

PARCO EOLICO

COMUNE DI ISILI
PROVINCIA DEL SUD SARDEGNA (SU)



STUDIO DI IMPATTO AMBIENTALE

Elaborato:

ELABORAZIONI SIA

Relazione shadow flickering

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1. PREMESSA

La presente relazione espone l'analisi dell'evoluzione dell'ombra giornaliera generata dalla presenza degli aerogeneratori del parco eolico proposto, sito nel Comune di Isili, Sud Sardegna, così come richiesto nell'allegato alla D.G.R n.3/17 del 16/01/09, "Studio per l'individuazione delle aree in cui ubicare gli impianti eolici". Lo studio prende in considerazione la formazione di ghiaccio sulle strade e lo sfarfallio dell'ombra (shadow flicker) sugli edifici presenti nell'ambiente circostante al parco.

La formazione di ghiaccio costituisce un pericolo per gli utilizzatori delle strade, e si presenta tipicamente in zone montane, pedemontane o appenniniche. L'analisi è limitata alle strade statali e provinciali e alle principali strade comunali che attraversano l'area vasta del parco.

Lo sfarfallio dell'ombra si presenta quando la pala di una turbina interposta tra un recettore e il sole "taglia" il fascio luminoso, producendo un alternarsi di ombra e luce. A seconda della frequenza di sfarfallio questo fenomeno può indurre attacchi epilettici su soggetti predisposti. È stato mostrato¹ che frequenze di sfarfallio inferiori a 3 Hz non pongono un rischio su soggetti fotosensibili². Pertanto in questo studio si prenderà tale valore come riferimento.

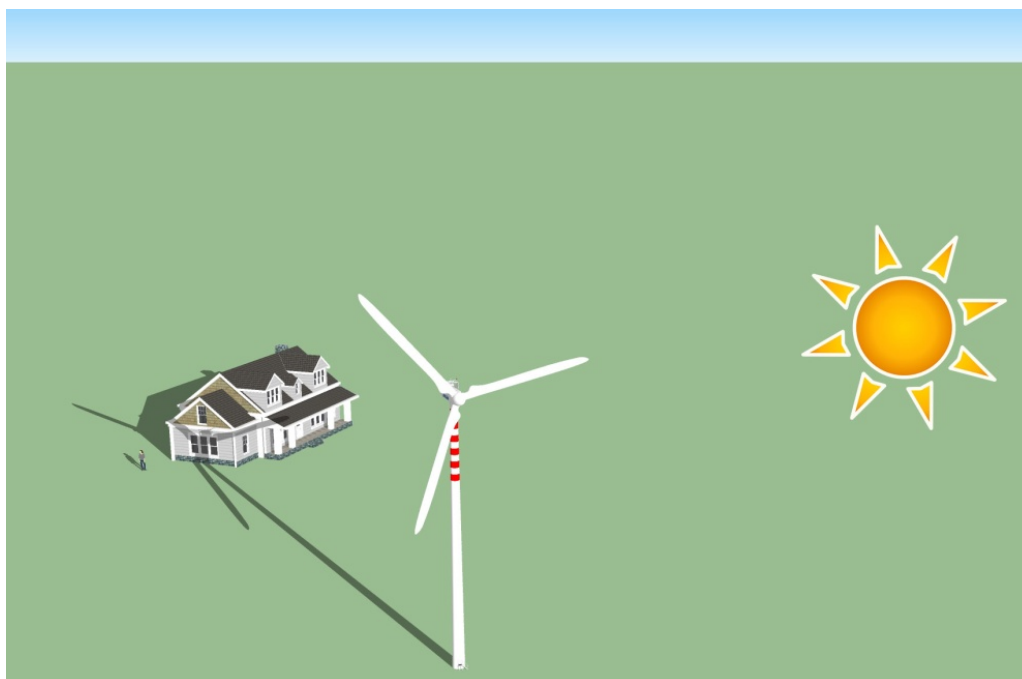


Figura 1: rappresentazione grafica del fenomeno di ombreggiamento.

1 Harding et al doi:10.1111/j.1528-1167.2008.01563.x

2 Ovvero il rischio cumulativo di attacco epilettico è inferiore a 17 persone per milione di soggetti fotosensitivi quando la frequenza di sfarfallio è inferiore a 3 Hz.

Allo stato attuale solo la Germania possiede linee-guida dettagliate sui limiti e sulle condizioni per il calcolo dell'impatto dell'ombra e sono consultabili nel documento "Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen" (WEA-Shattenwurf-Hinweise).

Una condizione necessaria affinché si verifichi il fenomeno dello sfarfallio in un dato recettore è che, da quel sito, la dimensione angolare delle pale sia paragonabile alla dimensione angolare del sole, in quanto se la dimensione relativa della pala è piccola rispetto al sole, questa non produce ombra percettibile sul recettore. Seguendo le linee guida tedesche, si pone la soglia di 1/5 come rapporto minimo tra la dimensione angolare della pala e la dimensione angolare del sole perché si possa verificare lo sfarfallio in un certo sito.

I problemi sopra esposti non sussistono qualora (linee guida tedesche):

- Il recettore subisca meno di 30 ore/anno di ombra da parte degli aerogeneratori;
- per ogni giorno dell'anno, il recettore subisca meno di 30 minuti di ombra;
- la frequenza di sfarfallio (flickering) è inferiore ai 3Hz.

Inoltre le linee guida specificano che gli ombreggiamenti diventano rilevanti solamente quando si considerano i recettori comportanti attività residenziali e lavorative stabili: "è auspicabile (che l'effetto flickering) si mantenga al di sotto delle 30 ore/anno in presenza di attività lavorative statiche, tipo ufficio, scuole, ospedali, interessate direttamente da impatto".

Questa indicazione è legata al fatto che all'interno di un edificio adibito a uffici, le postazioni di lavoro sono generalmente fisse, pertanto se l'edificio con pareti finestrate risulta prospiciente l'impianto eolico, chiaramente lo sfarfallio delle ombre oltre certi limiti può costituire un problema per quei lavoratori che si trovino con le loro postazioni proprio davanti alle pareti vetrate. Viceversa, lo sfarfallio diventa irrilevante per tutti gli edifici di tipo non residenziale e dedicati ad attività che non richiedono un'assidua presenza in una stazione fissa, come ad esempio le attività agricole e agropastorali, nelle quali il personale addetto si muove in continuazione all'interno dei terreni per svolgere le proprie mansioni.

Le stesse considerazioni valgono per tutti i beni paesaggistici, manufatti, beni archeologici etc, i quali possono essere frequentati ma le persone devono, per natura dei luoghi, muoversi in continuazione e non stazionare ferme nello stesso punto per quantità considerevoli di tempo. L'unica eccezione vale per quei contesti nei quali delle persone devono svolgere dei lavori e/o passare del tempo in maniera continuativa in una certa posizione fissa rispetto alle turbine. In quel caso si procede ad uno studio approfondito esattamente come nel caso dei recettori residenziali.

2. METODOLOGIA

2.1 Specifiche aerogeneratori

Il modello proposto per gli aerogeneratori è Vestas V162. Questi hanno altezza al mozzo di 119 m e altezza totale all'apice di 200 m. Le pale sono lunghe 79.35 m e possiedono larghezza massima di 4.3m. La velocità massima di rotazione del rotore è pari a 12.1 rpm.

2.2 Modello digitale di elevazione (DEM)

Il modello digitale di elevazione (DEM) utilizzato per effettuare le simulazioni con il software WindPro è quello fornito dalla Regione Sardegna³, con risoluzione 10 m. Inoltre si è ipotizzata l'altezza degli occhi di un generico osservatore pari a 1.6 m. L'orografia può determinare l'occlusione della vista degli aerogeneratori da parte dei recettori (Figura 2) ed in questi casi non viene considerato il possibile effetto di ombreggiamento.

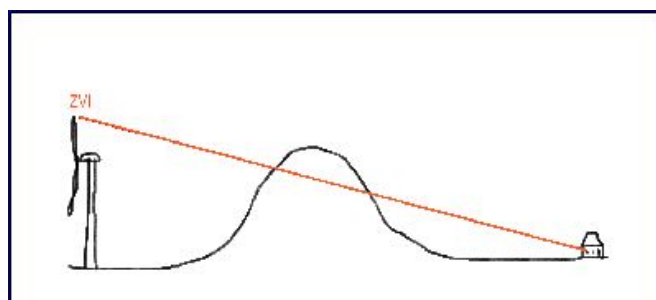


Figura 2: occlusione visiva dell'aerogeneratore rispetto al recettore, a causa dell'andamento orografico.

2.3 Recettori

Sono presenti complessivamente 31 recettori entro un buffer di 1km attorno al parco in proposta. Di questi 3 sono classificati come recettori residenziali (categoria catastale A) e sono riportati evidenziati in Tabella 1 mentre i restanti 28 sono classificati come fabbricati non residenziali (categoria catastale diversa da A oppure diruti/ruderi o terreni). In via conservativa è stato considerato il caso peggiore, ovvero che tutti i recettori e fabbricati siano delle serre sferiche (green house), ovvero che tutte le pareti siano trasparenti e che siano ortogonali a tutti gli aerogeneratori. In questo modo la simulazione fornisce una sovrastima degli effetti di ombra delle turbine sui recettori.

³ <http://www.sardegnaegeoportale.it/webgis2/sardegnamappe/>

Se i risultati della simulazione non indicano superamenti dei limiti indicati nelle linee guida, non si procede oltre, in caso contrario può essere necessario procedere a delle verifiche di dettaglio considerando le reali aperture dei ricettori (dimensioni ed orientazioni di finestre e porte).

Per gli edifici non residenziali non è necessario procedere con ulteriori analisi in quanto lo shadow flickering non è impattante per questi (capitolo 1).

Recettore	Tipo	Categoria catastale	Est GB (m)	Nord GB (m)	Altitudine (m)	WTG più vicina	Distanza WTG più vicina (m)
R01	Non residenziale	D01	1510997	4405939	577	IS_01	665
R02	Non residenziale	D10	1510722	4405876	561	IS_01	595
R03	Residenziale	A03	1510800	4405866	565	IS_01	575
R04	Non residenziale	D10	1510701	4405703	554	IS_01	433
R05	Non residenziale	F02	1511046	4405555	562	IS_01	334
R06	Non residenziale	F02	1511447	4405590	593	IS_02	566
R07	Non residenziale	D08	1510787	4404691	510	IS_01	604
R08	Non residenziale	D01	1510905	4404664	508	IS_02	602
R09	Non residenziale	D07	1511524	4404711	517	IS_02	345
R10	Non residenziale	Non censito al catasto fabbricati	1511475	4404526	512	IS_02	509
R11	Non residenziale	D01	1511123	4404316	508	IS_02	758
R12	Residenziale	A10	1511262	4404267	508	IS_02	770
R13	Non residenziale	Non censito al catasto fabbricati	1511441	4404375	510	IS_02	654
R14	Non residenziale	Non censito al catasto fabbricati	1511751	4404876	526	IS_02	395
R15	Non residenziale	Non censito al catasto fabbricati	1511760	4404825	523	IS_02	426
R16	Non residenziale	Non censito al catasto fabbricati	1513283	4404435	620	IS_04	437
R17	Non residenziale	D08	1512510	4403743	540	IS_03	658
R18	Non residenziale	D10	1512540	4402888	494	IS_05	594
R19	Non residenziale	D10	1512505	4402534	478	IS_05	859
R20	Non residenziale	B07	1513794	4401807	590	IS_07	634
R21	Non residenziale	C02	1514015	4401674	584	IS_07	781
R22	Residenziale	A03	1514258	4402330	610	IS_07	422
R23	Non residenziale	Non censito al catasto fabbricati	1513133	4402466	510	IS_07	718
R24	Non residenziale	D01	1511198	4404447	509	IS_02	610
R25	Non residenziale	D01	1511235	4404449	509	IS_02	598
R26	Non residenziale	D01	1511067	4404594	509	IS_02	538
R27	Non residenziale	F02	1511328	4404317	509	IS_02	713
R28	Non residenziale	Non censito al catasto fabbricati	1511075	4404128	508	IS_02	951
R29	Non residenziale	F02	1511251	4404148	508	IS_02	890
R30	Non residenziale	D07	1511605	4404104	502	IS_02	949
R31	Non residenziale	Non censito al catasto fabbricati	1513535	4402486	559	IS_07	319

Tabella 1 Recettori adiacenti al parco in proposta (1km).

2.4 Eliofania e distribuzione dei venti

I problemi dovuti all'ombra degli aerogeneratori sono presenti solamente quando è presente illuminazione diretta del sole (eliofania). I dati rilevanti nelle nostre simulazioni sono la lunghezza del dì (ovvero le ore presenti tra alba e tramonto, che non dipende dalle condizioni meteo) e le ore di illuminazione diretta. La prima varia con continuità nell'arco dell'anno, senza apprezzabili distinzioni tra le varie zone della Sardegna, mentre la seconda è variabile da zona a zona e dipende da fenomeni a grande scala che influenzano in maniera sostanzialmente uniforme l'intera superficie isolana.

Di conseguenza il valore climatologico dell'eliofania è da considerarsi lo stesso su tutta la Sardegna (fonte: ARPA Sardegna), e per questo motivo sono stati utilizzati i valori di eliofania forniti dalla stazione meteorologica di Elmas.

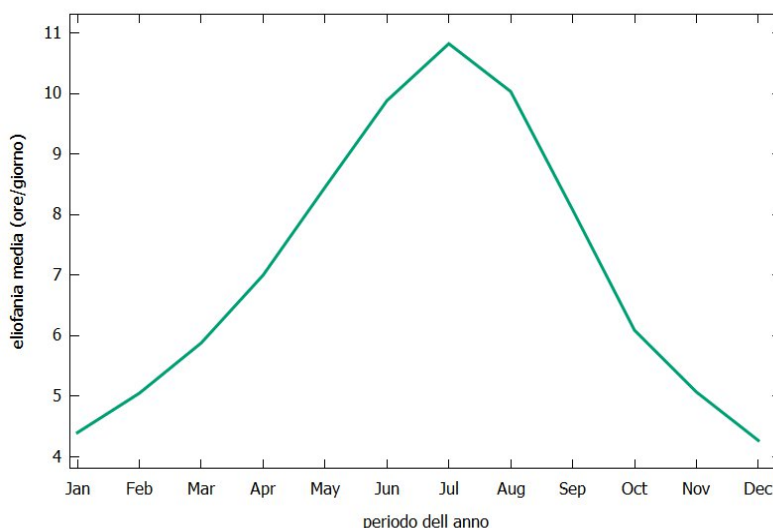


Figura 3: Eliofania media. Dati rilevati nella stazione di Elmas.

L'ombra che gli aerogeneratori proiettano sui recettori dipende anche dalla direzione del piano di rotazione delle pale; nello specifico, l'ombra è massima quando il piano di rotazione è perpendicolare al recettore. L'orientamento del piano di rotazione è determinato dalla direzione del vento, quindi l'orientamento segue la distribuzione dei venti:

	N	NNE	ENE	E	ESE	SSE
ore di attività annuali	130	93	150	171	259	145
	S	SSW	WSW	W	WNW	NNW
ore di attività annuali	62	26	52	150	493	347

Tabella 2 Rosa dei venti. Valori scalati su un anno equivalente di attività, ovvero su un totale di 2079 ore.

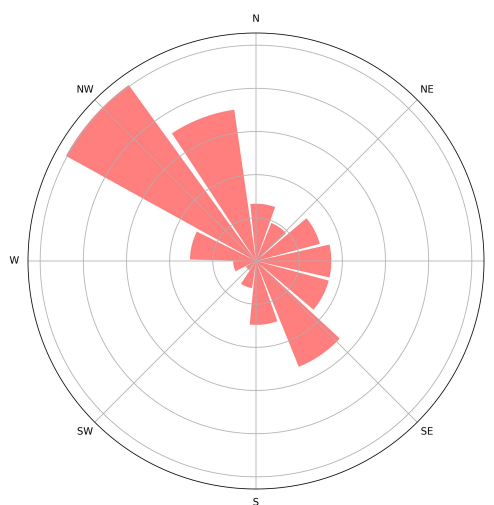


Figura 4: rosa dei venti per la località del parco in proposta in unità arbitrarie.

Nella simulazione questo fattore è preso in considerazione, in modo da diminuire o aumentare l'ombra a seconda dell'orientamento relativo tra il piano di rotazione delle pale e i recettori. In Figura 4 è riportata la rosa dei venti in unità arbitrarie e in Tabella 2. la distribuzione dei venti normalizzata rispetto ad un anno di attività, ovvero al 24% di un anno, che rappresenta il tempo medio di attività del parco. Questo quantitativo di ore è quello che viene inserito come input nella simulazione per determinare la porzione di tempo nella quale una turbina ruota in una specifica direzione. I dati sono presi dallo Studio di valutazione della risorsa anemologica (IS_SIA_A029).

Tutte le considerazioni espone tengono conto dei risultati delle simulazioni realistiche, ovvero simulazioni basate sull'eliofania e sulla distribuzione dei venti (a differenza della simulazione rispetto al caso peggiore in cui non se ne tiene conto).

3. RISULTATI

3.1 Recettori

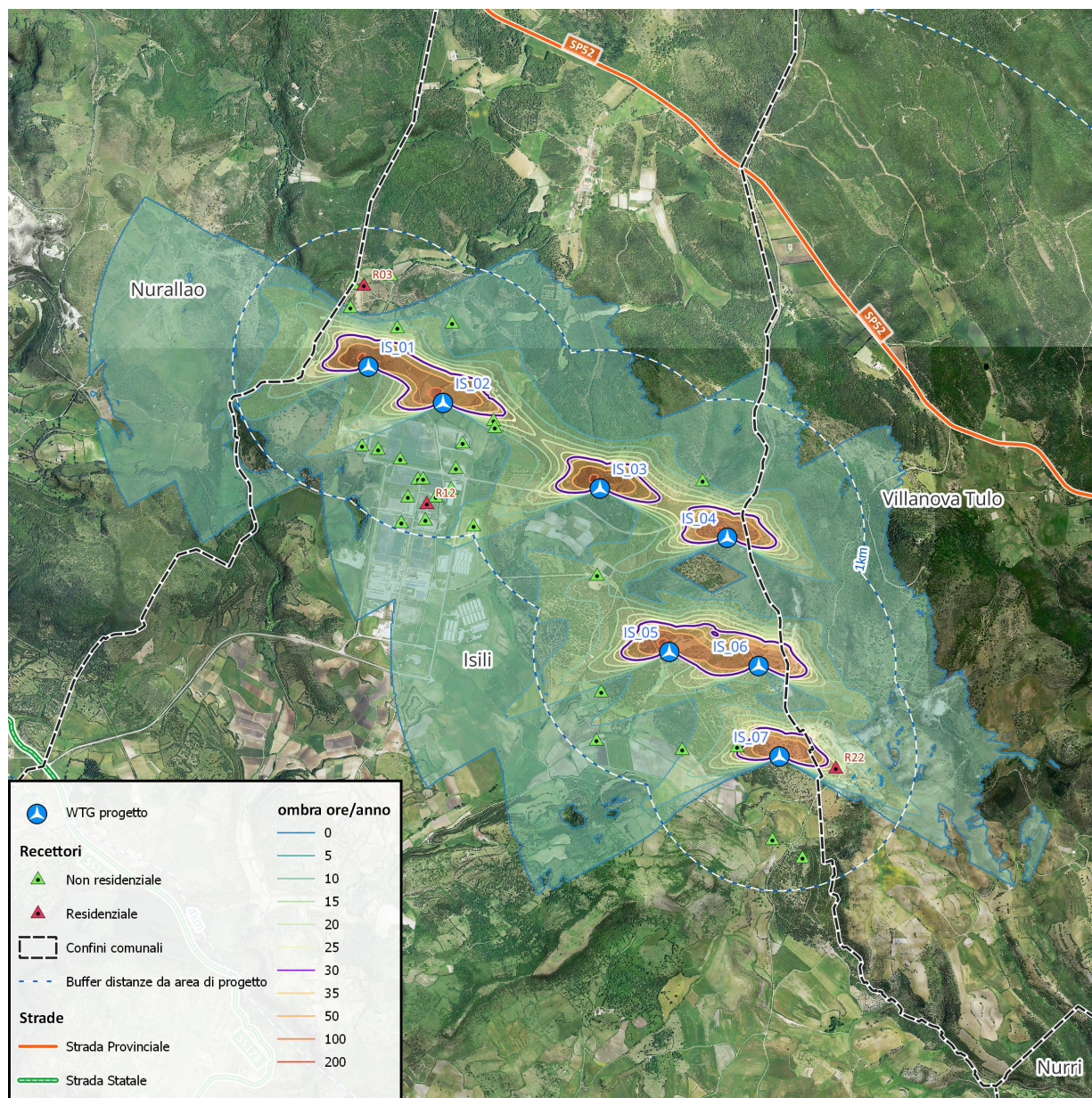


Figura 5: Ore di ombra totale all'anno su ortofoto, caso realistico che tiene conto dell'eliofania e della rosa dei venti. Sono presenti tutti i recettori (residenziali e non). L'isolinea viola delimita al suo interno regioni con ombra > 30 ore/anno e al suo esterno regioni con ombra < 30 ore/anno.

In Figura 5 sono riportati i risultati della simulazione di ore totali di ombra all'anno, la zona ad alto impatto (ombra > 30 ore/anno) è delimitata dalla curva viola. I relativi valori sono tabulati in Tabella 3. **Nessun recettore (residenziale e non) subisce un'ombreggiatura > 30 ore/anno.**

Nome	ombra (ore/anno)	massimo ombra giornaliera (min/giorno)	Giornate di ombra all'anno	Nome	ombra (ore/anno)	massimo ombra giornaliera (min/giorno)	Giornate di ombra all'anno
R01	0	0	0	R17	10	5	203
R02	0	0	0	R18	3	4	84
R03	0	0	0	R19	3	3	75
R04	0	0	0	R20	0	0	0
R05	11	8	116	R21	0	0	0
R06	4	4	96	R22	23	13	141
R07	2	3	63	R23	5	7	69
R08	1	3	30	R24	1	3	36
R09	2	3	45	R25	1	3	36
R10	2	4	42	R26	1	3	30
R11	1	3	36	R27	2	4	42
R12	2	4	42	R28	1	3	36
R13	3	4	86	R29	2	3	78
R14	22	15	162	R30	8	5	188
R15	12	10	120	R31	23	14	156
R16	6	6	107				

Tabella 3 Ombra proiettata sui recettori. Caso realistico che tiene conto dell'eliofania e della rosa dei venti. I recettori residenziali sono evidenziati, nessun recettore subisce ombreggiatura maggiore di 30 ore/anno.

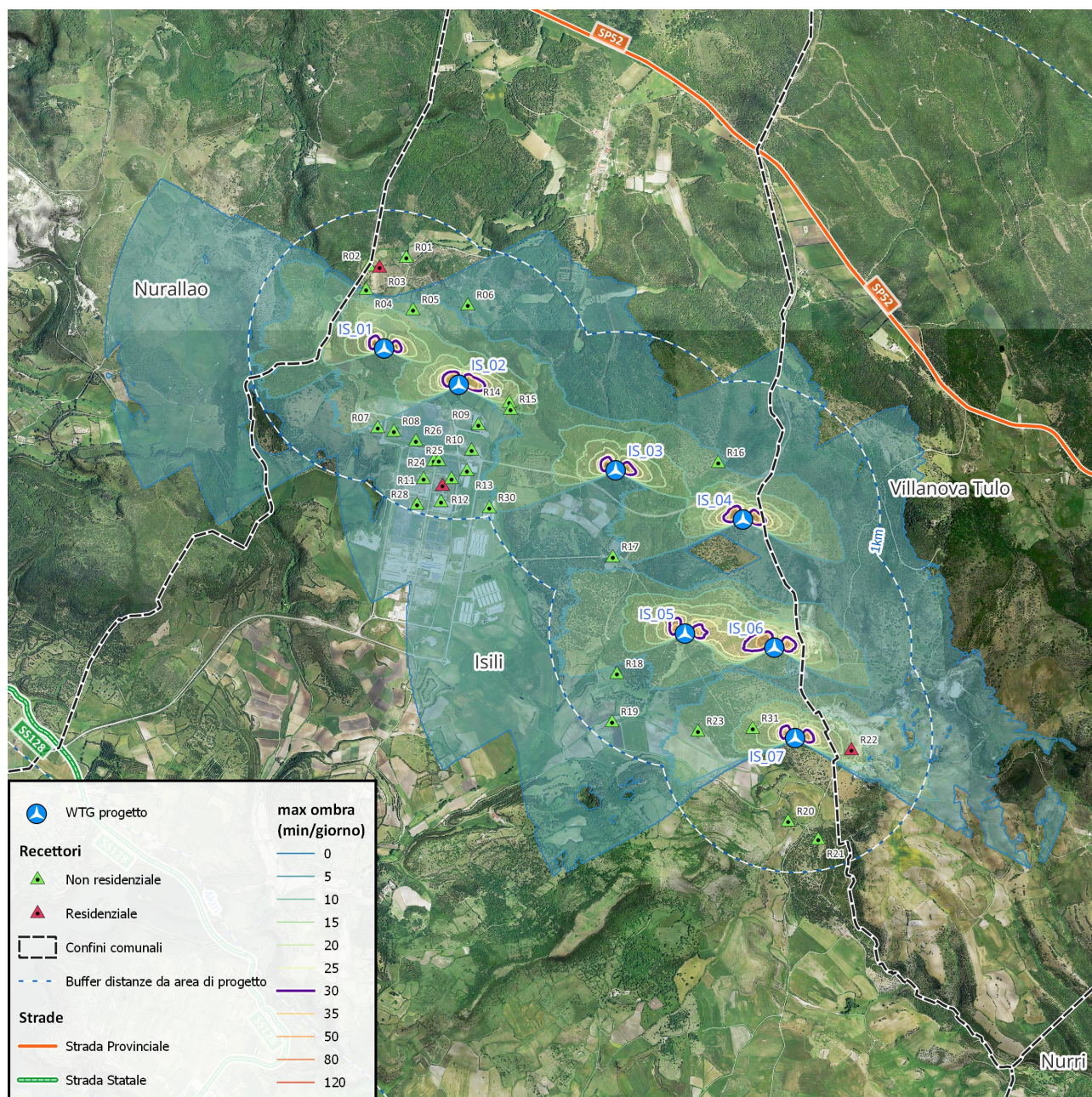


Figura 6: Massimo tempo di ombreggiatura giornaliera (minuti/giorno), caso realistico che tiene conto dell'eliofania e della rosa dei venti. L'isolinea viola delimita le zone a basso impatto (ombra < 30 min/giorno) dalle zone ad alto impatto (ombra > 30 minuti/giorno).

In Figura 6 è riportato il massimo numero di minuti di ombra percepita dai recettori e fabbricati in un singolo giorno realisticamente; nessun recettore ricade nella zona con ombreggiatura massima giornaliera > 30 min/giorno (Tabella 3). **Nessun recettore ricade dentro l'area di alto impatto con ombreggiatura massima giornaliera > 30 min/giorno.**

3.2 Effetti cumulativi

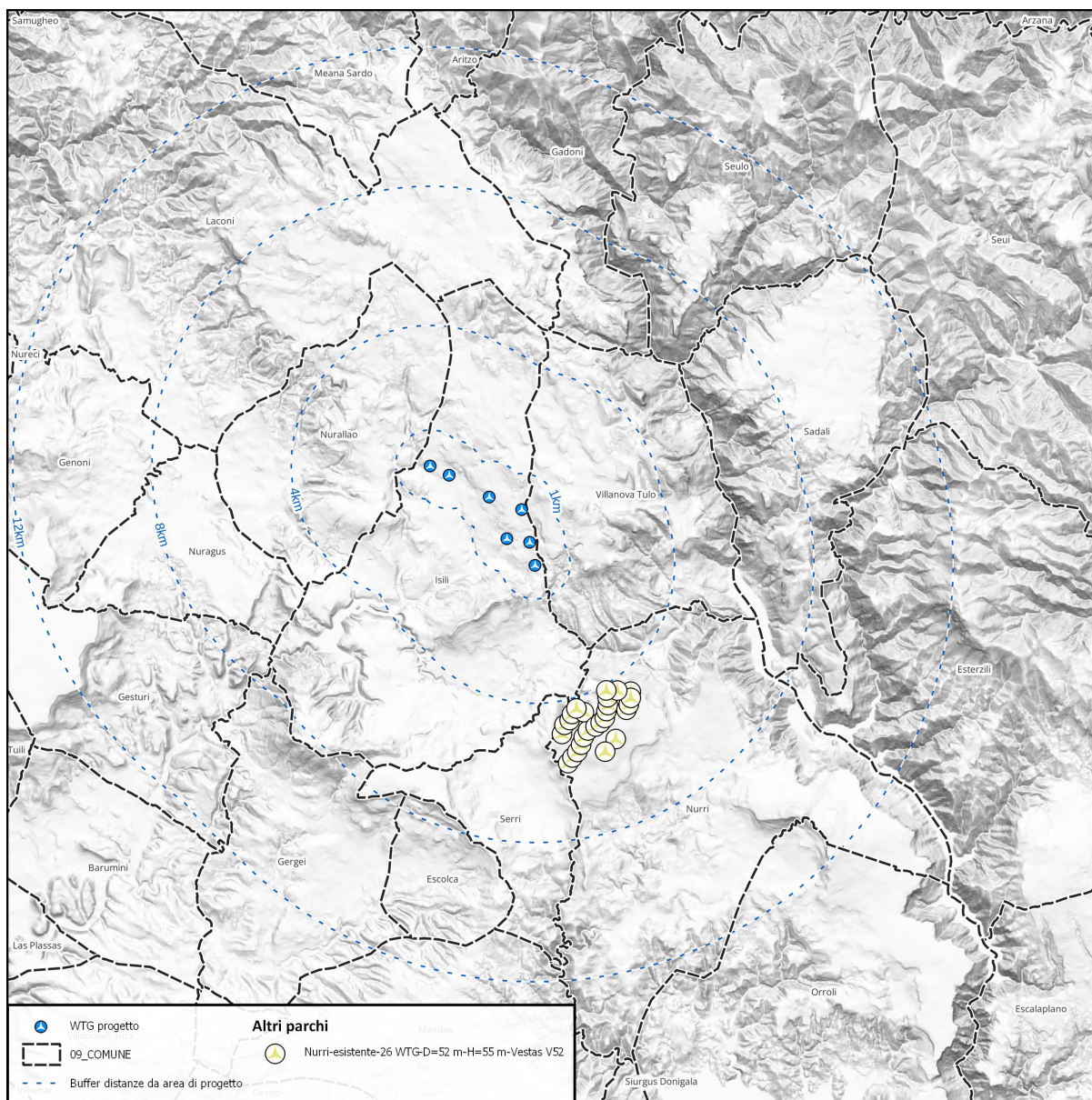


Figura 7 Parchi esistenti o autorizzati limitrofi al parco in proposta.

I parchi esistenti o autorizzati nelle vicinanze del parco in proposta sono riportati in Figura 7. Nelle analisi di ombreggiamento si considerano recettori limitrofi al parco entro una distanza di 1 km, pertanto nell'analisi cumulativa è necessario analizzare gli effetti complessivi di tutti i parchi esistenti o autorizzati entro 2 km da quello in proposta. Nessun parco esistente o autorizzato ricade entro una distanza da 2 km dal parco in proposta. In particolare il parco più vicino risulta essere "Nurri" che conta 26 aerogeneratori, segnato bianco-giallo in legenda della Figura 7 distante oltre 4 km dal parco in proposta.

3.3 Flickering

Le turbine in proposta (Vestas V162) hanno una velocità massima di rotazione pari a 12.1 rpm, ossia 0.20Hz, che poi risulta in una frequenza di taglio di 0.60Hz (ovvero la frequenza con cui le pale tagliano la luce di una sorgente luminosa) poiché la turbina è composta di 3 pale. Affinché si verifichi il fenomeno di flickering con almeno 3Hz (soglia minima per soggetti fotosensibili, vedi capitolo 1) è necessario dunque che 4 o più turbine siano allineate rispetto ad un recettore; questo non avviene in nessun caso per i recettori considerati.

Nello specifico gli edifici [R14,R15] subiscono l'ombra contemporanea di 2 generatori per volta in certi periodi dell'anno ad esempio [IS_01,IS_02] oppure [IS_03,IS_04] per R14. Questo è rappresentato in Figura 8.

In ogni caso la frequenza di taglio media di 2 turbine allineate è pari a 1.26Hz, minore del valore di soglia di 3Hz. Questo scongiura la possibilità del verificarsi di potenziali rischi per soggetti fotosensibili, che si manifestano in presenza di frequenze di flickering superiori a 3Hz.

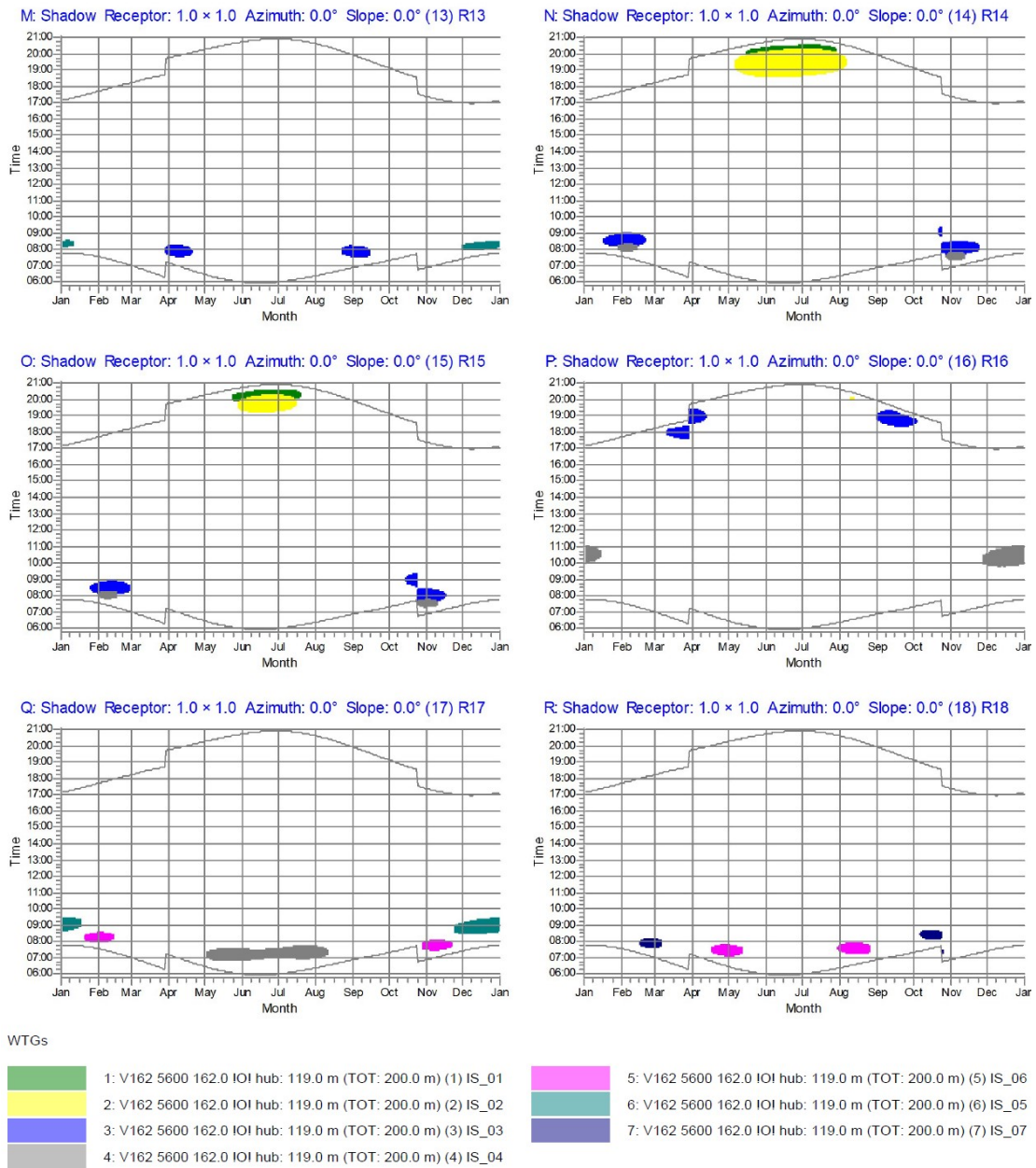


Figura 8: Calendario grafico ombre per ogni recettore nel caso peggiore, senza tenere conto di eliofania e rosa dei venti. Le linee continue indicano l'ora di alba e tramonto. Le macchie colorate indicano il periodo dell'anno e le ore nelle quali i recettori sono interessati dall'ombra di una turbina.

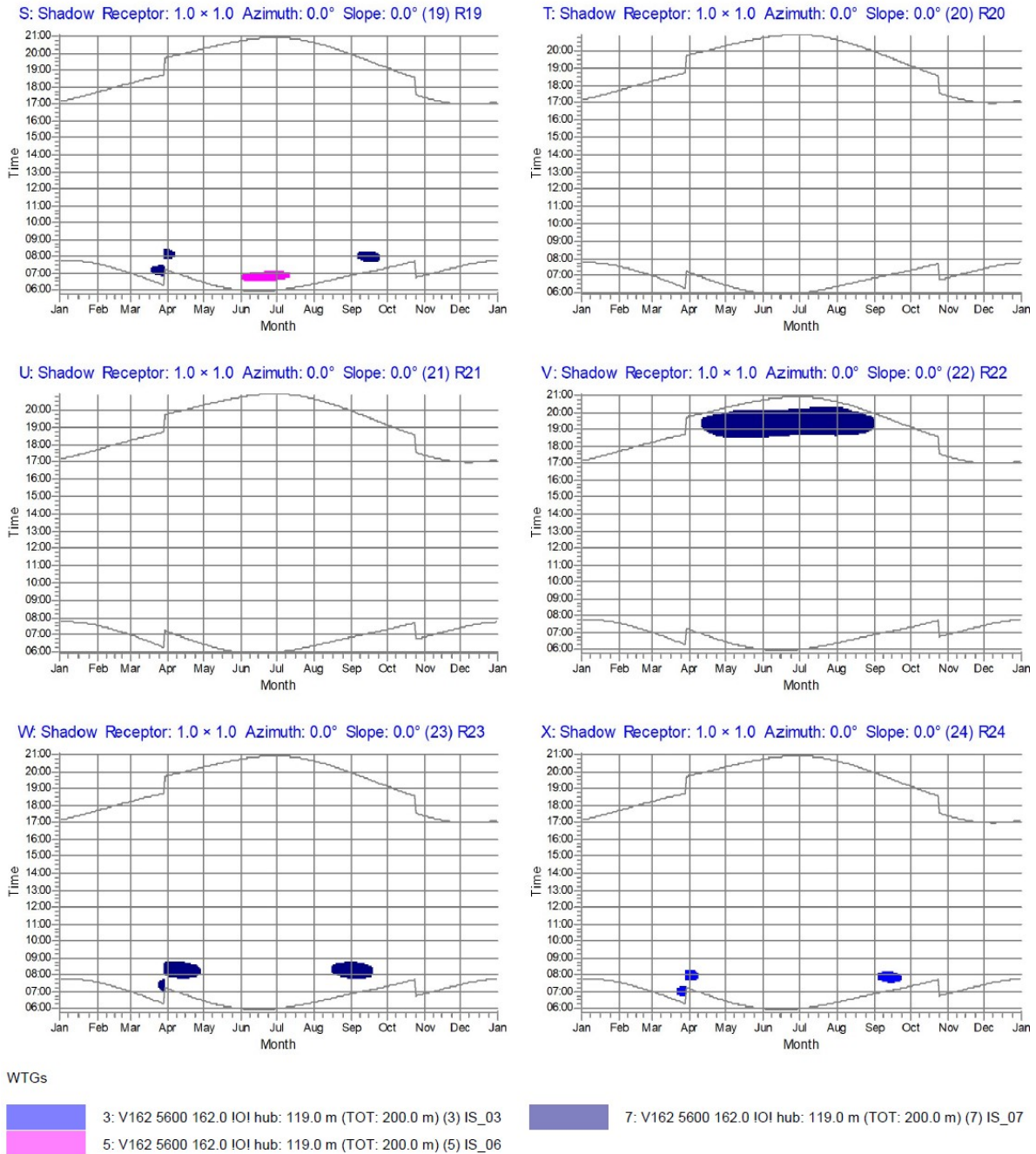


Figura 9: Calendario grafico ombre per ogni recettore nel caso peggiore, senza tenere conto di eliofania e rosa dei venti. Le linee continue indicano l'ora di alba e tramonto. Le macchie colorate indicano il periodo dell'anno e le ore nelle quali i recettori sono interessati dall'ombra di una turbina.

La Figura 8 e Figura 9 riportano i calendari grafici delle ombre subite da alcuni recettori. Da questi è possibile determinare il periodo dell'anno e della giornata nel quale il recettore è interessato dall'ombra di una turbina. Ad esempio è possibile determinare che il recettore R15 subisce l'ombra della turbina IS_01 e IS_02 nei mesi di giugno e luglio durante la sera (circa 19:30-20:30).

3.4 Strade

Le strade provinciali e statali sono riportate in Figura 6. La strada più vicina al parco in proposta è la strada provinciale SP52 ad una distanza maggiore di 1.5 km. Essa non ricade dentro l'area con ombreggiatura massima giornaliera > 30 min/giorno e di conseguenza l'impatto delle ombre del parco in proposta sulle strade statali e provinciali limitrofe risulta nullo.

4. Conclusioni

Sono presenti 31 recettori entro una distanza di 1 km dal parco proposto. I recettori [R03,R12,R22] risultano di categoria catastale A, mentre i restanti sono stati definiti come “non residenziali” in questo studio. **Nessun recettore subisce un ombreggiatura maggiore di 30 ore/anno dal parco in proposta.** Questo permette di definire trascurabili gli impatti di ombreggiamento del parco in proposta sui recettori considerati.

Gli impatti cumulativi degli altri parchi esistenti o autorizzati limitrofi risultano nulli in quanto, il parco più vicino (Nurri) risulta essere ad una distanza di 4 km, maggiore della soglia di 2 km che si considera per gli impatti cumulativi.

Nessun recettore subisce ombreggiamento da parte di 3 o più turbine contemporaneamente, questo permette di concludere che per nessun recettore o fabbricato si presenta il fenomeno di flickering a 3Hz o maggiore.

La strada provinciale o statale più vicina risulta essere la strada provinciale SP52 ad una distanza maggiore di 1.5 km per la quale l’impatto ai fini dello studio sulle ombre è nullo.

5. Appendice

Si riporta in appendice il calendario grafico e tabellare per ogni recettore e per ogni turbina. Le metodologie di lettura delle tabelle e dei grafici sono state esposte nei precedenti paragrafi.

