:06	06:36
29	07:17	18:01	17:23 (6)	06:01	06:17	05:51	05:50	20:35 (7)	06:14	06:40	07:06	06:36
30	07:16	17:30	17:22 (6)	05:59	06:16	05:50	05:50	20:36 (7)	06:14	06:40	07:06	06:36
31	07:15	17:31	17:21 (6)	06:58	06:15	05:50	05:50	20:37 (7)	06:14	06:40	07:06	06:36
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	297
Total, worst case		156				278				134		26
Sun reduction		0,75				0,92				0,79		0,76
Oper. time red.		0,99				0,99				0,99		0,99
Wind dir. red.		0,55				0,72				0,55		0,55
Total reduction		0,40				0,65				0,43		0,41
Total, real		63				180				57		11

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 29

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: V - R22

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:25	07:13	06:40	06:53	06:12	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:35	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:35	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:46	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:10	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:34	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:13
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:33	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:20	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:22	06:54	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	05:54	05:48	06:05	06:32	06:58	07:26	06:58	07:22
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:35	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:05	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:01	07:24
	17:26	18:00	18:27	19:55	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:02	07:24
	17:27	18:01	18:28	19:56	20:22	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:03	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 30

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: W - R23

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:25	07:13	06:40	06:53	06:12	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:35	20:17	19:37	18:51	17:10	16:50
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:49	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:35	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:46	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:44	07:10	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:34	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:07	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:43	07:13
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:41	06:04	05:47	05:56	06:20	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:33	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:20	18:35	16:59	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:47	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:51
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:15	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:01	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:22	06:54	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:21	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:21
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:23	05:54	05:48	06:05	06:32	06:58	07:26	06:58	07:22
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:35	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:05	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:01	07:24
	17:26	18:00	18:27	19:55	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:02	07:24
	17:27	18:01	18:28	19:56	20:22	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:03	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
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)

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 31

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: X - R24

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June					
1	07:25	07:15	06:43	06:56	18:32 (2)	06:15					
	17:01	17:32	18:02	19:32	18:58 (2)	19:59					
2	07:25	07:14	06:41	06:55	18:34 (2)	06:14					
	17:01	17:33	18:03	19:33	20	18:54 (2)	20:00				
3	07:25	07:13	06:40	06:53	18:37 (2)	06:12					
	17:02	17:34	18:04	19:33	14	18:51 (2)	20:01				
4	07:26	07:12	06:38	06:52	06:11	05:49	19:52 (3)				
	17:03	17:35	18:05	19:34	20:25	10	20:02 (3)				
5	07:26	07:11	06:37	06:50	20:02	05:49	19:51 (3)				
	17:04	17:36	18:06	19:35	06:10	20:26	10	20:01 (3)			
6	07:26	07:10	06:35	17:43 (2)	06:49	05:49	19:51 (3)				
	17:05	17:38	18:07	4	17:47 (2)	19:36	20:27	12	20:03 (3)		
7	07:26	07:09	06:34	17:40 (2)	06:47	06:08	05:48	19:53 (3)			
	17:06	17:39	18:08	8	17:48 (2)	19:37	20:27	10	20:03 (3)		
8	07:26	07:08	06:33	17:37 (2)	06:46	20:02	05:48	19:52 (3)			
	17:07	17:40	18:09	12	17:49 (2)	19:38	20:28	10	20:04 (3)		
9	07:26	07:07	06:31	17:35 (2)	06:44	06:07	05:47	19:54 (3)			
	17:07	17:41	18:10	14	17:49 (2)	19:39	20:30	12	20:06 (3)		
10	07:25	07:06	06:30	17:34 (2)	06:43	06:05	05:47	19:54 (3)			
	17:08	17:42	18:11	16	17:50 (2)	19:40	20:31	12	20:06 (3)		
11	07:25	07:05	06:28	17:32 (2)	06:41	06:04	05:47	19:56 (3)			
	17:09	17:43	18:12	20	17:52 (2)	19:41	20:31	12	20:08 (3)		
12	07:25	07:04	06:27	17:31 (2)	06:40	06:03	05:47	19:56 (3)			
	17:10	17:44	18:13	22	17:53 (2)	19:42	20:32	12	20:08 (3)		
13	07:25	07:03	06:25	17:29 (2)	06:39	06:02	05:47	19:56 (3)			
	17:11	17:45	18:14	24	17:53 (2)	19:43	20:32	12	20:08 (3)		
14	07:25	07:02	06:24	17:28 (2)	06:37	06:01	05:47	19:56 (3)			
	17:12	17:46	18:15	26	17:54 (2)	19:44	20:33	12	20:08 (3)		
15	07:24	07:01	06:22	17:28 (2)	06:36	06:00	05:47	19:56 (3)			
	17:13	17:47	18:16	28	17:56 (2)	19:44	20:33	12	20:08 (3)		
16	07:24	06:59	06:21	17:27 (2)	06:34	05:59	05:47	19:56 (3)			
	17:14	17:49	18:17	30	17:57 (2)	19:45	20:33	14	20:10 (3)		
17	07:24	06:58	06:19	17:27 (2)	06:33	05:59	05:47	19:58 (3)			
	17:15	17:50	18:18	30	17:57 (2)	19:46	20:34	12	20:10 (3)		
18	07:23	06:57	06:18	17:25 (2)	06:32	05:58	05:47	19:58 (3)			
	17:17	17:51	18:19	32	17:57 (2)	19:47	20:34	12	20:10 (3)		
19	07:23	06:56	06:16	17:26 (2)	06:30	05:57	19:50 (3)	05:47	19:58 (3)		
	17:18	17:52	18:20	34	18:00 (2)	19:48	20:34	12	20:10 (3)		
20	07:22	06:54	06:15	17:24 (2)	06:29	05:56	4	19:54 (3)	20:34	12	20:10 (3)
	17:19	17:53	18:21	36	18:00 (2)	19:49	05:56	05:47	19:58 (3)		
21	07:22	06:53	06:13	17:25 (2)	06:27	05:56	19:51 (3)	05:47	19:58 (3)		
	17:20	17:54	18:21	36	18:01 (2)	19:50	4	19:55 (3)	20:35	12	20:10 (3)
22	07:21	06:52	06:12	17:25 (2)	06:26	05:55	19:50 (3)	05:48	19:59 (3)		
	17:21	17:55	18:22	36	18:01 (2)	19:51	4	19:54 (3)	20:35	12	20:11 (3)
23	07:21	06:51	06:10	17:24 (2)	06:25	05:54	19:50 (3)	05:48	19:59 (3)		
	17:22	17:56	18:23	38	18:02 (2)	19:52	6	19:56 (3)	20:35	12	20:11 (3)
24	07:20	06:49	06:09	17:24 (2)	06:23	05:53	19:49 (3)	05:48	19:59 (3)		
	17:23	17:57	18:24	40	18:04 (2)	19:53	6	19:55 (3)	20:35	12	20:11 (3)
25	07:20	06:48	06:07	17:25 (2)	06:22	05:53	19:51 (3)	05:48	19:59 (3)		
	17:24	17:58	18:25	40	18:05 (2)	19:54	6	19:57 (3)	20:36	12	20:11 (3)
26	07:19	06:47	06:05	17:25 (2)	06:21	05:52	19:50 (3)	05:49	19:58 (3)		
	17:25	17:59	18:26	40	18:05 (2)	19:55	8	19:58 (3)	20:36	14	20:12 (3)
27	07:18	06:45	06:04	17:26 (2)	06:20	05:52	19:50 (3)	05:49	19:58 (3)		
	17:26	18:00	18:27	40	18:06 (2)	19:56	8	19:58 (3)	20:36	12	20:10 (3)
28	07:18	06:44	06:02	17:26 (2)	06:18	05:51	19:49 (3)	05:49	19:58 (3)		
	17:27	18:01	18:28	40	18:06 (2)	19:56	10	19:59 (3)	20:36	12	20:10 (3)
29	07:17	06:43	06:01	18:27 (2)	06:17	05:51	19:51 (3)	05:50	19:59 (3)		
	17:29	18:03	18:30	38	19:05 (2)	19:57	8	19:59 (3)	20:36	12	20:11 (3)
30	07:16	06:42	06:00	18:29 (2)	06:16	05:50	19:50 (3)	05:50	19:59 (3)		
	17:30	18:04	18:31	34	19:03 (2)	19:58	10	20:00 (3)	20:36	12	20:11 (3)
31	07:15	06:41	06:00	18:29 (2)	06:15	05:50	19:50 (3)	05:49	19:58 (3)		
	17:31	18:05	18:32	30	18:59 (2)	19:57	10	20:00 (3)	20:36	12	20:11 (3)
Potential sun hours	306	302	370	395	440	442					
Total, worst case			748	60	84	356					
Sun reduction			0,77	0,81	0,84	0,92					
Oper. time red.			0,99	0,99	0,99	0,99					
Wind dir. red.			0,59	0,59	0,70	0,70					
Total reduction			0,45	0,47	0,58	0,64					
Total, real			337	28	49	227					

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 32

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: X - R24

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	July	August	September	October	November	December		
1	05:50	20:00 (3)	06:12	06:39	07:04	18:09 (2)	06:34	07:05
	20:36	12 20:12 (3)	20:19	19:40	18:54	22 18:31 (2)	17:12	16:51
2	05:51	19:58 (3)	06:13	06:39	07:05	18:10 (2)	06:35	07:06
	20:36	12 20:10 (3)	20:18	19:39	18:53	20 18:30 (2)	17:11	16:51
3	05:51	19:59 (3)	06:14	06:40	07:06	18:11 (2)	06:36	07:07
	20:35	12 20:11 (3)	20:17	19:37	18:51	18 18:29 (2)	17:10	16:50
4	05:52	19:59 (3)	06:14	06:41	07:07	18:12 (2)	06:37	07:08
	20:35	12 20:11 (3)	20:16	19:36	18:49	16 18:28 (2)	17:09	16:50
5	05:52	20:00 (3)	06:15	06:42	07:08	18:13 (2)	06:38	07:09
	20:35	12 20:12 (3)	20:15	19:34	18:48	12 18:25 (2)	17:08	16:50
6	05:53	19:58 (3)	06:16	06:43	07:09	18:16 (2)	06:39	07:10
	20:35	12 20:10 (3)	20:14	19:33	18:46	8 18:24 (2)	17:07	16:50
7	05:54	19:59 (3)	06:17	06:44	07:10	18:17 (2)	06:40	07:11
	20:35	12 20:11 (3)	20:13	19:31	18:45	6 18:23 (2)	17:06	16:50
8	05:54	19:59 (3)	06:18	06:44	07:10	06:41	07:12	16:50
	20:34	10 20:09 (3)	20:12	19:30	18:44	17:05	07:12	16:50
9	05:55	19:58 (3)	06:19	06:45	18:31 (2)	07:11	06:42	07:13
	20:34	12 20:10 (3)	20:11	19:28	14 18:45 (2)	18:42	17:04	16:50
10	05:55	19:59 (3)	06:20	06:46	18:27 (2)	07:12	06:44	07:13
	20:34	12 20:11 (3)	20:10	19:27	20 18:47 (2)	18:41	17:03	16:50
11	05:56	19:59 (3)	06:20	06:47	18:24 (2)	07:13	06:45	07:14
	20:33	10 20:09 (3)	20:09	19:25	26 18:50 (2)	18:39	17:02	16:50
12	05:57	20:00 (3)	06:21	06:48	18:21 (2)	07:14	06:46	07:15
	20:33	10 20:10 (3)	20:07	19:24	30 18:51 (2)	18:38	17:01	16:51
13	05:57	19:58 (3)	06:22	06:49	18:20 (2)	07:15	06:47	07:16
	20:33	10 20:08 (3)	20:06	19:22	34 18:54 (2)	18:36	17:00	16:51
14	05:58	19:59 (3)	06:23	06:50	18:19 (2)	07:16	06:48	07:17
	20:32	10 20:09 (3)	20:05	19:20	36 18:55 (2)	18:35	16:59	16:51
15	05:59	20:00 (3)	06:24	06:50	18:16 (2)	07:17	06:49	07:17
	20:32	8 20:08 (3)	20:04	19:19	40 18:56 (2)	18:33	16:59	16:51
16	05:59	19:58 (3)	06:25	06:51	18:14 (2)	07:18	06:50	07:18
	20:31	8 20:06 (3)	20:02	19:17	40 18:54 (2)	18:32	16:58	16:51
17	06:00	19:59 (3)	06:26	06:52	18:13 (2)	07:19	06:51	07:19
	20:31	8 20:07 (3)	20:01	19:16	40 18:53 (2)	18:31	16:57	16:52
18	06:01	20:00 (3)	06:27	06:53	18:12 (2)	07:20	06:52	07:19
	20:30	6 20:06 (3)	20:00	19:14	40 18:52 (2)	18:29	16:57	16:52
19	06:01	20:01 (3)	06:27	06:54	18:11 (2)	07:21	06:53	07:20
	20:30	6 20:07 (3)	19:59	19:13	40 18:51 (2)	18:28	16:56	16:53
20	06:02	19:59 (3)	06:28	06:55	18:12 (2)	07:22	06:54	07:20
	20:29	6 20:05 (3)	19:57	19:11	38 18:50 (2)	18:27	16:55	16:53
21	06:03	20:00 (3)	06:29	06:56	18:11 (2)	07:23	06:55	07:21
	20:28	4 20:04 (3)	19:56	19:10	38 18:49 (2)	18:25	16:55	16:53
22	06:04	20:01 (3)	06:30	06:56	18:09 (2)	07:24	06:56	07:22
	20:28	4 20:05 (3)	19:55	19:08	36 18:45 (2)	18:24	16:54	16:54
23	06:05	20:02 (3)	06:31	06:57	18:08 (2)	07:25	06:57	07:22
	20:27	4 20:06 (3)	19:53	19:06	36 18:44 (2)	18:23	16:54	16:54
24	06:05	20:00 (3)	06:32	06:58	18:09 (2)	07:26	06:58	07:22
	20:26	4 20:04 (3)	19:52	19:05	34 18:43 (2)	18:21	16:53	16:55
25	06:06	06:33	06:59	06:59	18:08 (2)	06:27	06:59	07:23
	20:25	06:33	19:03	34 18:42 (2)	17:20	16:53	16:55	
26	06:07	06:33	07:00	06:28	18:09 (2)	06:28	07:00	07:23
	20:25	19:49	19:02	30 18:39 (2)	17:19	16:52	16:56	
27	06:08	06:34	07:01	06:29	18:08 (2)	06:29	07:01	07:24
	20:24	19:48	19:00	30 18:38 (2)	17:18	16:52	16:57	
28	06:09	06:35	07:02	06:30	18:08 (2)	06:30	07:02	07:24
	20:23	19:46	18:59	28 18:36 (2)	17:16	16:52	16:57	
29	06:09	06:36	07:02	06:31	18:09 (2)	06:31	07:03	07:24
	20:22	19:45	18:57	26 18:35 (2)	17:15	16:51	16:58	
30	06:10	06:37	07:03	06:32	18:08 (2)	06:32	07:04	07:25
	20:21	19:43	18:56	26 18:34 (2)	17:14	16:51	16:59	
31	06:11	06:38	06:33	06:33	17:13	16:51	07:25	
	20:20	19:42	17:13	348	305	298	17:00	
Potential sun hours	450	422	374	348	305	298		
Total, worst case	216		716	102				
Sun reduction	0,96		0,87	0,79				
Oper. time red.	0,99		0,99	0,99				
Wind dir. red.	0,70		0,59	0,59				
Total reduction	0,66		0,51	0,46				
Total, real	144		365	47				

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 33

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE Shadow receptor: Y - R25

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:25	07:15	06:43	06:56	06:15	05:49	05:51	06:12	06:39	07:04	06:34	07:05
	17:01	17:32	18:02	19:32	19:59	20:25	20:36	20:19	19:40	18:54	17:12	16:51
2	07:25	07:14	06:41	06:55	06:14	05:49	05:51	06:13	06:39	07:05	06:35	07:06
	17:01	17:33	18:03	19:33	20:00	20:26	20:36	20:18	19:39	18:53	17:11	16:51
3	07:26	07:13	06:40	06:53	06:13	05:49	05:51	06:14	06:40	07:06	06:36	07:07
	17:02	17:34	18:04	19:33	20:01	20:27	20:36	20:17	19:37	18:51	17:10	16:51
4	07:26	07:12	06:38	06:52	06:11	05:48	05:52	06:14	06:41	07:07	06:37	07:08
	17:03	17:35	18:05	19:34	20:02	20:27	20:35	20:16	19:36	18:50	17:09	16:50
5	07:26	07:11	06:37	06:50	06:10	05:48	05:52	06:15	06:42	07:08	06:38	07:09
	17:04	17:36	18:06	19:35	20:03	20:28	20:35	20:15	19:34	18:48	17:08	16:50
6	07:26	07:10	06:36	06:49	06:09	05:48	05:53	06:16	06:43	07:09	06:39	07:10
	17:05	17:38	18:07	19:36	20:04	20:29	20:35	20:14	19:33	18:47	17:07	16:50
7	07:26	07:09	06:34	06:47	06:08	05:48	05:54	06:17	06:44	07:10	06:40	07:11
	17:06	17:39	18:08	19:37	20:05	20:29	20:35	20:13	19:31	18:45	17:06	16:50
8	07:26	07:08	06:33	06:46	06:07	05:47	05:54	06:18	06:45	07:11	06:41	07:12
	17:07	17:40	18:09	19:38	20:06	20:30	20:35	20:12	19:30	18:44	17:05	16:50
9	07:26	07:07	06:31	06:44	06:06	05:47	05:55	06:19	06:45	07:11	06:42	07:13
	17:08	17:41	18:10	19:39	20:07	20:30	20:34	20:11	19:28	18:42	17:04	16:50
10	07:25	07:06	06:30	06:43	06:05	05:47	05:55	06:20	06:46	07:12	06:44	07:14
	17:08	17:42	18:11	19:40	20:07	20:31	20:34	20:10	19:27	18:41	17:03	16:50
11	07:25	07:05	06:28	06:42	06:04	05:47	05:56	06:21	06:47	07:13	06:45	07:14
	17:09	17:43	18:12	19:41	20:08	20:31	20:34	20:09	19:25	18:39	17:02	16:50
12	07:25	07:04	06:27	06:40	06:03	05:47	05:57	06:21	06:48	07:14	06:46	07:15
	17:10	17:44	18:13	19:42	20:09	20:32	20:33	20:07	19:24	18:38	17:01	16:51
13	07:25	07:03	06:25	06:39	06:02	05:47	05:57	06:22	06:49	07:15	06:47	07:16
	17:11	17:45	18:14	19:43	20:10	20:32	20:33	20:06	19:22	18:36	17:00	16:51
14	07:25	07:02	06:24	06:37	06:01	05:47	05:58	06:23	06:50	07:16	06:48	07:17
	17:12	17:46	18:15	19:44	20:11	20:33	20:32	20:05	19:21	18:35	17:00	16:51
15	07:24	07:01	06:22	06:36	06:00	05:47	05:59	06:24	06:50	07:17	06:49	07:17
	17:13	17:48	18:16	19:44	20:12	20:33	20:32	20:04	19:19	18:33	16:59	16:51
16	07:24	06:59	06:21	06:34	05:59	05:47	05:59	06:25	06:51	07:18	06:50	07:18
	17:14	17:49	18:17	19:45	20:13	20:33	20:31	20:02	19:17	18:32	16:58	16:52
17	07:24	06:58	06:19	06:33	05:59	05:47	06:00	06:26	06:52	07:19	06:51	07:19
	17:16	17:50	18:18	19:46	20:14	20:34	20:31	20:01	19:16	18:31	16:57	16:52
18	07:23	06:57	06:18	06:32	05:58	05:47	06:01	06:27	06:53	07:20	06:52	07:19
	17:17	17:51	18:19	19:47	20:14	20:34	20:30	20:00	19:14	18:29	16:57	16:52
19	07:23	06:56	06:16	06:30	05:57	05:47	06:02	06:27	06:54	07:21	06:53	07:20
	17:18	17:52	18:20	19:48	20:15	20:34	20:30	19:59	19:13	18:28	16:56	16:53
20	07:22	06:55	06:15	06:29	05:56	05:47	06:02	06:28	06:55	07:22	06:54	07:20
	17:19	17:53	18:21	19:49	20:16	20:35	20:29	19:57	19:11	18:27	16:55	16:53
21	07:22	06:53	06:13	06:27	05:56	05:47	06:03	06:29	06:56	07:23	06:55	07:21
	17:20	17:54	18:22	19:50	20:17	20:35	20:28	19:56	19:10	18:25	16:55	16:53
22	07:21	06:52	06:12	06:26	05:55	05:48	06:04	06:30	06:56	07:24	06:56	07:22
	17:21	17:55	18:22	19:51	20:18	20:35	20:28	19:55	19:08	18:24	16:54	16:54
23	07:21	06:51	06:10	06:25	05:54	05:48	06:05	06:31	06:57	07:25	06:57	07:22
	17:22	17:56	18:23	19:52	20:19	20:35	20:27	19:53	19:06	18:23	16:54	16:54
24	07:20	06:49	06:09	06:24	05:54	05:48	06:05	06:32	06:58	07:26	06:58	07:23
	17:23	17:57	18:24	19:53	20:19	20:35	20:26	19:52	19:05	18:21	16:53	16:55
25	07:20	06:48	06:07	06:22	05:53	05:48	06:06	06:33	06:59	06:27	06:59	07:23
	17:24	17:58	18:25	19:54	20:20	20:36	20:25	19:50	19:03	17:20	16:53	16:56
26	07:19	06:47	06:06	06:21	05:52	05:49	06:07	06:33	07:00	06:28	07:00	07:23
	17:25	17:59	18:26	19:55	20:21	20:36	20:25	19:49	19:02	17:19	16:52	16:56
27	07:18	06:45	06:04	06:20	05:52	05:49	06:08	06:34	07:01	06:29	07:02	07:24
	17:26	18:00	18:27	19:56	20:22	20:36	20:24	19:48	19:00	17:18	16:52	16:57
28	07:18	06:44	06:02	06:18	05:51	05:49	06:09	06:35	07:02	06:30	07:03	07:24
	17:28	18:01	18:28	19:56	20:23	20:36	20:23	19:46	18:59	17:16	16:52	16:57
29	07:17		07:01	06:17	05:51	05:50	06:09	06:36	07:02	06:31	07:04	07:24
	17:29		19:29	19:57	20:23	20:36	20:22	19:45	18:57	17:15	16:51	16:58
30	07:16		06:59	06:16	05:50	05:50	06:10	06:37	07:03	06:32	07:04	07:25
	17:30		19:30	19:58	20:24	20:36	20:21	19:43	18:56	17:14	16:51	16:59
31	07:15		06:58		05:50		06:11	06:38		06:33		07:25
	17:31		19:31		20:25		20:20	19:42		17:13		17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298
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)	First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 34