Project:

Windpro Isili - shadow flickering

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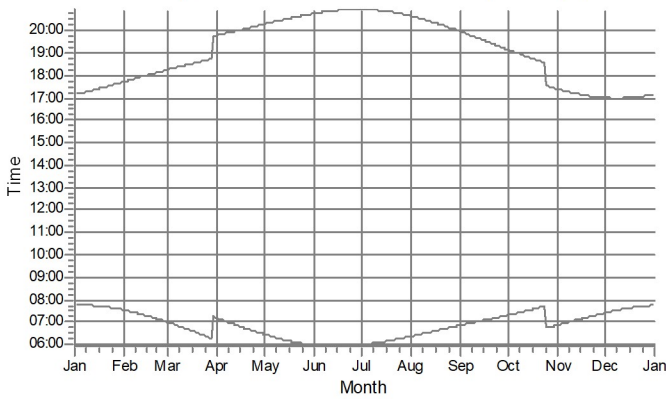
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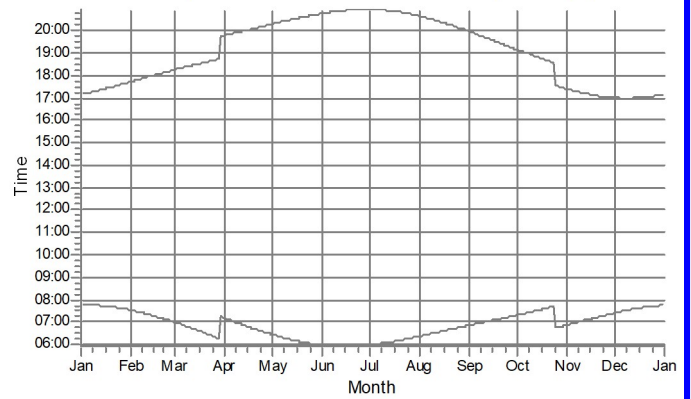
SHADOW - Calendar, graphical

Calculation: Isili

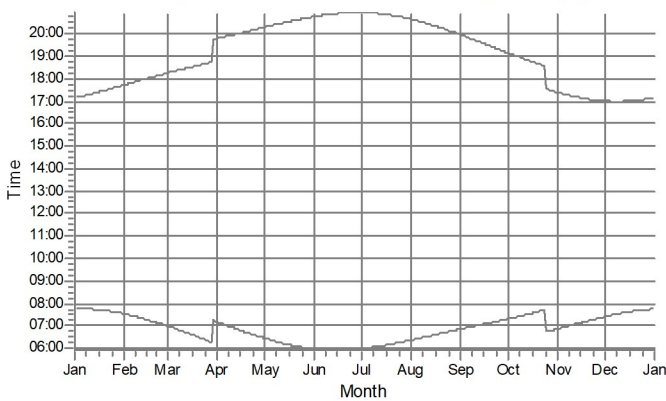
A: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (1) R01



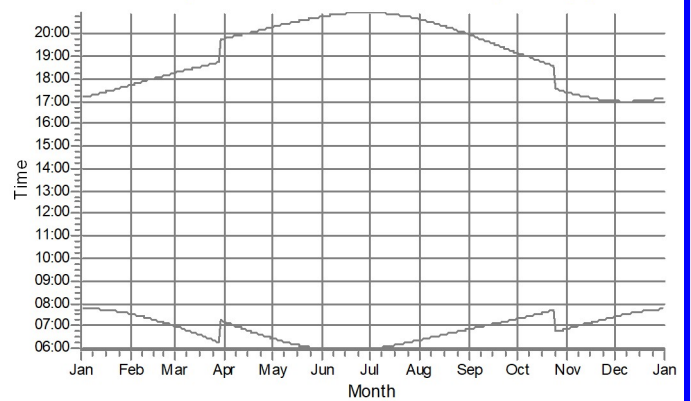
B: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (2) R02



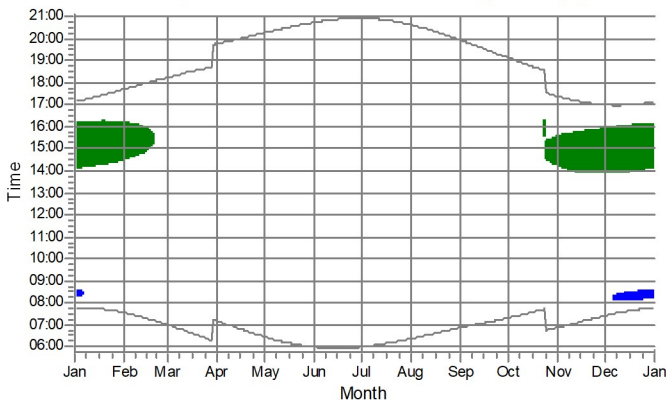
C: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (3) R03



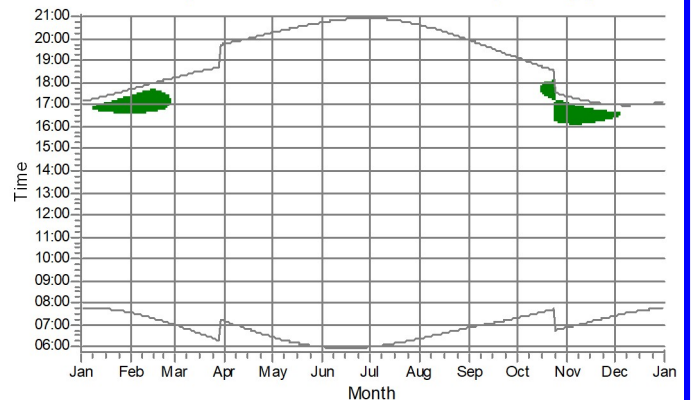
D: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (4) R04



E: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (5) R05



F: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (6) R06



WTGs

1: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1) IS_01

3: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03

Project:

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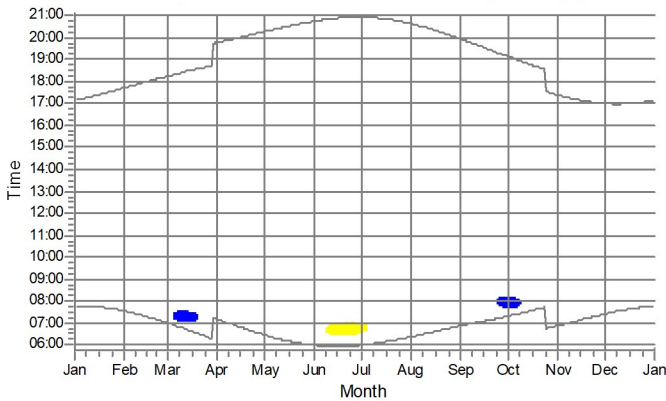
Calculated:

2023-12-04 10:43/2.8.579

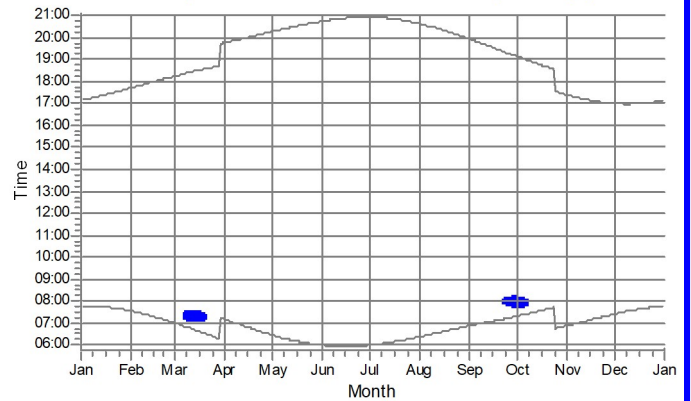
SHADOW - Calendar, graphical

Calculation: Isili

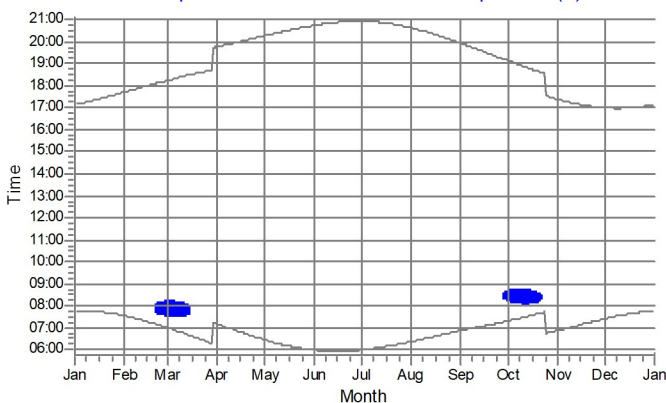
G: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (7) R07



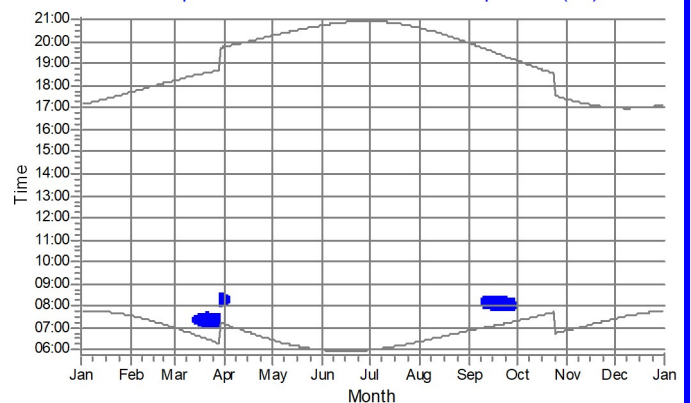
H: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (8) R08



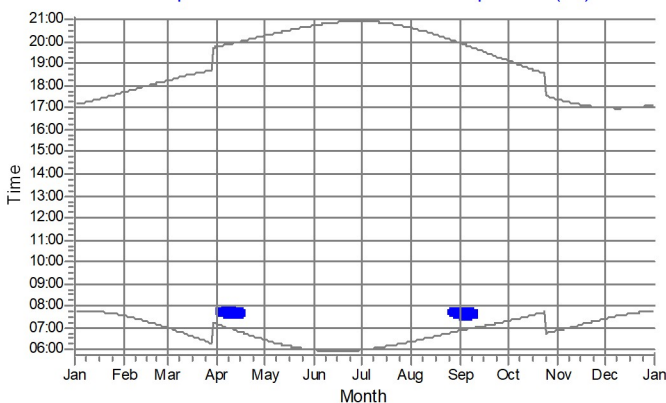
I: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (9) R09



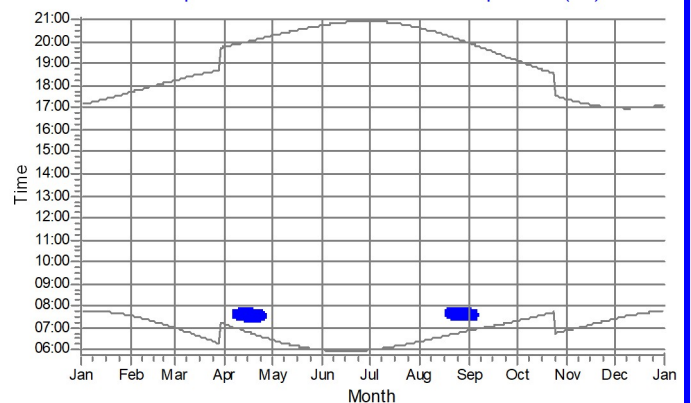
J: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (10) R10



K: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (11) R11



L: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (12) R12



WTGs

2: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (2) IS_02

3: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03

Project:

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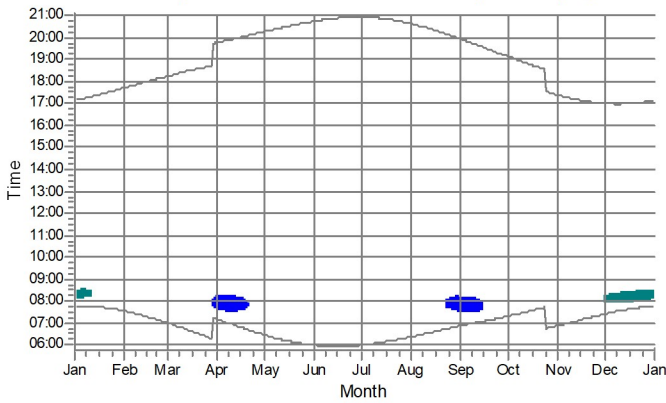
Calculated:

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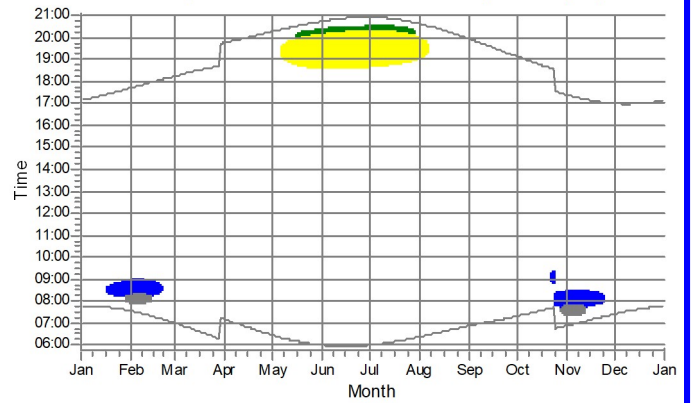
SHADOW - Calendar, graphical

Calculation: Isili

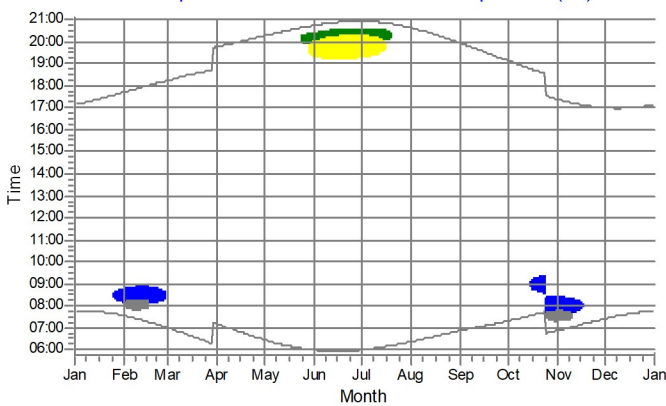
M: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (13) R13



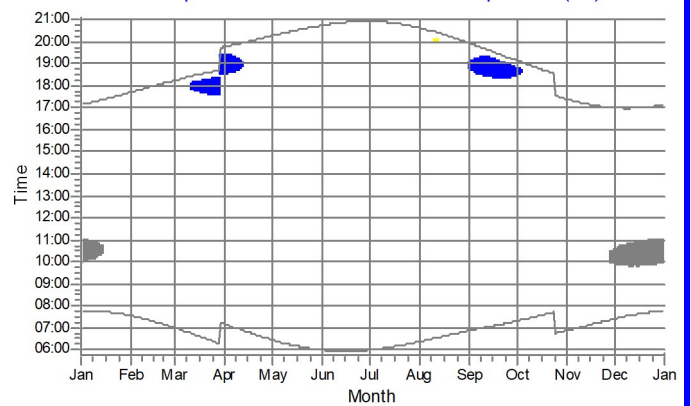
N: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (14) R14



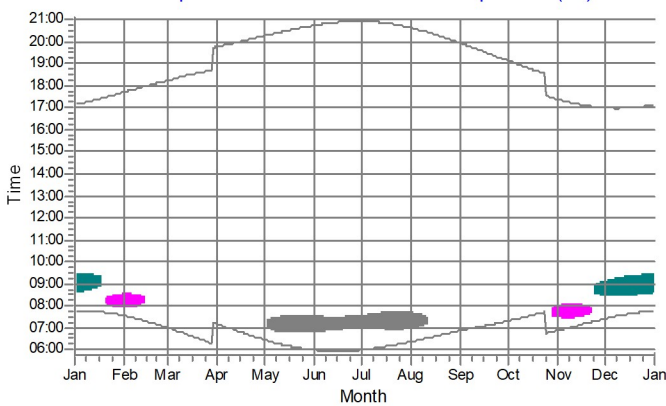
O: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (15) R15



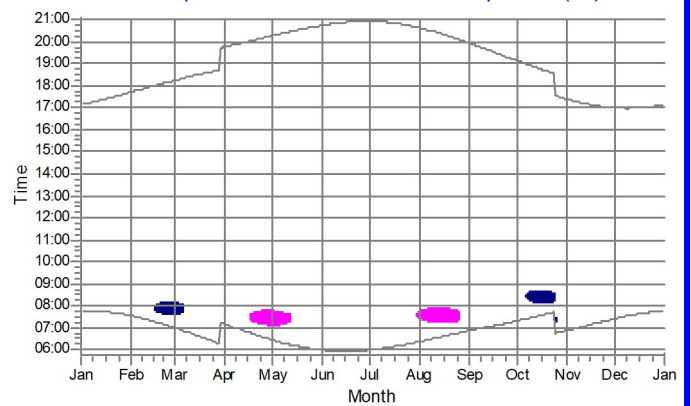
P: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (16) R16



Q: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (17) R17



R: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (18) R18



WTGs

- | | |
|--|---|
| <ul style="list-style-type: none"> 1: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1) IS_01 2: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (2) IS_02 3: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03 4: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4) IS_04 | <ul style="list-style-type: none"> 5: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5) IS_06 6: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6) IS_05 7: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7) IS_07 |
|--|---|

Project:

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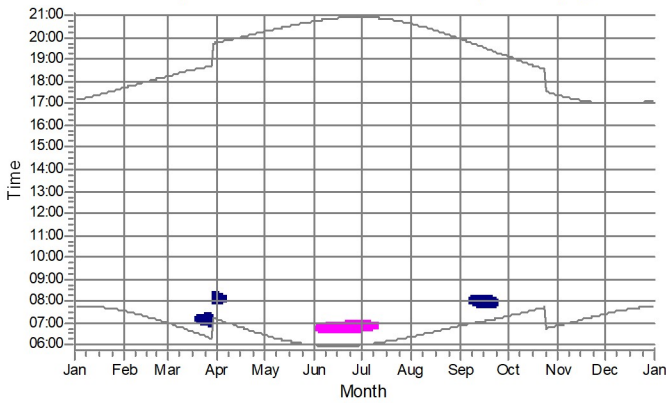
Calculated:

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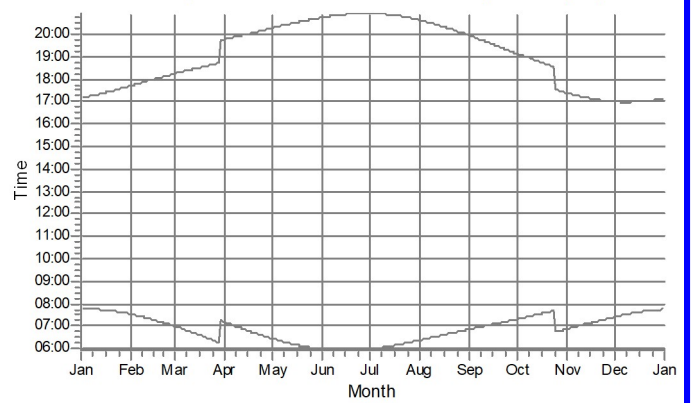
SHADOW - Calendar, graphical

Calculation: Isili

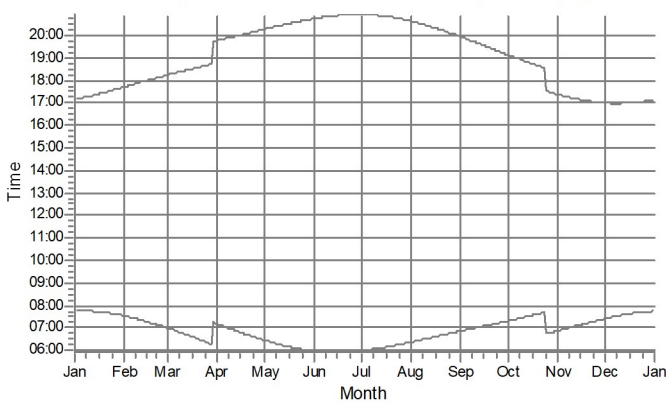
S: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (19) R19



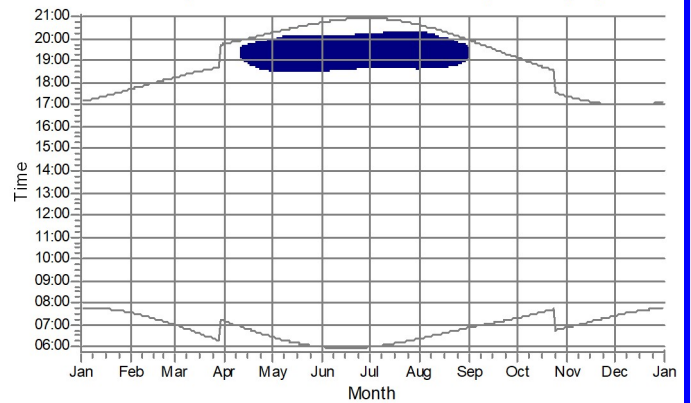
T: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (20) R20



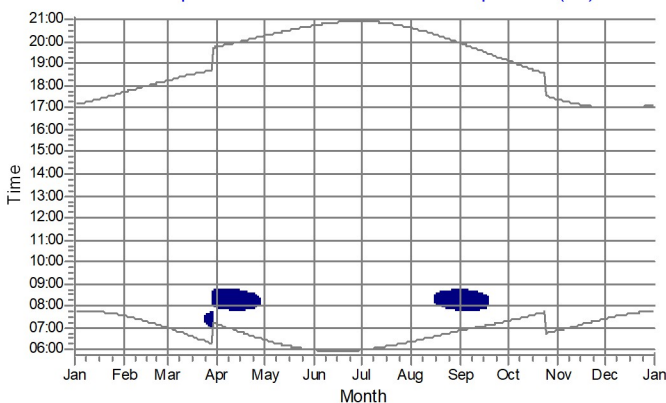
U: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (21) R21



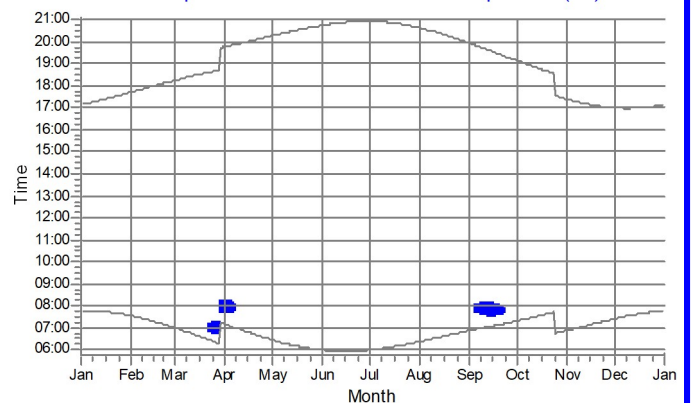
V: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (22) R22



W: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (23) R23



X: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (24) R24



WTGs

3: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03
 5: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5) IS_06

7: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7) IS_07

Project:

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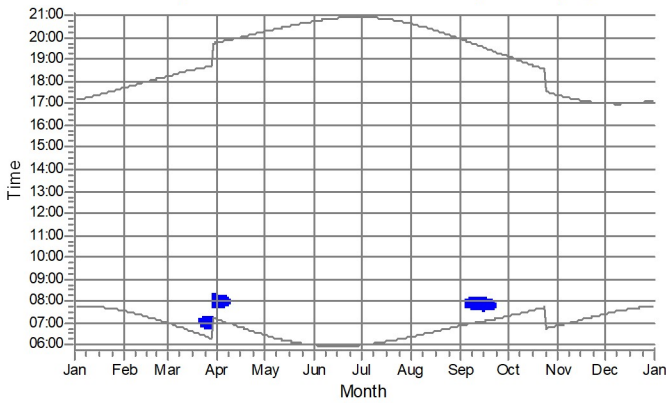
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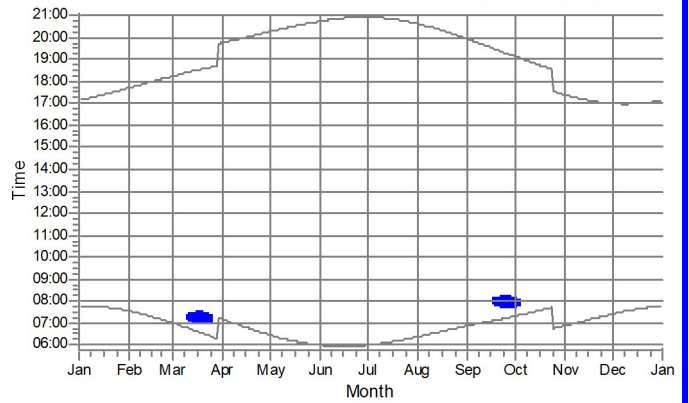
SHADOW - Calendar, graphical

Calculation: Isili

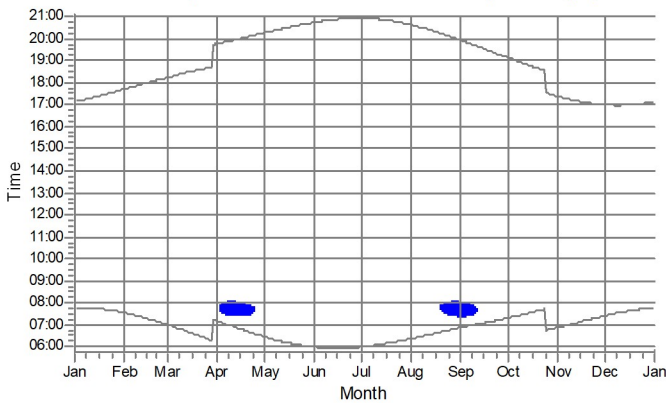
Y: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (25) R25



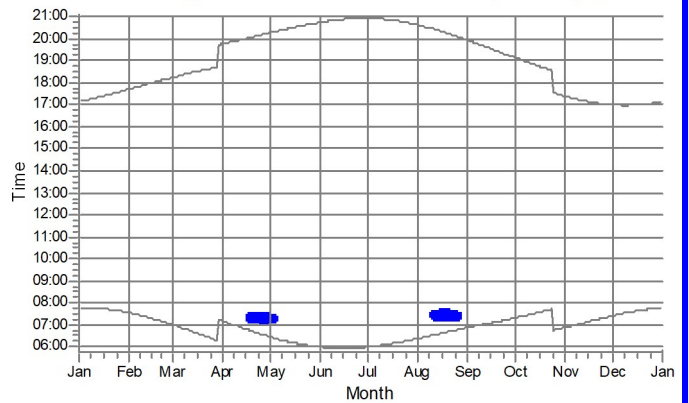
Z: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (26) R26



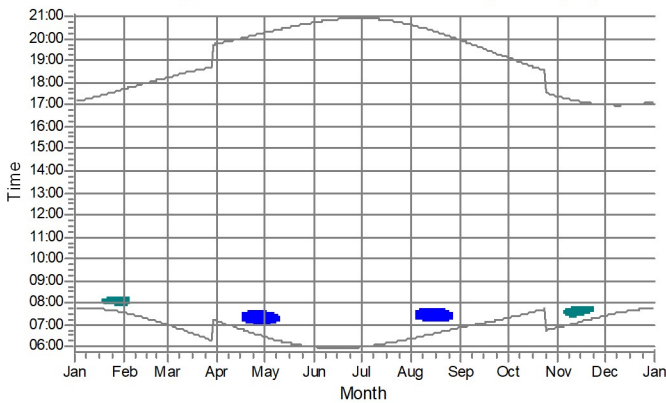
AA: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (27) R27



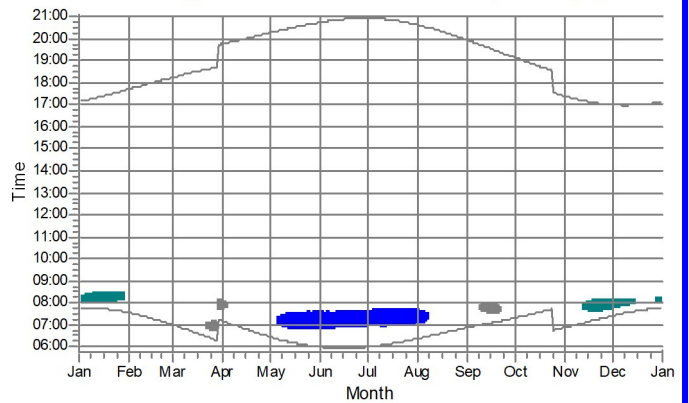
AB: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (28) R28



AC: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (29) R29



AD: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (30) R30



WTGs

- 3: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03
- 4: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4) IS_04

- 6: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6) IS_05

Project:

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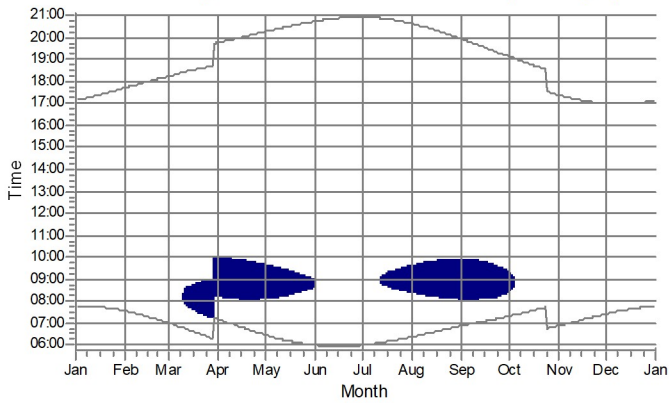
Calculated:

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SHADOW - Calendar, graphical

Calculation: Isili

AE: Shadow Receptor: 1.0 × 1.0 Azimuth: 0.0° Slope: 0.0° (31)



WTGs

7: V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7) IS_07

Project:

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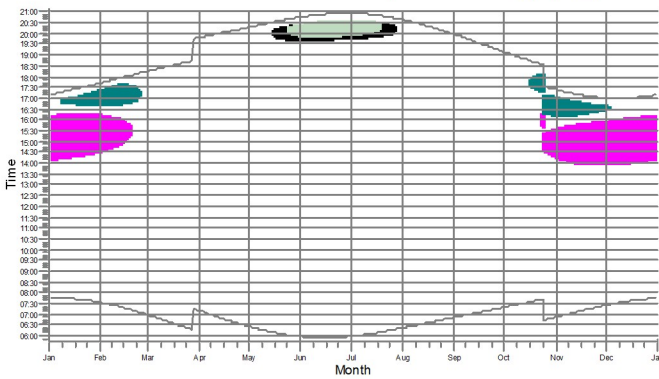
Calculated:

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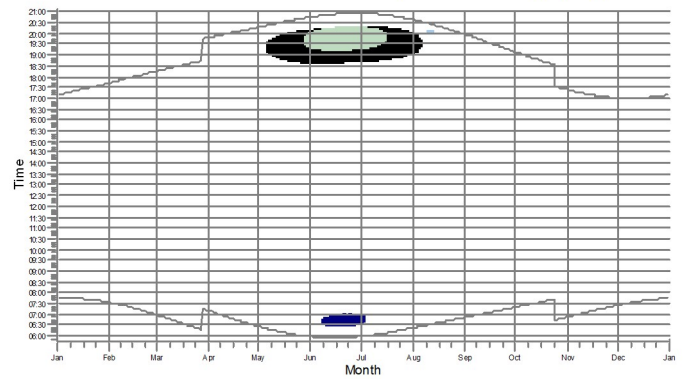
SHADOW - Calendar per WTG, graphical

Calculation: Isili

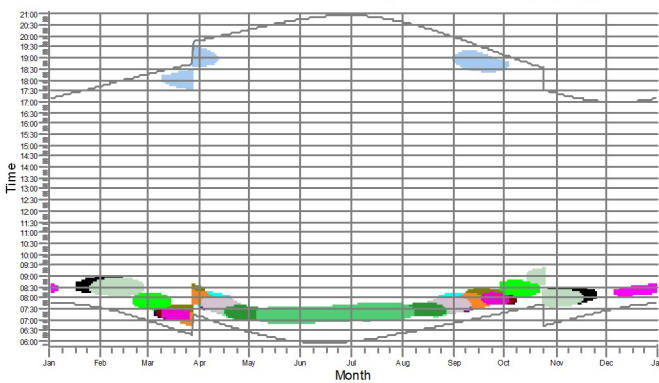
1: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (1) IS_01



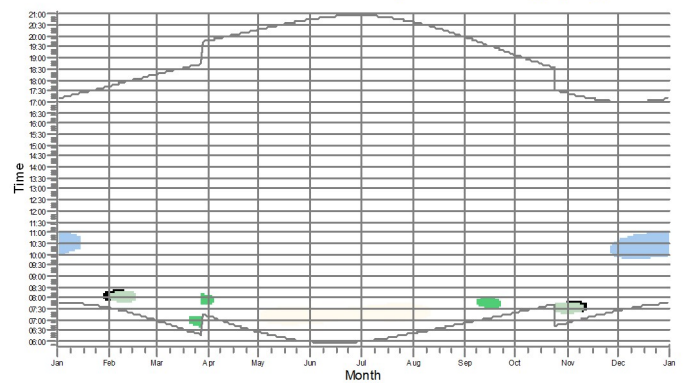
2: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (2) IS_02



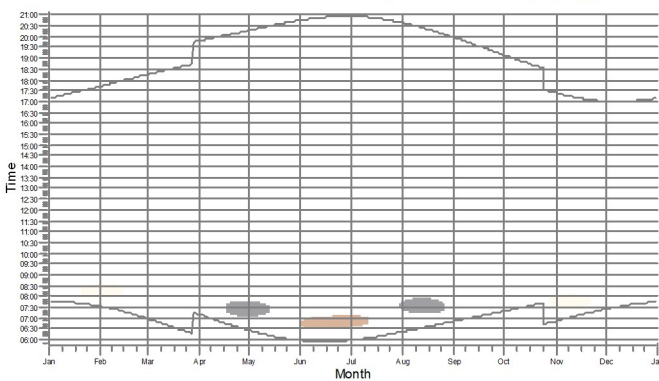
3: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (3) IS_03



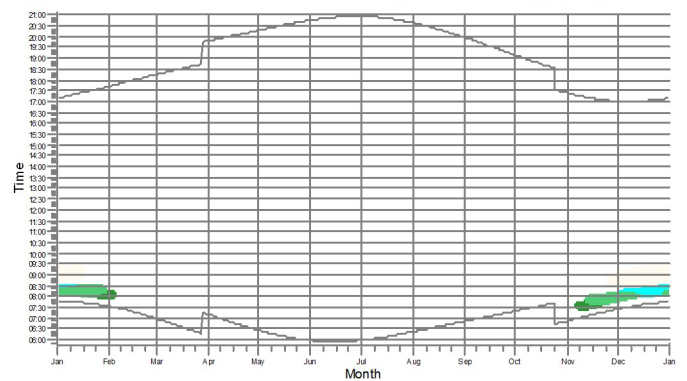
4: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (4) IS_04



5: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (5) IS_06



6: V162 5600 162.0 IO!hub: 119.0 m (TOT: 200.0 m) (6) IS_05



Shadow receptors

E: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (5) R05	M: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (13) R13	Y: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (25) R25
F: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (6) R06	N: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (14) R14	Z: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (26) R26
G: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (7) R07	O: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (15) R15	AA: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (27) R27
H: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (8) R08	P: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (16) R16	AB: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (28) R28
I: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (9) R09	Q: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (17) R17	AC: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (29) R29
J: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (10) R10	R: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (18) R18	AD: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (30) R30
K: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (11) R11	S: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (19) R19	
L: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (12) R12	X: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (24) R24	

Project:

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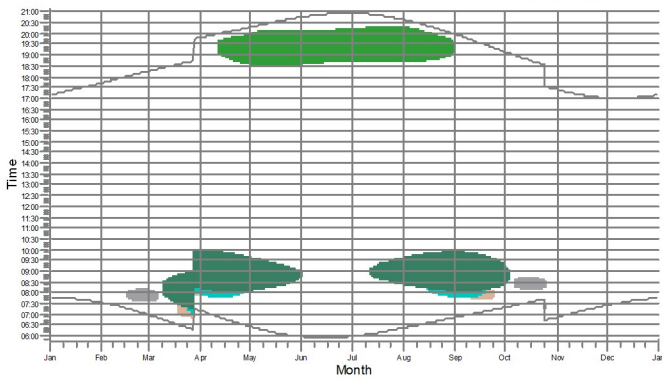
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SHADOW - Calendar per WTG, graphical

Calculation: Isili

7: V162 5600 162.0 !O!hub: 119.0 m (TOT: 200.0 m) (7) IS_07



Shadow receptors

- R: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (18) R18
- V: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (22) R22
- AE: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (31)
- S: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (19) R19
- W: Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (23) R23

Project:

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SHADOW - Calendar

Calculation: IsiliShadow receptor: A - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (1) R01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:19	06:52	07:25
	17:09	17:43	18:15	19:47	20:17	20:46	20:56	20:38	19:57	19:08	17:23	17:00
2	07:45	07:32	06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:20	06:53	07:26
	17:10	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:06	17:22	17:00
3	07:46	07:31	06:56	07:07	06:23	05:57	06:00	06:24	06:53	07:21	06:54	07:27
	17:11	17:45	18:17	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:22	05:57	06:00	06:25	06:54	07:22	06:55	07:28
	17:12	17:46	18:18	19:50	20:20	20:48	20:56	20:35	19:52	19:03	17:20	16:59
5	07:46	07:29	06:53	07:03	06:21	05:57	06:01	06:26	06:55	07:23	06:56	07:29
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:34	19:51	19:02	17:19	16:59
6	07:46	07:28	06:51	07:02	06:20	05:56	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:20	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:17	16:59
7	07:46	07:27	06:50	07:00	06:19	05:56	06:02	06:27	06:57	07:25	06:58	07:31
	17:15	17:50	18:22	19:53	20:23	20:50	20:55	20:32	19:47	18:58	17:16	16:59
8	07:46	07:26	06:48	06:59	06:17	05:56	06:03	06:28	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:15	16:59
9	07:45	07:25	06:47	06:57	06:16	05:56	06:03	06:29	06:58	07:27	07:01	07:33
	17:17	17:52	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:55	17:14	16:59
10	07:45	07:24	06:45	06:56	06:15	05:56	06:04	06:30	06:59	07:28	07:02	07:34
	17:18	17:53	18:25	19:56	20:26	20:51	20:54	20:28	19:42	18:54	17:13	16:59
11	07:45	07:23	06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:29	07:03	07:34
	17:19	17:54	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:52	17:12	16:59
12	07:45	07:22	06:42	06:52	06:13	05:55	06:05	06:32	07:01	07:30	07:04	07:35
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13	07:45	07:20	06:40	06:51	06:12	05:55	06:06	06:33	07:02	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:49	17:11	17:00
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15	07:44	07:18	06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:33	07:08	07:37
	17:23	17:59	18:30	20:01	20:31	20:54	20:52	20:22	19:34	18:46	17:09	17:00
16	07:44	07:17	06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:34	07:09	07:38
	17:24	18:00	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:08	17:00
17	07:43	07:15	06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:35	07:10	07:39
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18	07:43	07:14	06:32	06:43	06:07	05:55	06:10	06:38	07:07	07:36	07:11	07:39
	17:26	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:29	18:42	17:07	17:01
19	07:42	07:13	06:31	06:42	06:07	05:55	06:11	06:39	07:08	07:37	07:12	07:40
	17:27	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:40	17:06	17:01
20	07:42	07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:39	07:13	07:41
	17:28	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:05	17:02
21	07:41	07:10	06:27	06:39	06:05	05:56	06:12	06:41	07:10	07:40	07:14	07:41
	17:30	18:06	18:36	20:07	20:37	20:55	20:48	20:13	19:24	18:37	17:05	17:02
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	17:31	18:07	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:17	07:42
	17:32	18:08	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:03	17:03
24	07:39	07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:18	07:43
	17:33	18:09	18:39	20:10	20:39	20:56	20:46	20:09	19:19	18:33	17:03	17:04
25	07:39	07:04	06:21	06:34	06:02	05:57	06:16	06:44	07:13	07:44	07:19	07:43
	17:34	18:11	18:40	20:11	20:40	20:56	20:45	20:07	19:18	17:32	17:02	17:04
26	07:38	07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:20	07:44
	17:35	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05
27	07:37	07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:29	17:02	17:06
28	07:36	07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:01	17:06
29	07:36		07:15	06:28	06:00	05:58	06:19	06:48	07:17	07:48	07:23	07:45
	17:39		19:44	20:15	20:43	20:56	20:41	20:01	19:11	17:27	17:01	17:07
30	07:35		07:13	06:27	05:59	05:59	06:20	06:49	07:18	07:49	07:24	07:45
	17:40		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:00	17:08
31	07:34		07:11		05:59		06:21	06:50		06:51		07:45
	17:41		19:46		20:45		20:39	19:58		17:24		17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 2

Licensed user:

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Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: B - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (2) R02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:19	06:52	07:25
	17:09	17:43	18:15	19:47	20:17	20:46	20:56	20:38	19:57	19:08	17:23	17:00
2	07:45	07:32	06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:20	06:53	07:26
	17:10	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:06	17:22	17:00
3	07:46	07:31	06:56	07:07	06:23	05:57	06:00	06:24	06:53	07:21	06:54	07:27
	17:11	17:45	18:17	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:22	05:57	06:01	06:25	06:54	07:22	06:55	07:28
	17:12	17:46	18:18	19:50	20:20	20:48	20:56	20:35	19:52	19:03	17:20	17:00
5	07:46	07:29	06:53	07:03	06:21	05:57	06:01	06:26	06:55	07:23	06:56	07:29
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:34	19:51	19:02	17:19	16:59
6	07:46	07:28	06:51	07:02	06:20	05:56	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:20	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:17	16:59
7	07:46	07:27	06:50	07:00	06:19	05:56	06:02	06:27	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:53	20:23	20:50	20:55	20:32	19:47	18:58	17:16	16:59
8	07:46	07:26	06:48	06:59	06:17	05:56	06:03	06:28	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:15	16:59
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11	07:45	07:23	06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:29	07:03	07:34
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	17:22	17:58	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:00
15	07:44	07:18	06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:33	07:08	07:37
	17:23	17:59	18:30	20:01	20:31	20:54	20:52	20:22	19:34	18:46	17:09	17:00
16	07:44	07:17	06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:34	07:09	07:38
	17:24	18:00	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:08	17:00
17	07:43	07:15	06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:35	07:10	07:39
	17:25	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:43	17:07	17:01
18	07:43	07:14	06:32	06:44	06:07	05:55	06:10	06:38	07:07	07:36	07:11	07:40
	17:26	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:29	18:42	17:07	17:01
19	07:42	07:13	06:31	06:42	06:07	05:55	06:11	06:39	07:08	07:37	07:12	07:40
	17:27	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:40	17:06	17:01
20	07:42	07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:39	07:13	07:41
	17:28	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:05	17:02
21	07:41	07:10	06:28	06:39	06:05	05:56	06:12	06:41	07:10	07:40	07:14	07:41
	17:30	18:06	18:36	20:07	20:37	20:55	20:48	20:13	19:24	18:37	17:05	17:02
22	07:41	07:09	06:26	06:38	06:04	05:56	06:13	06:42	07:11	07:41	07:16	07:42
	17:31	18:07	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:17	07:42
	17:32	18:08	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:03	17:03
24	07:39	07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:18	07:43
	17:33	18:09	18:39	20:10	20:39	20:56	20:46	20:09	19:19	18:33	17:03	17:04
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	17:34	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:02	17:04
26	07:38	07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:20	07:44
	17:35	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05
27	07:37	07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:29	17:02	17:06
28	07:36	07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:01	17:06
29	07:36		07:15	06:28	06:00	05:58	06:19	06:48	07:17	07:48	07:23	07:45
	17:39		19:44	20:15	20:43	20:56	20:41	20:01	19:11	17:27	17:01	17:07
30	07:35		07:13	06:27	05:59	05:59	06:20	06:49	07:18	07:49	07:24	07:45
	17:40		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:00	17:08
31	07:34		07:11		05:59		06:21	06:50		06:51		07:45
	17:41		19:46		20:45		20:39	19:58		17:24		17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 3

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: C - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (3) R03