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: Z - R26

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8 700

	January	February	March	April	May	June	July	August	September	October	November	December			
1	07:25 17:01	07:15 17:32	06:43 18:02	06:56 19:32	06:15 19:59	06:41 (2) 20:25	05:49 20:38	06:30 (2) 20:36	05:51 20:19	06:40 (2) 20:19	06:12 20:19	06:39 (2) 19:40	07:04 18:54	06:34 17:12	07:05 16:51
2	07:25 17:01	07:14 17:33	06:41 18:03	06:55 19:33	06:14 20:00	06:38 (2) 20:26	05:49 20:36	06:31 (2) 20:36	05:51 20:18	06:40 (2) 20:18	06:13 20:18	06:39 (2) 19:39	07:05 18:53	06:35 17:11	07:06 16:51
3	07:26 17:02	07:13 17:34	06:40 18:04	06:53 19:34	06:13 20:01	06:37 (2) 20:27	05:49 20:36	06:30 (2) 20:36	05:52 20:17	06:40 (2) 20:17	06:14 20:17	06:39 (2) 19:37	07:06 18:51	06:36 17:10	07:07 16:51
4	07:26 17:03	07:12 17:35	06:38 18:05	06:52 19:34	06:11 20:02	06:36 (2) 20:27	05:48 20:35	06:33 (2) 20:35	05:52 20:16	06:39 (2) 20:16	06:15 20:16	06:39 (2) 19:36	07:07 18:50	06:37 17:09	07:08 16:50
5	07:26 17:04	07:11 17:37	06:37 18:06	06:50 19:35	06:10 20:03	06:33 (2) 20:28	05:48 20:35	06:32 (2) 20:35	05:53 20:15	06:40 (2) 20:15	06:15 20:15	06:40 (2) 19:34	07:08 18:48	06:38 17:08	07:09 16:50
6	07:26 17:05	07:10 17:38	06:36 18:07	06:49 19:36	06:09 20:04	06:32 (2) 20:29	05:48 20:34	06:32 (2) 20:35	05:53 20:14	06:38 (2) 20:14	06:16 20:14	06:41 (2) 19:33	07:09 18:47	06:39 17:07	07:10 16:50
7	07:26 17:06	07:09 17:39	06:34 18:08	06:47 19:37	06:08 20:05	06:31 (2) 20:29	05:48 20:32	06:31 (2) 20:35	05:54 20:13	06:39 (2) 20:13	06:17 20:13	06:42 (2) 19:31	07:10 18:45	06:40 17:06	07:11 16:50
8	07:26 17:07	07:08 17:40	06:33 18:09	06:46 19:38	06:07 20:06	06:30 (2) 20:30	05:47 20:30	06:30 (2) 20:35	05:54 20:12	06:39 (2) 20:12	06:18 20:12	06:43 (2) 19:30	07:11 18:44	06:41 17:05	07:12 16:50
9	07:26 17:08	07:07 17:41	06:31 18:10	06:44 19:39	06:06 20:07	06:29 (2) 20:30	05:47 20:30	06:29 (2) 20:34	05:55 20:11	06:38 (2) 20:11	06:19 20:11	06:45 (2) 19:28	07:11 18:42	06:43 17:04	07:13 16:50
10	07:25 17:08	07:06 17:42	06:30 18:11	06:43 19:40	06:05 20:07	06:30 (2) 20:31	05:47 20:30	06:30 (2) 20:34	05:55 20:10	06:39 (2) 20:10	06:20 20:10	06:46 (2) 19:27	07:12 18:41	06:44 17:03	07:14 16:50
11	07:25 17:09	07:05 17:43	06:28 18:12	06:42 19:41	06:04 20:08	06:29 (2) 20:31	05:47 20:30	06:30 (2) 20:34	05:56 20:09	06:39 (2) 20:09	06:21 20:09	06:49 (2) 19:25	07:13 18:39	06:45 17:02	07:14 16:50
12	07:25 17:10	07:04 17:44	06:27 18:13	06:40 19:42	06:03 20:09	06:28 (2) 20:32	05:47 20:30	06:30 (2) 20:33	05:57 20:08	06:38 (2) 20:07	06:21 20:07	06:52 (2) 19:24	07:14 18:38	06:46 17:01	07:15 16:51
13	07:25 17:11	07:03 17:45	06:25 18:14	06:39 19:43	06:02 20:10	06:27 (2) 20:32	05:47 20:30	06:30 (2) 20:33	05:57 20:06	06:39 (2) 20:06	06:22 20:06	06:49 19:22	07:15 18:36	06:47 17:00	07:16 16:51
14	07:25 17:12	07:02 17:46	06:24 18:15	06:37 19:44	06:01 20:11	06:26 (2) 20:33	05:47 20:30	06:30 (2) 20:32	05:58 20:05	06:37 (2) 20:05	06:23 20:05	06:50 19:21	07:16 18:35	06:48 17:00	07:17 16:51
15	07:24 17:13	07:01 17:48	06:22 18:16	06:36 19:45	06:00 20:12	06:25 (2) 20:33	05:47 20:30	06:30 (2) 20:32	05:59 20:04	06:38 (2) 20:04	06:24 20:04	06:50 19:19	07:17 18:33	06:49 17:00	07:18 16:51
16	07:24 17:15	06:59 17:49	06:21 18:17	06:34 19:45	06:00 20:13	06:24 (2) 20:33	05:47 20:30	06:30 (2) 20:31	05:59 20:02	06:39 (2) 20:02	06:25 20:02	06:51 19:17	07:18 18:32	06:50 17:00	07:19 16:52
17	07:24 17:16	06:58 17:50	06:19 18:18	06:33 19:46	05:59 20:14	06:23 (2) 20:34	05:47 20:30	06:30 (2) 20:31	06:00 20:01	06:37 (2) 20:01	06:26 20:01	06:52 19:16	07:19 18:31	06:51 17:00	07:20 16:52
18	07:23 17:17	06:57 17:51	06:18 18:19	06:32 19:47	05:58 20:15	06:22 (2) 20:34	05:47 20:30	06:30 (2) 20:30	06:01 20:00	06:38 (2) 20:00	06:27 20:00	06:53 19:14	07:20 18:29	06:52 17:00	07:21 16:52
19	07:23 17:18	06:56 17:52	06:16 18:20	06:30 19:48	05:57 20:15	06:21 (2) 20:34	05:47 20:30	06:30 (2) 20:30	06:02 20:00	06:37 (2) 20:00	06:27 20:00	06:54 19:13	07:21 18:28	06:53 17:00	07:22 16:53
20	07:22 17:19	06:55 17:53	06:15 18:21	06:29 19:49	05:56 20:16	06:20 (2) 20:35	05:47 20:30	06:30 (2) 20:29	06:02 20:00	06:37 (2) 20:00	06:28 20:00	06:55 19:11	07:22 18:27	06:54 17:00	07:23 16:53
21	07:22 17:20	06:53 17:54	06:13 18:22	06:28 19:50	05:56 20:17	06:19 (2) 20:35	05:47 20:30	06:30 (2) 20:28	06:03 20:00	06:38 (2) 20:00	06:29 20:00	06:56 19:10	07:23 18:25	06:55 17:00	07:24 16:53
22	07:21 17:21	06:52 17:55	06:12 18:22	06:26 19:51	05:55 20:18	06:18 (2) 20:35	05:48 20:30	06:30 (2) 20:28	06:04 20:00	06:37 (2) 20:00	06:30 20:00	06:56 19:08	07:24 18:24	06:56 17:00	07:25 16:54
23	07:21 17:22	06:51 17:56	06:10 18:23	06:25 19:52	05:54 20:19	06:17 (2) 20:35	05:48 20:30	06:30 (2) 20:27	06:05 20:00	06:38 (2) 20:00	06:31 20:00	06:57 19:07	07:25 18:23	06:57 17:00	07:26 16:54
24	07:20 17:23	06:49 17:57	06:09 18:24	06:24 19:53	05:54 20:19	06:16 (2) 20:35	05:48 20:30	06:30 (2) 20:26	06:05 20:00	06:39 (2) 20:00	06:32 20:00	06:58 19:05	07:26 18:21	06:58 17:00	07:27 16:55
25	07:20 17:24	06:48 17:58	06:07 18:25	06:22 19:54	05:53 20:20	06:15 (2) 20:36	05:48 20:30	06:30 (2) 20:25	06:06 20:00	06:37 (2) 20:00	06:33 20:00	06:59 19:03	07:27 18:20	06:59 17:00	07:28 16:56
26	07:19 17:25	06:47 17:59	06:06 18:26	06:21 19:55	05:52 20:21	06:14 (2) 20:36	05:49 20:30	06:30 (2) 20:25	06:07 20:00	06:38 (2) 20:00	06:33 20:00	07:00 19:02	07:28 18:19	06:59 17:00	07:29 16:56
27	07:18 17:26	06:45 18:00	06:04 18:27	06:20 19:56	05:52 20:22	06:13 (2) 20:36	05:49 20:30	06:30 (2) 20:24	06:08 20:00	06:37 (2) 20:00	06:34 20:00	07:01 19:00	07:29 18:18	06:59 17:00	07:30 16:57
28	07:18 17:28	06:44 18:01	06:02 18:28	06:18 19:56	05:51 20:23	06:12 (2) 20:36	05:49 20:30	06:30 (2) 20:23	06:09 20:00	06:38 (2) 20:00	06:35 20:00	07:02 18:59	07:30 18:16	06:59 17:00	07:31 16:57
29	07:17 17:29	07:17 18:01	06:01 18:29	06:17 19:57	05:51 20:23	06:11 (2) 20:36	05:50 20:30	06:30 (2) 20:22	06:09 20:00	06:39 (2) 20:00	06:36 20:00	07:02 18:57	07:31 18:15	06:59 17:00	07:32 16:58
30	07:16 17:30	07:16 18:02	06:00 18:30	06:16 19:58	05:50 20:24	06:10 (2) 20:36	05:50 20:30	06:30 (2) 20:21	06:10 20:00	06:37 (2) 20:00	06:37 20:00	07:03 18:56	07:32 18:14	06:59 17:00	07:33 16:59
31	07:15 17:31	07:15 18:03	06:00 18:31	06:16 19:59	05:50 20:25	06:09 (2) 20:36	05:50 20:30	06:30 (2) 20:20	06:11 20:00	06:38 (2) 20:00	06:38 20:00	07:04 18:56	07:33 18:13	06:59 17:00	07:34 17:00
Potential sun hours	306	302	370	395	440	442	450	422	374	348	305	298			
Total, worst case				4	1136	908	1176	364							
Sun reduction				0,81	0,84	0,92	0,96	0,97							
Oper. time red.				0,99	0,99	0,99	0,99	0,99							
Wind dir. red.				0,55	0,55	0,55	0,55	0,55							
Total reduction				0,44	0,46	0,50	0,53	0,53							
Total, real				2	522	457	618	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)
	Sun set (hh:mm)	Last time (hh:mm) with flicker	(WTG causing flicker last time)
	Minutes with flicker		

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 35

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: AA - R27

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time
 N NNE NE ENE E ESE SE SSE S SSW SW WSW W WNW NW NNW Sum
 1 100 620 250 240 160 330 750 680 530 300 380 420 670 610 790 870 8700

	January	February	March	April	May	June	
1	07:25 17:01	07:56 (2) 08:24 (2)	07:15 17:32	06:43 18:02	07:13 (3) 08:01 (3)	06:56 19:32	06:15 20:25
2	07:25 17:01	07:56 (2) 08:24 (2)	07:14 17:33	06:41 18:03	07:11 (3) 08:01 (3)	06:55 19:33	06:14 20:26
3	07:26 17:02	07:56 (2) 08:24 (2)	07:13 17:34	06:40 18:04	07:10 (3) 08:02 (3)	06:53 19:34	06:13 20:27
4	07:26 17:03	07:58 (2) 08:24 (2)	07:12 17:35	06:38 18:05	07:10 (3) 08:02 (3)	06:52 19:34	06:11 20:27
5	07:26 17:04	07:58 (2) 08:24 (2)	07:11 17:36	06:37 18:06	07:09 (3) 08:01 (3)	06:50 19:35	06:10 20:28
6	07:26 17:05	07:58 (2) 08:24 (2)	07:10 17:38	06:36 18:07	07:10 (3) 08:02 (3)	06:49 19:36	06:09 20:29
7	07:26 17:06	08:00 (2) 08:26 (2)	07:09 17:39	06:34 18:08	07:08 (3) 08:02 (3)	06:47 19:37	06:08 20:29
8	07:26 17:07	08:00 (2) 08:26 (2)	07:08 17:40	06:33 18:09	07:09 (3) 08:01 (3)	06:46 19:38	06:07 20:30
9	07:26 17:08	08:00 (2) 08:26 (2)	07:07 17:41	06:31 18:10	07:07 (3) 08:01 (3)	06:44 19:39	06:06 20:30
10	07:26 17:08	08:02 (2) 08:26 (2)	07:06 17:42	06:30 18:11	07:08 (3) 08:02 (3)	06:43 19:40	06:05 20:31
11	07:25 17:09	08:02 (2) 08:26 (2)	07:05 17:43	06:28 18:12	07:08 (3) 08:00 (3)	06:42 19:41	06:04 20:31
12	07:25 17:10	08:03 (2) 08:25 (2)	07:04 17:44	06:27 18:13	07:07 (3) 07:59 (3)	06:40 19:42	06:03 20:32
13	07:25 17:11	08:03 (2) 08:25 (2)	07:03 17:45	06:25 18:14	07:07 (3) 07:59 (3)	06:39 19:43	06:02 20:32
14	07:25 17:12	08:05 (2) 08:25 (2)	07:02 17:46	06:24 18:15	07:08 (3) 07:58 (3)	06:37 19:44	06:01 20:33
15	07:24 17:13	08:06 (2) 08:24 (2)	07:01 17:48	06:22 18:16	07:08 (3) 07:56 (3)	06:36 19:45	06:00 20:33
16	07:24 17:14	08:08 (2) 08:24 (2)	06:59 17:49	06:21 18:17	07:09 (3) 07:57 (3)	06:34 19:45	06:00 20:33
17	07:24 17:16	08:10 (2) 08:24 (2)	06:58 17:50	06:19 18:18	07:09 (3) 07:55 (3)	06:33 19:46	05:59 20:34
18	07:23 17:17	08:11 (2) 08:21 (2)	06:57 17:51	06:18 18:19	07:10 (3) 07:54 (3)	06:32 19:47	05:58 20:34
19	07:23 17:18	08:15 (2) 08:19 (2)	06:56 17:52	06:16 18:20	07:10 (3) 07:52 (3)	06:30 19:48	05:57 20:34
20	07:23 17:19	06:55 17:53	18 07:40 (3)	06:15 18:21	07:10 (3) 07:50 (3)	06:29 19:49	05:56 20:35
21	07:22 17:20	06:53 17:54	18 07:47 (3)	06:13 18:22	07:13 (3) 07:49 (3)	06:28 19:50	05:56 20:35
22	07:22 17:21	06:52 17:55	24 07:50 (3)	06:12 18:22	07:13 (3) 07:45 (3)	06:26 19:51	05:55 20:35
23	07:21 17:22	06:51 17:56	30 07:52 (3)	06:10 18:23	07:16 (3) 07:44 (3)	06:25 19:52	05:54 20:35
24	07:21 17:23	06:49 17:57	34 07:55 (3)	06:09 18:24	07:18 (3) 07:40 (3)	06:24 19:53	05:54 20:35
25	07:20 17:24	06:48 17:58	36 07:56 (3)	06:07 18:25	07:21 (3) 07:37 (3)	06:22 19:54	05:53 20:36
26	07:19 17:25	06:47 17:59	40 07:58 (3)	06:06 18:26	07:17 (3)	06:21 19:55	05:52 20:36
27	07:18 17:26	06:45 18:00	42 07:59 (3)	06:04 18:27	07:16 (3) 08:00 (3)	06:20 19:56	05:52 20:36
28	07:18 17:28	06:44 18:01	44 08:00 (3)	06:02 18:28	07:14 (3) 08:00 (3)	06:18 19:57	05:51 20:36
29	07:17 17:29		46 08:00 (3)	06:01 19:29	07:01 19:29	06:17 19:57	05:50 20:36
30	07:16 17:30			06:59 19:30	06:16 19:58	05:50 20:24	05:50 20:36
31	07:15 17:31			06:58 19:31		05:50 20:25	
Potential sun hours	306	302	370	395	440	442	
Total, worst case	414	318	1128				
Sun reduction	0,66	0,75	0,77				
Oper. time red.	0,99	0,99	0,99				
Wind dir. red.	0,72	0,67	0,67				
Total reduction	0,48	0,50	0,51				
Total, real	197	158	576				

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 36

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

Shadow receptor: AA - R27

Assumptions for shadow calculations

Maximum distance for influence 2 000 m
 Minimum sun height over horizon for influence 3 °
 Day step for calculation 1 days
 Time step for calculation 2 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 0,66 0,75 0,77 0,81 0,84 0,92 0,96 0,97 0,87 0,79 0,76 0,69

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum	
1	100	620	250	240	160	330	750	680	530	300	380	420	670	610	790	870	8700

	July	August	September	October	November	December
1	05:51	06:12	06:39	07:04	07:47 (3)	06:34
	20:36	20:19	19:40	18:54	08:39 (3)	17:12
2	05:51	06:13	06:39	07:05	07:46 (3)	06:35
	20:36	20:18	19:39	18:53	08:38 (3)	17:11
3	05:51	06:14	06:40	07:06	07:45 (3)	06:36
	20:36	20:17	19:37	18:51	08:39 (3)	17:10
4	05:52	06:15	06:41	07:07	07:46 (3)	06:37
	20:35	20:16	19:36	18:50	08:38 (3)	17:09
5	05:52	06:15	06:42	07:08	07:45 (3)	06:38
	20:35	20:15	19:34	18:48	08:39 (3)	17:08
6	05:53	06:16	06:43	07:09	07:44 (3)	06:39
	20:35	20:14	19:33	18:47	08:38 (3)	17:07
7	05:54	06:17	06:44	07:10	07:45 (3)	06:40
	20:35	20:13	19:31	18:45	08:37 (3)	17:06
8	05:54	06:18	06:45	07:11	07:44 (3)	06:41
	20:35	20:12	19:30	18:44	08:38 (3)	17:05
9	05:55	06:19	06:45	07:11	07:45 (3)	06:43
	20:34	20:11	19:28	18:42	08:37 (3)	17:04
10	05:55	06:20	06:46	07:12	07:46 (3)	06:44
	20:34	20:10	19:27	18:41	08:36 (3)	17:03
11	05:56	06:21	06:47	07:13	07:44 (3)	06:45
	20:34	20:09	19:25	18:39	08:34 (3)	17:02
12	05:57	06:21	06:48	07:14	07:45 (3)	06:46
	20:33	20:07	19:24	18:38	08:33 (3)	17:01
13	05:57	06:22	06:49	07:15	07:46 (3)	06:47
	20:33	20:06	19:22	18:36	08:34 (3)	17:00
14	05:58	06:23	06:50	07:16	07:47 (3)	06:48
	20:32	20:05	19:21	18:35	08:33 (3)	17:00
15	05:59	06:24	06:50	07:17	07:48 (3)	06:49
	20:32	20:04	19:19	18:33	08:30 (3)	16:59
16	05:59	06:25	06:51	07:18	07:49 (3)	06:50
	20:31	20:03	19:17	18:32	08:29 (3)	16:58
17	06:00	06:26	06:52	07:19	07:50 (3)	06:51
	20:31	20:01	19:16	18:31	08:28 (3)	16:57
18	06:01	06:27	06:53	08:10 (3)	07:20	07:51 (3)
	20:30	20:00	19:14	18:29	08:27 (3)	16:57
19	06:02	06:27	06:54	08:05 (3)	07:21	07:52 (3)
	20:30	19:59	19:13	18:28	08:24 (3)	16:56
20	06:02	06:28	06:55	08:02 (3)	07:22	07:53 (3)
	20:29	19:57	19:11	18:27	08:23 (3)	16:55
21	06:03	06:29	06:56	08:01 (3)	07:23	07:56 (3)
	20:28	19:56	19:10	18:25	08:20 (3)	16:55
22	06:04	06:30	06:56	07:57 (3)	07:24	08:02 (3)
	20:28	19:55	19:08	18:24	08:16 (3)	16:54
23	06:05	06:31	06:57	07:56 (3)	07:25	06:57
	20:27	19:53	19:07	18:23	08:14	07:51 (2)
24	06:05	06:32	06:58	07:53 (3)	07:26	06:58
	20:26	19:52	19:05	18:21	08:11	07:50 (2)
25	06:06	06:33	06:59	07:52 (3)	07:27	07:00
	20:25	19:50	19:03	18:19	08:09	07:49 (2)
26	06:07	06:33	07:00	07:51 (3)	07:28	07:01
	20:25	19:49	19:02	18:17	08:07	07:48 (2)
27	06:08	06:34	07:01	07:50 (3)	07:29	07:02
	20:24	19:48	19:00	18:16	08:06	07:47 (2)
28	06:09	06:35	07:02	07:49 (3)	07:30	07:03
	20:23	19:46	18:59	18:15	08:05	07:46 (2)
29	06:09	06:36	07:03	07:47 (3)	07:31	07:04
	20:22	19:45	18:57	18:14	08:04	07:45 (2)
30	06:10	06:37	07:03	07:48 (3)	07:32	07:05
	20:21	19:43	18:56	18:13	08:03	07:44 (2)
31	06:11	06:38		06:33		07:06
	20:20	19:42		17:13		07:25
Potential sun hours	450	422	374	348	305	298
Total, worst case			496	974	126	844
Sun reduction			0,87	0,79	0,76	0,69
Oper. time red.			0,99	0,99	0,99	0,99
Wind dir. red.			0,67	0,67	0,72	0,72
Total reduction			0,58	0,52	0,55	0,50
Total, real			286	510	69	419