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELIMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:19	06:52	07:25
	17:09	17:43	18:15	19:47	20:17	20:46	20:56	20:38	19:57	19:08	17:23	17:00
2	07:45	07:32	06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:20	06:53	07:26
	17:10	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:06	17:22	17:00
3	07:46	07:31	06:56	07:07	06:23	05:57	06:00	06:24	06:53	07:21	06:54	07:27
	17:11	17:45	18:17	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:22	05:57	06:00	06:25	06:54	07:22	06:55	07:28
	17:12	17:46	18:18	19:50	20:20	20:48	20:56	20:35	19:52	19:03	17:20	17:00
5	07:46	07:29	06:53	07:03	06:21	05:57	06:01	06:26	06:55	07:23	06:56	07:29
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:34	19:51	19:02	17:19	16:59
6	07:46	07:28	06:51	07:02	06:20	05:56	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:20	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:17	16:59
7	07:46	07:27	06:50	07:00	06:19	05:56	06:02	06:27	06:57	07:25	06:58	07:31
	17:15	17:50	18:22	19:53	20:23	20:50	20:55	20:32	19:47	18:58	17:16	16:59
8	07:46	07:26	06:48	06:59	06:17	05:56	06:03	06:28	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:15	16:59
9	07:45	07:25	06:47	06:57	06:16	05:56	06:03	06:29	06:58	07:27	07:01	07:33
	17:17	17:52	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:55	17:14	16:59
10	07:45	07:24	06:45	06:56	06:15	05:56	06:04	06:30	06:59	07:28	07:02	07:34
	17:18	17:53	18:25	19:56	20:26	20:51	20:54	20:28	19:42	18:54	17:13	16:59
11	07:45	07:23	06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:29	07:03	07:34
	17:19	17:54	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:52	17:12	16:59
12	07:45	07:22	06:42	06:53	06:13	05:55	06:05	06:32	07:01	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	17:12	16:59
13	07:45	07:20	06:40	06:51	06:12	05:55	06:06	06:33	07:02	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:49	17:11	17:00
14	07:44	07:19	06:39	06:49	06:11	05:55	06:07	06:34	07:03	07:32	07:07	07:37
	17:22	17:58	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:00
15	07:44	07:18	06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:33	07:08	07:37
	17:23	17:59	18:30	20:01	20:31	20:54	20:52	20:22	19:34	18:46	17:09	17:00
16	07:44	07:17	06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:34	07:09	07:38
	17:24	18:00	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:08	17:00
17	07:43	07:15	06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:35	07:10	07:39
	17:25	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:43	17:07	17:01
18	07:43	07:14	06:32	06:44	06:07	05:55	06:10	06:38	07:07	07:36	07:11	07:40
	17:26	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:29	18:42	17:07	17:01
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	17:27	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:40	17:06	17:01
20	07:42	07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:39	07:13	07:41
	17:28	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:05	17:02
21	07:41	07:10	06:28	06:39	06:05	05:56	06:12	06:41	07:10	07:40	07:14	07:41
	17:30	18:06	18:36	20:07	20:37	20:55	20:48	20:13	19:24	18:37	17:05	17:02
22	07:41	07:09	06:26	06:38	06:04	05:56	06:13	06:42	07:11	07:41	07:16	07:42
	17:31	18:07	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:17	07:42
	17:32	18:08	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:03	17:03
24	07:39	07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:18	07:43
	17:33	18:09	18:39	20:10	20:39	20:56	20:46	20:09	19:19	18:33	17:03	17:04
25	07:39	07:05	06:21	06:34	06:02	05:57	06:16	06:44	07:13	07:44	07:19	07:43
	17:34	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:02	17:04
26	07:38	07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:20	07:44
	17:35	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05
27	07:37	07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:29	17:02	17:06
28	07:36	07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:01	17:06
29	07:36		07:15	06:28	06:00	05:58	06:19	06:48	07:17	07:48	07:23	07:45
	17:39		19:44	20:15	20:43	20:56	20:41	20:01	19:11	17:27	17:01	17:07
30	07:35		07:13	06:27	05:59	05:59	06:20	06:49	07:18	07:49	07:24	07:45
	17:40		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:00	17:08
31	07:34		07:11		05:59		06:21	06:50		06:51		07:45
	17:41		19:46		20:45		20:39	19:58		17:24		17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 4

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: D - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (4) R04

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:19	06:52	07:25
	17:09	17:43	18:15	19:47	20:17	20:46	20:56	20:38	19:57	19:08	17:23	17:00
2	07:45	07:32	06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:20	06:53	07:26
	17:10	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:06	17:22	17:00
3	07:46	07:31	06:56	07:07	06:23	05:57	06:00	06:24	06:53	07:21	06:54	07:27
	17:11	17:45	18:17	19:49	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00
4	07:46	07:30	06:54	07:05	06:22	05:57	06:01	06:25	06:54	07:22	06:55	07:28
	17:12	17:46	18:18	19:50	20:20	20:48	20:56	20:35	19:52	19:03	17:20	17:00
5	07:46	07:29	06:53	07:03	06:21	05:57	06:01	06:26	06:55	07:23	06:56	07:29
	17:13	17:47	18:19	19:51	20:21	20:48	20:56	20:34	19:51	19:02	17:19	16:59
6	07:46	07:28	06:51	07:02	06:20	05:56	06:02	06:27	06:56	07:24	06:57	07:30
	17:14	17:49	18:20	19:52	20:22	20:49	20:55	20:33	19:49	19:00	17:17	16:59
7	07:46	07:27	06:50	07:00	06:19	05:56	06:02	06:27	06:57	07:25	06:59	07:31
	17:15	17:50	18:22	19:53	20:23	20:50	20:55	20:32	19:47	18:58	17:16	16:59
8	07:46	07:26	06:48	06:59	06:17	05:56	06:03	06:28	06:58	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	17:15	16:59
9	07:45	07:25	06:47	06:57	06:16	05:56	06:03	06:29	06:58	07:27	07:01	07:33
	17:17	17:52	18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:55	17:14	16:59
10	07:45	07:24	06:45	06:56	06:15	05:56	06:04	06:30	06:59	07:28	07:02	07:34
	17:18	17:53	18:25	19:56	20:26	20:51	20:54	20:28	19:42	18:54	17:13	16:59
11	07:45	07:23	06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:29	07:03	07:34
	17:19	17:54	18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:52	17:12	16:59
12	07:45	07:22	06:42	06:53	06:13	05:55	06:05	06:32	07:01	07:30	07:04	07:35
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	17:12	16:59
13	07:45	07:20	06:40	06:51	06:12	05:55	06:06	06:33	07:02	07:31	07:05	07:36
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:49	17:11	17:00
14	07:44	07:19	06:39	06:49	06:11	05:55	06:07	06:34	07:03	07:32	07:07	07:37
	17:22	17:58	18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	17:10	17:00
15	07:44	07:18	06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:33	07:08	07:37
	17:23	17:59	18:30	20:01	20:31	20:54	20:52	20:22	19:34	18:46	17:09	17:00
16	07:44	07:17	06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:34	07:09	07:38
	17:24	18:00	18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	17:08	17:00
17	07:43	07:15	06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:35	07:10	07:39
	17:25	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:43	17:07	17:01
18	07:43	07:14	06:32	06:44	06:07	05:55	06:10	06:38	07:07	07:36	07:11	07:40
	17:26	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:29	18:42	17:07	17:01
19	07:42	07:13	06:31	06:42	06:05	05:55	06:11	06:39	07:08	07:37	07:12	07:40
	17:27	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:40	17:06	17:01
20	07:42	07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:39	07:13	07:41
	17:28	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:05	17:02
21	07:41	07:10	06:28	06:39	06:05	05:56	06:12	06:41	07:10	07:40	07:14	07:41
	17:30	18:06	18:36	20:07	20:37	20:55	20:48	20:13	19:24	18:37	17:05	17:02
22	07:41	07:09	06:26	06:38	06:04	05:56	06:13	06:42	07:11	07:41	07:16	07:42
	17:31	18:07	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:17	07:42
	17:32	18:08	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:03	17:03
24	07:39	07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:18	07:43
	17:33	18:09	18:39	20:10	20:39	20:56	20:46	20:09	19:19	18:33	17:03	17:04
25	07:39	07:05	06:21	06:34	06:02	05:57	06:16	06:44	07:13	07:44	07:19	07:43
	17:34	18:11	18:40	20:11	20:40	20:56	20:45	20:08	19:18	17:32	17:02	17:04
26	07:38	07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:20	07:44
	17:35	18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05
27	07:37	07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:21	07:44
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:05	19:15	17:29	17:02	17:06
28	07:36	07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:22	07:44
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:01	17:06
29	07:36		07:15	06:28	06:00	05:58	06:19	06:48	07:17	07:48	07:23	07:45
	17:39		19:44	20:15	20:43	20:56	20:41	20:01	19:11	17:27	17:01	17:07
30	07:35		07:13	06:27	05:59	05:59	06:20	06:49	07:18	07:49	07:24	07:45
	17:40		19:45	20:16	20:44	20:56	20:40	20:00	19:10	17:26	17:00	17:08
31	07:34		07:11		05:59		06:21	06:50		06:51		07:45
	17:41		19:46		20:45		20:39	19:58		17:24		17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 5

Licensed user:

Ing. Bruno Manca
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IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: E - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (5) R05

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December				
1	07:45	08:18 (3) 07:33	14:34 (1) 06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:19	06:52	14:18 (1) 07:25	13:58 (1)			
	17:09	16:07 (1) 17:43	96	16:10 (1) 18:15	19:47	20:17	20:45	20:56	20:38	19:57	19:08	73	15:31 (1) 17:00	115	15:53 (1)	
2	07:45	08:19 (3) 07:32	14:36 (1) 06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:20	06:53	14:15 (1) 07:26	13:58 (1)			
	17:10	16:08 (1) 17:44	93	16:09 (1) 18:16	19:48	20:18	20:46	20:56	20:37	19:55	19:06	77	15:32 (1) 17:00	115	15:53 (1)	
3	07:46	08:20 (3) 07:31	14:37 (1) 06:56	07:07	06:23	05:57	06:00	06:24	06:53	07:21	06:54	14:14 (1) 07:27	13:58 (1)			
	17:11	16:08 (1) 17:45	91	16:08 (1) 18:17	19:49	20:19	20:47	20:56	20:36	19:54	19:05	77	15:33 (1) 17:00	116	15:54 (1)	
4	07:46	08:21 (3) 07:30	14:38 (1) 06:54	07:05	06:22	05:57	06:00	06:25	06:54	07:22	06:55	14:12 (1) 07:28	13:59 (1)			
	17:12	16:08 (1) 17:46	90	16:08 (1) 18:18	19:50	20:20	20:48	20:56	20:35	19:52	19:03	82	15:34 (1) 17:00	115	15:54 (1)	
5	07:46	08:23 (3) 07:29	14:40 (1) 06:53	07:03	06:21	05:57	06:01	06:26	06:55	07:23	06:56	14:11 (1) 07:29	13:59 (1)			
	17:13	16:09 (1) 17:47	87	16:07 (1) 18:19	19:51	20:21	20:48	20:56	20:34	19:51	19:02	85	15:36 (1) 16:59	116	15:55 (1)	
6	07:46	08:26 (3) 07:28	14:41 (1) 06:51	07:02	06:20	05:56	06:02	06:27	06:56	07:24	06:57	14:09 (1) 07:30	13:59 (1)			
	17:14	16:09 (1) 17:49	85	16:06 (1) 18:20	19:52	20:22	20:49	20:55	20:33	19:49	19:00	88	15:37 (1) 16:59	116	15:55 (1)	
7	07:46	14:14 (1) 07:27	14:42 (1) 06:50	07:00	06:19	05:56	06:02	06:27	06:57	07:25	06:58	14:08 (1) 07:31	13:59 (1)			
	17:15	16:10 (1) 17:50	82	16:04 (1) 18:22	19:53	20:23	20:50	20:55	20:32	19:47	18:58	90	15:38 (1) 16:59	123	15:56 (1)	
8	07:46	14:15 (1) 07:26	14:44 (1) 06:48	06:59	06:17	05:56	06:03	06:28	06:58	07:26	07:00	14:07 (1) 07:32	13:59 (1)			
	17:16	16:10 (1) 17:51	79	16:03 (1) 18:23	19:54	20:24	20:50	20:55	20:30	19:46	18:57	91	15:38 (1) 16:59	124	15:56 (1)	
9	07:45	14:15 (1) 07:25	14:46 (1) 06:47	06:57	06:16	05:56	06:03	06:29	06:58	07:27	07:01	17:15	14:05 (1) 07:33	124	15:56 (1)	
	17:17	16:11 (1) 17:52	76	16:02 (1) 18:24	19:55	20:25	20:51	20:54	20:29	19:44	18:55	94	15:39 (1) 16:59	128	15:57 (1)	
10	07:45	14:15 (1) 07:24	14:48 (1) 06:45	06:56	06:15	05:56	06:04	06:30	06:59	07:28	07:02	14:05 (1) 07:34	13:59 (1)			
	17:18	16:10 (1) 17:53	73	16:01 (1) 18:25	19:56	20:26	20:51	20:54	20:28	19:42	18:54	96	15:41 (1) 16:59	129	15:58 (1)	
11	07:45	14:16 (1) 07:23	14:50 (1) 06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:29	07:03	14:04 (1) 07:34	13:59 (1)			
	17:19	16:11 (1) 17:54	70	16:00 (1) 18:26	19:57	20:27	20:52	20:54	20:27	19:41	18:52	97	15:41 (1) 16:59	129	15:57 (1)	
12	07:45	14:17 (1) 07:22	14:53 (1) 06:42	06:52	06:13	05:55	06:05	06:32	07:01	07:30	07:04	14:03 (1) 07:35	13:59 (1)			
	17:20	16:11 (1) 17:56	66	15:59 (1) 18:27	19:58	20:28	20:52	20:53	20:26	19:39	18:51	99	15:42 (1) 16:59	131	15:58 (1)	
13	07:45	14:17 (1) 07:20	14:54 (1) 06:40	06:51	06:12	05:55	06:06	06:33	07:02	07:31	07:05	14:02 (1) 07:36	13:59 (1)			
	17:21	16:11 (1) 17:57	62	15:56 (1) 18:28	19:59	20:29	20:53	20:53	20:24	19:38	18:49	100	15:42 (1) 17:00	131	15:59 (1)	
14	07:44	14:18 (1) 07:19	14:57 (1) 06:39	06:49	06:11	05:55	06:07	06:34	07:03	07:32	07:06	14:02 (1) 07:37	13:59 (1)			
	17:22	16:12 (1) 17:58	58	15:55 (1) 18:29	20:00	20:30	20:53	20:52	20:23	19:36	18:48	102	15:44 (1) 17:00	132	15:59 (1)	
15	07:44	14:19 (1) 07:18	15:00 (1) 06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:33	07:08	14:01 (1) 07:37	13:59 (1)			
	17:23	16:12 (1) 17:59	53	15:53 (1) 18:30	20:01	20:31	20:54	20:52	20:22	19:34	18:46	103	15:44 (1) 17:00	132	15:59 (1)	
16	07:44	14:19 (1) 07:17	15:04 (1) 06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:34	07:09	14:00 (1) 07:38	13:59 (1)			
	17:24	16:12 (1) 18:00	46	15:50 (1) 18:31	20:02	20:32	20:54	20:51	20:20	19:33	18:45	105	15:45 (1) 17:00	133	16:00 (1)	
17	07:43	14:20 (1) 07:15	15:07 (1) 06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:35	07:10	14:00 (1) 07:39	13:59 (1)			
	17:25	16:12 (1) 18:01	40	15:47 (1) 18:32	20:03	20:33	20:54	20:51	20:19	19:31	18:43	107	15:45 (1) 17:01	133	16:01 (1)	
18	07:43	14:21 (1) 07:14	15:12 (1) 06:32	06:44	06:07	05:55	06:10	06:38	07:07	07:36	07:11	13:59 (1) 07:39	13:59 (1)			
	17:26	16:12 (1) 18:03	31	15:43 (1) 18:33	20:04	20:34	20:55	20:50	20:18	19:29	18:42	107	15:46 (1) 17:01	134	16:01 (1)	
19	07:42	14:22 (1) 07:13	15:18 (1) 06:31	06:42	06:07	05:55	06:11	06:39	07:08	07:37	07:12	14:00 (1) 07:40	13:59 (1)			
	17:27	16:13 (1) 18:04	20	15:38 (1) 18:34	20:05	20:35	20:55	20:49	20:16	19:28	18:40	107	15:47 (1) 17:01	135	16:02 (1)	
20	07:42	14:22 (1) 07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:39	07:13	13:59 (1) 07:41	13:59 (1)			
	17:28	16:12 (1) 18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	18:39	17:05	108	15:47 (1) 17:02	135	16:02 (1)	
21	07:41	14:23 (1) 07:10	06:27	06:39	06:05	05:56	06:12	06:41	07:10	07:40	07:14	13:59 (1) 07:41	13:59 (1)			
	17:30	16:12 (1) 18:06	18:36	20:07	20:37	20:55	20:48	20:13	19:24	18:37	17:05	109	15:48 (1) 17:02	135	16:03 (1)	
22	07:41	14:24 (1) 07:09	06:26	06:38	06:04	05:56	06:13	06:42	07:11	07:41	07:16	13:58 (1) 07:42	13:58 (1)			
	17:31	16:12 (1) 18:07	18:37	20:08	20:37	20:56	20:47	20:12	19:23	18:36	17:04	110	15:48 (1) 17:03	134	16:02 (1)	
23	07:40	14:25 (1) 07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:17	13:58 (1) 07:42	13:58 (1)			
	17:32	16:12 (1) 18:08	18:38	20:09	20:38	20:56	20:46	20:10	19:21	18:35	24	16:10 (1) 17:03	111	15:49 (1) 17:03	135	16:04 (1)
24	07:39	14:25 (1) 07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:18	13:58 (1) 07:43	13:58 (1)			
	17:33	16:12 (1) 18:09	18:39	20:10	20:39	20:56	20:46	20:09	19:19	18:33	34	16:14 (1) 17:03	111	15:49 (1) 17:04	135	16:04 (1)
25	07:39	14:27 (1) 07:04	06:21	06:34	06:02	05:57	06:16	06:44	07:13	07:44	07:19	13:58 (1) 07:43	13:58 (1)			
	17:34	16:12 (1) 18:11	18:40	20:11	20:40	20:56	20:45	20:07	19:18	18:32	42	15:17 (1) 17:02	112	15:50 (1) 17:04	134	16:05 (1)
26	07:38	14:27 (1) 07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:20	13:58 (1) 07:44	13:58 (1)			
	17:35	16:12 (1) 18:12	18:41	20:12	20:41	20:56	20:44	20:06	19:16	18:31	48	15:21 (1) 17:02	113	15:51 (1) 17:05	133	16:05 (1)
27	07:37	14:28 (1) 07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:21	13:58 (1) 07:44	13:58 (1)			
	17:37	16:11 (1) 18:13	18:42	20:13	20:42	20:56	20:43	20:04	19:15	18:29	54	15:23 (1) 17:02	113	15:51 (1) 17:06	133	16:05 (1)
28	07:36	14:29 (1) 07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:22	13:58 (1) 07:44	13:58 (1)			
	17:38	16:11 (1) 18:14	18:43	20:14	20:42	20:56	20:42	20:03	19:13	18:28	59	15:25 (1) 17:01	114	15:52 (1) 17:06	132	16:06 (1)
29	07:36	14:30 (1) 07:00	06:15	06:28	06:00	05:58	06:19	06:48	07:17	07:48	07:23	13:58 (1) 07:45	13:58 (1)			
	17:39	16:10 (1) 18:15	18:44	20:15	20:43	20:56	20:41	20:01	19:11	18:27	62	15:26 (1) 17:01	114	15:52 (1) 17:07	132	16:06 (1)
30	07:35	14:32 (1) 07:00	06:13	06:27	05:59	05:59	06:20	06:49	07:18	07:49	07:24	13:58 (1) 07:45	13:58 (1)			
	17:40	16:11 (1) 18:17	18:45	20:16	20:44	20:56	20:40	20:00	19:10	18:26	67	15:28 (1) 17:00	114	15:52 (1) 17:08	131	16:07 (1)
31	07:34	14:33 (1) 07:00	06:11	06:25	05:59	05:59	06:21	06:50	07:20	07:51	07:45	14:20 (1) 17:00	114	15:52 (1) 17:08	131	16:07 (1)
	17:41	16:10 (1) 18:19	18:46	20:17	20:45	20:57	20:39	19:58	19:08	18:24	70	15:30 (1)				

Project: Windpro Isili - shadow flickering

Printed/Page: 2023-12-04 10:46 / 6

Licensed user:
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 Calculated:
 2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: F - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (6) R06

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:09	07:33 17:43	16:42 (1) 06:59 17:19 (1) 18:15	07:10 19:47	06:26 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	16:13 (1) 17:00 17:00 (1) 17:00
2	07:45 17:10	07:32 17:44	16:42 (1) 06:57 17:21 (1) 18:16	07:08 19:48	06:24 20:18	05:58 20:46	05:59 20:56	06:23 20:37	06:52 19:55	07:20 19:06	06:53 17:22	16:13 (1) 17:00 16:59 (1) 17:00
3	07:46 17:11	07:31 17:45	16:42 (1) 06:56 17:22 (1) 18:17	07:07 19:49	06:23 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	16:12 (1) 17:00 16:57 (1) 17:00
4	07:46 17:12	07:30 17:46	16:43 (1) 06:54 17:23 (1) 18:18	07:05 19:50	06:22 20:20	05:57 20:48	06:00 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	16:12 (1) 17:00 16:56 (1) 16:59
5	07:46 17:13	07:29 17:47	16:43 (1) 06:53 17:25 (1) 18:19	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	07:23 19:02	06:56 17:19	16:13 (1) 17:00 16:57 (1) 16:59
6	07:46 17:14	07:28 17:48	16:43 (1) 06:51 17:26 (1) 18:20	07:02 19:52	06:20 20:22	05:56 20:49	06:02 20:55	06:26 20:33	06:56 19:49	07:24 19:00	06:57 17:17	16:13 (1) 17:00 16:54 (1) 16:59
7	07:46 17:15	07:27 17:50	16:42 (1) 06:50 17:26 (1) 18:22	07:00 19:53	06:18 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:25 18:58	06:58 17:16	16:12 (1) 17:00 16:53 (1) 16:59
8	07:46 17:16	07:26 17:51	16:43 (1) 06:48 17:28 (1) 18:23	06:59 19:54	06:17 20:24	05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	07:26 18:57	07:00 17:15	16:12 (1) 17:00 16:52 (1) 16:59
9	07:45 17:17	16:51 (1) 07:25 16:52 (1) 17:52	16:43 (1) 06:47 17:29 (1) 18:24	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	07:27 18:55	07:01 17:14	16:12 (1) 17:00 16:51 (1) 16:59
10	07:45 17:18	16:49 (1) 07:24 16:52 (1) 17:53	16:44 (1) 06:45 17:31 (1) 18:25	06:56 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	07:28 18:54	07:02 17:13	16:13 (1) 17:00 16:50 (1) 16:59
11	07:45 17:19	16:49 (1) 07:23 16:53 (1) 17:54	16:44 (1) 06:43 17:32 (1) 18:26	06:54 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	07:29 18:52	07:03 17:12	16:13 (1) 17:00 16:49 (1) 16:59
12	07:45 17:20	16:49 (1) 07:22 16:55 (1) 17:56	16:45 (1) 06:42 17:34 (1) 18:27	06:52 19:58	06:13 20:28	05:55 20:52	06:05 20:53	06:32 20:26	07:01 19:39	07:30 18:51	07:04 17:12	16:13 (1) 17:00 16:48 (1) 16:59
13	07:45 17:21	16:47 (1) 07:20 16:55 (1) 17:57	16:45 (1) 06:40 17:34 (1) 18:28	06:51 19:59	06:12 20:29	05:55 20:53	06:06 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:05 17:11	16:14 (1) 17:00 16:47 (1) 17:00
14	07:44 17:22	16:47 (1) 07:19 16:57 (1) 17:58	16:46 (1) 06:39 17:36 (1) 18:29	06:49 20:00	06:11 20:30	05:55 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 17:10	16:15 (1) 17:00 16:47 (1) 17:00
15	07:44 17:23	16:47 (1) 07:18 16:58 (1) 17:59	16:47 (1) 06:37 17:37 (1) 18:30	06:48 20:01	06:10 20:31	05:55 20:54	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:08 17:09	16:15 (1) 17:00 16:46 (1) 17:00
16	07:44 17:24	16:46 (1) 07:17 16:59 (1) 18:00	16:48 (1) 06:36 17:36 (1) 18:31	06:46 20:02	06:09 20:32	05:55 20:54	06:08 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:08	16:16 (1) 17:00 16:44 (1) 17:00
17	07:43 17:25	16:46 (1) 07:15 17:01 (1) 18:01	16:48 (1) 06:34 17:34 (1) 18:32	06:45 20:03	06:08 20:33	05:55 20:54	06:09 20:51	06:37 20:19	07:06 19:31	07:35 18:43	17:36 (1) 17:10 17:49 (1) 17:07	16:16 (1) 17:00 16:43 (1) 17:01
18	07:43 17:26	16:45 (1) 07:14 17:01 (1) 18:03	16:50 (1) 06:32 17:33 (1) 18:33	06:43 20:04	06:07 20:34	05:55 20:55	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	17:31 (1) 17:11 17:53 (1) 17:07	16:17 (1) 17:00 16:42 (1) 17:01
19	07:42 17:27	16:45 (1) 07:13 17:03 (1) 18:04	16:51 (1) 06:31 17:33 (1) 18:34	06:42 20:05	06:07 20:35	05:55 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:40	17:29 (1) 17:12 17:57 (1) 17:06	16:18 (1) 17:00 16:43 (1) 17:01
20	07:42 17:28	16:44 (1) 07:11 17:04 (1) 18:05	16:52 (1) 06:29 17:30 (1) 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:11 20:49	06:40 20:15	07:09 19:26	07:38 18:39	17:27 (1) 17:13 17:59 (1) 17:05	16:19 (1) 17:00 16:42 (1) 17:02
21	07:41 17:30	16:44 (1) 07:10 17:05 (1) 18:06	16:54 (1) 06:27 17:29 (1) 18:36	06:39 20:07	06:05 20:37	05:56 20:55	06:12 20:48	06:41 20:13	07:10 19:24	07:40 18:37	17:24 (1) 17:14 18:00 (1) 17:05	16:20 (1) 17:00 16:41 (1) 17:02
22	07:41 17:31	16:44 (1) 07:09 17:07 (1) 18:07	16:56 (1) 06:26 17:26 (1) 18:37	06:38 20:08	06:04 20:37	05:56 20:56	06:13 20:47	06:42 20:12	07:11 19:23	07:41 18:36	17:22 (1) 17:16 18:01 (1) 17:04	16:20 (1) 17:00 16:40 (1) 17:03
23	07:40 17:32	16:43 (1) 07:07 17:08 (1) 18:08	16:59 (1) 06:24 17:24 (1) 18:38	06:36 20:09	06:03 20:38	05:56 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	17:21 (1) 17:17 18:03 (1) 17:03	16:21 (1) 17:00 16:39 (1) 17:03
24	07:39 17:33	16:43 (1) 07:06 17:08 (1) 18:09	17:02 (1) 06:23 17:21 (1) 18:39	06:35 20:10	06:03 20:39	05:56 20:56	06:15 20:46	06:43 20:09	07:12 19:19	07:43 18:33	17:19 (1) 17:18 18:03 (1) 17:03	16:22 (1) 17:00 16:38 (1) 17:04
25	07:39 17:34	16:43 (1) 07:04 17:10 (1) 18:11	17:08 (1) 06:21 17:14 (1) 18:40	06:34 20:11	06:02 20:40	05:57 20:56	06:16 20:45	06:44 20:07	07:13 19:18	07:44 18:44	17:13 17:32	16:18 (1) 17:00 16:39 (1) 17:04
26	07:38 17:35	16:43 (1) 07:03 17:12 (1) 18:12	17:19 (1) 06:20 17:12 (1) 18:42	06:33 20:12	06:01 20:41	05:57 20:56	06:17 20:44	06:45 20:06	07:14 19:16	07:45 18:41	17:14 17:31	16:18 (1) 17:00 16:38 (1) 17:00
27	07:37 17:37	16:42 (1) 07:02 17:13 (1) 18:13	17:19 (1) 06:19 17:13 (1) 18:43	06:32 20:13	06:01 20:42	05:57 20:56	06:17 20:43	06:46 20:04	07:15 19:14	07:46 18:39	17:15 17:29	16:16 (1) 17:00 16:37 (1) 17:06
28	07:36 17:38	16:42 (1) 07:00 17:14 (1) 18:14	17:19 (1) 06:18 17:14 (1) 18:44	06:31 20:14	06:00 20:42	05:58 20:56	06:18 20:42	06:47 20:03	07:16 19:13	07:47 18:38	17:16 17:28	16:15 (1) 17:00 16:37 (1) 17:06
29	07:36 17:39	16:42 (1) 07:00 17:15 (1) 18:15	17:19 (1) 06:17 17:15 (1) 18:45	06:30 20:15	06:00 20:43	05:58 20:56	06:19 20:41	06:48 20:01	07:17 19:11	07:48 18:37	17:17 17:27	16:15 (1) 17:00 16:36 (1) 17:05
30	07:35 17:40	16:43 (1) 07:00 17:16 (1) 18:16	17:19 (1) 06:16 17:16 (1) 18:46	06:29 20:16	06:00 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:49 18:36	17:18 17:26	16:14 (1) 17:00 16:36 (1) 17:05
31	07:34 17:41	16:42 (1) 07:00 17:18 (1) 18:18	17:19 (1) 06:15 17:18 (1) 18:47	06:28 20:17	06:00 20:45	05:59 20:56	06:21 20:39	06:50 19:58	07:19 19:09	07:50 18:35	17:19 17:24	16:13 (1) 17:00 16:35 (1) 17:04
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case	442	1001							595	856		10
Sun reduction	0.45	0.47							0.54	0.51		0.45
Oper. time red.	0.24	0.24							0.24	0.24		0.24
Wind dir. red.	0.65	0.65							0.65	0.65		0.65
Total reduction	0.07	0.07							0.08	0.08		0.07
Total, real	31	73							50	67		1

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: Windpro Isili - shadow flickering

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2023-12-04 10:46 / 7

Licensed user:
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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: G - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (7) R07

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELIMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:58 20:45	05:59 20:56	06:38 (2) 20:36	06:22 19:57	07:19 19:08	07:46 (3) 17:23	07:25 17:00
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 20:18	05:58 20:46	06:00 20:56	06:40 (2) 20:37	06:52 (2) 19:55	06:23 18:06	06:53 17:22	07:26 17:00
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 20:19	05:57 20:47	06:00 20:56	06:41 (2) 20:36	06:53 19:54	06:24 19:05	06:54 17:21	07:27 17:00
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 20:20	05:57 20:48	06:01 20:56	06:42 (2) 20:36	06:54 19:52	06:25 19:03	06:54 17:20	07:28 17:00
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:50 (2) 20:36	06:55 19:51	06:26 19:02	06:55 17:19	07:29 16:59
6	07:46 17:14	07:28 17:49	06:51 18:20	07:15 (3) 19:52	07:02 20:22	05:56 20:49	06:02 20:55	06:39 (2) 20:33	06:56 19:49	06:27 19:00	06:56 17:17	07:30 16:59
7	07:46 17:15	07:27 17:50	06:50 18:22	07:12 (3) 19:53	07:00 20:23	05:56 20:49	06:02 20:55	06:40 (2) 20:32	06:57 19:47	06:27 18:58	06:57 17:16	07:31 16:59
8	07:46 17:16	07:26 17:51	06:48 18:23	07:10 (3) 19:54	06:59 20:24	05:56 20:50	06:03 20:55	06:41 (2) 20:30	06:58 19:46	06:28 18:57	06:58 17:15	07:32 16:59
9	07:45 17:17	07:25 17:52	06:47 18:24	07:09 (3) 19:55	06:57 20:25	05:56 20:51	06:37 (2) 20:54	06:03 20:54	06:58 19:44	06:29 18:55	06:58 17:14	07:33 16:59
10	07:45 17:18	07:24 17:53	06:45 18:25	07:07 (3) 19:56	06:56 20:26	05:56 20:51	06:35 (2) 20:54	06:04 20:54	06:59 19:42	06:30 18:54	06:59 17:13	07:34 16:59
11	07:45 17:19	07:23 17:54	06:43 18:26	07:07 (3) 19:57	06:54 20:27	05:55 20:52	06:34 (2) 20:54	06:05 20:54	07:00 19:41	06:31 18:52	07:00 17:12	07:34 16:59
12	07:45 17:20	07:22 17:56	06:42 18:27	07:06 (3) 19:58	06:53 20:28	05:55 20:52	06:33 (2) 20:53	06:05 20:53	07:01 19:39	06:32 18:51	07:01 17:12	07:35 16:59
13	07:45 17:21	07:20 17:57	06:40 18:28	07:07 (3) 19:59	06:51 20:29	05:55 20:53	06:33 (2) 20:53	06:06 20:53	07:02 19:38	06:33 18:49	07:02 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	07:06 (3) 20:00	06:49 20:30	05:55 20:53	06:32 (2) 20:52	06:07 20:52	07:03 19:36	06:34 18:48	07:03 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	07:06 (3) 20:01	06:48 20:31	05:55 20:54	06:32 (2) 20:52	06:08 20:52	07:04 19:34	06:35 18:46	07:04 17:09	07:37 17:00
16	07:44 17:24	07:17 18:00	06:36 18:31	07:08 (3) 20:02	06:46 20:32	05:55 20:54	06:31 (2) 20:51	06:08 20:51	07:05 19:33	06:36 18:45	07:05 17:08	07:38 17:00
17	07:43 17:25	07:15 18:02	06:34 18:32	07:08 (3) 20:03	06:45 20:33	05:55 20:54	06:31 (2) 20:51	06:09 20:19	07:06 19:31	06:37 18:35	07:06 17:07	07:39 17:01
18	07:43 17:26	07:14 18:03	06:32 18:33	07:11 (3) 20:04	06:44 20:34	05:55 20:55	06:31 (2) 20:50	06:10 20:50	07:07 19:29	06:38 18:42	07:07 17:11	07:40 17:01
19	07:42 17:27	07:13 18:04	06:31 18:34	07:21 (3) 20:05	06:42 20:35	05:55 20:55	06:31 (2) 20:49	06:11 20:49	07:08 19:28	06:39 18:40	07:08 17:06	07:41 17:01
20	07:42 17:28	07:11 18:05	06:29 18:35	07:25 (3) 20:06	06:41 20:36	05:55 20:55	06:31 (2) 20:49	06:11 20:49	07:09 19:26	06:40 18:39	07:09 17:13	07:42 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	07:26 (3) 20:07	06:39 20:37	05:56 20:55	06:32 (2) 20:48	06:12 20:48	07:04 19:24	06:41 18:37	07:10 17:05	07:43 17:02
22	07:41 17:31	07:09 18:07	06:26 18:37	07:27 (3) 20:08	06:38 20:37	05:56 20:56	06:32 (2) 20:47	06:13 20:47	07:11 19:23	06:42 18:36	07:11 17:04	07:44 17:03
23	07:40 17:32	07:07 18:08	06:24 18:38	07:28 (3) 20:09	06:36 20:38	05:56 20:56	06:32 (2) 20:46	06:14 20:46	07:12 19:21	06:43 18:35	07:12 17:03	07:45 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	07:29 (3) 20:10	06:35 20:39	05:56 20:56	06:32 (2) 20:46	06:15 20:46	07:13 19:19	06:44 18:33	07:13 17:03	07:46 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	07:30 (3) 20:11	06:34 20:40	05:57 20:56	06:33 (2) 20:45	06:16 20:45	07:13 19:18	06:44 18:32	07:13 17:02	07:47 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	07:31 (3) 20:12	06:32 20:41	05:57 20:56	06:33 (2) 20:44	06:17 20:44	07:14 19:16	8 08:02 (3) 07:51 (3)	06:45 17:31	07:48 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	07:32 (3) 20:13	06:31 20:42	05:57 20:56	06:34 (2) 20:43	06:17 20:43	07:15 19:15	06:46 18:30	06:46 17:29	07:49 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	07:33 (3) 20:14	06:30 20:42	05:58 20:56	06:35 (2) 20:42	06:18 20:42	07:16 19:13	06:47 18:06	06:47 17:28	07:50 17:06
29	07:36 17:39	07:00 19:44	06:16 18:43	07:34 (3) 20:15	06:31 20:43	05:58 20:56	06:35 (2) 20:41	06:19 20:41	07:17 19:11	06:48 18:07	06:48 17:27	07:51 17:07
30	07:35 17:40	07:00 19:45	06:16 18:43	07:35 (3) 20:16	06:32 20:44	05:59 20:56	06:37 (2) 20:40	06:20 20:40	07:18 19:10	06:49 18:07	06:49 17:26	07:52 17:08
31	07:34 17:41	07:00 19:46	06:16 18:43	07:36 (3) 20:16	06:33 20:44	05:59 20:56	06:38 (2) 20:40	06:21 20:40	07:19 19:10	06:50 18:07	06:51 17:26	07:53 17:09
Potential sun hours	301	299	296	397	445	448	455	426	374	347	301	292
Total, worst case			219			438		36		126		
Sun reduction			0.49			0.66		0.74		0.65		0.54
Oper. time red.			0.24			0.24		0.24		0.24		0.24
Wind dir. red.			0.79			0.63		0.63		0.79		0.79
Total reduction			0.09			0.10		0.11		0.12		0.10
Total, real			21			44		4		13		

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 8

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: H - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (8) R08

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	07:46 (3) 08:08 (3)	06:52 17:23	07:25 17:00
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:06	07:46 (3) 08:08 (3)	06:53 17:22	07:26 17:00
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	07:46 (3) 08:07 (3)	06:54 17:21	07:27 17:00
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 20:20	05:57 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	07:47 (3) 08:06 (3)	06:55 17:20	07:28 17:00
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:51	07:23 19:02	07:48 (3) 08:04 (3)	06:56 17:19	07:29 16:59
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	06:20 20:22	05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	07:49 (3) 08:02 (3)	06:57 17:17	07:30 16:59
7	07:46 17:15	07:27 17:50	06:50 18:22	07:14 (3) 07:24 (3)	07:00 19:53	06:19 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:25 18:58	06:58 17:16	07:31 16:59
8	07:46 17:16	07:26 17:51	06:48 18:23	07:12 (3) 07:27 (3)	06:59 19:54	06:17 20:24	05:56 20:50	06:03 20:30	06:28 19:46	06:58 18:57	07:26 18:51	07:00 17:15	07:32 16:59
9	07:45 17:17	07:25 17:52	06:47 18:24	07:10 (3) 07:27 (3)	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	07:27 18:55	07:01 17:14	07:33 16:59
10	07:45 17:18	07:24 17:53	06:45 18:25	07:08 (3) 07:28 (3)	06:56 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	07:28 18:54	07:02 17:13	07:34 16:59
11	07:45 17:19	07:23 17:54	06:43 18:26	07:08 (3) 07:29 (3)	06:54 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	07:29 18:52	07:03 17:12	07:34 16:59
12	07:45 17:20	07:22 17:56	06:42 18:27	07:07 (3) 07:29 (3)	06:53 19:58	06:13 20:28	05:55 20:52	06:05 20:26	06:32 19:39	07:01 18:51	07:30 18:51	07:04 17:12	07:35 16:59
13	07:45 17:21	07:20 17:57	06:40 18:28	07:07 (3) 07:29 (3)	06:51 19:59	06:12 20:29	05:55 20:53	06:06 20:34	06:33 19:38	07:02 18:49	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	07:06 (3) 07:28 (3)	06:49 20:00	06:11 20:30	05:55 20:52	06:07 20:23	06:24 19:36	07:03 18:48	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	07:06 (3) 07:27 (3)	06:48 20:01	06:10 20:31	05:55 20:52	06:08 20:22	06:35 19:34	07:04 18:46	07:33 18:46	07:08 17:09	07:37 17:00
16	07:44 17:24	07:17 18:00	06:36 18:31	07:06 (3) 07:27 (3)	06:46 20:02	06:09 20:32	05:55 20:54	06:08 20:20	06:36 19:33	07:05 18:45	07:34 18:45	07:09 17:08	07:38 17:00
17	07:43 17:25	07:15 18:02	06:34 18:32	07:06 (3) 07:26 (3)	06:45 20:03	06:08 20:33	05:55 20:51	06:09 20:19	06:37 19:31	07:06 18:43	07:35 18:43	07:10 17:07	07:39 17:01
18	07:43 17:26	07:14 18:03	06:32 18:33	07:08 (3) 07:25 (3)	06:44 20:04	06:08 20:34	05:55 20:50	06:10 20:18	06:38 19:29	07:07 18:42	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:27	07:13 18:04	06:31 18:34	07:09 (3) 07:23 (3)	06:42 20:05	06:07 20:35	05:55 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:40	07:12 17:06	07:40 17:01
20	07:42 17:28	07:11 18:05	06:29 18:35	07:11 (3) 07:19 (3)	06:41 20:06	06:06 20:36	05:56 20:55	06:11 20:49	06:40 20:15	07:09 19:26	07:39 18:39	07:13 17:05	07:41 17:02
21	07:41 17:30	07:10 18:06	06:28 18:36	07:19 (3) 20:07	06:39 20:37	06:05 20:55	05:56 20:48	06:12 20:13	06:41 19:24	07:10 18:37	07:40 18:37	07:14 17:05	07:41 17:02
22	07:41 17:31	07:09 18:07	06:26 18:37	07:26 (3) 20:08	06:38 20:37	06:04 20:56	05:56 20:47	06:13 20:12	06:42 19:23	07:11 18:36	07:41 18:36	07:16 17:04	07:42 17:03
23	07:40 17:32	07:07 18:08	06:24 18:38	07:36 (3) 20:09	06:36 20:38	06:04 20:56	05:56 20:46	06:14 20:10	06:43 19:21	07:12 18:35	07:42 18:35	07:17 17:03	07:42 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	07:35 (3) 20:10	06:35 20:39	06:03 20:56	05:56 20:46	06:15 20:09	06:43 19:19	07:13 18:33	07:43 18:33	07:18 17:03	07:43 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	07:34 (3) 20:11	06:34 20:40	06:02 20:56	05:57 20:45	06:16 20:07	06:44 19:18	07:13 18:32	07:44 18:32	07:19 17:02	07:43 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	07:33 (3) 20:12	06:32 20:41	06:02 20:56	05:57 20:44	06:17 20:06	06:45 19:16	07:14 18:31	07:45 18:31	07:20 17:02	07:44 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	07:32 (3) 20:13	06:31 20:42	06:01 20:56	05:57 20:43	06:17 20:04	06:46 19:15	07:15 18:29	07:46 18:29	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	07:31 (3) 20:14	06:30 20:42	06:00 20:56	05:58 20:42	06:18 20:03	06:47 19:13	07:16 18:28	07:47 (3) 08:09 (3)	06:47 17:28	07:22 17:01
29	07:36 17:39	07:15 18:14	06:15 18:44	07:30 (3) 20:15	06:28 20:43	06:00 20:56	05:58 20:41	06:19 20:01	06:48 19:11	07:17 18:22	07:47 (3) 08:09 (3)	06:48 17:27	07:23 17:01
30	07:35 17:40	07:13 18:15	06:13 18:45	07:29 (3) 20:16	06:27 20:44	05:59 20:56	05:59 20:40	06:20 20:00	06:49 19:10	07:18 18:23	07:46 (3) 08:09 (3)	06:49 17:26	07:24 17:00
31	07:34 17:41	07:11 18:16	06:11 18:46	07:28 (3) 20:17	06:26 20:45	05:59 20:56	06:21 20:39	06:50 19:58	06:51 18:24	06:51 17:24	06:51 17:24	06:51 17:08	07:45 17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292	
Total, worst case			250						139	119			
Sun reduction			0.49						0.65	0.54			
Oper. time red.			0.24						0.24	0.24			
Wind dir. red.			0.79						0.79	0.79			
Total reduction			0.09						0.12	0.10			
Total, real			23						17	12			

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 9

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: I - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (9) R09