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

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

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 37

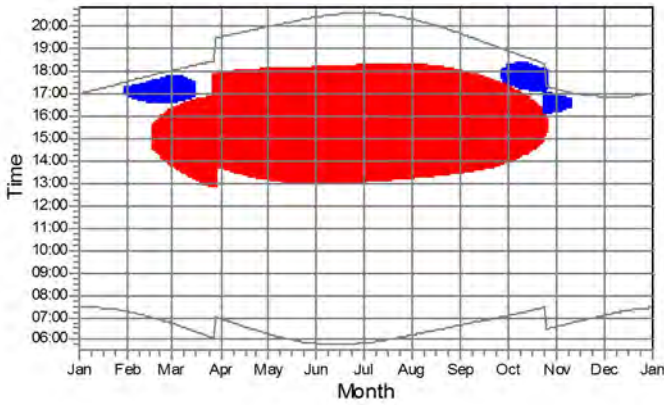
Calculated:

03/06/2024 20:57/2.4.0.62

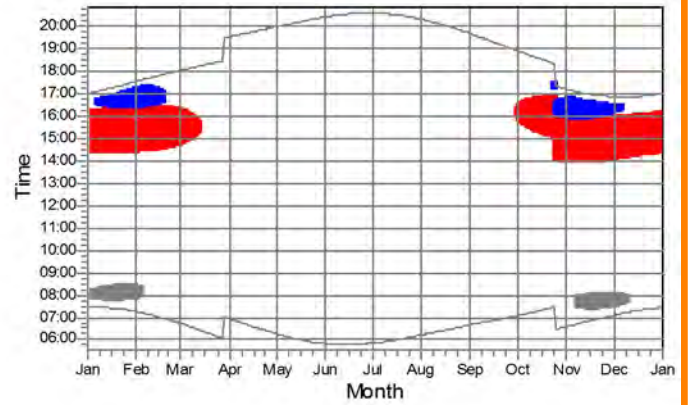
SHADOW - Calendar, graphical

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

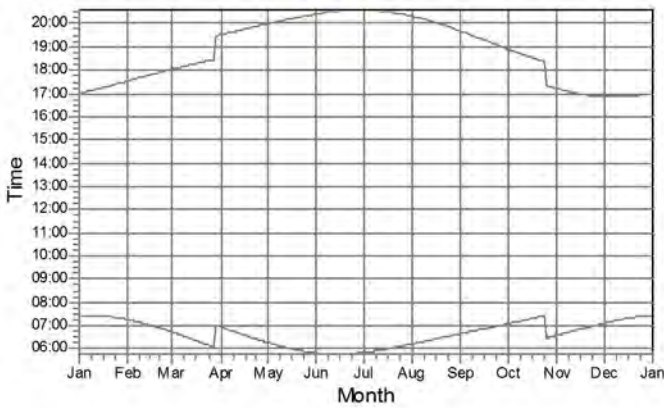
A: R01



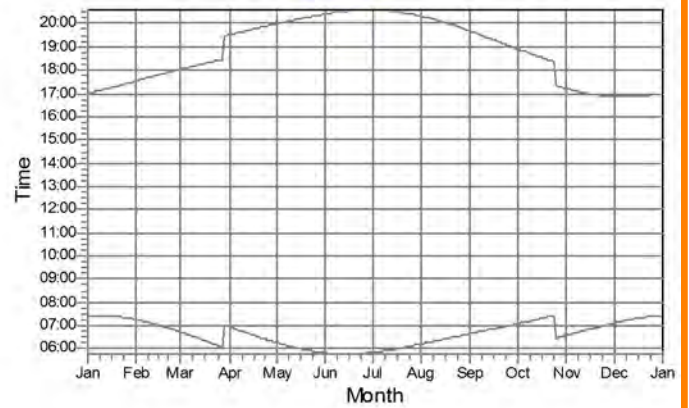
B: R02



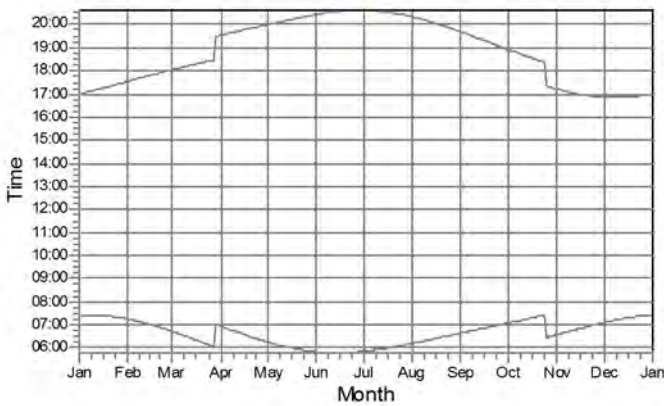
C: R03



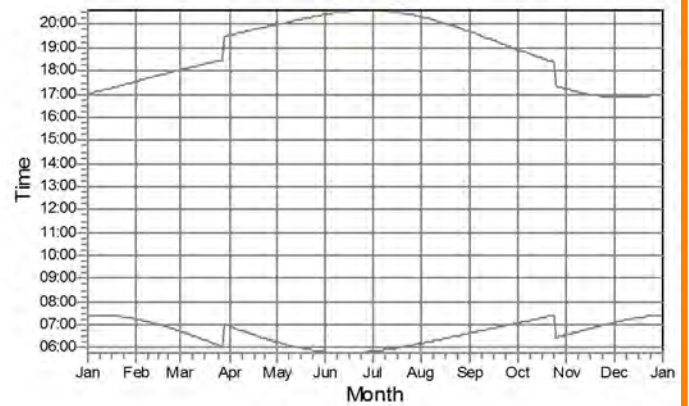
D: R04



E: R05



F: R06



WTGs

CM1

CM4

CM5

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

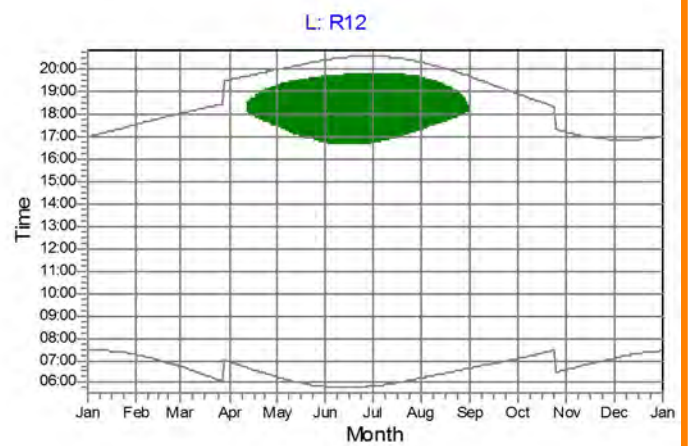
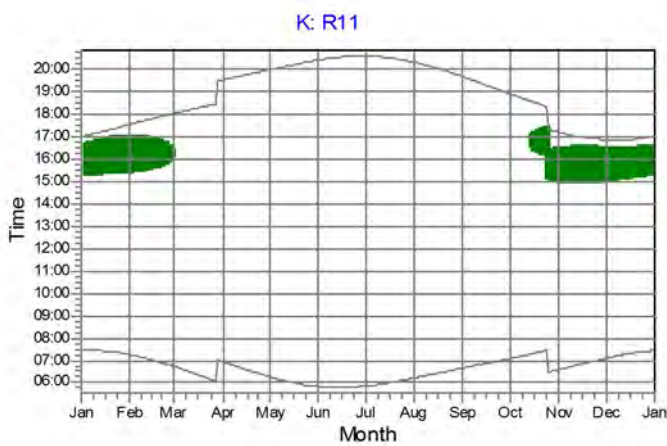
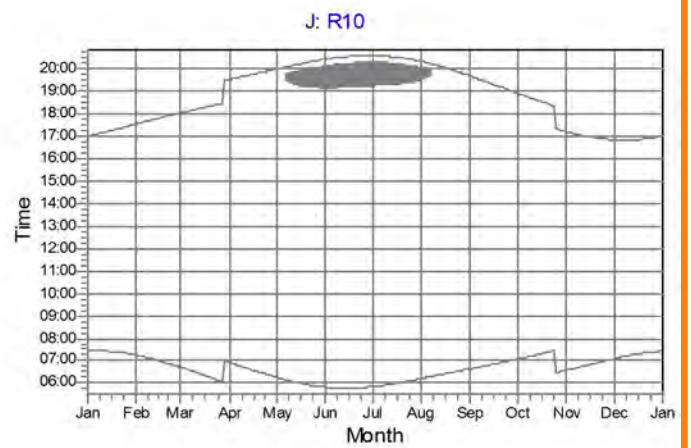
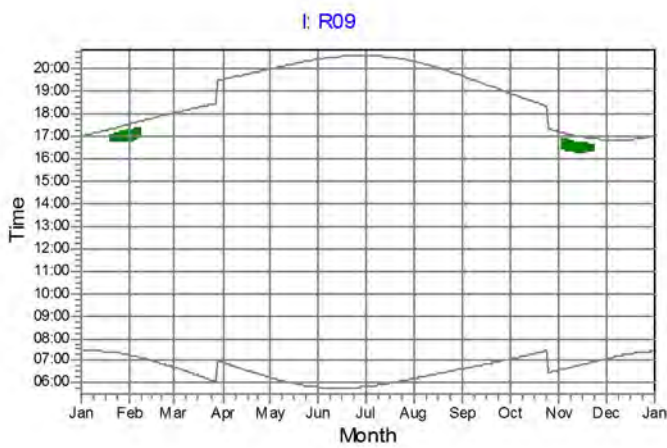
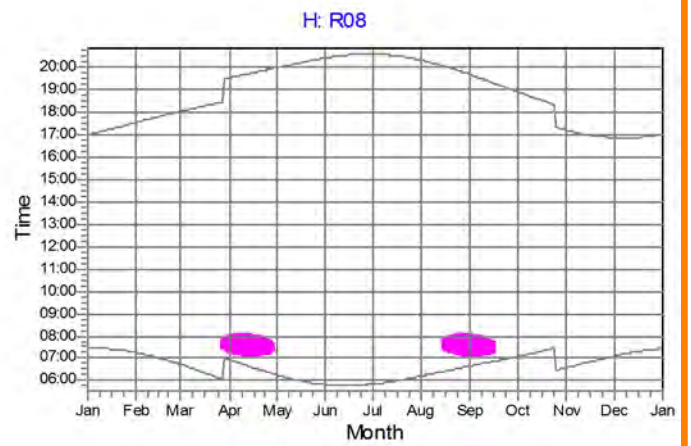
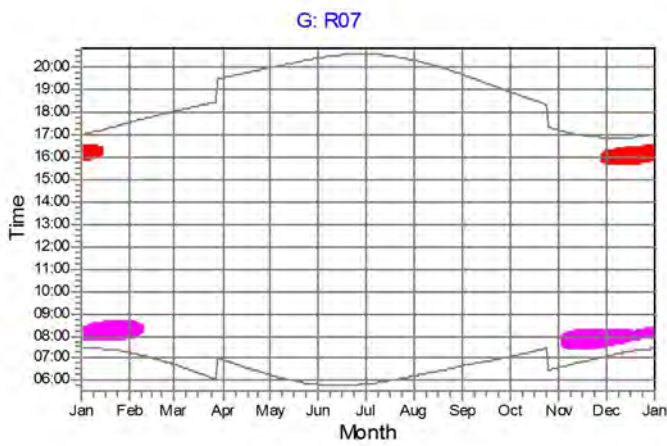
03/06/2024 21:35 / 38

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar, graphical

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE



WTGs

■ CM1

■ CM2

■ CM5

■ CM6

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

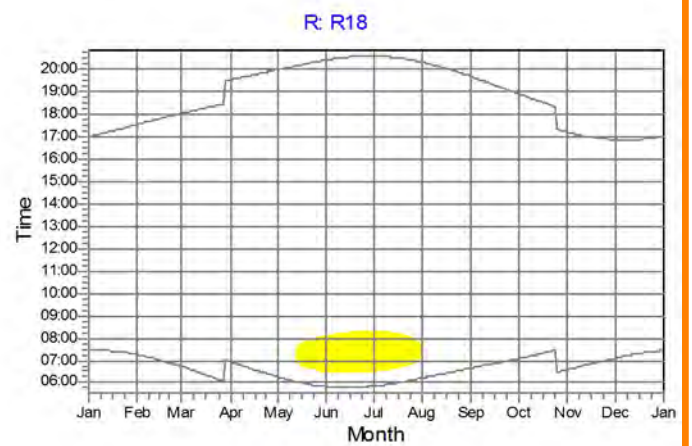
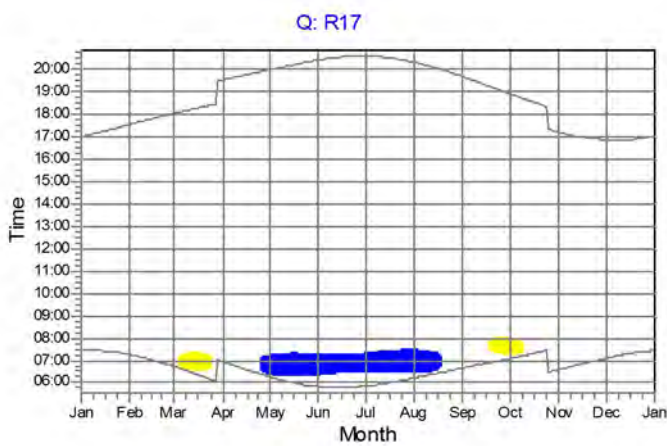
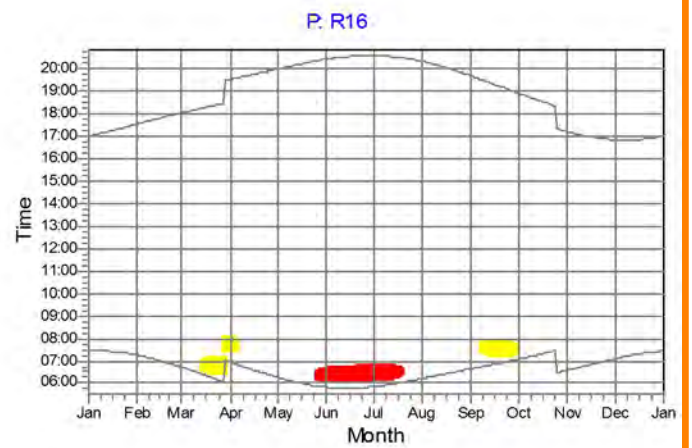
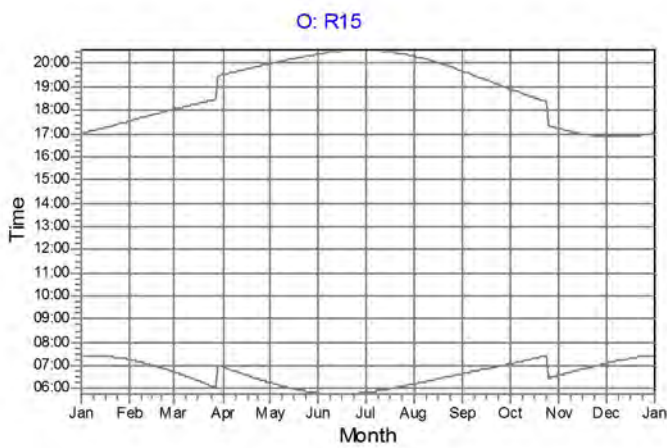
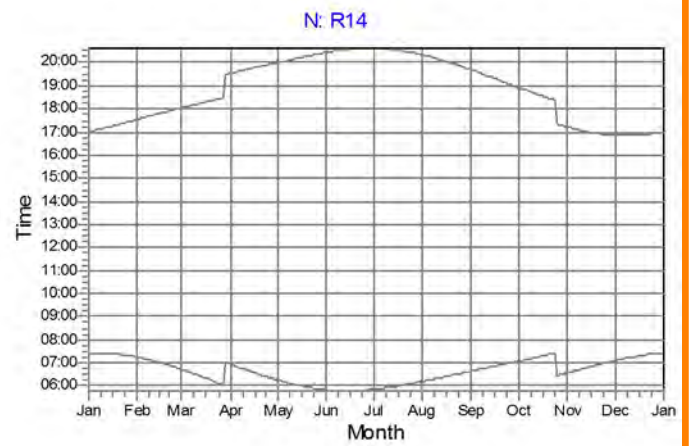
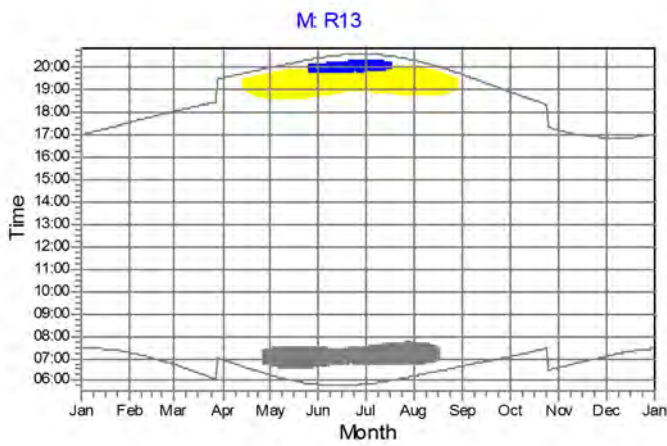
03/06/2024 21:35 / 39

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar, graphical

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE



WTGs



CM1



CM3



CM4



CM5

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

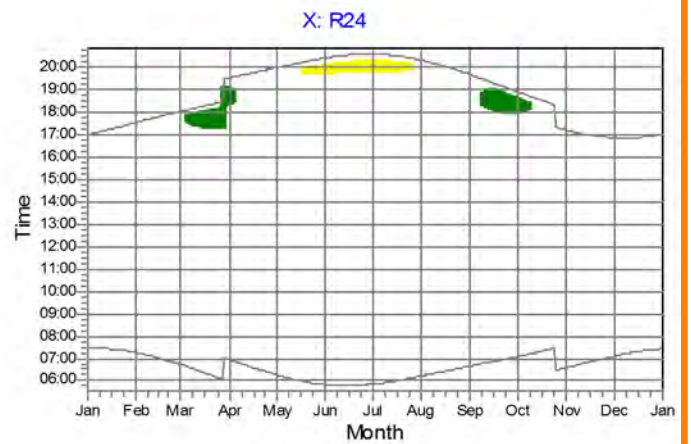
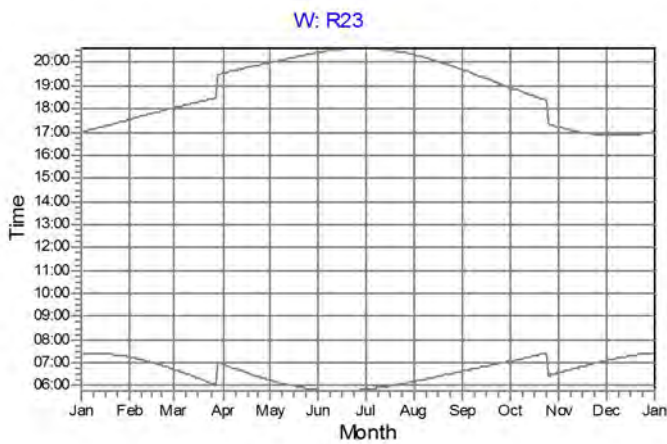
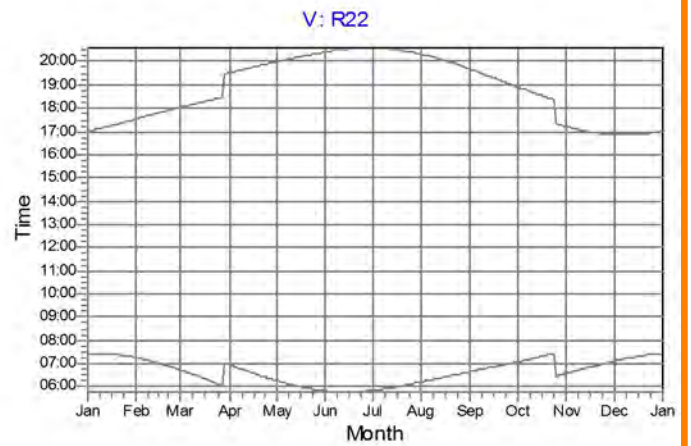
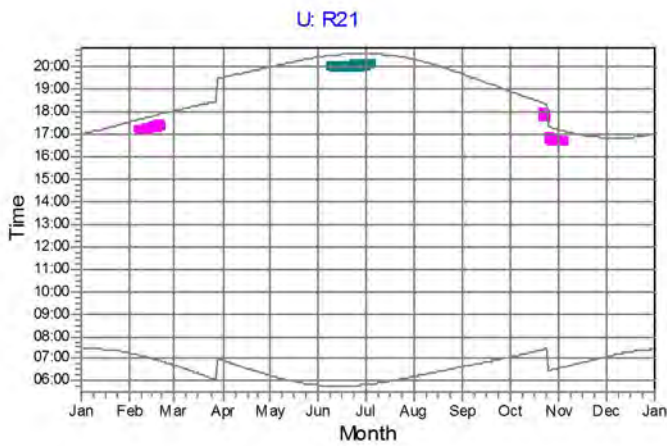
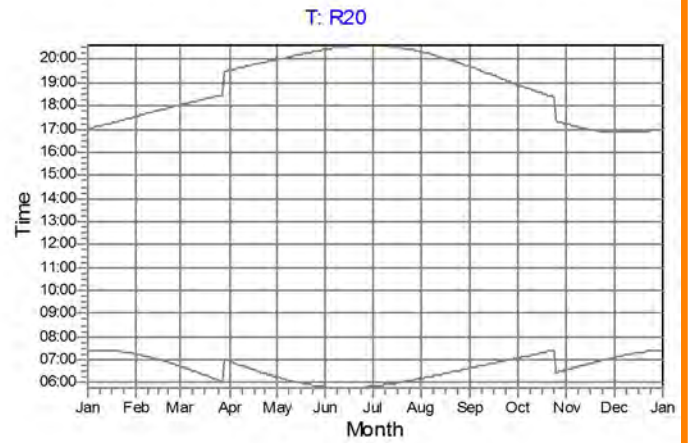
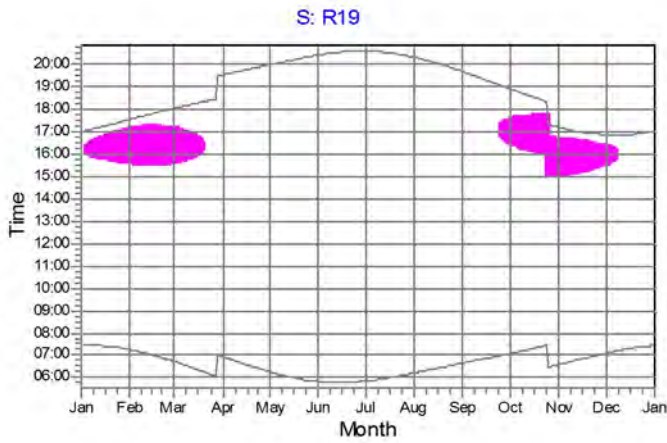
03/06/2024 21:35 / 40