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:09	07:33 17:43	06:59 18:15	07:34 (3) 08:07 (3)	07:10 19:47	06:26 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57		06:52 17:23
2	07:45 17:10	07:32 17:44	06:57 18:16	07:34 (3) 08:08 (3)	07:08 19:48	06:24 20:18	05:58 20:46	05:59 20:56	06:23 20:37	06:52 19:55	22 08:16 (3)	06:53 17:22
3	07:46 17:11	07:31 17:45	06:56 18:17	07:33 (3) 08:08 (3)	07:07 19:49	06:23 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	28 08:13 (3)	06:54 17:20
4	07:46 17:12	07:30 17:46	06:54 18:18	07:33 (3) 08:08 (3)	07:05 19:50	06:22 20:20	05:57 20:48	06:00 20:56	06:25 20:35	06:54 19:52	30 08:12 (3)	06:55 17:20
5	07:46 17:13	07:29 17:47	06:53 18:19	07:32 (3) 08:07 (3)	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	31 08:11 (3)	06:56 17:19
6	07:46 17:14	07:28 17:49	06:51 18:20	07:33 (3) 08:07 (3)	07:02 19:52	06:20 20:22	05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	32 08:10 (3)	06:57 17:17
7	07:46 17:15	07:27 17:50	06:50 18:22	07:33 (3) 08:06 (3)	07:00 19:53	06:19 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	34 08:09 (3)	06:58 17:16
8	07:45 17:16	07:26 17:51	06:48 18:23	07:34 (3) 08:06 (3)	06:59 19:54	06:17 20:24	05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	35 08:08 (3)	06:59 17:15
9	07:45 17:17	07:25 17:52	06:47 18:24	07:34 (3) 08:04 (3)	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	35 08:43 (3)	06:59 17:14
10	07:45 17:18	07:24 17:53	06:45 18:25	07:34 (3) 08:03 (3)	06:56 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	35 08:07 (3)	06:59 17:13
11	07:45 17:19	07:23 17:54	06:43 18:26	07:35 (3) 08:02 (3)	06:54 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	35 08:42 (3)	06:59 17:12
12	07:45 17:20	07:21 17:56	06:42 18:27	07:36 (3) 08:00 (3)	06:52 19:58	06:13 20:28	05:55 20:52	06:05 20:53	06:32 20:25	07:01 19:39	34 08:41 (3)	06:59 17:12
13	07:45 17:21	07:20 17:57	06:40 18:28	07:38 (3) 07:58 (3)	06:51 19:59	06:12 20:29	05:55 20:53	06:06 20:53	06:33 20:24	07:02 19:38	34 08:41 (3)	06:59 17:11
14	07:44 17:22	07:19 17:58	06:39 18:29	07:40 (3) 07:55 (3)	06:49 20:00	06:11 20:30	05:55 20:53	06:07 20:52	06:34 20:23	07:03 19:36	32 08:40 (3)	06:59 17:10
15	07:44 17:23	07:18 17:59	06:37 18:30	07:18 20:01	06:48 20:31	06:10 20:31	05:55 20:54	06:08 20:52	06:35 20:22	07:04 19:34	31 08:39 (3)	06:59 17:09
16	07:44 17:24	07:17 18:00	06:36 18:31	07:17 20:02	06:46 20:32	06:09 20:32	05:55 20:54	06:08 20:51	06:36 20:20	07:05 19:33	29 08:38 (3)	06:59 17:08
17	07:43 17:25	07:15 18:01	06:34 18:32	06:45 20:03	06:08 20:33	06:08 20:33	05:55 20:54	06:09 20:51	06:37 20:19	07:06 19:31	27 08:36 (3)	06:59 17:07
18	07:43 17:26	07:14 18:03	06:32 18:33	06:43 20:04	06:07 20:34	06:07 20:34	05:55 20:55	06:10 20:50	06:38 20:18	07:07 19:29	25 08:35 (3)	06:59 17:07
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	06:07 20:35	05:55 20:55	06:11 20:49	06:39 20:16	07:08 19:28	21 08:34 (3)	06:59 17:06
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	06:06 20:36	05:56 20:55	06:11 20:49	06:40 20:15	07:09 19:26	16 08:31 (3)	06:59 17:05
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:37	06:05 20:37	05:56 20:55	06:12 20:48	06:41 20:13	07:10 19:24	8 08:27 (3)	06:59 17:05
22	07:41 17:31	07:09 18:07	06:26 18:37	07:43 (3) 08:00 (3)	06:26 18:37	06:04 20:08	05:56 20:56	06:13 20:47	06:42 20:12	07:11 19:23		06:59 17:04
23	07:40 17:32	07:07 18:08	06:24 18:38	07:41 (3) 08:03 (3)	06:24 18:38	06:04 20:09	05:56 20:56	06:14 20:46	06:43 20:10	07:12 19:21		06:59 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	07:39 (3) 08:05 (3)	06:23 18:39	06:03 20:10	05:56 20:56	06:15 20:46	06:43 20:09	07:12 19:19		06:59 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	07:37 (3) 08:05 (3)	06:21 18:40	06:02 20:11	05:57 20:56	06:16 20:45	06:44 20:07	07:13 19:18		06:59 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	07:37 (3) 08:07 (3)	06:19 18:41	06:01 20:12	05:57 20:56	06:17 20:44	06:45 20:06	07:14 19:16		06:59 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	07:35 (3) 08:07 (3)	06:18 18:42	06:01 20:13	05:57 20:56	06:17 20:43	06:46 20:04	07:15 19:14		06:59 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	07:35 (3) 08:08 (3)	06:16 18:43	06:00 20:14	05:58 20:56	06:18 20:42	06:47 20:03	07:16 19:13		06:59 17:06
29	07:36 17:39		06:15 19:44	07:15 19:44	06:28 20:15	06:00 20:43	05:58 20:56	06:19 20:41	06:48 20:01	07:17 19:11	12 08:34 (3)	06:48 17:27
30	07:35 17:40		06:13 19:45	07:13 19:45	06:27 20:16	05:59 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	18 08:37 (3)	06:49 17:26
31	07:34 17:41		06:11 19:46	07:11 19:46	06:27 20:15	05:59 20:45	05:59 20:56	06:21 20:39	06:50 19:58	07:19 17:24		06:50 17:24
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case		200	416						30	600		
Sun reduction		0.47	0.49						0.65	0.54		
Oper. time red.		0.24	0.24						0.24	0.24		
Wind dir. red.		0.80	0.80						0.80	0.80		
Total reduction		0.09	0.09						0.12	0.10		
Total, real		18	39						4	62		

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:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: J - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (10) R10

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45	07:33	06:59	07:10								
	17:09	17:43	18:15	19:47								
2	07:45	07:32	06:57	07:08								
	17:10	17:44	18:16	19:48								
3	07:46	07:31	06:56	07:07								
	17:11	17:45	18:17	19:49								
4	07:46	07:30	06:54	07:05								
	17:12	17:46	18:18	19:50								
5	07:46	07:29	06:53	07:03								
	17:13	17:47	18:19	19:51								
6	07:46	07:28	06:51	07:02								
	17:14	17:49	18:20	19:52								
7	07:46	07:27	06:50	07:00								
	17:15	17:50	18:22	19:53								
8	07:45	07:26	06:48	06:59								
	17:16	17:51	18:23	19:54								
9	07:45	07:25	06:47	06:57								
	17:17	17:52	18:24	19:55								
10	07:45	07:24	06:45	06:56								
	17:18	17:53	18:25	19:56								
11	07:45	07:23	06:43	06:54								
	17:19	17:54	18:26	19:57								
12	07:45	07:21	06:42	06:52								
	17:20	17:56	18:27	19:58								
13	07:45	07:20	06:40	06:51								
	17:21	17:57	18:28	19:59								
14	07:44	07:19	06:39	06:49								
	17:22	17:58	18:29	20:00								
15	07:44	07:18	06:37	06:48								
	17:23	17:59	18:30	20:01								
16	07:44	07:17	06:36	06:46								
	17:24	18:00	18:31	20:02								
17	07:43	07:15	06:34	06:45								
	17:25	18:01	18:32	20:03								
18	07:43	07:14	06:32	06:43								
	17:26	18:03	18:33	20:04								
19	07:42	07:13	06:31	06:42								
	17:27	18:04	18:34	20:05								
20	07:42	07:11	06:29	06:41								
	17:28	18:05	18:35	20:06								
21	07:41	07:10	06:27	06:39								
	17:30	18:06	18:36	20:07								
22	07:41	07:09	06:26	06:38								
	17:31	18:07	18:37	20:08								
23	07:40	07:07	06:24	06:36								
	17:32	18:08	18:38	20:09								
24	07:39	07:06	06:23	06:35								
	17:33	18:09	18:39	20:10								
25	07:39	07:04	06:21	06:34								
	17:34	18:11	18:40	20:11								
26	07:38	07:03	06:19	06:32								
	17:35	18:12	18:41	20:12								
27	07:37	07:02	06:18	06:31								
	17:37	18:13	18:42	20:13								
28	07:36	07:00	06:16	06:30								
	17:38	18:14	18:43	20:14								
29	07:36		07:15	06:28								
	17:39		19:44	20:15								
30	07:35		07:13	06:27								
	17:40		19:45	20:16								
31	07:34		07:11	06:26								
	17:41		19:46	20:17								
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case			534	53					591			
Sun reduction			0.49	0.53					0.65			
Oper. time red.			0.24	0.24					0.24			
Wind dir. red.			0.79	0.79					0.79			
Total reduction			0.09	0.10					0.12			
Total, real			49	5					72			

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:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: K - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (11) R11

Assumptions for shadow calculations

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

Table with 12 columns: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec. Values: 4.40, 5.05, 5.88, 7.00, 8.45, 9.88, 10.82, 10.03, 8.08, 6.09, 5.07, 4.27

Operational time

Table with 13 columns: N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum. Values: 130, 93, 150, 171, 259, 145, 62, 26, 52, 150, 493, 347, 2,078

Idle start wind speed: Cut in wind speed from power curve

Main shadow flickering data table with columns for months (January to December) and rows for each day (1-31) showing sunrise, sunset, and shadow flickering times. Includes summary rows for potential sun hours and various reductions.

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: L - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (12) R12

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 19:17	05:58 20:17	05:59 20:45	06:22 20:38	06:51 19:57	07:22 (3) 07:48 (3)	07:19 19:08	06:52 17:23
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 19:18	05:58 20:18	06:00 20:46	06:23 20:37	06:52 19:55	07:23 (3) 07:47 (3)	07:20 19:06	06:53 17:22
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 19:19	05:57 20:19	06:00 20:47	06:24 20:36	06:53 19:54	07:24 (3) 07:45 (3)	07:21 19:05	06:54 17:21
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 19:20	05:57 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:25 (3) 07:43 (3)	07:22 19:03	06:55 17:20
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	07:28 (3) 07:41 (3)	07:23 19:02	06:56 17:19
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	06:20 20:22	05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:32 (3) 07:35 (3)	07:24 19:00	06:57 17:17
7	07:46 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:35 (3)	07:25 18:58	06:58 17:16
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24	05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	07:35 (3)	07:26 18:57	06:58 17:15
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	07:35 (3)	07:27 18:55	06:58 17:14
10	07:45 17:18	07:24 17:53	06:45 18:25	06:56 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	07:35 (3)	07:28 18:54	06:59 17:13
11	07:45 17:19	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	07:35 (3)	07:29 18:52	07:03 17:12
12	07:45 17:20	07:21 17:56	06:42 18:27	06:52 19:58	06:13 20:28	05:55 20:52	06:05 20:53	06:32 20:25	07:01 19:39	07:35 (3)	07:30 18:51	07:04 17:12
13	07:45 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 20:53	06:06 20:53	06:33 20:24	07:02 19:38	07:35 (3)	07:31 18:49	07:05 17:11
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:35 (3)	07:32 18:48	07:06 17:10
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 20:54	06:08 20:52	06:35 20:22	07:04 19:34	07:35 (3)	07:33 18:46	07:08 17:09
16	07:44 17:24	07:17 18:00	06:36 18:31	06:46 20:02	06:09 20:32	05:55 20:54	06:08 20:51	06:36 20:20	07:05 19:33	07:35 (3)	07:34 18:45	07:09 17:08
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:08 20:33	05:55 20:54	06:09 20:51	06:37 20:19	07:06 19:31	07:34 (3)	07:35 18:43	07:10 17:07
18	07:43 17:26	07:14 18:03	06:32 18:33	06:44 20:04	06:07 20:34	05:55 20:55	06:10 20:50	06:38 20:18	07:07 19:29	07:34 (3)	07:36 18:42	07:11 17:07
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:55 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:34 (3)	07:37 18:40	07:12 17:06
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:11 20:49	06:40 20:15	07:09 19:26	07:34 (3)	07:38 18:39	07:13 17:05
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:37	05:56 20:55	06:12 20:48	06:41 20:13	07:10 19:24	07:34 (3)	07:40 18:37	07:14 17:05
22	07:41 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:04 20:37	05:56 20:56	06:13 20:47	06:42 20:12	07:11 19:23	07:34 (3)	07:41 18:36	07:15 17:04
23	07:40 17:32	07:07 18:08	06:24 18:38	06:36 20:09	06:04 20:38	05:56 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:34 (3)	07:42 18:35	07:17 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	06:35 20:10	06:03 20:39	05:56 20:56	06:15 20:46	06:43 20:09	07:13 19:19	07:34 (3)	07:43 18:33	07:18 17:03
25	07:39 17:34	07:04 18:11	06:21 18:40	06:34 20:11	06:02 20:40	05:57 20:56	06:16 20:45	06:44 20:07	07:13 19:18	07:34 (3)	06:44 17:32	07:19 17:02
26	07:38 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:02 20:41	05:57 20:56	06:17 20:44	06:45 20:06	07:14 19:16	07:34 (3)	06:45 17:31	07:20 17:02
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:57 20:56	06:17 20:43	06:46 20:04	07:15 19:14	07:34 (3)	06:46 17:29	07:21 17:02
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 20:42	05:58 20:56	06:18 20:42	06:47 20:03	07:16 19:13	07:34 (3)	06:47 17:28	07:22 17:01
29	07:36 17:39	07:00 18:15	06:16 18:44	06:30 20:15	06:00 20:43	05:58 20:56	06:19 20:41	06:48 20:01	07:17 19:11	07:34 (3)	06:48 17:27	07:23 17:01
30	07:35 17:40	07:00 18:16	06:15 18:45	06:29 20:16	05:59 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:34 (3)	06:49 17:26	07:24 17:00
31	07:34 17:41	07:00 18:17	06:14 18:46	06:28 20:17	05:58 20:45	05:58 20:56	06:21 20:39	06:50 19:58	07:19 19:09	07:34 (3)	06:51 17:24	07:45 17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case				466				369	105			
Sun reduction				0.53				0.73	0.65			
Oper. time red.				0.24				0.24	0.24			
Wind dir. red.				0.75				0.75	0.75			
Total reduction				0.09				0.13	0.12			
Total, real				44				48	12			

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

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

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: M - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (13) R13

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45	08:10 (6)	07:33	06:59	07:10	05:58
	17:09	18 08:28 (6)	17:43	18:15	19:47	20:45
2	07:45	08:10 (6)	07:32	06:57	07:08	05:58
	17:10	18 08:28 (6)	17:44	18:16	19:48	20:46
3	07:45	08:11 (6)	07:31	06:56	07:07	05:57
	17:11	17 08:28 (6)	17:45	18:17	19:49	20:47
4	07:46	08:12 (6)	07:30	06:54	07:05	05:57
	17:12	16 08:28 (6)	17:46	18:18	19:50	20:48
5	07:46	08:12 (6)	07:29	06:53	07:03	05:57
	17:13	16 08:28 (6)	17:47	18:19	19:51	20:48
6	07:46	08:13 (6)	07:28	06:51	07:02	05:56
	17:14	16 08:29 (6)	17:49	18:20	19:52	20:49
7	07:46	08:14 (6)	07:27	06:50	07:00	05:56
	17:15	15 08:29 (6)	17:50	18:22	19:53	20:49
8	07:45	08:16 (6)	07:26	06:48	06:59	05:56
	17:16	12 08:28 (6)	17:51	18:23	19:54	20:50
9	07:45	08:17 (6)	07:25	06:47	06:57	05:56
	17:17	11 08:28 (6)	17:52	18:24	19:55	20:51
10	07:45	08:18 (6)	07:24	06:45	06:56	05:56
	17:18	9 08:27 (6)	17:53	18:25	19:56	20:51
11	07:45	08:20 (6)	07:23	06:43	06:54	05:55
	17:19	6 08:26 (6)	17:54	18:26	19:57	20:52
12	07:45		07:21	06:42	06:52	05:55
	17:20		17:56	18:27	19:58	20:52
13	07:45		07:20	06:40	06:51	05:55
	17:21		17:57	18:28	19:59	20:53
14	07:44		07:19	06:39	06:49	05:55
	17:22		17:58	18:29	20:00	20:53
15	07:44		07:18	06:37	06:48	05:55
	17:23		17:59	18:30	20:01	20:53
16	07:44		07:17	06:36	06:46	05:55
	17:24		18:00	18:31	20:02	20:54
17	07:43		07:15	06:34	06:45	05:55
	17:25		18:01	18:32	20:03	20:54
18	07:43		07:14	06:32	06:43	05:55
	17:26		18:03	18:33	20:04	20:55
19	07:42		07:13	06:31	06:42	05:55
	17:27		18:04	18:34	20:05	20:55
20	07:42		07:11	06:29	06:41	05:56
	17:28		18:05	18:35	20:06	20:55
21	07:41		07:10	06:27	06:39	05:56
	17:30		18:06	18:36	20:07	20:55
22	07:41		07:09	06:26	06:38	05:56
	17:31		18:07	18:37	20:08	20:56
23	07:40		07:07	06:24	06:36	05:56
	17:32		18:08	18:38	20:09	20:56
24	07:39		07:06	06:23	06:35	05:56
	17:33		18:09	18:39	20:10	20:56
25	07:39		07:04	06:21	06:34	05:57
	17:34		18:11	18:40	20:11	20:56
26	07:38		07:03	06:19	06:32	05:57
	17:35		18:12	18:41	20:12	20:56
27	07:37		07:02	06:18	06:31	05:57
	17:37		18:13	18:42	20:13	20:56
28	07:36		07:00	06:16	06:30	05:58
	17:38		18:14	18:43	20:14	20:56
29	07:36			07:15	07:51 (3)	05:58
	17:39			19:44	11 08:02 (3)	20:56
30	07:35			07:13	07:47 (3)	05:59
	17:40			19:45	18 08:05 (3)	20:56
31	07:34			07:11	07:45 (3)	05:59
	17:41			19:46	22 08:07 (3)	20:45
Potential sun hours	301	299	370	397	445	448
Total, worst case	154		51	545		
Sun reduction	0.45		0.49	0.53		
Oper. time red.	0.24		0.24	0.24		
Wind dir. red.	0.78		0.77	0.77		
Total reduction	0.08		0.09	0.10		
Total, real	13		5	53		

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 14

Licensed user:

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Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: M - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (13) R13

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December						
1	05:59 20:56	06:22 20:38	06:51 19:57	07:34 (3) 08:07 (3)	07:19 19:08	06:52 17:23	07:25 17:00	6	08:02 (6) 08:08 (6)			
2	05:59 20:56	06:23 20:37	06:52 19:55	07:34 (3) 08:07 (3)	07:20 19:06	06:53 17:22	07:26 17:00	9	08:01 (6) 08:10 (6)			
3	06:00 20:56	06:24 20:36	06:53 19:54	07:34 (3) 08:07 (3)	07:21 19:05	06:54 17:21	07:27 17:00	11	08:00 (6) 08:11 (6)			
4	06:01 20:56	06:25 20:35	06:54 19:52	07:33 (3) 08:07 (3)	07:22 19:03	06:55 17:20	07:28 17:00	12	08:00 (6) 08:12 (6)			
5	06:01 20:56	06:26 20:34	06:55 19:50	07:33 (3) 08:07 (3)	07:23 19:02	06:56 17:19	07:29 16:59	14	08:00 (6) 08:14 (6)			
6	06:02 20:55	06:27 20:33	06:56 19:49	07:33 (3) 08:06 (3)	07:24 19:00	06:57 17:17	07:30 16:59	16	07:59 (6) 08:15 (6)			
7	06:02 20:55	06:27 20:32	06:57 19:47	07:33 (3) 08:06 (3)	07:25 18:58	06:58 17:16	07:31 16:59	15	08:00 (6) 08:15 (6)			
8	06:03 20:55	06:28 20:30	06:58 19:46	07:34 (3) 08:05 (3)	07:26 18:57	07:00 17:15	07:32 16:59	16	08:00 (6) 08:16 (6)			
9	06:03 20:54	06:29 20:29	06:58 19:44	07:33 (3) 08:03 (3)	07:27 18:55	07:01 17:14	07:33 16:59	17	08:00 (6) 08:17 (6)			
10	06:04 20:54	06:30 20:28	06:59 19:42	07:34 (3) 08:02 (3)	07:28 18:54	07:02 17:13	07:34 16:59	18	08:00 (6) 08:18 (6)			
11	06:05 20:54	06:31 20:27	07:00 19:41	07:35 (3) 08:00 (3)	07:29 18:52	07:03 17:12	07:34 16:59	18	08:00 (6) 08:18 (6)			
12	06:05 20:53	06:32 20:25	07:01 19:39	07:36 (3) 07:59 (3)	07:30 18:51	07:04 17:12	07:35 16:59	19	08:00 (6) 08:19 (6)			
13	06:06 20:53	06:33 20:24	07:02 19:38	07:38 (3) 07:56 (3)	07:31 18:49	07:05 17:11	07:36 17:00	18	08:01 (6) 08:19 (6)			
14	06:07 20:52	06:34 20:23	07:03 19:36	07:41 (3) 07:53 (3)	07:32 18:48	07:06 17:10	07:37 17:00	19	08:01 (6) 08:20 (6)			
15	06:08 20:52	06:35 20:22	07:04 19:34	07:43 (3) 07:05	07:33 18:46	07:08 17:09	07:37 17:00	19	08:01 (6) 08:20 (6)			
16	06:08 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 17:08	07:38 17:00	07:38 17:00	19	08:02 (6) 08:21 (6)			
17	06:09 20:51	06:37 20:19	07:06 19:31	07:35 18:43	07:10 17:07	07:39 17:01	07:39 17:01	20	08:02 (6) 08:22 (6)			
18	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01	07:39 17:01	20	08:02 (6) 08:22 (6)			
19	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:40	07:12 17:06	07:40 17:01	07:40 17:01	20	08:03 (6) 08:23 (6)			
20	06:11 20:49	06:40 20:15	07:09 19:26	07:38 18:39	07:13 17:05	07:41 17:02	07:41 17:02	20	08:03 (6) 08:23 (6)			
21	06:12 20:48	06:41 20:13	07:10 19:24	07:40 18:37	07:14 17:05	07:41 17:02	07:41 17:02	20	08:04 (6) 08:24 (6)			
22	06:13 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03	07:42 17:03	20	08:04 (6) 08:24 (6)			
23	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:17 17:03	07:42 17:03	07:42 17:03	20	08:05 (6) 08:25 (6)			
24	06:15 20:46	06:43 20:09	07:12 19:19	07:43 18:33	07:18 17:03	07:43 17:04	07:43 17:04	20	08:05 (6) 08:25 (6)			
25	06:16 20:45	06:44 20:07	07:13 19:18	07:44 (3) 18:32	07:19 17:02	07:43 17:04	07:43 17:04	20	08:06 (6) 08:26 (6)			
26	06:17 20:44	06:45 20:06	07:14 19:16	07:42 (3) 18:31	07:14 17:02	07:44 17:05	07:44 17:05	20	08:06 (6) 08:26 (6)			
27	06:17 20:43	06:46 20:04	07:15 19:14	07:40 (3) 18:30	07:15 17:02	07:44 17:06	07:44 17:06	19	08:07 (6) 08:26 (6)			
28	06:18 20:42	06:47 20:03	07:16 19:13	07:39 (3) 18:29	07:16 17:01	07:44 17:06	07:44 17:06	19	08:07 (6) 08:26 (6)			
29	06:19 20:41	06:48 20:01	07:17 19:11	07:38 (3) 18:28	07:17 17:01	07:44 17:07	07:44 17:07	19	08:08 (6) 08:27 (6)			
30	06:20 20:40	06:49 20:00	07:18 19:10	07:37 (3) 18:27	07:18 17:00	07:45 17:08	07:45 17:08	19	08:08 (6) 08:27 (6)			
31	06:21 20:39	06:50 19:58	07:19 19:09	07:35 (3) 18:26	07:19 17:00	07:45 17:08	07:45 17:08	19	08:09 (6) 08:28 (6)			
Potential sun hours	455	426	374	347	301	292						
Total, worst case			203	400								541
Sun reduction			0.73	0.65								0.45
Oper. time red.			0.24	0.24								0.24
Wind dir. red.			0.77	0.77								0.78
Total reduction			0.13	0.12								0.08
Total, real			27	47								45

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 15

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: N - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (14) R14

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June		
1	07:45	07:33	07:57 (4)	06:59	07:10	06:26	05:58	18:40 (2)
	17:09	17:43	08:54 (3)	18:15	19:47	20:17	20:45	101 20:21 (1)
2	07:45	07:32	07:56 (4)	06:57	07:08	06:24	05:58	18:40 (2)
	17:10	17:44	08:55 (3)	18:16	19:48	20:18	20:46	101 20:21 (1)
3	07:45	07:31	07:56 (4)	06:56	07:07	06:23	05:57	18:40 (2)
	17:11	17:45	08:55 (3)	18:17	19:49	20:19	20:47	101 20:21 (1)
4	07:46	07:30	07:56 (4)	06:54	07:05	06:22	05:57	18:40 (2)
	17:12	17:46	08:55 (3)	18:18	19:50	20:20	20:48	102 20:22 (1)
5	07:46	07:29	07:55 (4)	06:53	07:03	06:21	05:57	18:40 (2)
	17:13	17:47	08:55 (3)	18:19	19:51	20:21	20:48	102 20:22 (1)
6	07:46	07:28	07:55 (4)	06:51	07:02	06:20	05:56	18:40 (2)
	17:14	17:48	08:55 (3)	18:20	19:52	20:22	20:49	103 20:23 (1)
7	07:46	07:27	07:55 (4)	06:50	07:00	06:18	05:56	18:39 (2)
	17:15	17:50	08:55 (3)	18:22	19:53	20:23	18 19:31 (2) 20:49	103 20:22 (1)
8	07:45	07:26	07:55 (4)	06:48	06:59	06:17	19:08 (2) 05:56	18:39 (2)
	17:16	17:51	08:55 (3)	18:23	19:54	20:24	28 19:36 (2) 20:50	104 20:23 (1)
9	07:45	07:25	07:56 (4)	06:47	06:57	06:16	19:04 (2) 05:56	18:40 (2)
	17:17	17:52	08:54 (3)	18:24	19:55	20:25	35 19:39 (2) 20:51	103 20:23 (1)
10	07:45	07:24	07:56 (4)	06:45	06:56	06:15	19:01 (2) 05:56	18:40 (2)
	17:18	17:53	08:54 (3)	18:25	19:56	20:26	41 19:42 (2) 20:51	103 20:23 (1)
11	07:45	07:23	07:58 (4)	06:43	06:54	06:14	18:59 (2) 05:55	18:40 (2)
	17:19	17:54	08:54 (3)	18:26	19:57	20:27	45 19:44 (2) 20:52	104 20:24 (1)
12	07:45	07:21	07:59 (4)	06:42	06:52	06:13	18:57 (2) 05:55	18:40 (2)
	17:20	17:56	08:54 (3)	18:27	19:58	20:28	49 19:46 (2) 20:52	104 20:24 (1)
13	07:45	07:20	08:00 (4)	06:40	06:51	06:12	18:55 (2) 05:55	18:40 (2)
	17:21	17:57	08:52 (3)	18:28	19:59	20:29	53 19:48 (2) 20:53	104 20:24 (1)
14	07:44	07:19	08:17 (3)	06:39	06:49	06:11	18:53 (2) 05:55	18:40 (2)
	17:22	17:58	08:51 (3)	18:29	20:00	20:30	57 19:50 (2) 20:53	105 20:25 (1)
15	07:44	07:18	08:19 (3)	06:37	06:48	06:10	18:52 (2) 05:55	18:40 (2)
	17:23	17:59	08:51 (3)	18:30	20:01	20:31	59 19:51 (2) 20:53	105 20:25 (1)
16	07:44	07:17	08:20 (3)	06:35	06:46	06:09	18:50 (2) 05:55	18:41 (2)
	17:24	18:00	08:49 (3)	18:31	20:02	20:32	71 20:05 (1) 20:54	104 20:25 (1)
17	07:43	07:15	08:21 (3)	06:34	06:45	06:08	18:49 (2) 05:55	18:41 (2)
	17:25	18:01	08:47 (3)	18:32	20:03	20:33	79 20:08 (1) 20:54	104 20:25 (1)
18	07:43	08:25 (3)	07:14	06:32	06:43	06:07	18:48 (2) 05:55	18:41 (2)
	17:26	11 08:36 (3)	18:03	22 08:45 (3)	18:33	20:04	82 20:10 (1) 20:55	104 20:25 (1)
19	07:42	08:23 (3)	07:13	06:31	06:42	06:07	18:47 (2) 05:55	18:41 (2)
	17:27	16 08:39 (3)	18:04	17 08:43 (3)	18:34	20:05	84 20:11 (1) 20:55	104 20:25 (1)
20	07:42	08:21 (3)	07:11	06:29	06:41	06:06	18:46 (2) 05:56	18:41 (2)
	17:28	20 08:41 (3)	18:05	9 08:38 (3)	18:35	20:06	86 20:12 (1) 20:55	104 20:25 (1)
21	07:41	08:19 (3)	07:10	06:27	06:39	06:05	18:45 (2) 05:56	18:42 (2)
	17:30	23 08:42 (3)	18:06	18:36	20:07	20:37	88 20:13 (1) 20:55	104 20:26 (1)
22	07:41	08:19 (3)	07:09	06:26	06:38	06:04	18:44 (2) 05:56	18:42 (2)
	17:31	26 08:45 (3)	18:07	18:37	20:08	20:37	89 20:13 (1) 20:56	104 20:26 (1)
23	07:40	08:18 (3)	07:07	06:24	06:36	06:03	18:44 (2) 05:56	18:42 (2)
	17:32	28 08:46 (3)	18:08	18:38	20:09	20:38	91 20:15 (1) 20:56	104 20:26 (1)
24	07:39	08:17 (3)	07:06	06:23	06:35	06:03	18:43 (2) 05:56	18:42 (2)
	17:33	30 08:47 (3)	18:09	18:39	20:10	20:39	92 20:15 (1) 20:56	104 20:26 (1)
25	07:39	08:17 (3)	07:04	06:21	06:34	06:02	18:43 (2) 05:57	18:43 (2)
	17:34	32 08:49 (3)	18:11	18:40	20:11	20:40	93 20:16 (1) 20:56	104 20:27 (1)
26	07:38	08:16 (3)	07:03	06:19	06:32	06:01	18:42 (2) 05:57	18:43 (2)
	17:35	33 08:49 (3)	18:12	18:41	20:12	20:41	95 20:17 (1) 20:56	104 20:27 (1)
27	07:37	08:15 (3)	07:02	06:18	06:31	06:01	18:41 (2) 05:57	18:42 (2)
	17:37	35 08:50 (3)	18:13	18:42	20:13	20:42	96 20:17 (1) 20:56	105 20:27 (1)
28	07:36	08:15 (3)	07:00	06:16	06:30	06:00	18:41 (2) 05:58	18:43 (2)
	17:38	36 08:51 (3)	18:14	18:43	20:14	20:42	97 20:18 (1) 20:56	105 20:28 (1)
29	07:36	08:14 (3)		07:15	06:28	06:00	18:41 (2) 05:58	18:43 (2)
	17:39	38 08:52 (3)		19:44	20:15	20:43	98 20:19 (1) 20:56	104 20:27 (1)
30	07:35	07:59 (4)		07:13	06:27	05:59	18:41 (2) 05:59	18:44 (2)
	17:40	47 08:52 (3)		19:45	20:16	20:44	99 20:20 (1) 20:56	104 20:28 (1)
31	07:34	07:58 (4)		07:11		05:59	18:41 (2)	
	17:41	53 08:54 (3)		19:46		20:45	100 20:21 (1)	
Potential sun hours	301	299	370	397	445	100	448	
Total, worst case	428	905				1825	3107	
Sun reduction	0.45	0.47				0.59	0.66	
Oper. time red.	0.24	0.24				0.24	0.24	
Wind dir. red.	0.79	0.79				0.80	0.80	
Total reduction	0.08	0.09				0.11	0.13	
Total, real	36	80				204	390	

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 16

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: N - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (14) R14

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59	18:44 (2)	06:22	19:07 (2)	06:51	07:19
	20:56	20:28 (1)	20:38	19:55 (2)	19:57	19:08
2	05:59	18:44 (2)	06:23	19:09 (2)	06:52	07:20
	20:56	20:28 (1)	20:37	19:53 (2)	19:55	19:06
3	06:00	18:45 (2)	06:24	19:12 (2)	06:53	07:21
	20:56	20:28 (1)	20:36	19:51 (2)	19:54	19:05
4	06:00	18:46 (2)	06:25	19:15 (2)	06:54	07:22
	20:56	20:29 (1)	20:35	19:48 (2)	19:52	19:03
5	06:01	18:45 (2)	06:26	19:19 (2)	06:55	07:23
	20:56	20:28 (1)	20:34	19:44 (2)	19:50	19:02
6	06:02	18:46 (2)	06:26	19:25 (2)	06:56	07:24
	20:55	20:29 (1)	20:33	19:38 (2)	19:49	19:00
7	06:02	18:46 (2)	06:27		06:57	07:25
	20:55	20:28 (1)	20:32		19:47	18:58
8	06:03	18:47 (2)	06:28		06:58	07:26
	20:55	20:29 (1)	20:30		19:46	18:57
9	06:03	18:47 (2)	06:29		06:58	07:27
	20:54	20:28 (1)	20:29		19:44	18:55
10	06:04	18:47 (2)	06:30		06:59	07:28
	20:54	20:29 (1)	20:28		19:42	18:54
11	06:05	18:48 (2)	06:31		07:00	07:29
	20:54	20:29 (1)	20:27		19:41	18:52
12	06:05	18:48 (2)	06:32		07:01	07:30
	20:53	20:28 (1)	20:25		19:39	18:51
13	06:06	18:49 (2)	06:33		07:02	07:31
	20:53	20:28 (1)	20:24		19:38	18:49
14	06:07	18:50 (2)	06:34		07:03	07:32
	20:52	20:28 (1)	20:23		19:36	18:48
15	06:08	18:51 (2)	06:35		07:04	07:33
	20:52	20:28 (1)	20:22		19:34	18:46
16	06:08	18:50 (2)	06:36		07:05	07:34
	20:51	20:27 (1)	20:20		19:33	18:45
17	06:09	18:51 (2)	06:37		07:06	07:35
	20:51	20:26 (1)	20:19		19:31	18:43
18	06:10	18:52 (2)	06:38		07:07	07:36
	20:50	20:26 (1)	20:17		19:29	18:42
19	06:11	18:53 (2)	06:39		07:08	07:37
	20:49	20:26 (1)	20:16		19:28	18:40
20	06:11	18:53 (2)	06:40		07:09	07:38
	20:49	20:24 (1)	20:15		19:26	18:39
21	06:12	18:54 (2)	06:41		07:10	07:40
	20:48	20:24 (1)	20:13		19:24	18:37
22	06:13	18:55 (2)	06:42		07:11	07:41
	20:47	20:23 (1)	20:12		19:23	18:36
23	06:14	18:56 (2)	06:43		07:12	07:42
	20:46	20:23 (1)	20:10		19:21	18:35
24	06:15	18:57 (2)	06:43		07:12	07:43
	20:46	20:22 (1)	20:09		19:19	18:33
25	06:16	18:57 (2)	06:44		07:13	07:44
	20:45	20:21 (1)	20:07		19:18	18:32
26	06:17	18:59 (2)	06:45		07:14	07:45
	20:44	20:20 (1)	20:06		19:16	18:31
27	06:17	19:00 (2)	06:46		07:15	07:46
	20:43	20:18 (1)	20:04		19:14	18:30
28	06:18	19:01 (2)	06:47		07:16	07:47
	20:42	20:13 (1)	20:03		19:13	18:29
29	06:19	19:03 (2)	06:48		07:17	07:48
	20:41	20:01 (2)	20:01		19:11	18:27
30	06:20	19:05 (2)	06:49		07:18	07:49
	20:40	20:00 (2)	20:00		19:10	18:26
31	06:21	19:06 (2)	06:50		07:19	07:50
	20:39	19:58 (2)	19:58		19:08	18:25
Potential sun hours	455	426	374	347	301	292
Total, worst case	2814	202	336	1014		
Sun reduction	0.74	0.73	0.54	0.51		
Oper. time red.	0.24	0.24	0.24	0.24		
Wind dir. red.	0.80	0.80	0.79	0.79		
Total reduction	0.14	0.14	0.10	0.09		
Total, real	394	28	34	96		

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 17

Licensed user:

Ing. Bruno Manca
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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: O - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (15) R15

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1	07:45	07:33	08:13 (3)	06:59	07:10	06:26	05:58
	17:09	17:43	31 08:44 (3)	18:15	19:47	20:17	20:45
2	07:45	07:32	07:59 (4)	06:57	07:08	06:24	05:58
	17:10	17:44	39 08:45 (3)	18:16	19:48	20:18	20:46
3	07:45	07:31	07:56 (4)	06:56	07:07	06:23	05:57
	17:11	17:45	46 08:46 (3)	18:17	19:49	20:19	20:47
4	07:46	07:30	07:55 (4)	06:54	07:05	06:22	05:57
	17:12	17:46	50 08:47 (3)	18:18	19:50	20:20	20:48
5	07:46	07:29	07:54 (4)	06:53	07:03	06:21	05:57
	17:13	17:47	54 08:48 (3)	18:19	19:51	20:21	20:48
6	07:46	07:28	07:53 (4)	06:51	07:02	06:20	05:56
	17:14	17:48	56 08:49 (3)	18:20	19:52	20:22	20:49
7	07:46	07:27	07:52 (4)	06:50	07:00	06:18	05:56
	17:15	17:50	57 08:49 (3)	18:22	19:53	20:23	20:49
8	07:45	07:26	07:52 (4)	06:48	06:59	06:17	05:56
	17:16	17:51	57 08:49 (3)	18:23	19:54	20:24	20:50
9	07:45	07:25	07:52 (4)	06:47	06:57	06:16	05:56
	17:17	17:52	58 08:50 (3)	18:24	19:55	20:25	20:51
10	07:45	07:24	07:52 (4)	06:45	06:56	06:15	05:56
	17:18	17:53	58 08:50 (3)	18:25	19:56	20:26	20:51
11	07:45	07:23	07:52 (4)	06:43	06:54	06:14	05:55
	17:19	17:54	58 08:50 (3)	18:26	19:57	20:27	20:52
12	07:45	07:21	07:53 (4)	06:42	06:52	06:13	05:55
	17:20	17:56	58 08:51 (3)	18:27	19:58	20:28	20:52
13	07:45	07:20	07:53 (4)	06:40	06:51	06:12	05:55
	17:21	17:57	57 08:50 (3)	18:28	19:59	20:29	20:53
14	07:44	07:19	07:54 (4)	06:39	06:49	06:11	05:55
	17:22	17:58	56 08:50 (3)	18:29	20:00	20:30	20:53
15	07:44	07:18	07:55 (4)	06:37	06:48	06:10	05:55
	17:23	17:59	55 08:50 (3)	18:30	20:01	20:31	20:53
16	07:44	07:17	07:57 (4)	06:35	06:46	06:09	05:55
	17:24	18:00	52 08:50 (3)	18:31	20:02	20:32	20:54
17	07:43	07:15	08:09 (3)	06:34	06:45	06:08	05:55
	17:25	18:01	39 08:48 (3)	18:32	20:03	20:33	20:54
18	07:43	07:14	08:09 (3)	06:32	06:43	06:07	05:55
	17:26	18:03	39 08:48 (3)	18:33	20:04	20:34	20:55
19	07:42	07:13	08:10 (3)	06:31	06:42	06:07	05:55
	17:27	18:04	38 08:48 (3)	18:34	20:05	20:35	20:55
20	07:42	07:11	08:10 (3)	06:29	06:41	06:06	05:56
	17:28	18:05	36 08:46 (3)	18:35	20:06	20:36	20:55
21	07:41	07:10	08:12 (3)	06:27	06:39	06:05	05:56
	17:30	18:06	33 08:45 (3)	18:36	20:07	20:37	20:55
22	07:41	07:09	08:12 (3)	06:26	06:38	06:04	05:56
	17:31	18:07	31 08:43 (3)	18:37	20:08	20:37	20:56
23	07:40	07:07	08:14 (3)	06:24	06:36	06:03	05:56
	17:32	18:08	28 08:42 (3)	18:38	20:09	20:38	20:56
24	07:39	07:06	08:16 (3)	06:23	06:35	06:03	05:56
	17:33	18:09	24 08:40 (3)	18:39	20:10	20:39	20:56
25	07:39	07:04	08:18 (3)	06:21	06:34	06:02	05:57
	17:34	18:11	19 08:37 (3)	18:40	20:11	20:40	8 20:12 (1)
26	07:38	08:24 (3)	07:03	08:21 (3)	06:19	06:32	06:01
	17:35	6 08:30 (3)	18:12	13 08:34 (3)	18:41	20:12	20:41
27	07:37	08:20 (3)	07:02	06:18	06:31	06:01	19:59 (1)
	17:37	14 08:34 (3)	18:13	06:16	06:30	06:00	17 20:16 (1)
28	07:36	08:17 (3)	07:00	06:16	06:30	06:00	19:58 (1)
	17:38	20 08:37 (3)	18:14	06:16	06:30	06:00	20 20:18 (1)
29	07:36	08:16 (3)	07:00	06:15	06:28	06:00	19:32 (2)
	17:39	23 08:39 (3)	07:00	06:15	06:28	06:00	38 20:19 (1)
30	07:35	08:14 (3)	07:00	06:13	06:27	05:59	19:29 (2)
	17:40	27 08:41 (3)	07:00	06:13	06:27	05:59	46 20:20 (1)
31	07:34	08:14 (3)	07:00	06:11	06:25	05:59	19:27 (2)
	17:41	29 08:43 (3)	07:00	06:11	06:25	05:59	53 20:21 (1)
Potential sun hours	301	299	370	397	445	448	
Total, worst case	119	1142			196		2082
Sun reduction	0.45	0.47			0.59		0.66
Oper. time red.	0.24	0.24			0.24		0.24
Wind dir. red.	0.80	0.80			0.80		0.80
Total reduction	0.09	0.09			0.11		0.12
Total, real	10	102			22		260

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 18

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: O - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (15) R15

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59	19:21 (2)	06:22	06:51	07:19	06:52
	20:56	70 20:31 (1)	20:38	19:57	19:08	17:23 58 08:20 (3)
2	05:59	19:21 (2)	06:23	06:52	07:20	06:53 07:22 (4)
	20:56	70 20:31 (1)	20:37	19:55	19:06	17:22 57 08:19 (3)
3	06:00	19:23 (2)	06:24	06:53	07:21	06:54 07:22 (4)
	20:56	68 20:31 (1)	20:36	19:54	19:05	17:21 57 08:19 (3)
4	06:00	19:24 (2)	06:25	06:54	07:22	06:55 07:22 (4)
	20:56	67 20:31 (1)	20:35	19:52	19:03	17:20 56 08:18 (3)
5	06:01	19:24 (2)	06:26	06:55	07:23	06:56 07:23 (4)
	20:56	67 20:31 (1)	20:34	19:50	19:02	17:19 56 08:19 (3)
6	06:02	19:26 (2)	06:26	06:56	07:24	06:57 07:24 (4)
	20:55	65 20:31 (1)	20:33	19:49	19:00	17:17 54 08:18 (3)
7	06:02	19:26 (2)	06:27	06:57	07:25	06:58 07:25 (4)
	20:55	64 20:30 (1)	20:32	19:47	18:58	17:16 51 08:17 (3)
8	06:03	19:28 (2)	06:28	06:58	07:26	07:00 07:26 (4)
	20:55	62 20:30 (1)	20:30	19:46	18:57	17:15 46 08:16 (3)
9	06:03	19:29 (2)	06:29	06:58	07:27	07:01 07:29 (4)
	20:54	60 20:29 (1)	20:29	19:44	18:55	17:14 38 08:15 (3)
10	06:04	19:30 (2)	06:30	06:59	07:28	07:02 07:44 (3)
	20:54	59 20:29 (1)	20:28	19:42	18:54	17:13 31 08:15 (3)
11	06:05	19:32 (2)	06:31	07:00	07:29	07:03 07:45 (3)
	20:54	57 20:29 (1)	20:27	19:41	18:52	17:12 29 08:14 (3)
12	06:05	19:34 (2)	06:32	07:01	07:30	07:04 07:46 (3)
	20:53	54 20:28 (1)	20:25	19:39	18:51	17:12 26 08:12 (3)
13	06:06	19:36 (2)	06:33	07:02	07:31	07:05 07:48 (3)
	20:53	50 20:28 (1)	20:24	19:38	18:49	17:11 23 08:11 (3)
14	06:07	19:39 (2)	06:34	07:03	07:32	07:06 07:51 (3)
	20:52	42 20:28 (1)	20:23	19:36	18:48	17:10 19 08:10 (3)
15	06:08	19:44 (2)	06:35	07:04	07:33	08:58 (3) 07:08 07:53 (3)
	20:52	33 20:28 (1)	20:22	19:34	18:46	3 09:01 (3) 17:09 14 08:07 (3)
16	06:08	20:08 (1)	06:36	07:05	07:34	08:51 (3) 07:09 07:58 (3)
	20:51	18 20:26 (1)	20:20	19:33	18:45	16 09:07 (3) 17:08 4 08:02 (3)
17	06:09	20:10 (1)	06:37	07:06	07:35	08:48 (3) 07:10 07:39
	20:51	15 20:25 (1)	20:19	19:31	18:43	22 09:10 (3) 17:07 17:01
18	06:10	20:12 (1)	06:38	07:07	07:36	08:46 (3) 07:11 07:39
	20:50	11 20:23 (1)	20:17	19:29	18:42	26 09:12 (3) 17:07 17:01
19	06:11	20:17 (1)	06:39	07:08	07:37	08:45 (3) 07:12 07:40
	20:49	2 20:19 (1)	20:16	19:28	18:40	29 09:14 (3) 17:06 17:01
20	06:11	06:40	07:09	07:38	08:43 (3)	07:13 07:41
	20:49	20:15	19:26	18:39	32 09:15 (3)	17:05 17:02
21	06:12	06:41	07:10	07:40	08:42 (3)	07:14 07:41
	20:48	20:13	19:24	18:37	34 09:16 (3)	17:05 17:02
22	06:13	06:42	07:11	07:41	08:41 (3)	07:15 07:42
	20:47	20:12	19:23	18:36	36 09:17 (3)	17:04 17:03
23	06:14	06:43	07:12	07:42	08:40 (3)	07:17 07:42
	20:46	20:10	19:21	18:35	37 09:17 (3)	17:03 17:03
24	06:15	06:43	07:12	07:43	08:39 (3)	07:18 07:43
	20:46	20:09	19:19	18:33	39 09:18 (3)	17:03 17:04
25	06:16	06:44	07:13	06:44	07:29 (4)	07:19 07:43
	20:45	20:07	19:18	17:32	45 08:18 (3)	17:02 17:04
26	06:17	06:45	07:14	06:45	07:27 (4)	07:20 07:44
	20:44	20:06	19:16	17:31	51 08:19 (3)	17:02 17:05
27	06:17	06:46	07:15	06:46	07:25 (4)	07:21 07:44
	20:43	20:04	19:14	17:29	55 08:20 (3)	17:01 17:06
28	06:18	06:47	07:16	06:47	07:23 (4)	07:22 07:44
	20:42	20:03	19:13	17:28	57 08:20 (3)	17:01 17:06
29	06:19	06:48	07:17	06:48	07:22 (4)	07:23 07:44
	20:41	20:01	19:11	17:27	57 08:19 (3)	17:01 17:07
30	06:20	06:49	07:18	06:49	07:22 (4)	07:24 07:45
	20:40	20:00	19:10	17:26	57 08:19 (3)	17:00 17:08
31	06:21	06:50	06:51	07:21 (4)	07:21 (4)	07:45 07:45
	20:39	19:58	17:24	58 08:19 (3)	17:08 17:08	
Potential sun hours	455	426	374	347	301	292
Total, worst case	934			654		619
Sun reduction	0.74			0.54		0.51
Oper. time red.	0.24			0.24		0.24
Wind dir. red.	0.80			0.80		0.80
Total reduction	0.14			0.10		0.10
Total, real	130			67		59

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 19

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: P - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (16) R16

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June			
1	07:45	10:02 (4)	07:33	06:59	07:10	18:38 (3)	06:26	05:58	
	17:09	54 10:56 (4)	17:42	18:15	19:47	19:24 (3)	20:17	20:45	
2	07:45	10:03 (4)	07:32	06:57	07:08	18:38 (3)	06:24	05:58	
	17:10	53 10:56 (4)	17:44	18:16	19:48	19:23 (3)	20:18	20:46	
3	07:45	10:05 (4)	07:31	06:56	07:06	18:40 (3)	06:23	05:57	
	17:11	52 10:56 (4)	17:45	18:17	19:49	19:22 (3)	20:19	20:47	
4	07:45	10:05 (4)	07:30	06:54	07:05	18:40 (3)	06:22	05:57	
	17:12	50 10:55 (4)	17:46	18:18	19:50	19:20 (3)	20:20	20:47	
5	07:46	10:06 (4)	07:29	06:53	07:03	18:40 (3)	06:21	05:57	
	17:13	49 10:55 (4)	17:47	18:19	19:51	19:18 (3)	20:21	20:48	
6	07:46	10:08 (4)	07:28	06:51	07:02	18:42 (3)	06:20	05:56	
	17:14	46 10:54 (4)	17:48	18:20	19:52	19:17 (3)	20:22	20:49	
7	07:45	10:09 (4)	07:27	06:50	07:00	18:43 (3)	06:18	05:56	
	17:15	45 10:54 (4)	17:50	18:21	19:53	19:15 (3)	20:23	20:49	
8	07:45	10:11 (4)	07:26	06:48	06:59	18:45 (3)	06:17	05:56	
	17:16	42 10:53 (4)	17:51	18:23	19:54	19:13 (3)	20:24	20:50	
9	07:45	10:12 (4)	07:25	06:46	06:57	18:46 (3)	06:16	05:56	
	17:17	39 10:51 (4)	17:52	18:24	19:55	19:10 (3)	20:25	20:51	
10	07:45	10:14 (4)	07:24	06:45	06:55	18:50 (3)	06:15	05:55	
	17:18	36 10:50 (4)	17:53	18:25	19:56	19:08 (3)	20:26	20:51	
11	07:45	10:16 (4)	07:23	06:43	17:59 (3)	06:54	18:55 (3)	06:14	05:55
	17:19	33 10:49 (4)	17:54	18:26	6 18:05 (3)	19:57	6 19:01 (3)	20:27	20:52
12	07:45	10:19 (4)	07:21	06:42	17:55 (3)	06:52	06:13	05:55	
	17:20	28 10:47 (4)	17:56	18:27	11 18:06 (3)	19:58	20:28	20:52	
13	07:44	10:21 (4)	07:20	06:40	17:53 (3)	06:51	06:12	05:55	
	17:21	23 10:44 (4)	17:57	18:28	15 18:08 (3)	19:59	20:29	20:53	
14	07:44	10:25 (4)	07:19	06:39	17:50 (3)	06:49	06:11	05:55	
	17:22	16 10:41 (4)	17:58	18:29	18 18:08 (3)	20:00	20:30	20:53	
15	07:44	07:18	06:37	17:48 (3)	06:48	06:10	05:55		
	17:23	17:59	18:30	21 18:09 (3)	20:01	20:31	20:53		
16	07:43	07:16	06:35	17:47 (3)	06:46	06:09	05:55		
	17:24	18:00	18:31	24 18:11 (3)	20:02	20:32	20:54		
17	07:43	07:15	06:34	17:45 (3)	06:45	06:08	05:55		
	17:25	18:01	18:32	26 18:11 (3)	20:03	20:33	20:54		
18	07:43	07:14	06:32	17:44 (3)	06:43	06:07	05:55		
	17:26	18:03	18:33	29 18:13 (3)	20:04	20:34	20:54		
19	07:42	07:13	06:31	17:43 (3)	06:42	06:07	05:55		
	17:27	18:04	18:34	30 18:13 (3)	20:05	20:35	20:55		
20	07:42	07:11	06:29	17:41 (3)	06:41	06:06	05:55		
	17:28	18:05	18:35	33 18:14 (3)	20:06	20:36	20:55		
21	07:41	07:10	06:27	17:41 (3)	06:39	06:05	05:56		
	17:29	18:06	18:36	35 18:16 (3)	20:07	20:36	20:55		
22	07:40	07:09	06:26	17:40 (3)	06:38	06:04	05:56		
	17:31	18:07	18:37	36 18:16 (3)	20:08	20:37	20:56		
23	07:40	07:07	06:24	17:39 (3)	06:36	06:03	05:56		
	17:32	18:08	18:38	38 18:17 (3)	20:09	20:38	20:56		
24	07:39	07:06	06:23	17:39 (3)	06:35	06:03	05:56		
	17:33	18:09	18:39	40 18:19 (3)	20:10	20:39	20:56		
25	07:39	07:04	06:21	17:38 (3)	06:33	06:02	05:57		
	17:34	18:11	18:40	41 18:19 (3)	20:11	20:40	20:56		
26	07:38	07:03	06:19	17:38 (3)	06:32	06:01	05:57		
	17:35	18:12	18:41	43 18:21 (3)	20:12	20:41	20:56		
27	07:37	07:02	06:18	17:38 (3)	06:31	06:01	05:57		
	17:36	18:13	18:42	43 18:21 (3)	20:13	20:42	20:56		
28	07:36	07:00	06:16	17:37 (3)	06:29	06:00	05:58		
	17:38	18:14	18:43	45 18:22 (3)	20:14	20:42	20:56		
29	07:36	07:14	06:28	18:38 (3)	06:28	06:00	05:58		
	17:39	19:44	06:29	46 19:24 (3)	20:15	20:43	20:56		
30	07:35	07:13	06:27	18:38 (3)	06:27	05:59	05:58		
	17:40	19:45	06:26	46 19:24 (3)	20:16	20:44	20:56		
31	07:34	07:11	06:25	18:37 (3)	06:26	05:59	05:58		
	17:41	19:46	06:24	47 19:24 (3)	20:17	20:45	20:56		
Potential sun hours	301	299	370	397	445	448			
Total, worst case	566		673	354					
Sun reduction	0.45		0.49	0.53					
Oper. time red.	0.24		0.24	0.24					
Wind dir. red.	0.65		0.76	0.76					
Total reduction	0.07		0.09	0.09					
Total, real	39		60	34					

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 20

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: P - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (16) R16

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December		
1	05:59 20:56	06:22 20:38	06:51 19:57	18:53 (3) 19:01 (3)	07:19 19:08	18:33 (3) 17:23	06:52 17:00	09:58 (4) 10:31 (4)
2	05:59 20:56	06:23 20:37	06:52 19:55	18:48 (3) 19:06 (3)	07:20 19:06	18:36 (3) 17:22	06:53 17:00	09:57 (4) 10:33 (4)
3	06:00 20:56	06:24 20:36	06:53 19:54	18:45 (3) 19:08 (3)	07:21 19:05	18:41 (3) 17:21	06:54 17:00	09:56 (4) 10:35 (4)
4	06:00 20:56	06:25 20:35	06:54 19:52	18:42 (3) 19:10 (3)	07:22 19:03	18:40 (3) 17:20	06:55 17:00	09:55 (4) 10:37 (4)
5	06:01 20:55	06:26 20:34	06:55 19:50	18:40 (3) 19:12 (3)	07:23 19:01	18:40 (3) 17:18	06:56 17:00	09:54 (4) 10:39 (4)
6	06:02 20:55	06:26 20:33	06:56 19:49	18:38 (3) 19:13 (3)	07:24 19:00	18:38 (3) 17:17	06:57 17:00	09:54 (4) 10:40 (4)
7	06:02 20:55	06:27 20:32	06:57 19:47	18:36 (3) 19:14 (3)	07:25 18:58	18:36 (3) 17:16	06:58 17:00	09:53 (4) 10:42 (4)
8	06:03 20:55	06:28 20:30	06:57 19:46	18:35 (3) 19:15 (3)	07:26 18:57	18:35 (3) 17:15	06:59 17:00	09:53 (4) 10:43 (4)
9	06:03 20:54	06:29 20:29	06:58 19:44	18:33 (3) 19:15 (3)	07:27 18:55	18:33 (3) 17:14	07:01 17:00	09:53 (4) 10:45 (4)
10	06:04 20:54	06:30 20:28	20:04 (2) 20:05 (2)	06:59 19:42	18:32 (3) 18:54	07:02 17:13	07:02 17:00	09:52 (4) 10:45 (4)
11	06:05 20:54	06:31 20:27	20:03 (2) 20:04 (2)	07:00 19:41	18:31 (3) 18:52	07:03 17:12	07:03 17:00	09:52 (4) 10:46 (4)
12	06:05 20:53	06:32 20:25	20:02 (2) 20:03 (2)	07:01 19:39	18:30 (3) 18:51	07:04 17:11	07:04 17:00	09:52 (4) 10:48 (4)
13	06:06 20:53	06:33 20:24	07:02 19:37	18:29 (3) 19:16 (3)	07:31 18:49	07:05 17:11	07:05 17:00	09:53 (4) 10:49 (4)
14	06:07 20:52	06:34 20:23	07:03 19:36	18:28 (3) 19:14 (3)	07:32 18:48	07:06 17:10	07:06 17:00	09:53 (4) 10:50 (4)
15	06:08 20:52	06:35 20:21	07:04 19:34	18:28 (3) 19:13 (3)	07:33 18:46	07:08 17:09	07:08 17:00	09:52 (4) 10:50 (4)
16	06:08 20:51	06:36 20:20	07:05 19:33	18:27 (3) 19:11 (3)	07:34 18:45	07:09 17:08	07:09 17:00	09:53 (4) 10:51 (4)
17	06:09 20:50	06:37 20:19	07:06 19:31	18:27 (3) 19:09 (3)	07:35 18:43	07:10 17:07	07:10 17:00	09:53 (4) 10:52 (4)
18	06:10 20:50	06:38 20:17	07:07 19:29	18:26 (3) 19:08 (3)	07:36 18:42	07:11 17:07	07:11 17:00	09:53 (4) 10:52 (4)
19	06:11 20:49	06:39 20:16	07:08 19:28	18:25 (3) 19:05 (3)	07:37 18:40	07:12 17:06	07:12 17:00	09:54 (4) 10:53 (4)
20	06:11 20:49	06:40 20:15	07:09 19:26	18:25 (3) 19:04 (3)	07:38 18:39	07:13 17:05	07:13 17:00	09:54 (4) 10:53 (4)
21	06:12 20:48	06:41 20:13	07:10 19:24	18:25 (3) 19:02 (3)	07:39 18:37	07:14 17:05	07:14 17:00	09:55 (4) 10:54 (4)
22	06:13 20:47	06:42 20:12	07:11 19:23	18:25 (3) 19:00 (3)	07:41 18:36	07:15 17:04	07:15 17:00	09:55 (4) 10:54 (4)
23	06:14 20:46	06:42 20:10	07:11 19:21	18:25 (3) 18:59 (3)	07:42 18:35	07:17 17:03	07:17 17:00	09:56 (4) 10:55 (4)
24	06:15 20:46	06:43 20:09	07:12 19:19	18:26 (3) 18:57 (3)	07:43 18:33	07:18 17:03	07:18 17:00	09:56 (4) 10:55 (4)
25	06:16 20:45	06:44 20:07	07:13 19:18	18:26 (3) 18:56 (3)	06:44 17:32	07:19 17:02	07:19 17:00	09:56 (4) 10:55 (4)
26	06:16 20:44	06:45 20:06	07:14 19:16	18:27 (3) 18:54 (3)	06:45 17:31	07:20 17:02	07:20 17:00	09:57 (4) 10:56 (4)
27	06:17 20:43	06:46 20:04	07:15 19:14	18:28 (3) 18:52 (3)	06:46 17:29	07:21 17:01	07:21 17:00	09:58 (4) 10:56 (4)
28	06:18 20:42	06:47 20:03	07:16 19:13	18:29 (3) 18:51 (3)	06:47 17:28	07:22 17:01	07:22 17:00	09:58 (4) 10:56 (4)
29	06:19 20:41	06:48 20:01	07:17 19:11	18:30 (3) 18:49 (3)	06:48 17:27	07:23 17:01	07:23 17:00	10:00 (4) 10:57 (4)
30	06:20 20:40	06:49 20:00	07:18 19:10	18:31 (3) 18:48 (3)	06:49 17:25	07:24 17:00	07:24 17:00	10:00 (4) 10:57 (4)
31	06:21 20:39	06:50 19:58			17:24	06:50 17:00	06:50 17:00	10:01 (4) 10:57 (4)
Potential sun hours	455	426	374	347	301	292	292	1660
Total, worst case		6	1020	23	65	1660		
Sun reduction		0.73	0.65	0.54	0.51	0.45		
Oper. time red.		0.24	0.24	0.24	0.24	0.24		
Wind dir. red.		0.80	0.76	0.76	0.65	0.65		
Total reduction		0.14	0.12	0.10	0.08	0.07		
Total, real		1	119	2	5	115		

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 21

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: Q - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (17) R17

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1	07:45	08:40 (6) 07:33	08:00 (5) 06:59	07:10 06:26		05:58	
	17:09	43 09:23 (6) 17:42	29 08:29 (5) 18:15	19:47 20:17		20:45 34 07:27 (4)	
2	07:45	08:41 (6) 07:32	08:00 (5) 06:57	07:08 06:24		05:58 06:54 (4)	
	17:10	42 09:23 (6) 17:44	29 08:29 (5) 18:16	19:48 20:18		20:46 34 07:28 (4)	
3	07:45	08:42 (6) 07:31	08:01 (5) 06:56	07:07 06:23		07:04 (4) 05:57 06:54 (4)	
	17:11	41 09:23 (6) 17:45	28 08:29 (5) 18:17	19:49 20:19	12	07:16 (4) 20:47 33 07:27 (4)	
4	07:46	08:43 (6) 07:30	08:01 (5) 06:54	07:05 06:22		07:01 (4) 05:57 06:54 (4)	
	17:12	40 09:23 (6) 17:46	28 08:29 (5) 18:18	19:50 20:20	18	07:19 (4) 20:47 33 07:27 (4)	
5	07:46	08:43 (6) 07:29	08:01 (5) 06:53	07:03 06:21		06:59 (4) 05:57 06:55 (4)	
	17:13	40 09:23 (6) 17:47	28 08:29 (5) 18:19	19:51 20:21	22	07:21 (4) 20:48 32 07:27 (4)	
6	07:46	08:44 (6) 07:28	08:01 (5) 06:51	07:02 06:20		06:58 (4) 05:56 06:56 (4)	
	17:14	39 09:23 (6) 17:48	27 08:28 (5) 18:20	19:52 20:22	24	07:22 (4) 20:49 31 07:27 (4)	
7	07:45	08:45 (6) 07:27	08:01 (5) 06:50	07:00 06:18		06:56 (4) 05:56 06:55 (4)	
	17:15	38 09:23 (6) 17:50	27 08:28 (5) 18:21	19:53 20:23	28	07:24 (4) 20:49 31 07:26 (4)	
8	07:45	08:47 (6) 07:26	08:02 (5) 06:48	06:59 06:17		06:55 (4) 05:56 06:56 (4)	
	17:16	36 09:23 (6) 17:51	25 08:27 (5) 18:23	19:54 20:24	30	07:25 (4) 20:50 30 07:26 (4)	
9	07:45	08:48 (6) 07:25	08:03 (5) 06:46	06:57 06:16		06:54 (4) 05:56 06:57 (4)	
	17:17	35 09:23 (6) 17:52	24 08:27 (5) 18:24	19:55 20:25	32	07:26 (4) 20:51 29 07:26 (4)	
10	07:45	08:48 (6) 07:24	08:04 (5) 06:45	06:56 06:15		06:54 (4) 05:56 06:57 (4)	
	17:18	34 09:22 (6) 17:53	22 08:26 (5) 18:25	19:56 20:26	32	07:26 (4) 20:51 29 07:26 (4)	
11	07:45	08:50 (6) 07:23	08:06 (5) 06:43	06:54 06:14		06:53 (4) 05:55 06:58 (4)	
	17:19	32 09:22 (6) 17:54	19 08:25 (5) 18:26	19:57 20:27	34	07:27 (4) 20:52 28 07:26 (4)	
12	07:45	08:51 (6) 07:21	08:08 (5) 06:42	06:52 06:13		06:52 (4) 05:55 06:58 (4)	
	17:20	30 09:21 (6) 17:56	15 08:23 (5) 18:27	19:58 20:28	35	07:27 (4) 20:52 28 07:26 (4)	
13	07:44	08:52 (6) 07:20	08:10 (5) 06:40	06:51 06:12		06:52 (4) 05:55 06:59 (4)	
	17:21	28 09:20 (6) 17:57	10 08:20 (5) 18:28	19:59 20:29	36	07:28 (4) 20:53 27 07:26 (4)	
14	07:44	08:54 (6) 07:19	06:39 06:49	06:11		06:51 (4) 05:55 06:59 (4)	
	17:22	25 09:19 (6) 17:58	18:29 20:00	20:30	37	07:28 (4) 20:53 27 07:26 (4)	
15	07:44	08:56 (6) 07:18	06:37 06:48	06:10		06:51 (4) 05:55 07:00 (4)	
	17:23	22 09:18 (6) 17:59	18:30 20:01	20:31	37	07:28 (4) 20:53 26 07:26 (4)	
16	07:43	08:58 (6) 07:17	06:35 06:46	06:09		06:50 (4) 05:55 07:00 (4)	
	17:24	18 09:16 (6) 18:00	18:31 20:02	20:32	38	07:28 (4) 20:54 26 07:26 (4)	
17	07:43	09:02 (6) 07:15	06:34 06:45	06:08		06:50 (4) 05:55 07:00 (4)	
	17:25	12 09:14 (6) 18:01	18:32 20:03	20:33	38	07:28 (4) 20:54 26 07:26 (4)	
18	07:43	07:14	06:32 06:43	06:07		06:50 (4) 05:55 07:01 (4)	
	17:26	18:03	18:33 20:04	20:34	38	07:28 (4) 20:55 25 07:26 (4)	
19	07:42	07:13	06:31 06:42	06:07		06:50 (4) 05:55 07:01 (4)	
	17:27	18:04	18:34 20:05	20:35	39	07:29 (4) 20:55 25 07:26 (4)	
20	07:42	07:11	06:29 06:41	06:06		06:50 (4) 05:56 07:01 (4)	
	17:28	18:05	18:35 20:06	20:36	39	07:29 (4) 20:55 25 07:26 (4)	
21	07:41	07:10	06:27 06:39	06:05		06:50 (4) 05:56 07:02 (4)	
	17:30	7 08:15 (5) 18:06	18:36 20:07	20:36	39	07:29 (4) 20:55 25 07:27 (4)	
22	07:40	08:06 (5) 07:09	06:26 06:38	06:04		06:50 (4) 05:56 07:02 (4)	
	17:31	12 08:18 (5) 18:07	18:37 20:08	20:37	38	07:28 (4) 20:56 25 07:27 (4)	
23	07:40	08:04 (5) 07:07	06:24 06:36	06:03		06:51 (4) 05:56 07:02 (4)	
	17:32	16 08:20 (5) 18:08	18:38 20:09	20:38	38	07:29 (4) 20:56 25 07:27 (4)	
24	07:39	08:03 (5) 07:06	06:23 06:35	06:03		06:50 (4) 05:56 07:02 (4)	
	17:33	18 08:21 (5) 18:09	18:39 20:10	20:39	38	07:28 (4) 20:56 25 07:27 (4)	
25	07:39	08:03 (5) 07:04	06:21 06:34	06:02		06:51 (4) 05:57 07:02 (4)	
	17:34	20 08:23 (5) 18:11	18:40 20:11	20:40	38	07:29 (4) 20:56 26 07:28 (4)	
26	07:38	08:02 (5) 07:03	06:19 06:32	06:01		06:51 (4) 05:57 07:02 (4)	
	17:35	22 08:24 (5) 18:12	18:41 20:12	20:41	37	07:28 (4) 20:56 26 07:28 (4)	
27	07:37	08:01 (5) 07:02	06:18 06:31	06:01		06:51 (4) 05:57 07:02 (4)	
	17:37	24 08:25 (5) 18:13	18:42 20:13	20:42	37	07:28 (4) 20:56 26 07:28 (4)	
28	07:36	08:01 (5) 07:00	06:16 06:30	06:00		06:52 (4) 05:58 07:03 (4)	
	17:38	25 08:26 (5) 18:14	18:43 20:14	20:42	36	07:28 (4) 20:56 26 07:29 (4)	
29	07:36	08:00 (5) 07:00	06:15 06:28	06:00		06:52 (4) 05:58 07:02 (4)	
	17:39	26 08:26 (5) 18:15	19:44 20:15	20:43	36	07:28 (4) 20:56 27 07:29 (4)	
30	07:35	08:00 (5) 07:00	06:13 06:27	05:59		06:52 (4) 05:59 07:03 (4)	
	17:40	27 08:27 (5) 18:16	19:45 20:16	20:44	36	07:28 (4) 20:56 27 07:30 (4)	
31	07:34	08:01 (5) 07:00	06:11 06:25	05:59		06:53 (4) 05:59 07:03 (4)	
	17:41	27 08:28 (5) 18:17	19:46 20:17	20:45	35	07:28 (4) 20:56 27 07:30 (4)	
Potential sun hours	301	299	370	397	445	448	
Total, worst case		779	311			977	837
Sun reduction		0.45	0.47			0.59	0.66
Oper. time red.		0.24	0.24			0.24	0.24
Wind dir. red.		0.75	0.80			0.69	0.69
Total reduction		0.08	0.09			0.10	0.11
Total, real		64	28			95	91

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:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: Q - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (17) R17

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59	07:02 (4) 06:22	07:02 (4) 06:51	07:19	06:52	07:34 (5) 07:25
	28	07:30 (4) 20:38	07:37 (4) 19:57	19:08	17:23	07:56 (5) 17:00
2	05:59	07:02 (4) 06:23	07:03 (4) 06:52	07:20	06:53	07:33 (5) 07:26
	28	07:30 (4) 20:37	07:36 (4) 19:55	19:06	17:22	07:57 (5) 17:00
3	06:00	07:02 (4) 06:24	07:04 (4) 06:53	07:21	06:54	07:32 (5) 07:27
	29	07:31 (4) 20:36	07:36 (4) 19:54	19:05	17:21	07:57 (5) 17:00
4	06:00	07:01 (4) 06:25	07:04 (4) 06:54	07:22	06:55	07:31 (5) 07:28
	30	07:31 (4) 20:35	07:35 (4) 19:52	19:03	17:20	07:58 (5) 16:59
5	06:01	07:02 (4) 06:26	07:05 (4) 06:55	07:23	06:56	07:30 (5) 07:29
	30	07:32 (4) 20:34	07:34 (4) 19:50	19:02	17:19	07:58 (5) 16:59
6	06:02	07:02 (4) 06:26	07:07 (4) 06:56	07:24	06:57	07:31 (5) 07:30
	31	07:33 (4) 20:33	07:33 (4) 19:49	19:00	17:17	07:59 (5) 16:59
7	06:02	07:01 (4) 06:27	07:08 (4) 06:57	07:25	06:58	07:31 (5) 07:31
	32	07:33 (4) 20:32	07:32 (4) 19:47	18:58	17:16	07:59 (5) 16:59
8	06:03	07:02 (4) 06:28	07:10 (4) 06:57	07:26	07:00	07:30 (5) 07:32
	32	07:34 (4) 20:30	07:30 (4) 19:46	18:57	17:15	07:59 (5) 16:59
9	06:03	07:01 (4) 06:29	07:12 (4) 06:58	07:27	07:01	07:30 (5) 07:33
	33	07:34 (4) 20:29	07:28 (4) 19:44	18:55	17:14	07:59 (5) 16:59
10	06:04	07:01 (4) 06:30	07:15 (4) 06:59	07:28	07:02	07:31 (5) 07:33
	34	07:35 (4) 20:28	07:23 (4) 19:42	18:54	17:13	08:00 (5) 16:59
11	06:05	07:01 (4) 06:31	07:00	07:29	07:03	07:31 (5) 07:34
	35	07:36 (4) 20:27	19:41	18:52	17:12	07:59 (5) 16:59
12	06:05	07:01 (4) 06:32	07:01	07:30	07:04	07:32 (5) 07:35
	34	07:35 (4) 20:25	19:39	18:51	17:11	07:59 (5) 16:59
13	06:06	07:01 (4) 06:33	07:02	07:31	07:05	07:32 (5) 07:36
	35	07:36 (4) 20:24	19:37	18:49	17:11	07:58 (5) 17:00
14	06:07	07:01 (4) 06:34	07:03	07:32	07:06	07:33 (5) 07:37
	36	07:37 (4) 20:23	19:36	18:48	17:10	07:58 (5) 17:00
15	06:08	07:01 (4) 06:35	07:04	07:33	07:08	07:34 (5) 07:37
	36	07:37 (4) 20:22	19:34	18:46	17:09	07:58 (5) 17:00
16	06:08	07:00 (4) 06:36	07:05	07:34	07:09	07:35 (5) 07:38
	37	07:37 (4) 20:20	19:33	18:45	17:08	07:57 (5) 17:00
17	06:09	07:00 (4) 06:37	07:06	07:35	07:10	07:36 (5) 07:39
	38	07:38 (4) 20:19	19:31	18:43	17:07	07:56 (5) 17:01
18	06:10	07:01 (4) 06:38	07:07	07:36	07:11	07:37 (5) 07:39
	37	07:38 (4) 20:17	19:29	18:42	17:07	07:55 (5) 17:01
19	06:11	07:01 (4) 06:39	07:08	07:37	07:12	07:38 (5) 07:40
	38	07:39 (4) 20:16	19:28	18:40	17:06	07:54 (5) 17:01
20	06:11	07:00 (4) 06:40	07:09	07:38	07:13	07:41 (5) 07:41
	38	07:38 (4) 20:15	19:26	18:39	17:05	07:53 (5) 17:02
21	06:12	07:00 (4) 06:41	07:10	07:39	07:14	07:44 (5) 07:41
	39	07:39 (4) 20:13	19:24	18:37	17:05	07:51 (5) 17:02
22	06:13	07:00 (4) 06:42	07:11	07:41	07:15	07:42
	39	07:39 (4) 20:12	19:23	18:36	17:04	07:03
23	06:14	07:01 (4) 06:42	07:12	07:42	07:17	07:42
	38	07:39 (4) 20:10	19:21	18:35	17:03	07:03
24	06:15	07:01 (4) 06:43	07:12	07:43	07:18	07:43
	38	07:39 (4) 20:09	19:19	18:33	17:03	07:04
25	06:16	07:00 (4) 06:44	07:13	06:44	07:19	08:39 (6) 07:43
	39	07:39 (4) 20:07	19:18	17:32	17:02	08:51 (6) 17:04
26	06:16	07:00 (4) 06:45	07:14	06:45	07:20	08:37 (6) 07:43
	39	07:39 (4) 20:06	19:16	17:31	17:02	08:55 (6) 17:05
27	06:17	07:01 (4) 06:46	07:15	06:46	07:21	08:36 (6) 07:44
	38	07:39 (4) 20:04	19:14	17:29	17:01	08:57 (6) 17:06
28	06:18	07:01 (4) 06:47	07:16	06:47	07:22	08:34 (6) 07:44
	38	07:39 (4) 20:03	19:13	17:28	17:01	08:59 (6) 17:06
29	06:19	07:02 (4) 06:48	07:17	06:48	07:23	08:33 (6) 07:44
	37	07:39 (4) 20:01	19:11	17:27	11	07:50 (5) 17:01
30	06:20	07:02 (4) 06:49	07:18	06:49	07:24	08:32 (6) 07:45
	36	07:38 (4) 20:00	19:10	17:25	16	07:52 (5) 17:00
31	06:21	07:03 (4) 06:50	06:50	07:34 (5)	30	09:02 (6) 17:08
	35	07:38 (4) 19:58	17:24	20	07:54 (5)	07:45
Potential sun hours	455	426	374	347	301	292
Total, worst case	1087	254	47	628	1311	
Sun reduction	0.74	0.73	0.54	0.51	0.45	
Oper. time red.	0.24	0.24	0.24	0.24	0.24	
Wind dir. red.	0.69	0.69	0.80	0.78	0.74	
Total reduction	0.12	0.12	0.10	0.09	0.08	
Total, real	132	31	5	59	105	

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:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: R - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (18) R18

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 17:09	07:33 17:43	06:59 18:15	07:39 (7) 08:04 (7)	07:10 19:47	05:58 20:45
2	07:45 17:10	07:32 17:44	06:57 18:16	07:40 (7) 08:03 (7)	07:08 19:48	05:58 20:46
3	07:45 17:11	07:31 17:45	06:56 18:17	07:40 (7) 08:02 (7)	07:07 19:49	05:57 20:47
4	07:45 17:12	07:30 17:46	06:54 18:18	07:42 (7) 08:01 (7)	07:05 19:50	05:57 20:47
5	07:46 17:13	07:29 17:47	06:53 18:19	07:43 (7) 07:58 (7)	07:03 19:51	05:57 20:48
6	07:46 17:14	07:28 17:48	06:51 18:20	07:46 (7) 07:55 (7)	07:02 19:52	05:56 20:49
7	07:45 17:15	07:27 17:50	06:50 18:21	07:00 19:53	07:00 20:23	05:56 20:49
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24	05:56 20:50
9	07:45 17:17	07:25 17:52	06:46 18:24	06:57 19:55	06:16 20:25	05:56 20:51
10	07:45 17:18	07:24 17:53	06:45 18:25	06:56 19:56	06:15 20:26	05:56 20:51
11	07:45 17:19	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27	05:55 20:52
12	07:45 17:20	07:21 17:56	06:42 18:27	06:52 19:58	06:13 20:28	05:55 20:52
13	07:44 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 20:53
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 20:53
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 20:53
16	07:43 17:24	07:17 18:00	06:35 18:31	06:46 20:02	06:09 20:32	05:55 20:54
17	07:43 17:25	07:15 18:01	06:34 18:32	06:45 20:03	06:08 20:33	05:55 20:54
18	07:43 17:26	07:14 18:03	06:32 18:33	06:43 20:04	07:22 (5) 07:35 (5)	06:07 20:34
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 20:05	07:19 (5) 07:36 (5)	06:07 20:35
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	07:17 (5) 07:38 (5)	06:06 20:36
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	07:16 (5) 07:40 (5)	06:05 20:36
22	07:40 17:31	07:09 18:07	06:26 18:37	06:38 20:08	07:14 (5) 07:40 (5)	06:04 20:37
23	07:40 17:32	07:07 18:08	06:24 18:38	06:36 20:09	07:13 (5) 07:41 (5)	06:04 20:38
24	07:39 17:33	07:06 18:09	06:23 18:39	06:35 20:10	07:12 (5) 07:41 (5)	06:03 20:39
25	07:39 17:34	07:04 18:11	06:21 18:40	06:34 20:11	07:11 (5) 07:42 (5)	06:02 20:40
26	07:38 17:35	07:03 18:12	06:19 18:41	06:32 20:12	07:11 (5) 07:42 (5)	06:01 20:41
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	07:11 (5) 07:42 (5)	06:01 20:42
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	07:10 (5) 07:42 (5)	06:00 20:42
29	07:36 17:39	07:00 18:14	06:16 18:43	06:30 20:14	07:10 (5) 07:42 (5)	06:00 20:42
30	07:35 17:40	07:00 18:14	06:16 18:43	06:30 20:14	07:10 (5) 07:42 (5)	06:00 20:42
31	07:34 17:41	07:00 18:14	06:16 18:43	06:30 20:14	07:10 (5) 07:42 (5)	06:00 20:42
Potential sun hours	301	299	370	397	445	448
Total, worst case		265	113	347	286	
Sun reduction		0.47	0.49	0.53	0.59	
Oper. time red.		0.24	0.24	0.24	0.24	
Wind dir. red.		0.80	0.80	0.73	0.73	
Total reduction		0.09	0.09	0.09	0.10	
Total, real		24	11	32	29	

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:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: R - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (18) R18

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December		
1	05:59	06:22	07:29 (5)	06:51	07:19	06:52	07:25	
	20:56	20:38	11 07:40 (5)	19:57	19:08	17:23	17:00	
2	05:59	06:23	07:27 (5)	06:52	07:20	06:53	07:26	
	20:56	20:37	15 07:42 (5)	19:55	19:06	17:22	17:00	
3	06:00	06:24	07:25 (5)	06:53	07:21	06:54	07:27	
	20:56	20:36	19 07:44 (5)	19:54	19:05	17:21	17:00	
4	06:01	06:25	07:24 (5)	06:54	07:22	06:55	07:28	
	20:56	20:35	21 07:45 (5)	19:52	19:03	17:20	17:00	
5	06:01	06:26	07:23 (5)	06:55	07:23	06:56	07:29	
	20:55	20:34	23 07:46 (5)	19:50	19:02	17:19	16:59	
6	06:02	06:26	07:22 (5)	06:56	07:24	06:57	07:30	
	20:55	20:33	25 07:47 (5)	19:49	19:00	17:17	16:59	
7	06:02	06:27	07:21 (5)	06:57	07:25	08:26 (7)	06:58	07:31
	20:55	20:32	27 07:48 (5)	19:47	18:58	2 08:27 (7)	17:16	16:59
8	06:03	06:28	07:20 (5)	06:57	07:26	08:20 (7)	07:00	07:32
	20:55	20:30	29 07:49 (5)	19:46	18:57	12 08:32 (7)	17:15	16:59
9	06:03	06:29	07:20 (5)	06:58	07:27	08:17 (7)	07:01	07:33
	20:54	20:29	29 07:49 (5)	19:44	18:55	17 08:34 (7)	17:14	16:59
10	06:04	06:30	07:18 (5)	06:59	07:28	08:16 (7)	07:02	07:33
	20:54	20:28	31 07:49 (5)	19:42	18:54	20 08:36 (7)	17:13	16:59
11	06:05	06:31	07:18 (5)	07:00	07:29	08:14 (7)	07:03	07:34
	20:54	20:27	31 07:49 (5)	19:41	18:52	23 08:37 (7)	17:12	16:59
12	06:05	06:32	07:18 (5)	07:01	07:30	08:13 (7)	07:04	07:35
	20:53	20:25	31 07:49 (5)	19:39	18:51	24 08:37 (7)	17:12	16:59
13	06:06	06:33	07:18 (5)	07:02	07:31	08:12 (7)	07:05	07:36
	20:53	20:24	31 07:49 (5)	19:37	18:49	25 08:37 (7)	17:11	17:00
14	06:07	06:34	07:18 (5)	07:03	07:32	08:11 (7)	07:06	07:37
	20:52	20:23	31 07:49 (5)	19:36	18:48	27 08:38 (7)	17:10	17:00
15	06:08	06:35	07:17 (5)	07:04	07:33	08:11 (7)	07:08	07:37
	20:52	20:22	32 07:49 (5)	19:34	18:46	27 08:38 (7)	17:09	17:00
16	06:08	06:36	07:18 (5)	07:05	07:34	08:10 (7)	07:09	07:38
	20:51	20:20	31 07:49 (5)	19:33	18:45	27 08:37 (7)	17:08	17:00
17	06:09	06:37	07:18 (5)	07:06	07:35	08:10 (7)	07:10	07:39
	20:50	20:19	31 07:49 (5)	19:31	18:43	27 08:37 (7)	17:07	17:01
18	06:10	06:38	07:18 (5)	07:07	07:36	08:10 (7)	07:11	07:39
	20:50	20:17	30 07:48 (5)	19:29	18:42	26 08:36 (7)	17:07	17:01
19	06:11	06:39	07:19 (5)	07:08	07:37	08:11 (7)	07:12	07:40
	20:49	20:16	29 07:48 (5)	19:28	18:40	26 08:37 (7)	17:06	17:01
20	06:11	06:40	07:19 (5)	07:09	07:38	08:12 (7)	07:13	07:41
	20:49	20:15	28 07:47 (5)	19:26	18:39	24 08:36 (7)	17:05	17:02
21	06:12	06:41	07:19 (5)	07:10	07:39	08:12 (7)	07:14	07:41
	20:48	20:13	26 07:45 (5)	19:24	18:37	23 08:35 (7)	17:05	17:02
22	06:13	06:42	07:20 (5)	07:11	07:41	08:13 (7)	07:15	07:42
	20:47	20:12	24 07:44 (5)	19:23	18:36	20 08:33 (7)	17:04	17:03
23	06:14	06:43	07:21 (5)	07:12	07:42	08:15 (7)	07:17	07:42
	20:46	20:10	21 07:42 (5)	19:21	18:35	17 08:32 (7)	17:03	17:03
24	06:15	06:43	07:23 (5)	07:12	07:43	08:16 (7)	07:18	07:43
	20:46	20:09	17 07:40 (5)	19:19	18:33	13 08:29 (7)	17:03	17:04
25	06:16	06:44	07:25 (5)	07:13	06:44	07:20 (7)	07:19	07:43
	20:45	20:07	12 07:37 (5)	19:18	17:32	5 07:25 (7)	17:02	17:04
26	06:17	06:45		07:14	06:45		07:20	07:43
	20:44	20:06		19:16	17:31		17:02	17:05
27	06:17	06:46		07:15	06:46		07:21	07:44
	20:43	20:04		19:14	17:29		17:02	17:06
28	06:18	06:47		07:16	06:47		07:22	07:44
	20:42	20:03		19:13	17:28		17:01	17:06
29	06:19	06:48		07:17	06:48		07:23	07:44
	20:41	20:01		19:11	17:27		17:01	17:07
30	06:20	06:49		07:18	06:49		07:24	07:45
	20:40	20:00		19:10	17:26		17:00	17:08
31	06:21	07:35 (5)	06:50		06:50			07:45
	20:39	2 07:36 (5)	19:58		17:24			17:08
Potential sun hours	455	426	374	347		301	292	
Total, worst case	2	635		385				
Sun reduction	0.74	0.73		0.54				
Oper. time red.	0.24	0.24		0.24				
Wind dir. red.	0.73	0.73		0.80				
Total reduction	0.13	0.13		0.10				
Total, real	0	80		40				

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:

Windpro Isili - shadow flickering

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+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: S - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (19) R19

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI/ELIMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

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

Project:

Windpro Isili - shadow flickering

Printed/Page

2023-12-04 10:46 / 26

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: T - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (20) R20

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

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

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 27

Licensed user:

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IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: U - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (21) R21

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELIMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

Table with columns for months (January-December) and rows for each day of the month (1-31), showing sun rise and set times and potential sun hours.

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 28

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: V - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (22) R22

Assumptions for shadow calculations

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

Table with 12 columns (Jan-Dec) and 2 rows of sunshine probability values.

Operational time

Table with 13 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 2 rows of operational time values.

Idle start wind speed: Cut in wind speed from power curve

Main shadow flickering calculation table with columns for months (January-December) and rows for sun hours, reduction factors, and total real sun hours.

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

Matrix defining table layout with columns for Day in month, Sun rise/set, Minutes with flicker, and First/Last time with flicker.

Project:

Windpro Isili - shadow flickering

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: W - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (23) R23

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

Table with columns for months (January to December) and rows for days (1 to 31). Includes data for sun rise/set times, minutes with flicker, and total reduction.