Calculated:

03/06/2024 20:57/2.4.0.62

SHADOW - Calendar, graphical

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE



WTGs

CM2

CM3

CM6

CM7

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 41

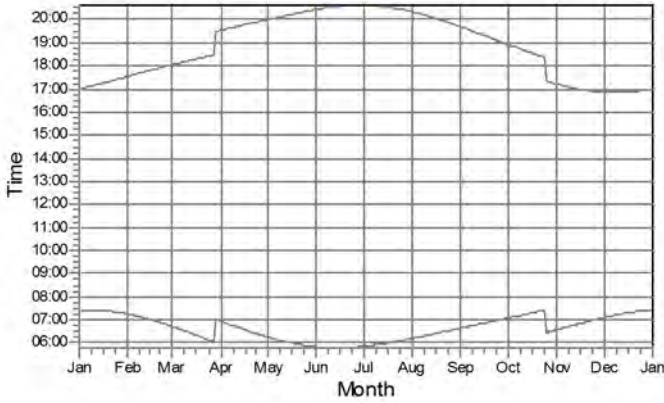
Calculated:

03/06/2024 20:57/2.4.0.62

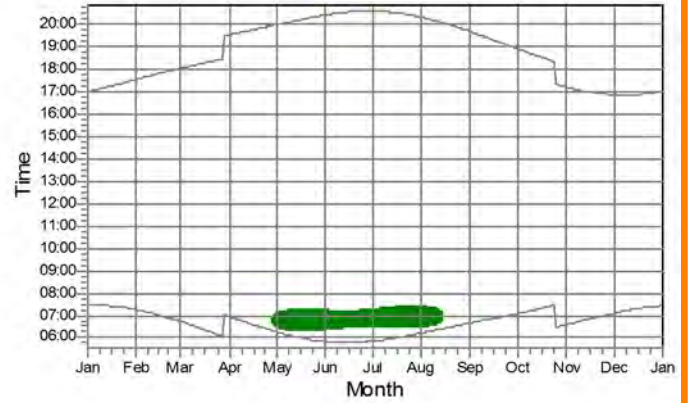
SHADOW - Calendar, graphical

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

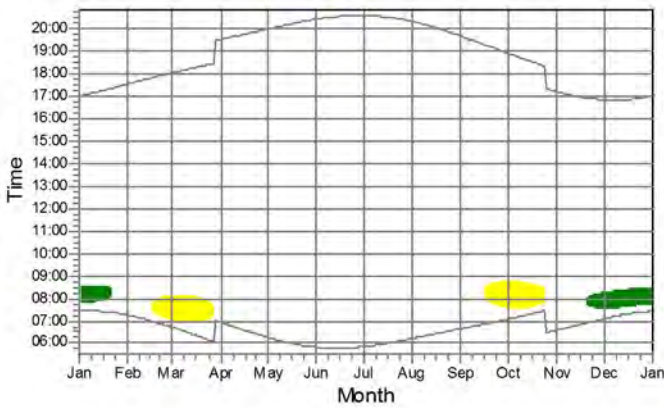
Y: R25



Z: R26



AA: R27



WTGs

CM2

CM3

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

03/06/2024 21:35 / 42

Calculated:

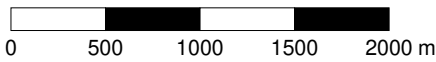
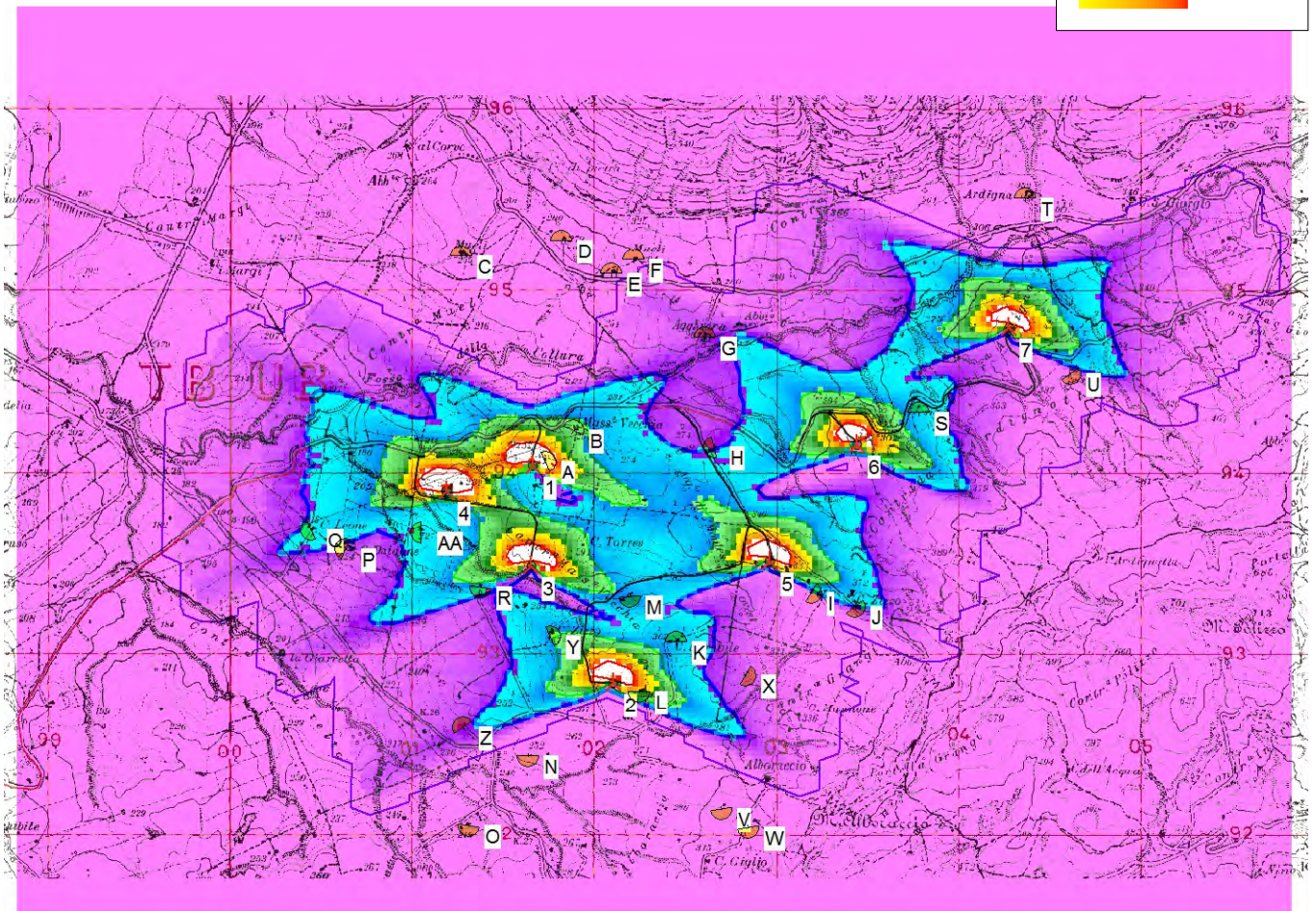
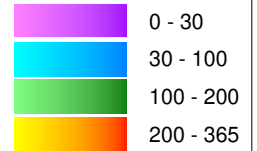
03/06/2024 20:57/2.4.0.62

SHADOW - IGM

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

File: Mirabile_IGM25.png

Shadow hours|per year
Real value calculation.

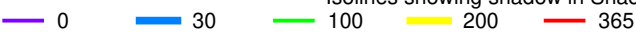


Map: , Print scale 1:40 000, Map center UTM WGS84 Zone: 33 East: 302 271 North: 4 193 878

New WTG

Shadow receptor

Isolines showing shadow in Shadow hours|per year. Real value calculation.



Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

30/05/2024 20:41 / 1

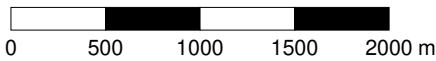
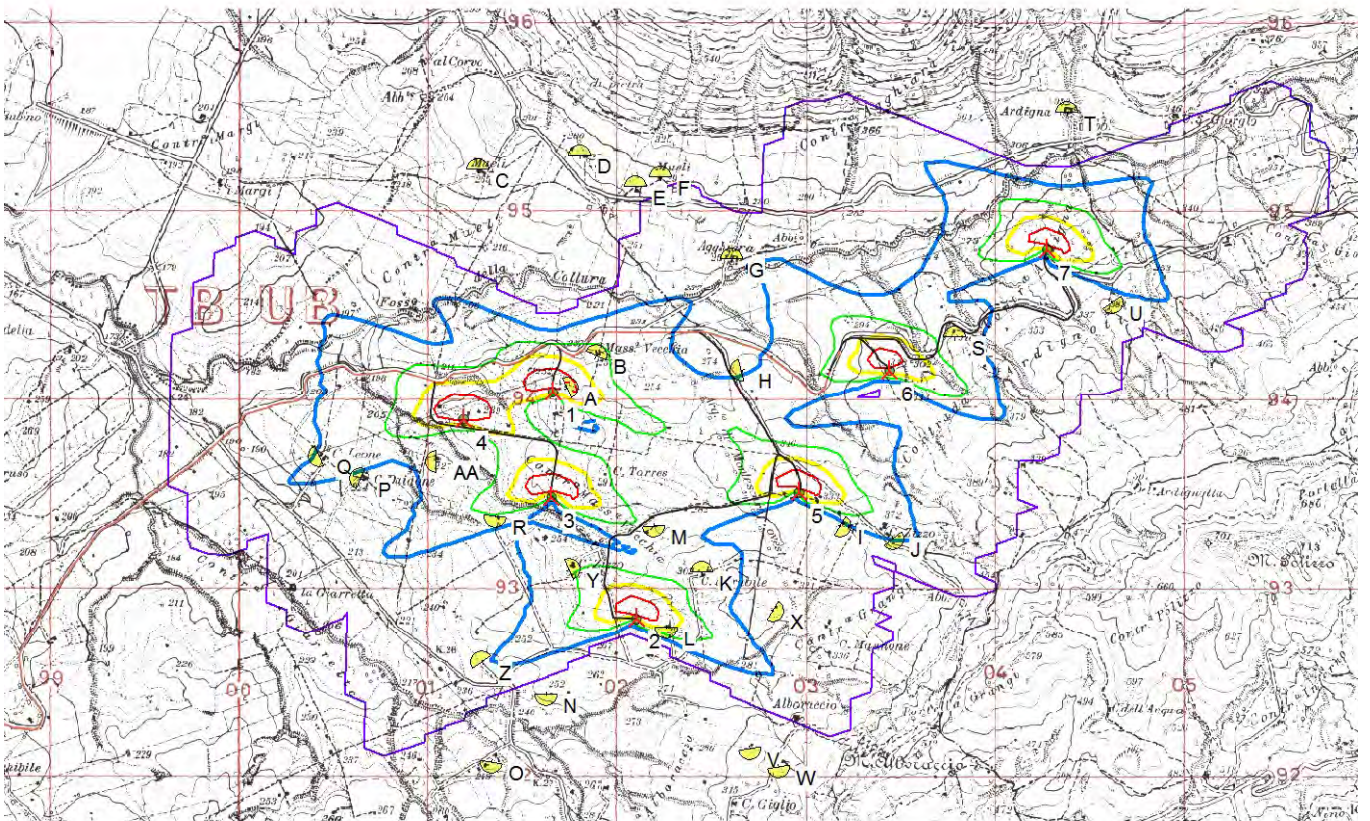
Calculated:

30/05/2024 19:58/2.4.0.62

SHADOW - IGM

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

File: Mirabile_IGM25.png



Map: , Print scale 1:40 000, Map center UTM WGS84 Zone: 33 East: 302 271 North: 4 193 878

New WTG

Shadow receptor

Isolines showing shadow in Shadow hours|per year. Real value calculation.

	0		30		100		200		365
--	---	--	----	--	-----	--	-----	--	-----

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

30/05/2024 20:33 / 1

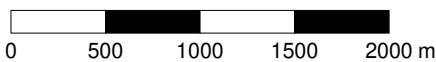
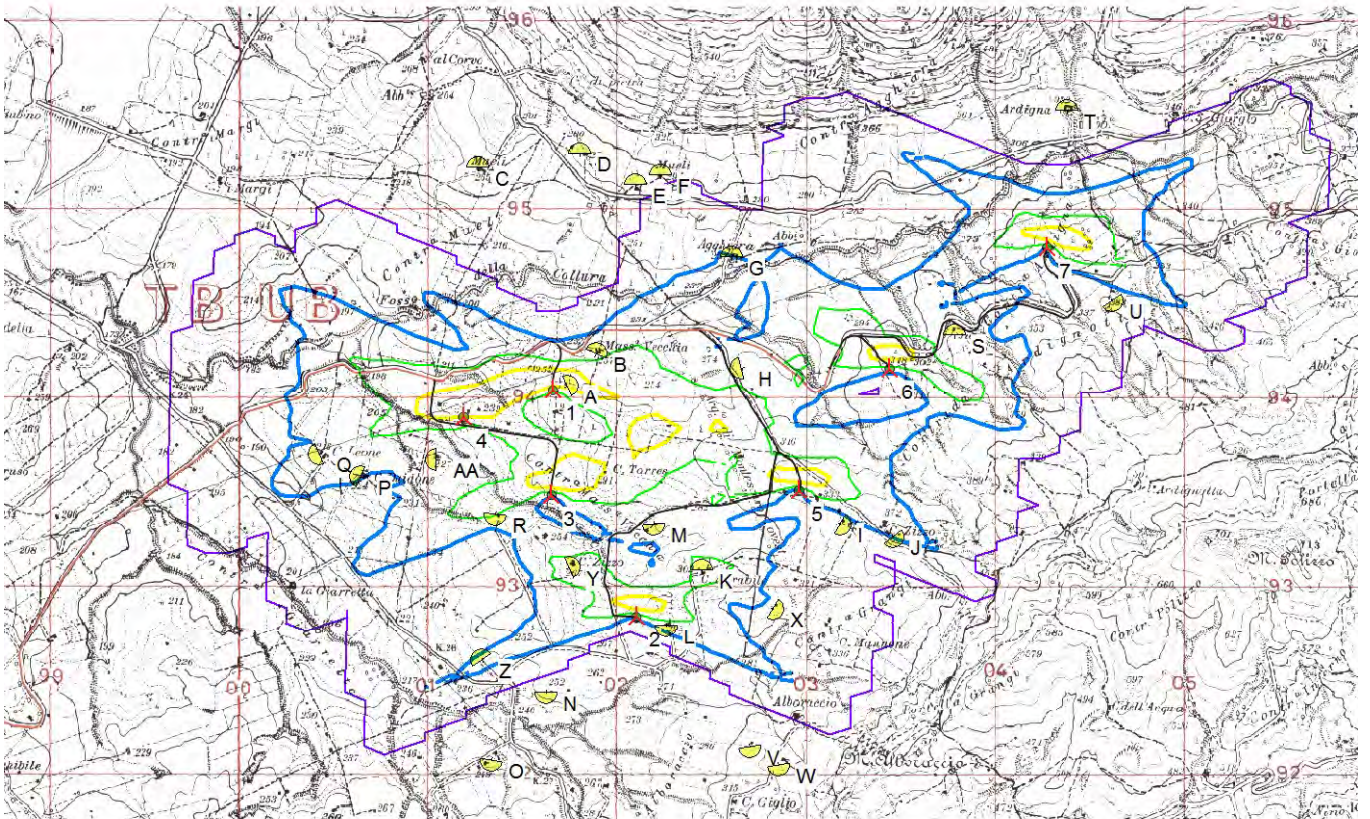
Calculated:

30/05/2024 19:58/2.4.0.62

SHADOW - IGM

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

File: Mirabile_IGM25.png



Map: , Print scale 1:40 000, Map center UTM WGS84 Zone: 33 East: 302 271 North: 4 193 878

New WTG

Shadow receptor

Isolines showing shadow in Shadow days per year. Real value calculation.

— 0
 — 90
 — 180
 — 270
 — 365

Project:

IMPIANTO EOLICO MIRABILE

Printed/Page

30/05/2024 20:36 / 1

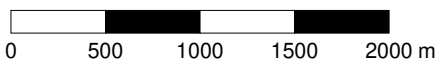
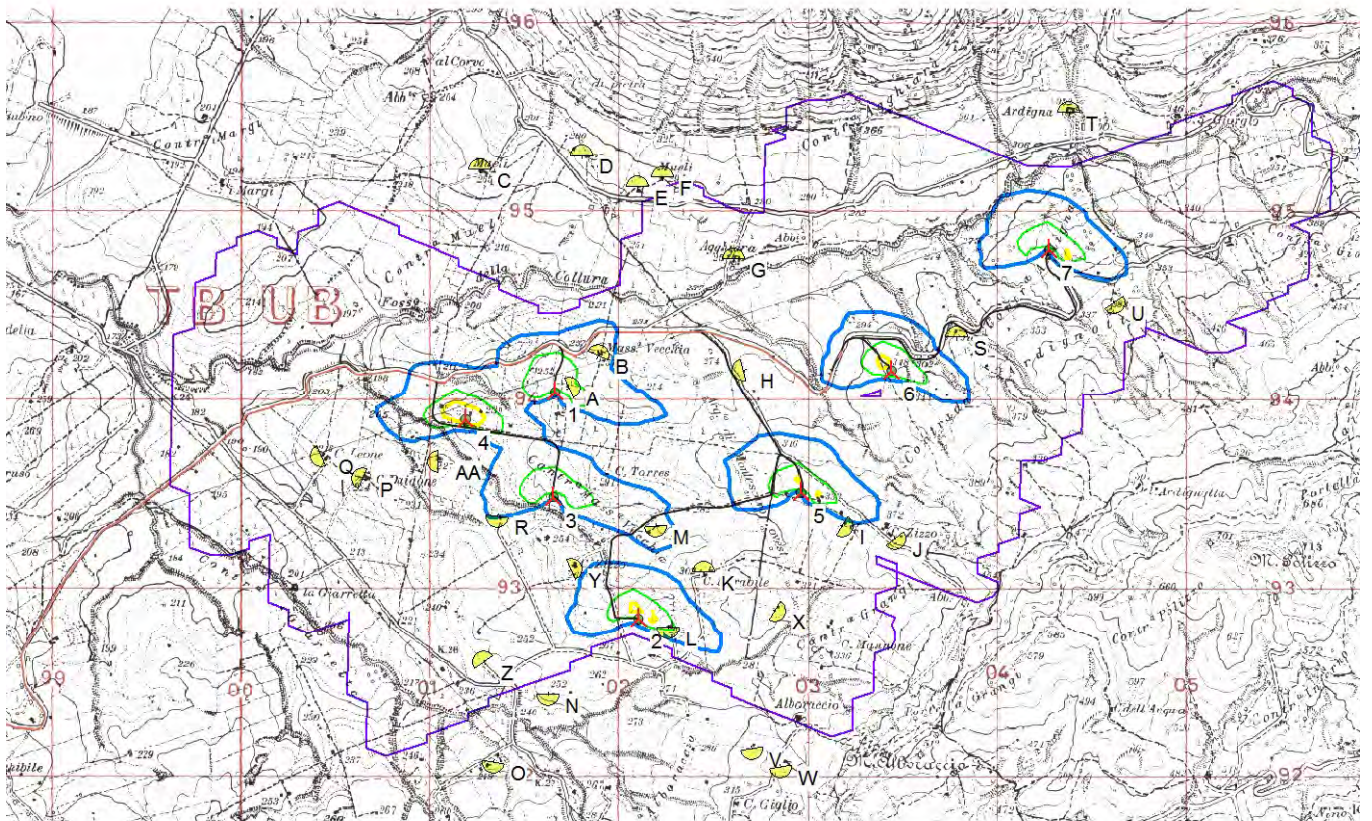
Calculated:

30/05/2024 19:58/2.4.0.62

SHADOW - IGM

Calculation: IMPATTO SHADOW FLICKERING PROGETTO MIRABILE

File: Mirabile_IGM25.png



Map: , Print scale 1:40 000, Map center UTM WGS84 Zone: 33 East: 302 271 North: 4 193 878

New WTG

Shadow receptor

Isolines showing shadow in Max shadow minutes per day. Real value calculation.

	0		50		100		150		216
--	---	--	----	--	-----	--	-----	--	-----