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 30

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Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: X - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (24) R24

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	07:45 (3) 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:00
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	07:45 (3) 20:18	05:58 20:46	05:59 20:56	06:23 20:37	06:52 19:55	07:20 19:06	06:53 17:22	07:26 17:00
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	07:46 (3) 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	07:46 (3) 20:20	05:57 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	07:47 (3) 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	07:47 (3) 19:02	06:56 17:19	07:29 16:59
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	07:48 (3) 20:22	05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:58 (3) 19:00	06:57 17:17	07:30 16:59
7	07:46 17:15	07:27 17:50	06:50 18:22	07:00 19:53	07:50 (3) 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:42 (3) 18:58	06:58 17:16	07:31 16:59
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	08:02 (3) 20:24	05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	07:41 (3) 18:57	07:26 17:15	07:32 16:59
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	07:39 (3) 18:55	07:27 17:14	07:33 16:59
10	07:45 17:18	07:24 17:53	06:45 18:25	06:56 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	07:38 (3) 18:54	07:28 17:13	07:34 16:59
11	07:45 17:19	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	07:37 (3) 18:52	07:29 17:12	07:34 16:59
12	07:45 17:20	07:21 17:56	06:42 18:27	06:52 19:58	06:13 20:28	05:55 20:52	06:05 20:53	06:32 20:26	07:01 19:39	07:37 (3) 18:51	07:30 17:12	07:35 16:59
13	07:45 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 20:53	06:06 20:53	06:33 20:24	07:02 19:38	07:36 (3) 18:49	07:31 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:36 (3) 18:48	07:32 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 20:54	06:08 20:52	06:35 20:22	07:04 19:34	07:36 (3) 18:46	07:33 17:09	07:38 17:00
16	07:44 17:24	07:17 18:00	06:36 18:31	06:46 20:02	06:09 20:32	05:55 20:54	06:08 20:51	06:36 20:20	07:05 19:33	07:36 (3) 18:45	07:34 17:08	07:38 17:00
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:08 20:33	05:55 20:54	06:09 20:51	06:37 20:19	07:06 19:31	07:36 (3) 18:43	07:35 17:07	07:39 17:01
18	07:43 17:26	07:14 18:03	06:32 18:33	06:44 20:04	06:07 20:34	05:55 20:55	06:10 20:50	06:38 20:18	07:07 19:29	07:37 (3) 18:42	07:36 17:07	07:39 17:01
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:55 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:38 (3) 18:40	07:37 17:06	07:40 17:01
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	06:11 20:49	06:40 20:15	07:09 19:26	07:38 (3) 18:39	07:38 17:05	07:41 17:02
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:37	05:56 20:55	06:12 20:48	06:41 20:13	07:10 19:24	07:40 (3) 18:37	07:40 17:05	07:41 17:02
22	07:41 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:04 20:37	05:56 20:56	06:13 20:47	06:37 20:12	07:06 19:23	07:36 (3) 18:36	07:35 17:04	07:42 17:03
23	07:40 17:32	07:07 18:08	06:24 18:38	06:36 20:09	06:04 20:38	05:56 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:50 (3) 18:35	07:42 17:03	07:43 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	06:35 20:10	06:03 20:39	05:56 20:56	06:15 20:46	06:43 20:09	07:13 19:19	07:43 (3) 18:33	07:43 17:03	07:43 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	06:34 20:11	06:02 20:40	05:57 20:56	06:16 20:45	06:44 20:07	07:13 19:18	07:44 (3) 18:32	07:44 17:02	07:43 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:01 20:41	05:57 20:56	06:17 20:44	06:45 20:06	07:14 19:16	07:45 (3) 18:31	07:45 17:02	07:44 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:57 20:56	06:17 20:43	06:46 20:04	07:15 19:15	07:46 (3) 18:30	07:46 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 20:42	05:58 20:56	06:18 20:42	06:47 20:03	07:16 19:13	07:47 (3) 18:29	07:47 17:01	07:44 17:06
29	07:36 17:39	07:15 19:44	06:28 19:15	06:28 20:15	06:00 20:43	05:58 20:56	06:19 20:41	06:48 20:01	07:17 19:11	07:48 (3) 18:27	07:48 17:01	07:45 17:07
30	07:35 17:40	07:13 19:45	06:27 19:15	06:27 20:16	05:59 20:44	05:59 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:49 (3) 18:26	07:49 17:00	07:45 17:08
31	07:34 17:41	07:11 19:46	06:25 19:16	06:25 20:17	05:59 20:45	05:59 20:56	06:21 20:39	06:50 19:58	07:19 18:24	07:50 (3) 18:24	07:50 17:08	07:45 17:08
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292
Total, worst case			234	147					389			
Sun reduction			0.49	0.53					0.65			
Oper. time red.			0.24	0.24					0.24			
Wind dir. red.			0.78	0.78					0.78			
Total reduction			0.09	0.10					0.12			
Total, real			21	14					47			

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:

Windpro Isili - shadow flickering

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Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: Y - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (25) R25

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:45	07:33	06:59	07:10	07:45 (3)	06:26	05:58	05:59	06:22	06:51	07:19	06:52	07:25	
	17:09	17:43	18:15	19:47	08:13 (3)	20:17	20:45	20:56	20:38	19:57	19:08	17:23	17:00	
2	07:45	07:32	06:57	07:08	07:45 (3)	06:24	05:58	05:59	06:23	06:52	07:20	06:53	07:26	
	17:10	17:44	18:16	19:48	08:12 (3)	20:18	20:46	20:56	20:37	19:55	19:06	17:22	17:00	
3	07:46	07:31	06:56	07:07	07:46 (3)	06:23	05:57	06:00	06:24	06:53	07:21	06:54	07:27	
	17:11	17:45	18:17	19:49	08:11 (3)	20:19	20:47	20:56	20:36	19:54	19:05	17:21	17:00	
4	07:46	07:30	06:54	07:05	07:46 (3)	06:22	05:57	06:01	06:25	06:54	07:52 (3)	07:22	06:55	07:28
	17:12	17:46	18:18	19:50	08:10 (3)	20:20	20:48	20:56	20:35	19:52	4 07:56 (3)	19:03	17:20	17:00
5	07:46	07:29	06:53	07:03	07:48 (3)	06:21	05:57	06:01	06:26	06:55	07:47 (3)	07:23	06:56	07:29
	17:13	17:47	18:19	19:51	08:09 (3)	20:21	20:48	20:56	20:34	19:50	13 08:00 (3)	19:02	17:19	16:59
6	07:46	07:28	06:51	07:02	07:49 (3)	06:20	05:56	06:02	06:27	06:56	07:45 (3)	07:24	06:57	07:30
	17:14	17:49	18:20	19:52	08:06 (3)	20:22	20:49	20:55	20:33	19:49	17 08:02 (3)	19:00	17:17	16:59
7	07:46	07:27	06:50	07:00	07:50 (3)	06:19	05:56	06:02	06:27	06:57	07:43 (3)	07:25	06:58	07:31
	17:15	17:50	18:22	19:53	08:03 (3)	20:23	20:49	20:55	20:32	19:47	21 08:04 (3)	18:58	17:16	16:59
8	07:45	07:26	06:48	06:59	07:54 (3)	06:17	05:56	06:03	06:28	06:58	07:41 (3)	07:26	07:00	07:32
	17:16	17:51	18:23	19:54	6 08:00 (3)	20:24	20:50	20:55	20:30	19:46	24 08:05 (3)	18:57	17:15	16:59
9	07:45	07:25	06:47	06:57	06:16	05:56	06:03	06:29	06:58	07:39 (3)	07:27	07:01	07:33	
	17:17	17:52	18:24	19:55	20:25	20:51	20:54	20:29	19:44	25 08:04 (3)	18:55	17:14	16:59	
10	07:45	07:24	06:45	06:56	06:15	05:56	06:04	06:30	06:59	07:38 (3)	07:28	07:02	07:34	
	17:18	17:53	18:25	19:56	20:26	20:51	20:54	20:28	19:42	27 08:05 (3)	18:54	17:13	16:59	
11	07:45	07:23	06:43	06:54	06:14	05:55	06:05	06:31	07:00	07:38 (3)	07:29	07:03	07:34	
	17:19	17:54	18:26	19:57	20:27	20:52	20:54	20:27	19:41	27 08:05 (3)	18:52	17:12	16:59	
12	07:45	07:21	06:42	06:52	06:13	05:55	06:05	06:32	07:01	07:37 (3)	07:30	07:04	07:35	
	17:20	17:56	18:27	19:58	20:28	20:52	20:53	20:26	19:39	28 08:05 (3)	18:51	17:12	16:59	
13	07:45	07:20	06:40	06:51	06:12	05:55	06:06	06:33	07:02	07:37 (3)	07:31	07:05	07:36	
	17:21	17:57	18:28	19:59	20:29	20:53	20:53	20:24	19:38	28 08:05 (3)	18:49	17:11	17:00	
14	07:44	07:19	06:39	06:49	06:11	05:55	06:07	06:34	07:03	07:37 (3)	07:32	07:06	07:37	
	17:22	17:58	18:29	20:00	20:30	20:53	20:52	20:23	19:36	28 08:05 (3)	18:48	17:10	17:00	
15	07:44	07:18	06:37	06:48	06:10	05:55	06:08	06:35	07:04	07:36 (3)	07:33	07:08	07:37	
	17:23	17:59	18:30	20:01	20:31	20:54	20:52	20:22	19:34	28 08:04 (3)	18:46	17:09	17:00	
16	07:44	07:17	06:36	06:46	06:09	05:55	06:08	06:36	07:05	07:37 (3)	07:34	07:09	07:38	
	17:24	18:00	18:31	20:02	20:32	20:54	20:51	20:20	19:33	27 08:04 (3)	18:45	17:08	17:00	
17	07:43	07:15	06:34	06:45	06:08	05:55	06:09	06:37	07:06	07:37 (3)	07:35	07:10	07:39	
	17:25	18:02	18:32	20:03	20:33	20:54	20:51	20:19	19:31	26 08:03 (3)	18:43	17:07	17:01	
18	07:43	07:14	06:32	06:44	06:07	05:55	06:10	06:38	07:07	07:37 (3)	07:36	07:11	07:39	
	17:26	18:03	18:33	20:04	20:34	20:55	20:50	20:18	19:29	25 08:02 (3)	18:42	17:07	17:01	
19	07:42	07:13	06:31	06:42	06:07	05:55	06:11	06:39	07:08	07:38 (3)	07:37	07:12	07:40	
	17:27	18:04	18:34	20:05	20:35	20:55	20:49	20:16	19:28	22 08:00 (3)	18:40	17:06	17:01	
20	07:42	07:11	06:29	06:41	06:06	05:56	06:11	06:40	07:09	07:38 (3)	07:38	07:13	07:41	
	17:28	18:05	18:35	20:06	20:36	20:55	20:49	20:15	19:26	20 07:58 (3)	18:39	17:05	17:02	
21	07:41	07:10	06:27	06:39	06:05	05:56	06:12	06:41	07:10	07:40 (3)	07:40	07:14	07:41	
	17:30	18:06	18:36	5 07:01 (3)	20:07	20:37	20:55	20:48	20:13	19:24	15 07:55 (3)	18:37	17:05	17:02
22	07:41	07:09	06:26	06:38	06:04	05:56	06:13	06:42	07:11	07:43 (3)	07:41	07:15	07:42	
	17:31	18:07	18:37	14 07:09 (3)	20:08	20:37	20:56	20:47	20:12	19:23	9 07:52 (3)	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	06:04	05:56	06:14	06:43	07:12	07:42	07:42	07:17	07:42	
	17:32	18:08	18:38	18 07:11 (3)	20:09	20:38	20:56	20:46	20:10	19:21	18:35	17:03	17:03	
24	07:39	07:06	06:23	06:35	06:03	05:56	06:15	06:43	07:13	07:43	07:43	07:18	07:43	
	17:33	18:09	18:39	22 07:13 (3)	20:10	20:39	20:56	20:46	20:09	19:19	18:33	17:03	17:04	
25	07:39	07:04	06:21	06:34	06:02	05:57	06:16	06:44	07:13	07:44	07:44	07:19	07:43	
	17:34	18:11	18:40	24 07:13 (3)	20:11	20:40	20:56	20:45	20:07	19:18	17:32	17:02	17:04	
26	07:38	07:03	06:19	06:32	06:01	05:57	06:17	06:45	07:14	07:45	07:45	07:20	07:44	
	17:35	18:12	18:41	25 07:14 (3)	20:12	20:41	20:56	20:44	20:06	19:16	17:31	17:02	17:05	
27	07:37	07:02	06:18	06:31	06:01	05:57	06:17	06:46	07:15	07:46	07:46	07:21	07:44	
	17:37	18:13	18:42	27 07:14 (3)	20:13	20:42	20:56	20:43	20:04	19:15	17:29	17:02	17:06	
28	07:36	07:00	06:16	06:30	06:00	05:58	06:18	06:47	07:16	07:47	07:47	07:22	07:44	
	17:38	18:14	18:43	28 07:14 (3)	20:14	20:42	20:56	20:42	20:03	19:13	17:28	17:01	17:06	
29	07:36	07:15	06:28	06:32	06:00	05:58	06:19	06:48	07:17	07:48	07:48	07:23	07:45	
	17:39	19:44	29 08:15 (3)	20:15	20:43	20:56	20:41	20:01	19:11	19:11	17:27	17:01	17:07	
30	07:35	07:13	06:27	06:31	05:59	05:59	06:20	06:49	07:18	07:49	07:49	07:24	07:45	
	17:40	19:45	28 08:14 (3)	20:16	20:44	20:56	20:40	20:00	19:10	19:10	17:26	17:00	17:08	
31	07:34	07:11	06:25	06:29	05:59	05:59	06:21	06:50			06:51	07:05	07:45	
	17:41	19:46	28 08:14 (3)		20:45		20:39	19:58			17:24	17:08	17:08	
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292		
Total, worst case			248	161					414					
Sun reduction			0.49	0.53					0.65					
Oper. time red.			0.24	0.24					0.24					
Wind dir. red.			0.78	0.78					0.78					
Total reduction			0.09	0.10					0.12					
Total, real			23	16					50					

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:
Windpro Isili - shadow flickering

Printed/Page
2023-12-04 10:46 / 32

Licensed user:
Ing. Bruno Manca
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IT-09028 Sestu
+390702358125
Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: Z - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (26) R26

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	07:46 (3) 17:23	06:52 17:00	07:25 17:00
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:06	07:48 (3) 17:22	06:53 17:00	07:26 17:00
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	07:50 (3) 17:21	06:54 17:00	07:27 17:00
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 20:20	05:57 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	07:59 (3) 17:20	06:55 17:00	07:28 17:00
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	07:23 19:02	07:59 (3) 17:19	06:56 16:59	07:29 16:59
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	06:20 20:22	05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	07:59 (3) 17:17	06:57 16:59	07:30 16:59
7	07:46 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:25 18:58	07:59 (3) 17:16	06:58 16:59	07:31 16:59
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24	05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	07:26 18:57	07:59 (3) 17:15	07:00 16:59	07:32 16:59
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:16 20:25	05:56 20:51	06:03 20:54	06:29 20:29	06:58 19:44	07:27 18:55	07:59 (3) 17:14	07:01 16:59	07:33 16:59
10	07:45 17:18	07:24 17:53	06:45 18:25	07:14 (3) 19:56	06:15 20:26	05:56 20:51	06:04 20:54	06:30 20:28	06:59 19:42	07:28 18:54	07:59 (3) 17:13	07:02 16:59	07:34 16:59
11	07:45 17:19	07:23 17:54	06:43 18:26	07:10 (3) 19:57	06:14 20:27	05:55 20:52	06:05 20:54	06:31 20:27	07:00 19:41	07:29 18:52	07:59 (3) 17:12	07:03 16:59	07:34 16:59
12	07:45 17:20	07:22 17:56	06:42 18:27	07:07 (3) 19:58	06:13 20:28	05:55 20:52	06:05 20:53	06:32 20:26	07:01 19:39	07:30 18:51	07:59 (3) 17:12	07:04 16:59	07:35 16:59
13	07:45 17:21	07:20 17:57	06:40 18:28	07:06 (3) 19:59	06:12 20:29	05:55 20:53	06:06 20:53	06:33 20:24	07:02 19:38	07:31 18:49	07:59 (3) 17:11	07:05 17:00	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	07:04 (3) 20:00	06:49 20:30	06:11 20:53	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:59 (3) 17:10	07:06 17:00	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	07:03 (3) 20:01	06:48 20:31	06:10 20:54	06:08 20:52	06:35 20:22	07:04 19:34	07:33 18:46	07:59 (3) 17:09	07:07 17:00	07:38 17:00
16	07:44 17:24	07:17 18:00	06:36 18:31	07:03 (3) 20:02	06:46 20:32	06:09 20:54	06:08 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:59 (3) 17:08	07:08 17:00	07:39 17:00
17	07:43 17:25	07:15 18:02	06:34 18:32	07:02 (3) 20:03	06:45 20:33	06:08 20:54	06:09 20:51	06:37 20:19	07:06 19:31	07:35 18:43	07:59 (3) 17:07	07:09 17:01	07:40 17:01
18	07:43 17:26	07:14 18:03	06:32 18:33	07:02 (3) 20:04	06:44 20:34	06:07 20:55	06:10 20:50	06:38 20:18	07:07 19:29	07:36 18:42	07:59 (3) 17:07	07:11 17:01	07:41 17:01
19	07:42 17:27	07:13 18:04	06:31 18:34	07:02 (3) 20:05	06:42 20:35	06:07 20:55	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:40	07:59 (3) 17:06	07:12 17:01	07:40 17:01
20	07:42 17:28	07:11 18:05	06:29 18:35	07:01 (3) 20:06	06:41 20:36	06:06 20:55	06:11 20:49	06:40 20:15	07:09 19:26	07:38 18:39	07:59 (3) 17:05	07:13 17:02	07:41 17:02
21	07:41 17:30	07:10 18:06	06:27 18:36	07:02 (3) 20:07	06:39 20:37	06:05 20:55	06:12 20:48	06:41 20:13	07:10 19:24	07:40 18:37	07:59 (3) 17:05	07:14 17:02	07:41 17:02
22	07:41 17:31	07:09 18:07	06:26 18:37	07:02 (3) 20:08	06:38 20:37	06:04 20:56	06:13 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:59 (3) 17:04	07:16 17:03	07:42 17:03
23	07:40 17:32	07:07 18:08	06:24 18:38	07:03 (3) 20:09	06:36 20:38	06:04 20:56	06:14 20:46	06:43 20:10	07:12 19:21	07:42 18:35	07:59 (3) 17:03	07:17 17:03	07:42 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	07:05 (3) 20:10	06:35 20:39	06:03 20:56	06:15 20:46	06:43 20:09	07:13 19:19	07:43 18:33	07:59 (3) 17:03	07:18 17:04	07:43 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	07:06 (3) 20:11	06:34 20:40	06:02 20:56	06:16 20:45	06:44 20:07	07:13 19:18	07:45 (3) 17:32	07:59 (3) 17:02	07:19 17:04	07:43 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	07:17 (3) 20:12	06:32 20:41	06:02 20:56	06:17 20:44	06:45 20:06	07:14 19:16	07:44 (3) 17:31	07:59 (3) 17:02	07:20 17:05	07:44 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	07:17 (3) 20:13	06:31 20:42	06:01 20:56	06:17 20:43	06:46 20:04	07:15 19:15	07:44 (3) 17:29	07:59 (3) 17:02	07:21 17:06	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	07:18 (3) 20:14	06:30 20:42	06:00 20:56	06:18 20:42	06:47 20:03	07:16 19:13	07:44 (3) 17:28	07:59 (3) 17:01	07:22 17:06	07:44 17:06
29	07:36 17:39	07:00 18:15	06:16 19:44	07:19 (3) 20:15	06:30 20:43	06:00 20:56	06:19 20:41	06:48 20:01	07:17 19:11	07:45 (3) 17:27	07:59 (3) 17:01	07:23 17:07	07:45 17:07
30	07:35 17:40	07:00 18:16	06:15 19:45	07:20 (3) 20:16	06:29 20:44	06:00 20:56	06:20 20:40	06:49 20:00	07:18 19:10	07:46 (3) 17:26	07:59 (3) 17:00	07:24 17:08	07:45 17:08
31	07:34 17:41	07:00 18:17	06:14 19:46	07:21 (3) 20:17	06:28 20:45	06:00 20:56	06:21 20:39	06:50 19:58	07:19 19:10	07:47 (3) 17:25	07:59 (3) 17:00	07:25 17:09	07:46 17:09
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292	
Total, worst case			309						273		41		
Sun reduction			0.49						0.65		0.54		
Oper. time red.			0.24						0.24		0.24		
Wind dir. red.			0.79						0.79		0.79		
Total reduction			0.09						0.12		0.10		
Total, real			29						33		4		

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 33

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AA - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (27) R27

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December				
1	07:45	07:33	06:59	07:10	06:26	05:58	05:59	06:22	06:51	07:26 (3)	07:19	06:52	07:25			
	17:09	17:43	18:15	19:47	19:17	20:17	20:45	20:38	19:57	31	07:57 (3)	19:08	17:23	17:00		
2	07:45	07:32	06:57	07:08	06:24	05:58	05:59	06:23	06:52	07:26 (3)	07:20	06:53	07:26			
	17:10	17:44	18:16	19:48	20:18	20:46	20:56	20:37	19:55	30	07:56 (3)	19:06	17:22	17:00		
3	07:46	07:31	06:56	07:07	07:39 (3)	06:23	05:57	06:00	06:53	07:26 (3)	07:21	06:54	07:27			
	17:11	17:45	18:17	19:49	13	07:52 (3)	20:19	20:47	19:54	30	07:56 (3)	19:05	17:21	17:00		
4	07:46	07:30	06:54	07:05	07:36 (3)	06:22	05:57	06:01	06:54	07:27 (3)	07:22	06:55	07:28			
	17:12	17:46	18:18	19:50	18	07:54 (3)	20:20	20:48	19:52	28	07:55 (3)	19:03	17:20	17:00		
5	07:46	07:29	06:53	07:03	07:34 (3)	06:21	05:57	06:01	06:55	07:27 (3)	07:23	06:56	07:29			
	17:13	17:47	18:19	19:51	22	07:56 (3)	20:21	20:48	19:50	27	07:54 (3)	19:02	17:19	16:59		
6	07:46	07:28	06:51	07:02	07:32 (3)	06:20	05:56	06:02	06:56	07:28 (3)	07:24	06:57	07:30			
	17:14	17:49	18:20	19:52	24	07:56 (3)	20:22	20:49	19:49	25	07:53 (3)	19:00	17:17	16:59		
7	07:46	07:27	06:50	07:00	07:30 (3)	06:19	05:56	06:02	06:57	07:29 (3)	07:25	06:58	07:31			
	17:15	17:50	18:22	19:53	27	07:57 (3)	20:23	20:49	19:47	22	07:51 (3)	18:58	17:16	16:59		
8	07:45	07:26	06:48	06:59	07:30 (3)	06:17	05:56	06:03	06:58	07:31 (3)	07:26	07:00	07:32			
	17:16	17:51	18:23	19:54	28	07:58 (3)	20:24	20:50	19:46	18	07:49 (3)	18:57	17:15	16:59		
9	07:45	07:25	06:47	06:57	07:28 (3)	06:16	05:56	06:03	06:58	07:32 (3)	07:27	07:01	07:33			
	17:17	17:52	18:24	19:55	30	07:58 (3)	20:25	20:51	19:44	13	07:45 (3)	18:55	17:14	16:59		
10	07:45	07:24	06:45	06:56	07:28 (3)	06:15	05:56	06:04	06:59	07:38 (3)	07:28	07:02	07:34			
	17:18	17:53	18:25	19:56	30	07:58 (3)	20:26	20:51	19:42	2	07:39 (3)	18:54	17:13	16:59		
11	07:45	07:23	06:43	06:54	07:27 (3)	06:14	05:55	06:05	06:31	07:00	07:29	07:03	07:34			
	17:19	17:54	18:26	19:57	31	07:58 (3)	20:27	20:52	19:41	18:52	17:12	16:59	17:00			
12	07:45	07:21	06:42	06:52	07:27 (3)	06:13	05:55	06:05	06:32	07:01	07:30	07:04	07:35			
	17:20	17:56	18:27	19:58	31	07:58 (3)	20:28	20:52	19:39	18:51	17:12	16:59	17:00			
13	07:45	07:20	06:40	06:51	07:27 (3)	06:12	05:55	06:06	06:33	07:02	07:31	07:05	07:36			
	17:21	17:57	18:28	19:59	30	07:57 (3)	20:29	20:53	19:38	18:49	17:11	17:00	17:00			
14	07:44	07:19	06:39	06:49	07:27 (3)	06:11	05:55	06:07	06:34	07:03	07:32	07:06	07:37			
	17:22	17:58	18:29	20:00	30	07:57 (3)	20:30	20:53	19:36	18:48	17:10	17:00	17:00			
15	07:44	07:18	06:37	06:48	07:27 (3)	06:10	05:55	06:08	06:35	07:04	07:33	07:08	07:37			
	17:23	17:59	18:30	20:01	29	07:56 (3)	20:31	20:54	19:34	18:46	17:09	17:00	17:00			
16	07:44	07:17	06:36	06:46	07:27 (3)	06:09	05:55	06:08	06:36	07:05	07:34	07:09	07:38			
	17:24	18:00	18:31	20:02	29	07:56 (3)	20:32	20:54	19:33	18:45	17:08	17:00	17:00			
17	07:43	07:15	06:34	06:45	07:27 (3)	06:08	05:55	06:09	06:37	07:06	07:35	07:10	07:39			
	17:25	18:01	18:32	20:03	27	07:54 (3)	20:33	20:54	19:31	18:43	17:07	17:01	17:01			
18	07:43	07:14	06:32	06:44	07:28 (3)	06:07	05:55	06:10	06:38	07:07	07:36	07:11	07:39			
	17:26	18:03	18:33	20:04	26	07:54 (3)	20:34	20:55	19:29	18:42	17:07	17:01	17:01			
19	07:42	07:13	06:31	06:42	07:28 (3)	06:07	05:55	06:11	06:39	07:08	07:37	07:12	07:40			
	17:27	18:04	18:34	20:05	24	07:52 (3)	20:35	20:55	19:28	18:40	17:06	17:01	17:01			
20	07:42	07:11	06:29	06:41	07:30 (3)	06:06	05:56	06:11	06:40	07:09	07:38	07:13	07:41			
	17:28	18:05	18:35	20:06	21	07:51 (3)	20:36	20:55	20:49	7	07:49 (3)	19:26	18:39	17:05	17:02	
21	07:41	07:10	06:27	06:39	07:31 (3)	06:05	05:56	06:12	06:41	07:37 (3)	07:10	07:40	07:14	07:41		
	17:30	18:06	18:36	20:07	18	07:49 (3)	20:37	20:55	20:48	20:13	14	07:51 (3)	19:24	18:37	17:05	17:02
22	07:41	07:09	06:26	06:38	07:33 (3)	06:04	05:56	06:13	06:42	07:35 (3)	07:11	07:41	07:15	07:42		
	17:31	18:07	18:37	20:08	13	07:46 (3)	20:37	20:56	20:47	20:12	18	07:53 (3)	19:23	18:36	17:04	17:03
23	07:40	07:07	06:24	06:36	07:38 (3)	06:04	05:56	06:14	06:43	07:33 (3)	07:12	07:42	07:17	07:42		
	17:32	18:08	18:38	20:09	4	07:42 (3)	20:38	20:56	20:46	20:10	22	07:55 (3)	19:21	18:35	17:03	17:03
24	07:39	07:06	06:23	06:35	06:03	06:03	05:56	06:15	06:43	07:32 (3)	07:13	07:43	07:18	07:43		
	17:33	18:09	18:39	20:10	20:39	20:56	20:46	20:09	24	07:56 (3)	19:19	18:33	17:03	17:04		
25	07:39	07:04	06:21	06:34	06:02	06:02	05:57	06:16	06:44	07:31 (3)	07:13	06:44	07:19	07:43		
	17:34	18:11	18:40	20:11	20:40	20:56	20:45	20:07	26	07:57 (3)	19:18	17:32	17:02	17:04		
26	07:38	07:03	06:19	06:32	06:01	06:01	05:57	06:17	06:45	07:30 (3)	07:14	06:45	07:20	07:44		
	17:35	18:12	18:41	20:12	20:41	20:56	20:44	20:06	27	07:57 (3)	19:16	17:31	17:02	17:05		
27	07:37	07:02	06:18	06:31	06:01	06:01	05:57	06:17	06:46	07:29 (3)	07:15	06:46	07:21	07:44		
	17:37	18:13	18:42	20:13	20:42	20:56	20:43	20:04	29	07:58 (3)	19:14	17:29	17:02	17:06		
28	07:36	07:00	06:16	06:30	06:00	06:00	05:58	06:18	06:47	07:28 (3)	07:16	06:47	07:22	07:44		
	17:38	18:14	18:43	20:14	20:42	20:56	20:42	20:03	30	07:58 (3)	19:13	17:28	17:01	17:06		
29	07:36	07:15	06:28	06:00	06:00	06:00	05:58	06:19	06:48	07:28 (3)	07:17	06:48	07:23	07:45		
	17:39	19:44	20:15	20:43	20:56	20:41	20:01	30	07:58 (3)	19:11	17:27	17:01	17:07	17:07		
30	07:35	07:13	06:27	06:00	05:59	05:59	06:20	06:49	07:28 (3)	07:18	06:49	07:24	07:45			
	17:40	19:45	20:16	20:44	20:56	20:40	20:00	30	07:58 (3)	19:10	17:26	17:00	17:08	17:08		
31	07:34	07:11	06:25	06:00	05:59	05:59	06:21	06:50	07:26 (3)	07:19	06:51	07:25	07:45			
	17:41	19:46	20:17	20:45	20:57	20:39	19:58	31	07:57 (3)	19:09	17:24	17:01	17:08	17:08		
Potential sun hours	301	299	370	397	445	448	455	426	374	347	301	292				
Total, worst case				505				288	226							
Sun reduction				0.53				0.73	0.65							
Oper. time red.				0.24				0.24	0.24							
Wind dir. red.				0.76				0.76	0.76							
Total reduction				0.10				0.13	0.12							
Total, real				48				38	26							

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 34

Licensed user:

Ing. Bruno Manca
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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AB - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (28) R28

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	07:08 (3) 20:17	05:58 20:45	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 17:00	
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 20:18	07:08 (3) 20:18	05:58 20:46	06:00 20:56	06:23 20:37	06:52 19:55	07:20 19:06	06:53 17:22	07:26 17:00	
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 20:19	07:10 (3) 20:19	05:57 20:47	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 17:00	
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 20:20	07:22 (3) 20:20	05:57 20:48	06:01 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 17:00	
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	07:19 (3) 20:21	05:57 20:48	06:01 20:56	06:26 20:34	06:55 19:50	07:23 19:02	06:56 17:19	07:29 16:59	
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	06:20 20:22		05:56 20:49	06:02 20:55	06:27 20:33	06:56 19:49	07:24 19:00	06:57 17:17	07:30 16:59	
7	07:46 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23		05:56 20:49	06:02 20:55	06:27 20:32	06:57 19:47	07:25 18:58	06:58 17:16	07:31 16:59	
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24		05:56 20:50	06:03 20:55	06:28 20:30	06:58 19:46	07:26 18:57	07:00 17:15	07:32 16:59	
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:16 20:25		05:56 20:51	06:03 20:54	06:29 20:29	07:22 (3) 19:44	06:58 19:44	07:27 18:55	07:01 17:14	07:33 16:59
10	07:45 17:18	07:24 17:53	06:45 18:25	06:56 19:56	06:15 20:26		05:56 20:51	06:04 20:54	06:30 20:28	07:19 (3) 19:42	06:59 19:42	07:28 18:54	07:02 17:13	07:34 16:59
11	07:45 17:19	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27		05:55 20:52	06:05 20:54	06:31 20:27	07:17 (3) 19:41	07:00 19:41	07:29 18:52	07:03 17:12	07:34 16:59
12	07:45 17:20	07:21 17:56	06:42 18:27	06:53 19:58	06:13 20:28		05:55 20:52	06:05 20:53	06:32 20:26	07:15 (3) 19:39	07:01 19:39	07:30 18:51	07:04 17:12	07:35 16:59
13	07:45 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29		05:55 20:53	06:06 20:53	06:33 20:24	07:14 (3) 19:38	07:02 19:38	07:31 18:49	07:05 17:11	07:36 17:00
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30		05:55 20:53	06:07 20:52	06:34 20:23	07:14 (3) 19:36	07:03 19:36	07:32 18:48	07:06 17:10	07:37 17:00
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31		05:55 20:54	06:08 20:52	06:35 20:22	07:13 (3) 19:34	07:04 19:34	07:33 18:46	07:08 17:09	07:37 17:00
16	07:44 17:24	07:17 18:00	06:36 18:31	06:46 20:02	06:09 20:32	07:15 (3)	05:55 20:54	06:08 20:51	06:36 20:20	07:12 (3) 19:33	07:05 19:33	07:34 18:45	07:09 17:08	07:38 17:00
17	07:43 17:25	07:15 18:02	06:34 18:32	06:45 20:03	06:08 20:33	07:26 (3)	05:55 20:54	06:09 20:51	06:37 20:19	07:12 (3) 19:31	07:06 19:31	07:35 18:43	07:10 17:07	07:39 17:01
18	07:43 17:26	07:14 18:03	06:32 18:33	06:44 20:04	06:08 20:34	07:27 (3)	05:55 20:55	06:09 20:50	06:38 20:18	07:12 (3) 19:29	07:07 19:29	07:36 18:42	07:11 17:07	07:39 17:01
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	07:29 (3)	05:55 20:55	06:11 20:49	06:39 20:16	07:12 (3) 19:28	07:08 19:28	07:37 18:40	07:12 17:06	07:40 17:01
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	07:29 (3)	05:56 20:55	06:11 20:49	06:40 20:15	07:13 (3) 19:26	07:09 19:26	07:38 18:39	07:13 17:05	07:41 17:02
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:37	07:07 (3)	05:56 20:55	06:12 20:48	06:41 20:13	07:11 (3) 19:24	07:10 19:24	07:40 18:37	07:14 17:05	07:41 17:02
22	07:41 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:04 20:37	07:31 (3)	05:56 20:56	06:13 20:47	06:42 20:12	07:11 (3) 19:23	07:11 19:23	07:41 18:36	07:15 17:04	07:42 17:03
23	07:40 17:32	07:07 18:08	06:24 18:38	06:36 20:09	06:04 20:38	07:32 (3)	05:56 20:56	06:14 20:46	06:43 20:10	07:12 (3) 19:21	07:12 19:21	07:42 18:35	07:17 17:03	07:42 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	06:35 20:10	06:03 20:39	07:33 (3)	05:56 20:56	06:15 20:46	06:43 20:09	07:12 (3) 19:19	07:13 19:19	07:43 18:33	07:18 17:03	07:43 17:04
25	07:39 17:34	07:04 18:11	06:21 18:40	06:34 20:11	06:02 20:40	07:34 (3)	05:57 20:56	06:16 20:45	06:44 20:07	07:13 (3) 19:18	07:13 19:18	07:44 17:32	07:19 17:02	07:43 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:02 20:41	07:35 (3)	05:57 20:56	06:17 20:44	06:45 20:06	07:15 (3) 19:16	07:14 19:16	07:45 17:31	07:20 17:02	07:44 17:05
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	07:36 (3)	05:57 20:56	06:17 20:43	06:46 20:04	07:17 (3) 19:15	07:15 19:15	07:46 17:29	07:21 17:02	07:44 17:06
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 20:42	07:37 (3)	05:58 20:56	06:18 20:42	06:47 20:03	07:27 (3) 19:13	07:16 19:13	07:47 17:28	07:22 17:01	07:44 17:06
29	07:36 17:39		07:15 19:44	06:28 20:15	06:00 20:43	07:38 (3)	05:58 20:56	06:19 20:41	06:48 20:01	07:17 (3) 19:11	07:17 19:11	07:48 17:27	07:23 17:01	07:45 17:07
30	07:35 17:40		07:13 19:45	06:27 20:16	05:59 20:44	07:39 (3)	05:59 20:56	06:20 20:40	06:49 20:00	07:18 (3) 19:10	07:18 19:10	07:49 17:26	07:24 17:00	07:45 17:08
31	07:34 17:41		07:11 19:46		05:59 20:45			06:21 20:39	06:50 19:58			06:51 17:24	07:45 17:08	
Potential sun hours	301	299	370	397	445		448	455	426	374	347	301	292	
Total, worst case				327	51				383					
Sun reduction				0.53	0.59				0.73					
Oper. time red.				0.24	0.24				0.24					
Wind dir. red.				0.73	0.73				0.73					
Total reduction				0.09	0.10				0.13					
Total, real				30	5				48					

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 35

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AC - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (29) R29

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45	07:33	07:55 (6)	06:59	07:10	06:26
	17:09	17:43	08:12 (6)	18:15	19:47	20:17
2	07:45	07:32	07:56 (6)	06:57	07:08	06:24
	17:10	17:44	08:11 (6)	18:16	19:48	20:18
3	07:46	07:31	07:58 (6)	06:56	07:07	06:23
	17:11	17:45	08:10 (6)	18:17	19:49	20:19
4	07:46	07:30	08:00 (6)	06:54	07:05	06:22
	17:12	17:46	08:09 (6)	18:18	19:50	20:20
5	07:46	07:29	06:53	07:03	06:21	07:07 (3)
	17:13	17:47	18:19	19:51	20:21	21 07:28 (3)
6	07:46	07:28	06:51	07:02	06:20	07:08 (3)
	17:14	17:49	18:20	19:52	20:22	19 07:27 (3)
7	07:46	07:27	06:50	07:00	06:19	07:10 (3)
	17:15	17:50	18:22	19:53	20:23	16 07:26 (3)
8	07:45	07:26	06:48	06:59	06:17	07:12 (3)
	17:16	17:51	18:23	19:54	20:24	12 07:24 (3)
9	07:45	07:25	06:47	06:57	06:16	07:15 (3)
	17:17	17:52	18:24	19:55	20:25	5 07:20 (3)
10	07:45	07:24	06:45	06:56	06:15	05:56
	17:18	17:53	18:25	19:56	20:26	20:51
11	07:45	07:23	06:43	06:54	06:14	05:55
	17:19	17:54	18:26	19:57	20:27	20:52
12	07:45	07:21	06:42	06:52	06:13	05:55
	17:20	17:56	18:27	19:58	20:28	20:52
13	07:45	07:20	06:40	06:51	06:12	05:55
	17:21	17:57	18:28	19:59	20:29	20:53
14	07:44	07:19	06:39	06:49	06:11	05:55
	17:22	17:58	18:29	20:00	20:30	20:53
15	07:44	07:18	06:37	06:48	06:10	05:55
	17:23	17:59	18:30	20:01	20:31	20:54
16	07:44	07:17	06:36	06:46	06:09	05:55
	17:24	18:00	18:31	20:02	20:32	20:54
17	07:43	07:15	06:34	06:45	07:17 (3)	06:08
	17:25	18:02	18:32	20:03	7 07:24 (3)	20:33
18	07:43	07:14	06:32	06:44	07:14 (3)	06:07
	17:26	18:03	18:33	20:04	14 07:28 (3)	20:34
19	07:42	08:03 (6)	06:31	06:42	07:11 (3)	06:07
	17:27	2 08:05 (6)	18:34	20:05	18 07:29 (3)	20:35
20	07:42	08:02 (6)	06:29	06:41	07:10 (3)	06:06
	17:28	4 08:06 (6)	18:35	20:06	21 07:31 (3)	20:36
21	07:41	08:01 (6)	06:27	06:39	07:09 (3)	06:05
	17:30	6 08:07 (6)	18:36	20:07	23 07:32 (3)	20:37
22	07:41	08:01 (6)	06:26	06:38	07:07 (3)	06:04
	17:31	8 08:09 (6)	18:37	20:08	25 07:32 (3)	20:37
23	07:40	08:00 (6)	06:24	06:36	07:06 (3)	06:04
	17:32	10 08:10 (6)	18:38	20:09	27 07:33 (3)	20:38
24	07:39	07:59 (6)	06:23	06:35	07:06 (3)	06:03
	17:33	11 08:10 (6)	18:39	20:10	28 07:34 (3)	20:39
25	07:39	07:59 (6)	06:21	06:34	07:05 (3)	06:02
	17:34	12 08:11 (6)	18:40	20:11	28 07:33 (3)	20:40
26	07:38	07:58 (6)	06:19	06:32	07:05 (3)	06:02
	17:35	14 08:12 (6)	18:41	20:12	29 07:34 (3)	20:41
27	07:37	07:57 (6)	06:18	06:31	07:05 (3)	06:01
	17:37	15 08:12 (6)	18:42	20:13	29 07:34 (3)	20:42
28	07:36	07:56 (6)	06:16	06:30	07:04 (3)	06:00
	17:38	16 08:12 (6)	18:43	20:14	29 07:33 (3)	20:42
29	07:36	07:55 (6)	06:15	06:28	07:04 (3)	06:00
	17:39	17 08:12 (6)	19:44	20:15	29 07:33 (3)	20:43
30	07:35	07:54 (6)	06:13	06:27	07:04 (3)	05:59
	17:40	18 08:12 (6)	19:45	20:16	28 07:32 (3)	20:44
31	07:34	07:55 (6)	06:11	06:25	05:59	
	17:41	18 08:13 (6)	19:46		20:45	
Potential sun hours	301	299	370	397	445	448
Total, worst case	151	53		335	175	
Sun reduction	0.45	0.47		0.53	0.59	
Oper. time red.	0.24	0.24		0.24	0.24	
Wind dir. red.	0.80	0.80		0.72	0.72	
Total reduction	0.09	0.09		0.09	0.10	
Total, real	13	5		31	18	

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 36

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AC - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (29) R29

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59	06:22	06:51	07:19	06:52	07:25
	20:56	20:38	19:57	19:08	17:23	17:00
2	06:00	06:23	06:52	07:20	06:53	07:26
	20:56	20:37	19:55	19:06	17:22	17:00
3	06:00	06:24	06:53	07:21	06:54	07:27
	20:56	20:36	19:54	19:05	17:21	17:00
4	06:01	06:25	07:23 (3)	06:54	07:22	06:55
	20:56	20:35	8 07:31 (3)	19:52	19:03	17:20
5	06:01	06:26	07:20 (3)	06:55	07:23	06:56
	20:56	20:34	14 07:34 (3)	19:50	19:02	17:19
6	06:02	06:27	07:19 (3)	06:56	07:24	06:57
	20:55	20:33	17 07:36 (3)	19:49	19:00	17:17
7	06:02	06:27	07:17 (3)	06:57	07:25	06:58
	20:55	20:32	20 07:37 (3)	19:47	18:58	17:16
8	06:03	06:28	07:16 (3)	06:58	07:26	07:00
	20:55	20:30	22 07:38 (3)	19:46	18:57	17:15
9	06:03	06:29	07:15 (3)	06:58	07:27	07:01
	20:54	20:29	24 07:39 (3)	19:44	18:55	17:14
10	06:04	06:30	07:15 (3)	06:59	07:28	07:02
	20:54	20:28	25 07:40 (3)	19:42	18:54	17:13
11	06:05	06:31	07:13 (3)	07:00	07:29	07:03
	20:54	20:27	27 07:40 (3)	19:41	18:52	17:12
12	06:05	06:32	07:13 (3)	07:01	07:30	07:04
	20:53	20:25	27 07:40 (3)	19:39	18:51	17:12
13	06:06	06:33	07:12 (3)	07:02	07:31	07:05
	20:53	20:24	28 07:40 (3)	19:38	18:49	17:11
14	06:07	06:34	07:12 (3)	07:03	07:32	07:06
	20:52	20:23	28 07:40 (3)	19:36	18:48	17:10
15	06:08	06:35	07:12 (3)	07:04	07:33	07:08
	20:52	20:22	29 07:41 (3)	19:34	18:46	17:09
16	06:08	06:36	07:12 (3)	07:05	07:34	07:09
	20:51	20:20	28 07:40 (3)	19:33	18:45	17:08
17	06:09	06:37	07:12 (3)	07:06	07:35	07:10
	20:51	20:19	28 07:40 (3)	19:31	18:43	17:07
18	06:10	06:38	07:12 (3)	07:07	07:36	07:11
	20:50	20:18	28 07:40 (3)	19:29	18:42	17:07
19	06:11	06:39	07:12 (3)	07:08	07:37	07:12
	20:49	20:16	27 07:39 (3)	19:28	18:40	17:06
20	06:11	06:40	07:12 (3)	07:09	07:38	07:13
	20:49	20:15	27 07:39 (3)	19:26	18:39	17:05
21	06:12	06:41	07:12 (3)	07:10	07:40	07:14
	20:48	20:13	25 07:37 (3)	19:24	18:37	17:05
22	06:13	06:42	07:13 (3)	07:11	07:41	07:15
	20:47	20:12	23 07:36 (3)	19:23	18:36	17:04
23	06:14	06:43	07:14 (3)	07:12	07:42	07:17
	20:46	20:10	21 07:35 (3)	19:21	18:35	17:03
24	06:15	06:43	07:15 (3)	07:13	07:43	07:18
	20:46	20:09	18 07:33 (3)	19:19	18:33	17:03
25	06:16	06:44	07:17 (3)	07:13	06:44	07:19
	20:45	20:07	14 07:31 (3)	19:18	17:32	17:02
26	06:17	06:45	07:21 (3)	07:14	06:45	07:20
	20:44	20:06	6 07:27 (3)	19:16	17:31	17:02
27	06:17	06:46	07:15	06:46	07:21	07:44
	20:43	20:04	19:15	17:29	17:02	17:06
28	06:18	06:47	07:16	06:47	07:22	07:44
	20:42	20:03	19:13	17:28	17:01	17:06
29	06:19	06:48	07:17	06:48	07:23	07:45
	20:41	20:01	19:11	17:27	17:01	17:07
30	06:20	06:49	07:18	06:49	07:24	07:45
	20:40	20:00	19:10	17:26	17:00	17:08
31	06:21	06:50	06:51	06:51	07:45	07:45
	20:39	19:58	17:24	17:24	17:08	17:08
Potential sun hours	455	426	374	347	301	292
Total, worst case		514			207	
Sun reduction		0.73			0.51	
Oper. time red.		0.24			0.24	
Wind dir. red.		0.72			0.80	
Total reduction		0.13			0.10	
Total, real		65			20	

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 37

Licensed user:

Ing. Bruno Manca
Via Vittorio Veneto 231
IT-09028 Sestu
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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AD - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (30) R30

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1	07:45 17:09	08:07 (6) 17:43	07:33 18:15	06:59 18:15	07:10 19:47	05:58 20:45	06:53 (3) 07:31 (3)
2	07:45 17:10	08:07 (6) 17:44	07:32 18:16	06:57 18:16	07:08 19:48	05:58 20:46	06:53 (3) 07:32 (3)
3	07:45 17:11	08:07 (6) 17:45	07:31 18:17	06:56 18:17	07:07 19:49	05:57 20:47	06:53 (3) 07:31 (3)
4	07:46 17:12	08:07 (6) 17:46	07:30 18:18	06:54 18:18	07:05 19:50	05:57 20:48	06:54 (3) 07:31 (3)
5	07:46 17:13	08:07 (6) 17:47	07:29 18:19	06:53 18:19	07:03 19:51	05:57 20:49	06:54 (3) 07:32 (3)
6	07:46 17:14	08:07 (6) 17:48	07:28 18:20	06:51 18:20	07:02 19:52	05:56 20:50	06:55 (3) 07:32 (3)
7	07:46 17:15	08:07 (6) 17:50	07:27 18:22	06:50 18:22	07:00 19:53	05:56 20:51	06:54 (3) 07:31 (3)
8	07:45 17:16	08:07 (6) 17:51	07:26 18:23	06:48 18:23	06:59 19:54	05:56 20:52	06:55 (3) 07:31 (3)
9	07:45 17:17	08:07 (6) 17:52	07:25 18:24	06:47 18:24	06:57 19:55	05:56 20:53	06:55 (3) 07:31 (3)
10	07:45 17:18	08:06 (6) 17:53	07:24 18:25	06:45 18:25	06:56 19:56	05:56 20:54	06:56 (3) 07:31 (3)
11	07:45 17:19	08:06 (6) 17:54	07:23 18:26	06:43 18:26	06:54 19:57	05:55 20:55	06:56 (3) 07:32 (3)
12	07:45 17:20	08:06 (6) 17:56	07:21 18:27	06:42 18:27	06:52 19:58	05:55 20:56	06:57 (3) 07:32 (3)
13	07:45 17:21	08:05 (6) 17:57	07:20 18:28	06:40 18:28	06:51 19:59	05:55 20:57	06:57 (3) 07:32 (3)
14	07:44 17:22	08:05 (6) 17:58	07:19 18:29	06:39 18:29	06:49 20:00	05:55 20:58	06:57 (3) 07:32 (3)
15	07:44 17:23	08:05 (6) 17:59	07:18 18:30	06:37 18:30	06:48 20:01	05:55 20:59	06:58 (3) 07:32 (3)
16	07:44 17:24	08:04 (6) 18:00	07:17 18:31	06:35 18:31	06:46 20:02	05:55 21:00	06:58 (3) 07:32 (3)
17	07:43 17:25	08:04 (6) 18:01	07:15 18:32	06:34 18:32	06:45 20:03	05:55 21:01	06:58 (3) 07:32 (3)
18	07:43 17:26	08:04 (6) 18:03	07:14 18:33	06:32 18:33	06:43 20:04	05:55 21:02	06:58 (3) 07:32 (3)
19	07:42 17:27	08:05 (6) 18:04	07:13 18:34	06:31 18:34	06:42 20:05	05:55 21:03	06:59 (3) 07:32 (3)
20	07:42 17:28	08:05 (6) 18:05	07:11 18:35	06:29 18:35	06:41 20:06	05:55 21:04	06:59 (3) 07:32 (3)
21	07:41 17:30	08:05 (6) 18:06	07:10 18:36	06:27 18:36	06:39 20:07	05:55 21:05	07:00 (3) 07:33 (3)
22	07:41 17:31	08:06 (6) 18:07	07:09 18:37	06:26 18:37	06:38 20:08	05:55 21:06	07:00 (3) 07:33 (3)
23	07:40 17:32	08:06 (6) 18:08	07:07 18:38	06:24 18:38	06:36 20:09	05:56 21:07	07:00 (3) 07:33 (3)
24	07:39 17:33	08:07 (6) 18:09	07:06 18:39	06:23 18:39	06:35 20:10	05:56 21:08	06:59 (3) 07:33 (3)
25	07:39 17:34	08:08 (6) 18:11	07:04 18:40	06:21 18:40	06:34 20:11	05:57 21:09	07:00 (3) 07:34 (3)
26	07:38 17:35	08:09 (6) 18:12	07:03 18:41	06:19 18:41	06:32 20:12	05:57 21:10	07:00 (3) 07:34 (3)
27	07:37 17:37	08:10 (6) 18:13	07:02 18:42	06:18 18:42	06:31 20:13	05:57 21:11	07:00 (3) 07:34 (3)
28	07:36 17:38	08:12 (6) 18:14	07:00 18:43	06:16 18:43	06:30 20:14	05:58 21:12	07:01 (3) 07:35 (3)
29	07:36 17:39	08:14 (6) 18:14	06:59 18:44	06:15 18:44	06:29 20:15	05:58 21:13	07:00 (3) 07:35 (3)
30	07:35 17:40	08:22 (6) 18:15	06:58 18:45	06:14 18:45	06:28 20:16	05:59 21:14	07:01 (3) 07:36 (3)
31	07:34 17:41	07:11 18:16	06:57 18:46	06:13 18:46	06:27 20:17	05:59 21:15	07:01 (3) 07:36 (3)
Potential sun hours	301	299	370	397	445	448	
Total, worst case	490		165	33	894	1053	
Sun reduction	0.45		0.49	0.53	0.59	0.66	
Oper. time red.	0.24		0.24	0.24	0.24	0.24	
Wind dir. red.	0.79		0.78	0.78	0.69	0.69	
Total reduction	0.09		0.09	0.10	0.10	0.11	
Total, real	42		15	3	87	115	

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 38

Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AD - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (30) R30

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59	07:01 (3) 06:22	07:06 (3) 06:51	07:19	06:52	07:25
	20:56	35 07:36 (3) 20:38	31 07:37 (3) 19:57	19:08	17:23	17:00 18 08:06 (6)
2	05:59	07:01 (3) 06:23	07:07 (3) 06:52	07:20	06:53	07:26
	20:56	35 07:36 (3) 20:37	29 07:36 (3) 19:55	19:06	17:22	17:00 17 08:06 (6)
3	06:00	07:01 (3) 06:24	07:08 (3) 06:53	07:21	06:54	07:27
	20:56	35 07:36 (3) 20:36	27 07:35 (3) 19:54	19:05	17:21	17:00 16 08:06 (6)
4	06:01	07:01 (3) 06:25	07:09 (3) 06:54	07:22	06:55	07:28
	20:56	36 07:37 (3) 20:35	24 07:33 (3) 19:52	19:03	17:20	17:00 14 08:05 (6)
5	06:01	07:01 (3) 06:26	07:11 (3) 06:55	07:23	06:56	07:29
	20:56	36 07:37 (3) 20:34	21 07:32 (3) 19:50	19:02	17:19	16:59 13 08:05 (6)
6	06:02	07:01 (3) 06:27	07:13 (3) 06:56	07:24	06:57	07:30
	20:55	37 07:38 (3) 20:33	17 07:30 (3) 19:49	19:00	17:17	16:59 12 08:05 (6)
7	06:02	07:01 (3) 06:27	07:16 (3) 06:57	07:25	06:58	07:31
	20:55	37 07:38 (3) 20:32	11 07:27 (3) 19:47	18:58	17:16	16:59 11 08:05 (6)
8	06:03	07:01 (3) 06:28	06:58	07:26	07:00	07:32
	20:55	37 07:38 (3) 20:30	19:46	18:57	17:15	16:59 10 08:05 (6)
9	06:03	07:00 (3) 06:29	06:58	07:45 (4) 07:27	07:01	07:33
	20:54	38 07:38 (3) 20:29	19:44	5 07:50 (4) 18:55	17:14	16:59 9 08:05 (6)
10	06:04	07:01 (3) 06:30	06:59	07:41 (4) 07:28	07:02	07:33
	20:54	38 07:39 (3) 20:28	19:42	12 07:53 (4) 18:54	17:13	16:59 8 08:05 (6)
11	06:05	07:01 (3) 06:31	07:00	07:39 (4) 07:29	07:03	07:34
	20:54	38 07:39 (3) 20:27	19:41	15 07:54 (4) 18:52	17:12	16:59 7 08:04 (6)
12	06:05	07:00 (3) 06:32	07:01	07:38 (4) 07:30	07:04	07:35
	20:53	39 07:39 (3) 20:25	19:39	17 07:55 (4) 18:51	17:12	16:59 6 08:04 (6)
13	06:06	07:01 (3) 06:33	07:02	07:37 (4) 07:31	07:05	07:36
	20:53	39 07:40 (3) 20:24	19:38	18 07:55 (4) 18:49	17:11	8 07:54 (6) 17:00 5 08:04 (6)
14	06:07	07:01 (3) 06:34	07:03	07:36 (4) 07:32	07:06	07:45 (6) 07:37
	20:52	39 07:40 (3) 20:23	19:36	20 07:56 (4) 18:48	17:10	12 07:57 (6) 17:00 3 08:03 (6)
15	06:08	07:01 (3) 06:35	07:04	07:36 (4) 07:33	07:08	07:43 (6) 07:37
	20:52	40 07:41 (3) 20:22	19:34	20 07:56 (4) 18:46	17:09	16 07:59 (6) 17:00
16	06:08	07:01 (3) 06:36	07:05	07:35 (4) 07:34	07:09	07:42 (6) 07:38
	20:51	39 07:40 (3) 20:20	19:33	20 07:55 (4) 18:45	17:08	18 08:00 (6) 17:00
17	06:09	07:01 (3) 06:37	07:06	07:35 (4) 07:35	07:10	07:41 (6) 07:39
	20:51	40 07:41 (3) 20:19	19:31	20 07:55 (4) 18:43	17:07	20 08:01 (6) 17:01
18	06:10	07:01 (3) 06:38	07:07	07:36 (4) 07:36	07:11	07:41 (6) 07:39
	20:50	40 07:41 (3) 20:17	19:29	18 07:54 (4) 18:42	17:07	20 08:01 (6) 17:01
19	06:11	07:02 (3) 06:39	07:08	07:36 (4) 07:37	07:12	07:41 (6) 07:40
	20:49	39 07:41 (3) 20:16	19:28	17 07:53 (4) 18:40	17:06	22 08:03 (6) 17:01
20	06:11	07:01 (3) 06:40	07:09	07:36 (4) 07:38	07:13	07:41 (6) 07:41
	20:49	40 07:41 (3) 20:15	19:26	14 07:50 (4) 18:39	17:05	22 08:03 (6) 17:02
21	06:12	07:01 (3) 06:41	07:10	07:38 (4) 07:40	07:14	07:41 (6) 07:41
	20:48	40 07:41 (3) 20:13	19:24	9 07:47 (4) 18:37	17:05	23 08:04 (6) 17:02
22	06:13	07:02 (3) 06:42	07:11	07:41	07:15	07:41 (6) 07:42
	20:47	39 07:41 (3) 20:12	19:23	18:36	17:04	23 08:04 (6) 17:03
23	06:14	07:02 (3) 06:43	07:12	07:42	07:17	07:41 (6) 07:42
	20:46	39 07:41 (3) 20:10	19:21	18:35	17:03	23 08:04 (6) 17:03
24	06:15	07:03 (3) 06:43	07:12	07:43	07:18	07:41 (6) 07:43
	20:46	38 07:41 (3) 20:09	19:19	18:33	17:03	23 08:04 (6) 17:04
25	06:16	07:02 (3) 06:44	07:13	06:44	07:19	07:42 (6) 07:43
	20:45	38 07:40 (3) 20:07	19:18	17:32	17:02	23 08:05 (6) 17:04
26	06:17	07:03 (3) 06:45	07:14	06:45	07:20	07:43 (6) 07:43
	20:44	37 07:40 (3) 20:06	19:16	17:31	17:02	23 08:06 (6) 17:05
27	06:17	07:03 (3) 06:46	07:15	06:46	07:21	07:44 (6) 07:44
	20:43	37 07:40 (3) 20:04	19:14	17:29	17:02	22 08:06 (6) 17:06
28	06:18	07:04 (3) 06:47	07:16	06:47	07:22	07:45 (6) 07:44
	20:42	36 07:40 (3) 20:03	19:13	17:28	17:01	21 08:06 (6) 17:06
29	06:19	07:04 (3) 06:48	07:17	06:48	07:23	07:46 (6) 07:44
	20:41	35 07:39 (3) 20:01	19:11	17:27	17:01	20 08:06 (6) 17:07
30	06:20	07:05 (3) 06:49	07:18	06:49	07:24	07:47 (6) 07:45
	20:40	34 07:39 (3) 20:00	19:10	17:26	17:00	19 08:06 (6) 17:08
31	06:21	07:06 (3) 06:50		06:51		07:45
	20:39	32 07:38 (3) 19:58		17:24		17:08 5 08:12 (6)
Potential sun hours	455	426	374	347	301	292
Total, worst case	1162	160	205		358	160
Sun reduction	0.74	0.73	0.65		0.51	0.45
Oper. time red.	0.24	0.24	0.24		0.24	0.24
Wind dir. red.	0.69	0.69	0.78		0.79	0.79
Total reduction	0.12	0.12	0.12		0.10	0.09
Total, real	141	19	25		34	14

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

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

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 39

Licensed user:

Ing. Bruno Manca
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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AE - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (31)

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 17:09	07:33 17:42	06:59 18:15	07:10 19:47	08:15 (7) 09:54 (7)	06:26 20:17
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	08:14 (7) 09:54 (7)	06:24 20:18
3	07:45 17:11	07:31 17:45	06:56 18:17	07:06 19:49	08:14 (7) 09:54 (7)	06:23 20:19
4	07:45 17:12	07:30 17:46	06:54 18:18	07:05 19:50	08:12 (7) 09:54 (7)	06:22 20:20
5	07:45 17:13	07:29 17:47	06:53 18:19	07:03 19:51	08:11 (7) 09:53 (7)	06:21 20:21
6	07:45 17:14	07:28 17:48	06:51 18:20	07:02 19:52	08:11 (7) 09:54 (7)	06:20 20:22
7	07:45 17:15	07:27 17:50	06:50 18:21	07:00 19:53	08:10 (7) 09:53 (7)	06:18 20:23
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	08:10 (7) 09:53 (7)	06:17 20:24
9	07:45 17:17	07:25 17:52	06:46 18:24	06:57 19:55	08:09 (7) 09:52 (7)	06:16 20:25
10	07:45 17:18	07:24 17:53	06:45 18:25	08:07 (7) 08:17 (7)	06:55 19:56	06:15 20:26
11	07:45 17:19	07:23 17:54	06:43 18:26	07:58 (7) 08:26 (7)	06:54 19:57	06:14 20:27
12	07:45 17:20	07:21 17:56	06:42 18:27	07:53 (7) 08:30 (7)	06:52 19:58	06:13 20:28
13	07:44 17:21	07:20 17:57	06:40 18:28	07:49 (7) 08:35 (7)	06:51 19:59	06:12 20:29
14	07:44 17:22	07:19 17:58	06:39 18:29	07:45 (7) 08:37 (7)	06:49 20:00	06:11 20:30
15	07:44 17:23	07:18 17:59	06:37 18:30	07:42 (7) 08:39 (7)	06:48 20:01	06:10 20:31
16	07:43 17:24	07:16 18:00	06:35 18:31	07:40 (7) 08:42 (7)	06:46 20:02	06:09 20:32
17	07:43 17:25	07:15 18:01	06:34 18:32	07:37 (7) 08:43 (7)	06:45 20:03	06:08 20:33
18	07:43 17:26	07:14 18:03	06:32 18:33	07:34 (7) 08:45 (7)	06:43 20:04	06:07 20:34
19	07:42 17:27	07:13 18:04	06:31 18:34	07:33 (7) 08:47 (7)	06:42 20:05	06:07 20:35
20	07:42 17:28	07:11 18:05	06:29 18:35	07:31 (7) 08:48 (7)	06:41 20:06	06:06 20:35
21	07:41 17:30	07:10 18:06	06:27 18:36	07:29 (7) 08:49 (7)	06:39 20:07	06:05 20:36
22	07:40 17:31	07:09 18:07	06:26 18:37	07:27 (7) 08:50 (7)	06:38 20:08	06:04 20:37
23	07:40 17:32	07:07 18:08	06:24 18:38	07:25 (7) 08:50 (7)	06:36 20:09	06:03 20:38
24	07:39 17:33	07:06 18:09	06:23 18:39	07:25 (7) 08:52 (7)	06:35 20:10	06:03 20:39
25	07:38 17:34	07:04 18:11	06:21 18:40	07:23 (7) 08:52 (7)	06:34 20:11	06:02 20:40
26	07:38 17:35	07:03 18:12	06:19 18:41	07:21 (7) 08:52 (7)	06:32 20:12	06:01 20:41
27	07:37 17:37	07:01 18:13	06:18 18:42	07:20 (7) 08:53 (7)	06:31 20:13	06:01 20:41
28	07:36 17:38	07:00 18:14	06:16 18:43	07:19 (7) 08:53 (7)	06:29 20:14	06:00 20:42
29	07:35 17:39	07:00 18:14	06:16 18:43	07:19 (7) 08:53 (7)	06:29 20:14	06:00 20:42
30	07:35 17:40	07:00 18:14	06:16 18:43	07:19 (7) 08:53 (7)	06:29 20:14	06:00 20:42
31	07:34 17:41	07:00 18:14	06:16 18:43	07:19 (7) 08:53 (7)	06:29 20:14	06:00 20:42
Potential sun hours	301	299	370	397	445	448
Total, worst case			1574	2959	1714	
Sun reduction			0.49	0.53	0.59	
Oper. time red.			0.24	0.24	0.24	
Wind dir. red.			0.79	0.79	0.79	
Total reduction			0.09	0.10	0.11	
Total, real			146	294	190	

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:

Windpro Isili - shadow flickering

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2023-12-04 10:46 / 40

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar

Calculation: IsiliShadow receptor: AE - Shadow Receptor: 1.0 x 1.0 Azimuth: 0.0° Slope: 0.0° (31)

Assumptions for shadow calculations

Sunshine probability S (Average daily sunshine hours) [CAGLIARI / ELIMA S]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4.40 5.05 5.88 7.00 8.45 9.88 10.82 10.03 8.08 6.09 5.07 4.27

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
130 93 150 171 259 145 62 26 52 150 493 347 2,078
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59 20:56	06:22 20:38	08:26 (7) 19:57	08:07 (7) 19:08	08:30 (7) 19:08	07:25 17:00
2	05:59 20:56	06:23 20:37	08:25 (7) 19:55	08:07 (7) 19:06	08:35 (7) 19:07 (7)	07:26 17:00
3	06:00 20:56	06:24 20:36	08:24 (7) 19:54	08:07 (7) 19:05	08:41 (7) 19:00 (7)	07:27 17:00
4	06:00 20:56	06:25 20:35	08:23 (7) 19:52	08:07 (7) 19:03	06:55 17:20	07:28 16:59
5	06:01 20:55	06:26 20:34	08:23 (7) 19:50	08:07 (7) 19:01	07:23 17:18	07:29 16:59
6	06:02 20:55	06:26 20:33	08:22 (7) 19:49	08:07 (7) 19:00	06:57 17:17	07:30 16:59
7	06:02 20:55	06:27 20:31	08:21 (7) 19:47	08:07 (7) 18:58	06:58 17:16	07:31 16:59
8	06:03 20:55	06:28 20:30	08:21 (7) 19:46	08:07 (7) 18:57	06:59 17:15	07:32 16:59
9	06:03 20:54	06:29 20:29	08:20 (7) 19:44	08:07 (7) 18:55	07:01 17:14	07:33 16:59
10	06:04 20:54	06:30 20:28	08:18 (7) 19:42	08:07 (7) 18:54	07:02 17:13	07:33 16:59
11	06:05 20:53	06:31 20:27	08:18 (7) 19:41	08:07 (7) 18:52	07:03 17:12	07:34 16:59
12	06:05 20:53	06:32 20:25	08:17 (7) 19:39	08:08 (7) 18:51	07:04 17:11	07:35 16:59
13	06:06 20:53	06:33 20:24	08:16 (7) 19:37	08:08 (7) 18:49	07:05 17:11	07:36 17:00
14	06:07 20:52	06:34 20:23	08:16 (7) 19:36	08:08 (7) 18:48	07:06 17:10	07:37 17:00
15	06:08 20:52	06:35 20:21	08:15 (7) 19:34	08:09 (7) 18:46	07:07 17:09	07:37 17:00
16	06:08 20:51	06:36 20:20	08:15 (7) 19:32	08:09 (7) 18:45	07:09 17:08	07:38 17:00
17	06:09 20:50	06:37 20:19	08:14 (7) 19:31	08:10 (7) 18:43	07:10 17:07	07:39 17:01
18	06:10 20:50	06:38 20:17	08:14 (7) 19:29	08:10 (7) 18:42	07:11 17:07	07:39 17:01
19	06:11 20:49	06:39 20:16	08:13 (7) 19:28	08:11 (7) 18:40	07:12 17:06	07:40 17:01
20	06:11 20:48	06:40 20:15	08:12 (7) 19:26	08:11 (7) 18:39	07:13 17:05	07:40 17:02
21	06:12 20:48	06:41 20:13	08:11 (7) 19:24	08:12 (7) 18:37	07:14 17:05	07:41 17:02
22	06:13 20:47	06:42 20:12	08:11 (7) 19:23	08:13 (7) 18:36	07:15 17:04	07:42 17:03
23	06:14 20:46	06:42 20:10	08:11 (7) 19:21	08:15 (7) 18:35	07:16 17:03	07:42 17:03
24	06:15 20:45	06:43 20:09	08:10 (7) 19:19	08:16 (7) 18:33	07:18 17:03	07:43 17:04
25	06:16 20:45	06:44 20:07	08:10 (7) 19:18	08:17 (7) 18:32	07:19 17:02	07:43 17:04
26	06:16 20:44	06:45 20:06	08:10 (7) 19:16	08:19 (7) 18:31	07:20 17:02	07:43 17:05
27	06:17 20:43	06:46 20:04	08:09 (7) 19:14	08:20 (7) 18:29	07:21 17:01	07:44 17:06
28	06:18 20:42	06:47 20:03	08:09 (7) 19:13	08:22 (7) 18:28	07:22 17:01	07:44 17:06
29	06:19 20:41	06:48 20:01	08:09 (7) 19:11	08:25 (7) 18:27	07:23 17:01	07:44 17:07
30	06:20 20:40	06:49 20:00	08:08 (7) 19:10	08:27 (7) 18:25	07:24 17:00	07:45 17:08
31	06:21 20:39	06:50 19:58	08:07 (7) 19:09	08:07 (7) 18:24	06:50 17:24	07:45 17:08
Potential sun hours	455	425	374	347	301	292
Total, worst case	819	2769	2641	93		
Sun reduction	0.74	0.73	0.65	0.54		
Oper. time red.	0.24	0.24	0.24	0.24		
Wind dir. red.	0.79	0.79	0.79	0.79		
Total reduction	0.14	0.14	0.12	0.10		
Total, real	114	381	322	10		

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:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 1

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 1 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1) IS_01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 14:10-16:07/117 17:09	07:33 14:34-16:10/96 17:43 16:42-17:19/37	06:59 18:15	07:10 19:47	06:26 20:17	05:58 19:43-20:21/38 20:45
2	07:45 14:11-16:08/117 17:10	07:32 14:36-16:09/93 17:44 16:42-17:21/39	06:57 18:16	07:08 19:48	06:24 20:18	05:58 19:43-20:22/39 20:46
3	07:46 14:11-16:08/117 17:11	07:31 14:37-16:08/91 17:45 16:42-17:22/40	06:56 18:17	07:07 19:49	06:23 20:19	05:57 19:42-20:22/40 20:47
4	07:46 14:12-16:08/116 17:12	07:30 14:38-16:08/90 17:46 16:43-17:23/40	06:54 18:18	07:05 19:50	06:22 20:20	05:57 19:43-20:23/40 20:48
5	07:46 14:13-16:09/116 17:13	07:29 14:40-16:07/87 17:47 16:43-17:25/42	06:53 18:19	07:03 19:51	06:21 20:21	05:57 19:43-20:24/41 20:48
6	07:46 14:13-16:09/116 17:14	07:28 14:41-16:06/85 17:49 16:43-17:26/43	06:51 18:20	07:02 19:52	06:20 20:22	05:56 19:43-20:25/42 20:49
7	07:46 14:14-16:10/116 17:15	07:27 14:42-16:04/82 17:50 16:42-17:26/44	06:50 18:22	07:00 19:53	06:19 20:23	05:56 19:43-20:24/41 20:50
8	07:46 14:15-16:10/115 17:16	07:26 14:44-16:03/79 17:51 16:43-17:28/45	06:48 18:23	06:59 19:54	06:17 20:24	05:56 19:43-20:25/42 20:50
9	07:45 14:15-16:11/116 17:17	07:25 14:46-16:02/76 17:52 16:43-17:29/46	06:47 18:24	06:57 19:55	06:16 20:25	05:56 19:43-20:26/43 20:51
10	07:45 14:15-16:10/115 17:18	07:24 14:48-16:01/73 17:53 16:44-17:31/47	06:45 18:25	06:56 19:56	06:15 20:26	05:56 19:44-20:26/42 20:51
11	07:45 14:16-16:11/115 17:19	07:23 14:50-16:00/70 17:54 16:44-17:32/48	06:43 18:26	06:54 19:57	06:14 20:27	05:55 19:44-20:27/43 20:52
12	07:45 14:17-16:11/114 17:20	07:22 14:53-15:59/66 17:56 16:45-17:34/49	06:42 18:27	06:53 19:58	06:13 20:28	05:55 19:44-20:28/44 20:52
13	07:45 14:17-16:11/114 17:21	07:20 14:54-15:56/62 17:57 16:45-17:34/49	06:40 18:28	06:51 19:59	06:12 20:29	05:55 19:44-20:28/44 20:53
14	07:44 14:18-16:12/114 17:22	07:19 14:57-15:55/58 17:58 16:46-17:36/50	06:39 18:29	06:49 20:00	06:11 20:30	05:55 19:45-20:28/43 20:53
15	07:44 14:19-16:12/113 17:23	07:18 15:00-15:53/53 17:59 16:47-17:37/50	06:37 18:30	06:48 20:01	06:10 20:31	05:55 19:45-20:29/44 20:54
16	07:44 14:19-16:12/113 17:24	07:17 15:04-15:50/46 18:00 16:48-17:36/48	06:36 18:31	06:46 20:02	06:09 19:56-20:05/9 20:32	05:55 19:45-20:29/44 20:54
17	07:43 14:20-16:12/112 17:25	07:15 15:07-15:47/40 18:02 16:48-17:34/46	06:34 18:32	06:45 20:03	06:08 19:53-20:08/15 20:33	05:55 19:45-20:29/44 20:54
18	07:43 14:21-16:12/111 17:26	07:14 15:12-15:43/31 18:03 16:50-17:33/43	06:32 18:33	06:44 20:04	06:07 19:50-20:10/20 20:34	05:55 19:45-20:30/45 20:55
19	07:42 14:22-16:13/111 17:27	07:13 15:18-15:38/20 18:04 16:51-17:33/42	06:31 18:34	06:42 20:05	06:07 19:50-20:11/21 20:35	05:55 19:45-20:30/45 20:55
20	07:42 14:22-16:12/110 17:28	07:11 16:52-17:30/38 18:05	06:29 18:35	06:41 20:06	06:06 19:48-20:12/24 20:36	05:56 19:45-20:30/45 20:55
21	07:41 14:23-16:12/109 17:30	07:10 16:54-17:29/35 18:06	06:28 18:36	06:39 20:07	06:05 19:47-20:13/26 20:37	05:56 19:46-20:31/45 20:55
22	07:41 14:24-16:12/108 17:31	07:09 16:56-17:26/30 18:07	06:26 18:37	06:38 20:08	06:04 19:46-20:13/27 20:37	05:56 19:46-20:31/45 20:56
23	07:40 14:25-16:12/107 17:32	07:07 16:59-17:24/25 18:08	06:24 18:38	06:36 20:09	06:04 19:46-20:15/29 20:38	05:56 19:46-20:31/45 20:56
24	07:39 14:25-16:12/107 17:33	07:06 17:02-17:21/19 18:09	06:23 18:39	06:35 20:10	06:03 19:45-20:15/30 20:39	05:56 19:46-20:31/45 20:56
25	07:39 14:27-16:12/105 17:34	07:04 17:08-17:14/6 18:11	06:21 18:40	06:34 20:11	06:02 19:45-20:13/28 20:40 20:13-20:16/3	05:57 19:47-20:32/45 20:56
26	07:38 14:27-16:12/105 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:01 19:44-20:16/32 20:41 20:16-20:17/1	05:57 19:47-20:31/44 20:56
27	07:37 14:28-16:11/103 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 19:43-20:17/34 20:42	05:57 19:47-20:31/44 20:56
28	07:36 14:29-16:11/102 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 19:44-20:18/34 20:42	05:58 19:48-20:32/44 20:56
29	07:36 14:30-16:10/100 17:39		07:15 19:44	06:28 20:15	06:00 19:43-20:19/36 20:43	05:58 19:47-20:31/44 20:56
30	07:35 14:32-16:11/99 17:40		07:13 19:45	06:27 20:16	05:59 19:43-20:20/37 20:44	05:59 19:48-20:32/44 20:56
31	07:34 14:33-16:10/97 17:41		07:11 19:46		05:59 19:43-20:21/38 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	3871	2299	0	0	444	1294

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 2

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 1 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (1) IS_01

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December						
1	05:59 19:48-20:31/43	06:22 20:38	06:51 19:57	07:19 19:08	06:52 14:18-15:31/73	07:25 13:58-15:53/115						
2	05:59 19:48-20:31/43	06:23 20:37	06:52 19:55	07:20 19:06	06:53 14:15-15:32/77	07:26 13:58-15:53/115						
3	06:00 19:48-20:31/43	06:24 20:36	06:53 19:54	07:21 19:05	06:54 14:14-15:33/79	07:27 13:58-15:54/116						
4	06:01 19:49-20:31/42	06:25 20:35	06:54 19:52	07:22 19:03	06:55 14:12-15:34/82	07:28 13:59-15:54/115						
5	06:01 19:49-20:31/42	06:26 20:34	06:55 19:51	07:23 19:02	06:56 14:11-15:36/85	07:29 13:59-15:55/116						
6	06:02 19:50-20:31/41	06:27 20:33	06:56 19:49	07:24 19:00	06:57 14:09-15:37/88	07:30 13:59-15:55/116						
7	06:02 19:49-20:30/41	06:27 20:32	06:57 19:47	07:25 18:58	06:58 14:08-15:38/90	07:31 14:00-15:56/116						
8	06:03 19:50-20:30/40	06:28 20:30	06:58 19:46	07:26 18:57	07:00 14:07-15:38/91	07:32 14:00-15:56/116						
9	06:03 19:50-20:29/39	06:29 20:29	06:58 19:44	07:27 18:55	07:01 14:05-15:39/94	07:33 14:00-15:57/117						
10	06:04 19:50-20:29/39	06:30 20:28	06:59 19:42	07:28 18:54	07:02 14:05-15:41/96	07:34 14:01-15:58/117						
11	06:05 19:51-20:29/38	06:31 20:27	07:00 19:41	07:29 18:52	07:03 14:04-15:41/97	07:34 14:01-15:57/116						
12	06:05 19:51-20:28/37	06:32 20:26	07:01 19:39	07:30 18:51	07:04 14:03-15:42/99	07:35 14:01-15:58/117						
13	06:06 19:51-20:28/37	06:33 20:24	07:02 19:38	07:31 18:49	07:05 14:02-15:42/100	07:36 14:02-15:59/117						
14	06:07 19:52-20:28/36	06:34 20:23	07:03 19:36	07:32 18:48	07:06 14:02-15:44/102	07:37 14:02-15:59/117						
15	06:08 19:53-20:28/35	06:35 20:22	07:04 19:34	07:33 18:46	07:08 14:01-15:44/103	07:37 14:02-15:59/117						
16	06:08 19:53-20:27/34	06:36 20:20	07:05 19:33	07:34 18:45	07:09 14:00-15:45/105	07:38 14:03-16:00/117						
17	06:09 19:53-20:26/33	06:37 20:19	07:06 19:31	07:35 17:36-17:49/13	07:10 14:00-15:45/105	07:39 14:04-16:01/117						
18	06:10 19:54-20:24/30	06:38 20:18	07:07 19:29	07:36 17:31-17:53/22	07:11 13:59-15:46/107	07:39 14:03-16:01/118						
19	06:11 19:55-20:20/25	06:39 20:16	07:08 19:28	07:37 17:29-17:57/28	07:12 14:00-15:47/107	07:40 14:04-16:02/118						
20	06:11 19:55-20:24/29	06:40 20:15	07:09 19:26	07:39 17:27-17:59/32	07:13 13:59-15:47/108	07:41 14:04-16:02/118						
21	06:12 19:56-20:24/28	06:41 20:13	07:10 19:24	07:40 17:24-18:00/36	07:14 13:59-15:48/109	07:41 14:05-16:03/118						
22	06:13 19:57-20:23/26	06:42 20:12	07:11 19:23	07:41 17:22-18:01/39	07:16 13:58-15:48/110	07:42 14:05-16:02/117						
23	06:14 19:58-20:23/25	06:43 20:10	07:12 19:21	07:42 15:46-16:10/24	07:17 13:58-15:49/111	07:42 14:06-16:04/118						
24	06:15 20:00-20:22/22	06:43 20:09	07:13 19:19	07:43 15:40-16:14/34	07:18 13:58-15:49/111	07:43 14:06-16:04/118						
25	06:16 20:00-20:21/21	06:44 20:07	07:13 19:18	06:44 14:35-15:17/42	07:19 13:58-15:50/112	07:43 14:07-16:05/118						
26	06:17 20:02-20:20/18	06:45 20:06	07:14 19:16	06:45 14:33-15:21/48	07:20 13:58-15:51/113	07:44 14:08-16:05/117						
27	06:17 20:04-20:18/14	06:46 20:05	07:15 19:15	06:46 14:29-15:23/54	07:21 13:58-15:51/113	07:44 14:08-16:05/117						
28	06:18 20:09-20:13/4	06:47 20:03	07:16 19:13	06:47 14:26-15:25/59	07:22 13:58-15:52/114	07:44 14:09-16:06/117						
29	06:19	06:48 20:01	07:17 19:11	06:48 14:24-15:26/62	07:23 13:58-15:52/114	07:45 14:09-16:06/117						
30	06:20	06:49 20:00	07:18 19:10	06:49 14:21-15:28/67	07:24 13:58-15:52/114	07:45 14:10-16:07/117						
31	06:21	06:50 19:58	07:19 19:09	06:51 14:20-15:30/70	17:00 16:30-16:36/6	07:45 14:10-16:07/117						
	Potential sun hours	455	426	374	347	301	3865	3631				
	Sum of minutes with flicker	913	0	0	1055	3865		3631				

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 3

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Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 2 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (2) IS_02

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December	
1	07:45 17:09	07:33 17:43	06:59 18:15	07:10 19:47	06:26 20:17	05:58 20:45	18:40-19:58/78 18:44-20:05/7	05:59 20:56	06:38-06:53/15 18:44-20:14/90	06:22 20:38	19:07-19:55/48 19:57	07:19 19:08	06:52 17:23
2	07:45 17:10	07:32 17:44	06:57 18:16	07:08 19:48	06:24 20:18	05:58 20:46	18:40-20:00/80 20:00-20:06/6	05:59 20:56	06:40-06:52/12 18:44-20:13/89	06:23 20:37	19:09-19:53/44 19:55	07:20 19:06	06:53 17:22
3	07:46 17:11	07:31 17:45	06:56 18:17	07:07 19:49	06:23 20:19	05:57 20:47	18:40-20:01/81 20:01-20:06/5	06:00 20:56	06:41-06:50/9 18:44-20:13/88	06:24 20:36	19:12-19:51/39 19:54	07:21 19:05	06:54 17:21
4	07:46 17:12	07:30 17:46	06:54 18:18	07:05 19:50	06:22 20:20	05:57 20:48	18:40-20:02/82 20:02-20:07/5	06:00 20:56	18:46-20:13/87 20:13-20:15/2	06:25 20:35	19:15-19:48/33 19:52	07:22 19:03	06:55 17:20
5	07:46 17:13	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48	18:40-20:04/84 20:04-20:08/4	06:01 20:56	18:45-20:12/87 20:12-20:14/2	06:26 20:34	19:19-19:44/25 19:50	07:23 19:02	06:56 17:19
6	07:46 17:14	07:28 17:49	06:51 18:20	07:02 19:52	06:20 20:22	05:56 20:49	18:40-20:05/85 20:05-20:08/3	06:02 20:55	18:46-20:12/86 20:12-20:15/3	06:27 20:33	19:25-19:38/13 19:49	07:24 19:00	06:57 17:17
7	07:46 17:15	07:27 17:50	06:50 18:22	07:00 19:53	06:19 20:23	05:56 20:49	18:39-20:06/87 20:06-20:08/2	06:02 20:55	18:46-20:11/85 20:11-20:14/3	06:27 20:32	19:47 19:47	19:00 18:58	17:17 17:16
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24	05:56 20:50	18:39-20:07/88 20:07-20:09/2	06:03 20:55	18:47-20:10/83 20:10-20:14/4	06:28 20:30	19:46 19:46	18:57 18:57	17:15 17:15
9	07:45 17:17	07:25 17:52	06:47 18:24	06:57 19:55	06:16 20:25	05:56 20:51	19:04-19:39/35 18:40-20:08/88	06:03 20:54	18:47-20:09/82 20:09-20:13/4	06:29 20:29	19:44 19:44	18:55 18:55	17:14 17:14
10	07:45 17:18	07:24 17:53	06:45 18:25	06:56 19:56	06:15 20:26	05:56 20:51	19:01-19:42/41 18:40-20:09/89	06:04 20:54	18:47-20:08/81 20:08-20:14/6	06:30 20:28	20:04-20:05/1 19:42	18:54 18:54	17:13 17:13
11	07:45 17:19	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27	05:55 20:52	18:59-19:44/45 18:40-20:10/90	06:05 20:54	18:48-20:07/79 20:07-20:14/7	06:31 20:27	20:03-20:04/1 19:41	18:52 18:52	17:12 17:12
12	07:45 17:20	07:21 17:56	06:42 18:27	06:52 19:58	06:13 20:28	05:55 20:52	18:57-19:46/49 18:40-20:10/90	06:05 20:53	18:48-20:04/76 20:04-20:13/9	06:32 20:26	20:02-20:03/1 19:39	18:51 18:51	17:12 17:12
13	07:45 17:21	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 20:53	18:55-19:48/53 18:40-20:11/91	06:06 20:53	18:49-20:03/74 20:03-20:13/10	06:33 20:24	19:38 19:38	18:49 18:49	17:11 17:11
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 20:53	18:53-19:50/57 18:40-20:11/91	06:07 20:52	18:50-20:00/70 20:00-20:13/13	06:34 20:23	19:03 19:36	18:58 18:48	17:10 17:10
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 20:54	18:52-19:51/59 18:40-20:11/91	06:08 20:52	18:51-19:57/66 19:57-20:13/16	06:35 20:22	19:04 19:34	18:48 18:46	17:09 17:09
16	07:44 17:24	07:17 18:00	06:36 18:31	06:46 20:02	06:09 20:32	05:55 20:54	18:50-19:52/62 18:41-20:12/91	06:08 20:51	18:50-20:12/82 20:12-20:19/1	06:36 20:20	19:05 19:33	18:46 18:45	17:08 17:08
17	07:43 17:25	07:15 18:01	06:34 18:32	06:45 20:03	06:08 20:33	05:55 20:54	18:49-19:53/64 18:41-20:12/91	06:09 20:51	18:51-20:11/80 20:11-20:19/1	06:37 20:19	19:06 19:31	18:45 18:43	17:08 17:07
18	07:43 17:26	07:14 18:03	06:32 18:33	06:43 20:04	06:07 20:34	05:55 20:55	18:48-19:54/66 18:41-20:12/91	06:10 20:50	18:52-20:11/79 20:11-20:19/1	06:38 20:18	19:07 19:29	18:43 18:42	17:07 17:07
19	07:42 17:27	07:13 19:04	06:31 18:34	06:42 20:05	06:07 20:35	05:55 20:55	18:47-19:56/69 18:41-20:12/91	06:11 20:49	18:53-20:11/78 20:11-20:19/1	06:39 20:16	19:08 19:28	18:42 18:40	17:06 17:06
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55	18:46-19:57/71 18:41-20:12/91	06:11 20:49	18:53-20:09/76 20:09-20:13/10	06:40 20:15	19:09 19:26	18:40 18:39	17:13 17:05
21	07:41 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:37	05:56 20:55	18:45-19:58/73 18:42-20:13/91	06:12 20:48	18:54-20:09/75 20:13-20:13/91	06:41 20:13	19:10 19:24	18:40 18:37	17:14 17:05
22	07:41 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:04 20:37	05:56 20:56	18:44-19:58/74 18:42-20:13/91	06:13 20:47	18:55-20:08/73 20:12-20:12	06:42 20:12	19:11 19:23	18:41 18:36	17:15 17:04
23	07:40 17:32	07:07 18:08	06:24 18:38	06:36 20:09	06:04 20:38	05:56 20:56	18:44-20:00/76 18:42-20:13/91	06:14 20:46	18:56-20:08/72 20:10-20:10	06:43 20:10	19:12 19:21	18:42 18:35	17:17 17:03
24	07:39 17:33	07:06 18:09	06:23 18:39	06:35 20:10	06:03 20:39	05:56 20:56	18:43-20:00/77 18:42-20:13/91	06:15 20:46	18:57-20:07/70 20:10-20:10	06:43 20:09	19:13 19:19	18:43 18:33	17:18 17:03
25	07:39 17:34	07:04 18:11	06:21 18:40	06:34 20:11	06:02 20:40	05:57 20:56	18:43-20:01/78 18:43-20:14/91	06:16 20:45	18:57-20:05/68 20:07-20:07	06:44 20:07	19:13 19:18	18:44 17:52	17:19 17:04
26	07:38 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:01 20:41	05:57 20:56	18:42-20:02/80 18:43-20:14/91	06:17 20:44	18:59-20:04/65 20:06-20:06	06:45 20:06	19:14 19:16	18:45 17:31	17:20 17:02
27	07:37 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:42	05:57 20:56	18:41-20:02/81 18:42-20:14/92	06:17 20:43	19:00-20:03/63 20:12-20:12	06:46 20:04	19:15 19:14	18:46 17:29	17:21 17:02
28	07:36 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 20:42	05:58 20:56	18:41-20:03/82 18:43-20:14/91	06:18 20:42	19:01-20:02/61 20:12-20:12	06:47 20:03	19:16 19:13	18:47 17:28	17:22 17:01
29	07:36 17:39	07:06 18:19	06:28 19:44	06:00 20:15	06:00 20:43	05:58 20:56	18:41-19:49/68 19:49-20:03/14	06:19 20:41	19:03-20:01/58 20:01-20:01	06:48 20:01	19:17 19:11	18:48 17:27	17:23 17:01
30	07:35 17:40	07:05 18:24	06:27 19:45	06:00 20:16	06:00 20:44	05:59 20:56	18:41-19:53/72 19:53-20:04/11	06:20 20:40	19:05-20:00/55 20:00-20:00	06:49 20:00	19:18 19:10	18:49 17:26	17:24 17:00
31	07:34 17:41	07:04 18:31	06:26 19:46	06:00 20:17	06:00 20:45	05:59 20:56	18:41-19:56/75 19:56-20:05/9	06:21 20:39	19:06-19:58/52 20:00-20:00	06:50 19:58	19:19 17:24	18:49 17:41	17:24 17:08
Potential sun hours	301	299	301	397	445	448	3135	455	2447	426	205	374	347
Sum of minutes with flicker	0	0	370	0	397	0	1587	0	2447	426	205	374	0

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 3 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03

Assumptions for shadow calculations

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

Table with 12 columns (Jan-Dec) and 2 rows of data for sunshine probability.

Operational time

Table with 12 columns (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW, Sum) and 2 rows of data for operational time.

Idle start wind speed: Cut in wind speed from power curve

Main shadow flickering calendar table with columns for months (January to June) and rows for days (1-31) showing sun rise/set times and flicker minutes.

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

Matrix table with 2 columns: Day in month, Sun rise/set times and First time/Last time/Minutes with flicker.

Project:

Windpro Isili - shadow flickering

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Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 3 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (3) IS_03

Assumptions for shadow calculations

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

Table with columns for months (Jan-Dec) and values for sunshine probability.

Operational time

Table with columns for directions (N, NNE, ENE, E, ESE, SSE, S, SSW, WSW, W, WNW, NNW) and Sum, with values for operational time.

Idle start wind speed: Cut in wind speed from power curve

Main shadow flickering calendar table with columns for months (July-December) and rows for days, showing sun rise/set times and minutes with flicker.

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

Matrix layout table with columns for Day in month, Sun rise/set, and First/Last time with flicker/Minutes with flicker.

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 6

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2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 4 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4) IS_04

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 10:02-10:56/54 17:09	07:33 07:57-08:12/15 17:42	06:59 18:15	07:10 07:47-08:02/15 19:47	06:26 20:17	05:58 06:53-07:27/34 20:45
2	07:45 10:03-10:56/53 17:10	07:32 07:56-08:06/10 17:44 08:06-08:13/7	06:57 18:16	07:08 07:48-08:00/12 19:48	06:24 20:18	05:58 06:54-07:28/34 20:46
3	07:45 10:04-10:56/52 17:11	07:31 07:56-08:08/12 17:45 08:08-08:14/6	06:56 18:17	07:06 07:51-07:57/6 19:49	06:23 07:04-07:16/12 20:19	05:57 06:54-07:27/33 20:47
4	07:45 10:05-10:55/50 17:12	07:30 07:55-08:10/15 17:46 08:10-08:15/5	06:54 18:18	07:05 19:50	06:22 07:01-07:19/18 20:20	05:57 06:54-07:27/33 20:47
5	07:45 10:06-10:55/49 17:13	07:29 07:54-08:11/17 17:47 08:11-08:15/4	06:53 18:19	07:03 19:51	06:21 06:59-07:21/22 20:21	05:57 06:55-07:27/32 20:48
6	07:45 10:08-10:54/46 17:14	07:28 07:53-08:12/19 17:48 08:12-08:16/4	06:51 18:20	07:02 19:52	06:20 06:58-07:22/24 20:22	05:56 06:56-07:27/31 20:49
7	07:45 10:09-10:54/45 17:15	07:27 07:52-08:12/20 17:50 08:12-08:15/3	06:50 18:21	07:00 19:53	06:18 06:56-07:24/28 20:23	05:56 06:55-07:26/31 20:49
8	07:45 10:11-10:53/42 17:16	07:26 07:52-08:13/21 17:51 08:13-08:15/2	06:48 18:23	06:59 19:54	06:17 06:55-07:25/30 20:24	05:56 06:56-07:26/30 20:50
9	07:45 10:12-10:51/39 17:17	07:25 07:52-08:13/21 17:52 08:13-08:15/2	06:46 18:24	06:57 19:55	06:16 06:54-07:26/32 20:25	05:56 06:57-07:26/29 20:51
10	07:45 10:14-10:50/36 17:18	07:24 07:52-08:13/21 17:53 08:13-08:14/1	06:45 18:25	06:55 19:56	06:15 06:54-07:26/32 20:26	05:55 06:57-07:26/29 20:51
11	07:45 10:16-10:49/33 17:19	07:23 07:52-08:13/21 17:54	06:43 18:26	06:54 19:57	06:14 06:53-07:27/34 20:27	05:55 06:58-07:26/28 20:52
12	07:45 10:19-10:47/28 17:20	07:21 07:53-08:12/19 17:56	06:42 18:27	06:52 19:58	06:13 06:52-07:27/35 20:28	05:55 06:58-07:26/28 20:52
13	07:44 10:21-10:44/23 17:21	07:20 07:53-08:11/18 17:57	06:40 18:28	06:51 19:59	06:12 06:52-07:28/36 20:29	05:55 06:59-07:26/27 20:53
14	07:44 10:25-10:41/16 17:22	07:19 07:54-08:10/16 17:58	06:39 18:29	06:49 20:00	06:11 06:51-07:28/37 20:30	05:55 06:59-07:26/27 20:53
15	07:44 17:23 17:25	07:18 07:55-08:09/14 17:59	06:37 18:30	06:48 20:01	06:10 06:51-07:28/37 20:31	05:55 07:00-07:26/26 20:53
16	07:43 17:24 17:26	07:16 07:57-08:08/11 18:00	06:35 18:31	06:46 20:02	06:09 06:50-07:28/38 20:32	05:55 07:00-07:26/26 20:54
17	07:43 17:25 17:27	07:15 18:01	06:34 18:32	06:45 20:03	06:08 06:50-07:28/38 20:33	05:55 07:00-07:26/26 20:54
18	07:43 17:26 17:28	07:14 18:03	06:32 18:33	06:43 20:04	06:07 06:50-07:28/38 20:34	05:55 07:01-07:26/25 20:54
19	07:42 17:27 17:29	07:13 18:04	06:31 18:34	06:42 20:05	06:07 06:50-07:29/39 20:35	05:55 07:01-07:26/25 20:55
20	07:42 17:28 17:30	07:11 18:05	06:29 18:35	06:41 20:06	06:06 06:50-07:29/39 20:36	05:55 07:01-07:26/25 20:55
21	07:41 17:29 17:31	07:10 18:06	06:27 18:36	06:39 20:07	06:05 06:50-07:29/39 20:36	05:56 07:02-07:27/25 20:55
22	07:40 17:31 17:33	07:09 18:07	06:26 06:54-07:01/7 18:37	06:38 20:08	06:04 06:50-07:28/38 20:37	05:56 07:02-07:27/25 20:56
23	07:40 17:32 17:34	07:07 18:08	06:24 06:51-07:03/12 18:38	06:36 20:09	06:03 06:51-07:29/38 20:38	05:56 07:02-07:27/25 20:56
24	07:39 17:33 17:35	07:06 18:09	06:23 06:49-07:05/16 18:39	06:35 20:10	06:03 06:50-07:28/38 20:39	05:56 07:02-07:27/25 20:56
25	07:39 17:34 17:36	07:04 18:11	06:21 06:48-07:05/17 18:40	06:33 20:11	06:02 06:51-07:29/38 20:40	05:57 07:02-07:28/26 20:56
26	07:38 17:35 17:37	07:03 18:12	06:19 06:47-07:06/19 18:41	06:32 20:12	06:01 06:51-07:28/37 20:41	05:57 07:02-07:28/26 20:56
27	07:37 17:36 17:38	07:01 18:13	06:18 06:46-07:06/20 18:42	06:31 20:13	06:01 06:51-07:28/37 20:41	05:57 07:02-07:28/26 20:56
28	07:36 17:38 17:39	07:00 18:14	06:16 06:45-07:05/20 18:43	06:29 20:14	06:00 06:52-07:28/36 20:42	05:58 07:03-07:29/26 20:56
29	07:35 17:39 17:41		07:14 07:46-08:05/19 19:44	06:28 20:15	06:00 06:52-07:28/36 20:43	05:58 07:02-07:29/27 20:56
30	07:35 17:40 17:41	07:59-08:08/9	07:13 07:46-08:04/18 19:45	06:27 20:16	05:59 06:52-07:28/36 20:44	05:58 07:03-07:30/27 20:56
31	07:34 17:41	07:58-08:11/13	07:11 07:47-08:04/17 19:46		05:59 06:53-07:28/35 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	588	304	165	33	977	837

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 7

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 4 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (4) IS_04

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59 07:02-07:30/28 20:56	06:22 07:02-07:37/35 20:38	06:51 19:57	07:19 19:08	06:52 07:22-07:43/21 17:23 07:43-07:44/1	07:25 09:58-10:31/33 17:00
2	05:59 07:02-07:30/28 20:56	06:23 07:03-07:36/33 20:37	06:52 19:55	07:20 19:06	06:53 07:22-07:43/21 17:22 07:43-07:44/1	07:26 09:57-10:33/36 17:00
3	06:00 07:02-07:31/29 20:56	06:24 07:04-07:36/32 20:36	06:53 19:54	07:21 19:05	06:54 07:22-07:43/21 17:21 07:43-07:45/2	07:27 09:56-10:35/39 17:00
4	06:00 07:01-07:31/30 20:56	06:25 07:04-07:35/31 20:35	06:54 19:52	07:22 19:03	06:55 07:22-07:42/20 17:20 07:42-07:45/3	07:28 09:55-10:37/42 16:59
5	06:01 07:02-07:32/30 20:55	06:26 07:05-07:34/29 20:34	06:55 19:50	07:23 19:01	06:56 07:23-07:42/19 17:18 07:42-07:45/3	07:29 09:54-10:39/45 16:59
6	06:02 07:02-07:33/31 20:55	06:26 07:07-07:33/26 20:33	06:56 19:49	07:24 19:00	06:57 07:24-07:41/17 17:17 07:41-07:45/4	07:30 09:54-10:40/46 16:59
7	06:02 07:01-07:33/32 20:55	06:27 07:08-07:32/24 20:32	06:57 19:47	07:25 18:58	06:58 07:25-07:40/15 17:16 07:40-07:45/5	07:31 09:53-10:42/49 16:59
8	06:03 07:02-07:34/32 20:55	06:28 07:10-07:30/20 20:30	06:57 19:46	07:26 18:57	06:59 07:26-07:38/12 17:15 07:38-07:44/6	07:32 09:53-10:43/50 16:59
9	06:03 07:01-07:34/33 20:54	06:29 07:12-07:28/16 20:29	06:58 19:44	07:27 18:55	07:01 07:26-07:35/9 17:14 07:35-07:43/8	07:33 09:53-10:45/52 16:59
10	06:04 07:01-07:35/34 20:54	06:30 07:15-07:23/8 20:28	06:59 19:42	07:28 18:54	07:02 07:28-07:43/15 17:13	07:33 09:52-10:45/53 16:59
11	06:05 07:01-07:36/35 20:54	06:31 19:41	07:00 19:41	07:29 18:52	07:03 07:29-07:42/13 17:12	07:34 09:52-10:46/54 16:59
12	06:05 07:01-07:35/34 20:53	06:32 19:39	07:01 19:39	07:30 18:51	07:04 07:31-07:40/9 17:11	07:35 09:52-10:48/56 16:59
13	06:06 07:01-07:36/35 20:53	06:33 19:37	07:02 19:37	07:31 18:49	07:05 17:11	07:36 09:53-10:49/56 17:00
14	06:07 07:01-07:37/36 20:52	06:34 19:36	07:03 19:36	07:32 18:48	07:06 17:10	07:37 09:53-10:50/57 17:00
15	06:08 07:01-07:37/36 20:52	06:35 19:34	07:04 19:34	07:33 18:46	07:07 17:09	07:37 09:52-10:50/58 17:00
16	06:08 07:00-07:37/37 20:51	06:36 19:32	07:05 19:32	07:34 18:45	07:09 17:08	07:38 09:53-10:51/58 17:00
17	06:09 07:00-07:38/38 20:50	06:37 19:31	07:06 19:31	07:35 18:43	07:10 17:07	07:39 09:53-10:52/59 17:01
18	06:10 07:01-07:38/37 20:50	06:38 19:27	07:07 19:29	07:36 18:42	07:11 17:07	07:39 09:53-10:52/59 17:01
19	06:11 07:01-07:39/38 20:49	06:39 19:26	07:08 19:28	07:37 18:40	07:12 17:06	07:40 09:54-10:53/59 17:01
20	06:11 07:00-07:38/38 20:49	06:40 19:25	07:09 19:26	07:38 18:39	07:13 17:05	07:41 09:54-10:53/59 17:02
21	06:12 07:00-07:39/39 20:48	06:41 19:24	07:10 19:24	07:39 18:37	07:14 17:05	07:41 09:55-10:54/59 17:02
22	06:13 07:00-07:39/39 20:47	06:42 19:23	07:11 19:23	07:40 18:36	07:15 17:04	07:42 09:55-10:54/59 17:03
23	06:14 07:01-07:39/38 20:46	06:42 19:21	07:11 19:21	07:42 18:35	07:16 17:03	07:42 09:56-10:55/59 17:03
24	06:15 07:01-07:39/38 20:45	06:43 19:19	07:12 19:19	07:43 18:33	07:18 17:03	07:43 09:56-10:55/59 17:04
25	06:16 07:00-07:39/39 20:45	06:44 19:18	07:13 19:18	07:44 18:32	07:19 17:02	07:43 09:56-10:55/59 17:04
26	06:16 07:00-07:39/39 20:44	06:45 19:16	07:14 19:16	07:45 18:31	07:20 17:02	07:43 09:57-10:56/59 17:05
27	06:17 07:01-07:39/38 20:43	06:46 19:14	07:15 19:14	07:46 18:30	07:21 17:01	07:44 09:58-10:56/58 17:05
28	06:18 07:01-07:39/38 20:42	06:47 19:13	07:16 19:13	07:47 18:28	07:22 17:01	07:44 09:58-10:56/58 17:06
29	06:19 07:02-07:39/37 20:41	06:48 19:11	07:17 19:11	07:48 18:27	07:23 17:01	07:44 10:00-10:57/57 17:07
30	06:20 07:02-07:38/36 20:40	06:49 19:10	07:18 19:10	07:49 18:25	07:24 17:00	07:45 10:00-10:57/57 17:08
31	06:21 07:03-07:38/35 20:39	06:50 19:58		06:50 17:24		07:45 10:01-10:57/56 17:08
Potential sun hours	455	426	374	347	301	292
Sum of minutes with flicker	1087	254	205	106	290	1660

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

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

Project:

Windpro Isili - shadow flickering

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Licensed user:

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Bruno Manca / ingbrunomanca@gmail.com
Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 5 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5) IS_06

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 17:09	07:33 08:00-08:29/29 17:42	06:59 18:15	07:10 19:47	06:26 07:10-07:42/32 20:17	05:58 20:45
2	07:45 17:10	07:32 08:00-08:29/29 17:44	06:57 18:16	07:08 19:48	06:24 07:09-07:40/31 20:18	05:58 06:43-06:48/5 20:46
3	07:45 17:11	07:31 08:01-08:29/28 17:45	06:56 18:17	07:06 19:49	06:23 07:10-07:40/30 20:19	05:57 06:40-06:50/10 20:47
4	07:45 17:12	07:30 08:01-08:29/28 17:46	06:54 18:18	07:05 19:50	06:22 07:10-07:40/30 20:20	05:57 06:39-06:51/12 20:47
5	07:45 17:13	07:29 08:01-08:29/28 17:47	06:53 18:19	07:03 19:51	06:21 07:11-07:39/28 20:21	05:57 06:39-06:53/14 20:48
6	07:45 17:14	07:28 08:01-08:28/27 17:48	06:51 18:20	07:02 19:52	06:20 07:12-07:38/26 20:22	05:56 06:38-06:54/16 20:49
7	07:45 17:15	07:27 08:01-08:28/27 17:50	06:50 18:21	07:00 19:53	06:18 07:12-07:37/25 20:23	05:56 06:37-06:54/17 20:49
8	07:45 17:16	07:26 08:02-08:27/25 17:51	06:48 18:23	06:59 19:54	06:17 07:13-07:36/23 20:24	05:56 06:37-06:55/18 20:50
9	07:45 17:17	07:25 08:03-08:27/24 17:52	06:46 18:24	06:57 19:55	06:16 07:15-07:35/20 20:25	05:56 06:37-06:56/19 20:50
10	07:45 17:18	07:24 08:04-08:26/22 17:53	06:45 18:25	06:55 19:56	06:15 07:16-07:34/18 20:26	05:55 06:37-06:57/20 20:51
11	07:45 17:19	07:23 08:06-08:25/19 17:54	06:43 18:26	06:54 19:57	06:14 07:18-07:32/14 20:27	05:55 06:36-06:57/21 20:52
12	07:45 17:20	07:21 08:08-08:23/15 17:56	06:42 18:27	06:52 19:58	06:13 07:20-07:29/9 20:28	05:55 06:36-06:58/22 20:52
13	07:44 17:21	07:20 08:10-08:20/10 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 06:36-06:58/22 20:52
14	07:44 17:22	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 06:36-06:59/23 20:53
15	07:44 17:23	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 06:36-06:59/23 20:53
16	07:43 17:24	07:16 18:00	06:35 18:31	06:46 20:02	06:09 20:32	05:55 06:36-07:00/24 20:54
17	07:43 17:25	07:15 18:01	06:34 18:32	06:45 20:03	06:08 20:33	05:55 06:36-07:00/24 20:54
18	07:43 17:26	07:14 18:03	06:32 18:33	06:43 07:22-07:35/13 20:04	06:07 20:34	05:55 06:36-07:00/24 20:54
19	07:42 17:27	07:13 18:04	06:31 18:34	06:42 07:19-07:36/17 20:05	06:07 20:35	05:55 06:36-07:00/24 20:55
20	07:42 17:28	07:11 18:05	06:29 18:35	06:41 07:17-07:38/21 20:06	06:06 20:35	05:56 06:36-07:00/24 20:55
21	07:41 08:08-08:15/7 17:30	07:10 18:06	06:27 18:36	06:39 07:16-07:40/24 20:07	06:05 20:36	05:56 06:37-07:01/24 20:55
22	07:40 08:06-08:18/12 17:31	07:09 18:07	06:26 18:37	06:38 07:14-07:40/26 20:08	06:04 20:37	05:56 06:37-07:01/24 20:55
23	07:40 08:04-08:20/16 17:32	07:07 18:08	06:24 18:38	06:36 07:13-07:41/28 20:09	06:03 20:38	05:56 06:37-07:01/24 20:56
24	07:39 08:03-08:21/18 17:33	07:06 18:09	06:23 18:39	06:35 07:12-07:41/29 20:10	06:03 20:39	05:56 06:37-07:01/24 20:56
25	07:38 08:03-08:23/20 17:34	07:04 18:10	06:21 18:40	06:33 07:11-07:42/31 20:11	06:02 20:40	05:57 06:38-07:02/24 20:56
26	07:38 08:02-08:24/22 17:35	07:03 18:12	06:19 18:41	06:32 07:11-07:42/31 20:12	06:01 20:41	05:57 06:38-07:02/24 20:56
27	07:37 08:01-08:25/24 17:36	07:01 18:13	06:18 18:42	06:31 07:11-07:42/31 20:13	06:01 20:41	05:57 06:38-07:01/23 20:56
28	07:36 08:01-08:26/25 17:38	07:00 18:14	06:16 18:43	06:29 07:10-07:42/32 20:14	06:00 20:42	05:58 06:39-07:02/23 20:56
29	07:35 08:00-08:26/26 17:39		06:14 19:44	06:28 07:10-07:42/32 20:15	06:00 20:43	05:58 06:39-07:02/23 20:56
30	07:35 08:00-08:27/27 17:40		06:13 19:45	06:27 07:10-07:42/32 20:16	05:59 20:44	05:58 06:40-07:02/22 20:56
31	07:34 08:01-08:28/27 17:41		06:11 19:46		05:59 20:45	
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	224	311	0	347	286	597

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

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

Project:

Windpro Isili - shadow flickering

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Licensed user:

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IT-09028 Sestu
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Bruno Manca / ingbrunomanca@gmail.com

Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 5 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (5) IS_06

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59 06:40-07:02/22	06:22 07:29-07:40/11	06:51 07:19	07:19	06:52 07:34-07:56/22	07:25
	20:56	20:38	19:57	19:08	17:23	17:00
2	05:59 06:41-07:02/21	06:23 07:27-07:42/15	06:52 07:20	07:20	06:53 07:33-07:57/24	07:26
	20:56	20:37	19:55	19:06	17:22	17:00
3	06:00 06:42-07:01/19	06:24 07:25-07:44/19	06:53 07:21	07:21	06:54 07:32-07:57/25	07:27
	20:56	20:36	19:54	19:05	17:21	17:00
4	06:00 06:43-07:02/19	06:25 07:24-07:45/21	06:54 07:22	07:22	06:55 07:31-07:58/27	07:28
	20:56	20:35	19:52	19:03	17:20	16:59
5	06:01 06:43-07:01/18	06:26 07:23-07:46/23	06:55 07:23	07:23	06:56 07:30-07:58/28	07:29
	20:55	20:34	19:50	19:01	17:18	16:59
6	06:02 06:44-07:01/17	06:26 07:22-07:47/25	06:56 07:24	07:24	06:57 07:31-07:59/28	07:30
	20:55	20:33	19:49	19:00	17:17	16:59
7	06:02 06:44-07:00/16	06:27 07:21-07:48/27	06:57 07:25	07:25	06:58 07:31-07:59/28	07:31
	20:55	20:31	19:47	18:58	17:16	16:59
8	06:03 06:46-06:59/13	06:28 07:20-07:49/29	06:57 07:26	07:26	06:59 07:30-07:59/29	07:32
	20:55	20:30	19:46	18:57	17:15	16:59
9	06:03 06:47-06:58/11	06:29 07:20-07:49/29	06:58 07:27	07:27	07:01 07:30-07:59/29	07:33
	20:54	20:29	19:44	18:55	17:14	16:59
10	06:04 06:49-06:56/7	06:30 07:18-07:49/31	06:59 07:28	07:28	07:02 07:31-08:00/29	07:33
	20:54	20:28	19:42	18:54	17:13	16:59
11	06:05	06:31 07:18-07:49/31	07:00 07:29	07:29	07:03 07:31-07:59/28	07:34
	20:53	20:27	19:41	18:52	17:12	16:59
12	06:05	06:32 07:18-07:49/31	07:01 07:30	07:30	07:04 07:32-07:59/27	07:35
	20:53	20:25	19:39	18:51	17:11	16:59
13	06:06	06:33 07:18-07:49/31	07:02 07:31	07:31	07:05 07:32-07:58/26	07:36
	20:53	20:24	19:37	18:49	17:10	17:00
14	06:07	06:34 07:18-07:49/31	07:03 07:32	07:32	07:06 07:33-07:58/25	07:37
	20:52	20:23	19:36	18:48	17:10	17:00
15	06:08	06:35 07:17-07:49/32	07:04 07:33	07:33	07:07 07:34-07:58/24	07:37
	20:52	20:21	19:34	18:46	17:09	17:00
16	06:08	06:36 07:18-07:49/31	07:05 07:34	07:34	07:09 07:35-07:57/22	07:38
	20:51	20:20	19:32	18:45	17:08	17:00
17	06:09	06:37 07:18-07:49/31	07:06 07:35	07:35	07:10 07:36-07:56/20	07:39
	20:50	20:19	19:31	18:43	17:07	17:01
18	06:10	06:38 07:18-07:48/30	07:07 07:36	07:36	07:11 07:37-07:55/18	07:39
	20:50	20:17	19:29	18:42	17:07	17:01
19	06:11	06:39 07:19-07:48/29	07:08 07:37	07:37	07:12 07:38-07:54/16	07:40
	20:49	20:16	19:28	18:40	17:06	17:01
20	06:11	06:40 07:19-07:47/28	07:09 07:38	07:38	07:13 07:41-07:53/12	07:40
	20:48	20:15	19:26	18:39	17:05	17:02
21	06:12	06:41 07:19-07:45/26	07:10 07:39	07:39	07:14 07:44-07:51/7	07:41
	20:48	20:13	19:24	18:37	17:05	17:02
22	06:13	06:42 07:20-07:44/24	07:11 07:40	07:40	07:15	07:42
	20:47	20:12	19:23	18:36	17:04	17:03
23	06:14	06:42 07:21-07:42/21	07:11 07:42	07:42	07:16	07:42
	20:46	20:10	19:21	18:35	17:03	17:03
24	06:15	06:43 07:23-07:40/17	07:12 07:43	07:43	07:18	07:43
	20:45	20:09	19:19	18:33	17:03	17:04
25	06:16	06:44 07:25-07:37/12	07:13 06:44	06:44	07:19	07:43
	20:45	20:07	19:18	17:32	17:02	17:04
26	06:16	06:45	07:14 06:45	06:45	07:20	07:43
	20:44	20:06	19:16	17:31	17:02	17:05
27	06:17	06:46	07:15 06:46	06:46	07:21	07:44
	20:43	20:04	19:14	17:29	17:01	17:05
28	06:18	06:47	07:16 06:47	06:47	07:22	07:44
	20:42	20:03	19:13	17:28	17:01	17:06
29	06:19	06:48	07:17 06:48	06:48	07:23	07:44
	20:41	20:01	19:11	17:27	17:01	17:07
30	06:20	06:49	07:18 06:49	06:49	07:24	07:45
	20:40	20:00	19:10	17:25	17:00	17:08
31	06:21 07:35-07:36/1	06:50	06:50 07:34-07:54/20			07:45
	20:39	19:58	17:24			17:08
Potential sun hours	455	426	374	347	301	292
Sum of minutes with flicker	164	635	0	47	494	0

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 10

Licensed user:

Ing. Bruno Manca
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IT-09028 Sestu
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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 6 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6) IS_05

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 08:07-08:15/8 08:40-09:23/43 17:09 08:15-08:28/13	07:33 07:55-08:12/17 17:42	06:59 18:15	07:10 19:17	06:26 20:17	05:58 20:45
2	07:45 08:07-08:16/9 08:41-09:23/42 17:10 08:16-08:28/12	07:32 07:56-08:11/15 17:44	06:57 18:16	07:08 19:48	06:24 20:18	05:58 20:46
3	07:45 08:07-08:17/10 08:42-09:23/41 17:11 08:17-08:28/11	07:31 07:58-08:10/12 17:45	06:56 18:17	07:06 19:49	06:23 20:19	05:57 20:47
4	07:45 08:07-08:18/11 08:43-09:23/40 17:12 08:18-08:28/10	07:30 08:00-08:09/9 17:46	06:54 18:18	07:05 19:50	06:22 20:20	05:57 20:47
5	07:45 08:07-08:19/12 08:43-09:23/40 17:13 08:19-08:28/9	07:29 17:47	06:53 18:19	07:03 19:51	06:21 20:21	05:57 20:48
6	07:45 08:07-08:20/13 08:44-09:23/39 17:14 08:20-08:29/9	07:28 17:48	06:51 18:20	07:02 19:52	06:20 20:22	05:56 20:49
7	07:45 08:07-08:21/14 08:45-09:23/38 17:15 08:21-08:29/8	07:27 17:50	06:50 18:21	07:00 19:53	06:18 20:23	05:56 20:49
8	07:45 08:07-08:22/15 08:47-09:23/36 17:16 08:22-08:28/6	07:26 17:51	06:48 18:23	06:59 19:54	06:17 20:24	05:56 20:50
9	07:45 08:07-08:23/16 08:48-09:23/35 17:17 08:23-08:28/5	07:25 17:52	06:46 18:24	06:57 19:55	06:16 20:25	05:56 20:51
10	07:45 08:06-08:23/17 08:48-09:22/34 17:18 08:23-08:27/4	07:24 17:53	06:45 18:25	06:55 19:56	06:15 20:26	05:56 20:51
11	07:45 08:06-08:25/19 08:50-09:22/32 17:19 08:25-08:26/1	07:23 17:54	06:43 18:26	06:54 19:57	06:14 20:27	05:55 20:52
12	07:45 08:06-08:25/19 17:20 08:51-09:21/30	07:21 17:56	06:42 18:27	06:52 19:58	06:13 20:28	05:55 20:52
13	07:44 08:05-08:25/20 17:21 08:52-09:20/28	07:20 17:57	06:40 18:28	06:51 19:59	06:12 20:29	05:55 20:53
14	07:44 08:05-08:26/21 17:22 08:54-09:19/25	07:19 17:58	06:39 18:29	06:49 20:00	06:11 20:30	05:55 20:53
15	07:44 08:05-08:27/22 17:23 08:56-09:18/22	07:18 17:59	06:37 18:30	06:48 20:01	06:10 20:31	05:55 20:53
16	07:43 08:04-08:26/22 17:24 08:58-09:16/18	07:16 18:00	06:35 18:31	06:46 20:02	06:09 20:32	05:55 20:54
17	07:43 08:04-08:27/23 17:25 09:02-09:14/12	07:15 18:01	06:34 18:32	06:45 20:03	06:08 20:33	05:55 20:54
18	07:43 08:04-08:27/23 17:26	07:14 18:03	06:32 18:33	06:43 20:04	06:07 20:34	05:55 20:54
19	07:42 08:03-08:28/25 17:27	07:13 18:04	06:31 18:34	06:42 20:05	06:07 20:35	05:55 20:55
20	07:42 08:02-08:28/26 17:28	07:11 18:05	06:29 18:35	06:41 20:06	06:06 20:36	05:56 20:55
21	07:41 08:01-08:28/27 17:30	07:10 18:06	06:27 18:36	06:39 20:07	06:05 20:36	05:56 20:55
22	07:40 08:01-08:28/27 17:31	07:09 18:07	06:26 18:37	06:38 20:08	06:04 20:37	05:56 20:55
23	07:40 08:00-08:28/28 17:32	07:07 18:08	06:24 18:38	06:36 20:09	06:03 20:38	05:56 20:56
24	07:39 07:59-08:27/28 17:33	07:06 18:09	06:23 18:39	06:35 20:10	06:03 20:39	05:56 20:56
25	07:39 07:59-08:28/29 17:34	07:04 18:11	06:21 18:40	06:34 20:11	06:02 20:40	05:57 20:56
26	07:38 07:58-08:27/29 17:35	07:03 18:12	06:19 18:41	06:32 20:12	06:01 20:41	05:57 20:56
27	07:37 07:57-08:26/29 17:37	07:02 18:13	06:18 18:42	06:31 20:13	06:01 20:41	05:57 20:56
28	07:36 07:56-08:24/28 17:38	07:00 18:14	06:16 18:43	06:30 20:14	06:00 20:42	05:58 20:56
29	07:35 07:55-08:12/17 17:39 08:14-08:22/8	---	07:14 19:44	06:28 20:15	06:00 20:43	05:58 20:56
30	07:35 07:54-08:12/18 17:40	---	07:13 19:45	06:27 20:16	05:59 20:44	05:59 20:56
31	07:34 07:55-08:13/18 17:41	---	07:11 19:46	---	05:59 20:45	---
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	1274	53	0	0	0	0

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 11

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 6 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (6) IS_05

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:59 20:56	06:22 20:38	06:51 19:57	07:19 19:08	06:52 17:23	07:25 07:48-08:07/19 08:32-09:04/32 17:00 08:07-08:08/1
2	05:59 20:56	06:23 20:37	06:52 19:55	07:20 19:06	06:53 17:22	07:26 07:49-08:07/18 08:31-09:05/34 17:00 08:07-08:10/3
3	06:00 20:56	06:24 20:36	06:53 19:54	07:21 19:05	06:54 17:21	07:27 07:50-08:07/17 08:31-09:06/35 17:00 08:07-08:11/4
4	06:00 20:56	06:25 20:35	06:54 19:52	07:22 19:03	06:55 17:20	07:28 07:51-08:06/15 08:31-09:07/36 16:59 08:06-08:12/6
5	06:01 20:55	06:26 20:34	06:55 19:50	07:23 19:01	06:56 17:18	07:29 07:52-08:06/14 08:31-09:08/37 16:59 08:06-08:14/8
6	06:02 20:55	06:26 20:33	06:56 19:49	07:24 19:00	06:57 07:33-07:35/2 17:17	07:30 07:53-08:06/13 08:31-09:09/38 16:59 08:06-08:15/9
7	06:02 20:55	06:27 20:32	06:57 19:47	07:25 18:58	06:58 07:29-07:39/10 17:16	07:31 07:54-08:06/12 08:31-09:10/39 16:59 08:06-08:15/9
8	06:03 20:55	06:28 20:30	06:57 19:46	07:26 18:57	06:59 07:27-07:40/13 17:15	07:32 07:55-08:06/11 08:31-09:11/40 16:59 08:06-08:16/10
9	06:03 20:54	06:29 20:29	06:58 19:44	07:27 18:55	07:01 07:26-07:41/15 17:14	07:33 07:56-08:06/10 08:31-09:12/41 16:59 08:06-08:17/11
10	06:04 20:54	06:30 20:28	06:59 19:42	07:28 18:54	07:02 07:26-07:43/17 17:13	07:33 07:57-08:06/9 08:30-09:12/42 16:59 08:06-08:18/12
11	06:05 20:54	06:31 20:27	07:00 19:41	07:29 18:52	07:03 07:26-07:43/17 17:12	07:34 07:57-08:05/8 08:30-09:13/43 16:59 08:05-08:18/13
12	06:05 20:53	06:32 20:25	07:01 19:39	07:30 18:51	07:04 07:26-07:44/18 17:11	07:35 07:58-08:05/7 08:31-09:14/43 16:59 08:05-08:19/14
13	06:06 20:53	06:33 20:24	07:02 19:37	07:31 18:49	07:05 07:27-07:44/17 17:11	07:36 07:59-08:05/6 08:31-09:15/44 17:00 08:05-08:19/14
14	06:07 20:52	06:34 20:23	07:03 19:36	07:32 18:48	07:06 07:29-07:57/28 17:10	07:37 08:00-08:04/4 08:32-09:16/44 17:00 08:04-08:20/16
15	06:08 20:52	06:35 20:21	07:04 19:34	07:33 18:46	07:07 07:30-07:59/29 17:09	07:37 08:01-08:20/19 17:00 08:31-09:16/45
16	06:08 20:51	06:36 20:20	07:05 19:33	07:34 18:45	07:09 07:31-08:00/29 17:08	07:38 08:02-08:21/19 17:00 08:32-09:17/45
17	06:09 20:50	06:37 20:19	07:06 19:31	07:35 18:43	07:10 07:32-08:01/29 17:07	07:39 08:02-08:22/20 17:01 08:33-09:18/45
18	06:10 20:50	06:38 20:17	07:07 19:29	07:36 18:42	07:11 07:33-08:01/28 17:07	07:39 08:02-08:22/20 17:01 08:32-09:18/46
19	06:11 20:49	06:39 20:16	07:08 19:28	07:37 18:40	07:12 07:35-08:03/28 17:06	07:40 08:03-08:23/20 17:01 08:33-09:18/45
20	06:11 20:49	06:40 20:15	07:09 19:26	07:38 18:39	07:13 07:36-08:03/27 17:05	07:41 08:03-08:23/20 17:02 08:33-09:18/45
21	06:12 20:48	06:41 20:13	07:10 19:24	07:39 18:37	07:14 07:37-08:04/27 17:05	07:41 08:04-08:24/20 17:02 08:34-09:19/45
22	06:13 20:47	06:42 20:12	07:11 19:23	07:41 18:36	07:15 07:38-08:04/26 17:04	07:42 08:04-08:24/20 17:03 08:34-09:19/45
23	06:14 20:46	06:42 20:10	07:11 19:21	07:42 18:35	07:16 07:39-08:04/25 17:03	07:42 08:05-08:25/20 17:03 08:35-09:20/45
24	06:15 20:45	06:43 20:09	07:12 19:19	07:43 18:33	07:18 07:41-08:04/23 17:03	07:43 08:05-08:25/20 17:04 08:35-09:20/45
25	06:16 20:45	06:44 20:07	07:13 19:18	06:44 17:32	07:19 07:42-08:05/23 17:02	07:43 08:06-08:26/20 17:04 08:36-09:22/46
26	06:16 20:44	06:45 20:06	07:14 19:16	06:45 17:31	07:20 07:43-08:06/23 17:02	07:43 08:06-08:26/20 17:05 08:37-09:22/45
27	06:17 20:43	06:46 20:04	07:15 19:14	06:46 17:29	07:21 07:44-08:06/22 17:01	07:44 08:07-08:26/19 17:06 08:37-09:22/45
28	06:18 20:42	06:47 20:03	07:16 19:13	06:47 17:28	07:22 07:45-08:06/21 17:01	07:44 08:07-08:26/19 17:06 08:37-09:22/45
29	06:19 20:41	06:48 20:01	07:17 19:11	06:48 17:27	07:23 07:46-08:06/20 17:01	07:44 08:07-08:10/3 08:39-09:23/44 17:07 08:10-08:27/17
30	06:20 20:40	06:49 20:00	07:18 19:10	06:49 17:25	07:24 07:47-08:06/19 17:00	07:45 08:07-08:12/5 08:39-09:23/44 17:08 08:12-08:27/15
31	06:21 20:39	06:50 19:58		06:50 17:24		07:45 08:07-08:13/6 08:40-09:23/43 17:08 08:13-08:28/15
Potential sun hours	455	426	374	347	301	292
Sum of minutes with flicker	0	0	0	0	678	1941

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

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

Project:

Windpro Isili - shadow flickering

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2023-12-04 10:49 / 12

Licensed user:

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Calculated:
2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 7 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7) IS_07

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:45 17:09	07:33 17:42	06:59 07:39-08:04/25 18:15	07:10 07:55-09:54/119 19:47	06:26 08:09-09:35/86 20:17 18:38-19:55/77	05:58 18:37-20:04/87 20:45
2	07:45 17:10	07:32 17:44	06:57 07:40-08:03/23 18:16	07:08 07:56-09:54/118 19:48	06:24 08:09-09:33/84 20:18 18:36-19:55/79	05:58 18:38-20:04/86 20:46
3	07:45 17:11	07:31 17:45	06:56 07:40-08:02/22 18:17	07:06 07:57-09:54/117 19:49	06:23 08:10-09:33/83 20:19 18:36-19:56/80	05:57 18:37-20:04/87 20:47
4	07:45 17:12	07:30 17:46	06:54 07:42-08:01/19 18:18	07:05 07:55-09:54/119 19:50	06:22 08:10-09:32/82 20:20 18:35-19:57/82	05:57 18:38-20:04/86 20:47
5	07:45 17:13	07:29 17:47	06:53 07:43-07:58/15 18:19	07:03 07:54-09:53/119 19:51	06:21 08:11-09:31/80 20:21 18:35-19:59/84	05:57 18:39-20:05/86 20:48
6	07:45 17:14	07:28 17:48	06:51 07:46-07:55/9 18:20	07:02 07:54-09:54/120 19:52	06:20 08:12-09:30/78 20:22 18:35-20:00/85	05:56 18:39-20:05/86 20:49
7	07:45 17:15	07:27 17:50	06:50 18:21	07:00 07:53-09:53/120 19:53	06:18 08:12-09:29/77 20:23 18:35-20:01/86	05:56 18:39-20:04/85 20:49
8	07:45 17:16	07:26 17:51	06:48 18:23	06:59 07:53-09:53/120 19:54	06:17 08:13-09:28/75 20:24 18:35-20:02/87	05:56 18:39-20:04/85 20:50
9	07:45 17:17	07:25 17:52	06:46 18:24	06:57 07:52-09:52/120 19:55	06:16 08:14-09:27/73 20:25 18:34-20:03/89	05:56 18:40-20:05/85 20:50
10	07:45 17:18	07:24 17:53	06:45 08:07-08:17/10 18:25	06:55 07:52-09:52/120 19:56	06:15 08:15-09:26/71 20:26 18:34-20:03/89	05:56 18:40-20:05/85 20:51
11	07:45 17:19	07:23 17:54	06:43 07:58-08:26/28 18:26	06:54 07:52-09:51/119 19:57	06:14 08:16-09:25/69 20:27 18:34-20:04/90	05:55 18:41-20:05/84 20:52
12	07:45 17:20	07:21 17:56	06:42 07:53-08:30/37 18:27	06:52 07:52-09:51/119 19:58 19:13-19:34/21	06:13 08:16-09:23/67 20:28 18:34-20:04/90	05:55 18:41-20:05/84 20:52
13	07:44 17:21	07:20 17:57	06:40 07:49-08:35/46 18:28	06:51 07:51-09:50/119 19:59 19:07-19:38/31	06:12 08:17-09:22/65 20:29 18:34-20:04/90	05:55 18:41-20:05/84 20:52
14	07:44 17:22	07:19 17:58	06:39 07:45-08:37/52 18:29	06:49 07:52-09:50/118 20:00 19:04-19:39/35	06:11 08:18-09:21/63 20:30 18:34-20:04/90	05:55 18:42-20:05/83 20:53
15	07:44 17:23	07:18 17:59	06:37 07:42-08:39/57 18:30	06:48 07:52-09:49/117 20:01 19:00-19:39/39	06:10 08:19-09:20/61 20:31 18:34-20:04/90	05:55 18:42-20:05/83 20:53
16	07:43 17:24	07:16 18:00	06:35 07:40-08:42/62 18:31	06:46 07:52-09:49/117 20:02 18:58-19:41/43	06:09 08:20-09:18/58 20:32 18:33-20:04/91	05:55 18:42-20:06/84 20:54
17	07:43 17:25	07:15 07:49-07:57/8 18:01	06:34 07:37-08:43/66 18:32	06:45 07:52-09:47/115 20:03 18:55-19:41/46	06:08 08:21-09:17/56 20:33 18:33-20:04/91	05:55 18:43-20:06/83 20:54
18	07:43 17:26	07:14 07:46-08:00/14 18:03	06:32 07:34-08:45/71 18:33	06:43 07:53-09:47/114 20:04 18:53-19:43/50	06:07 08:22-09:16/54 20:34 18:33-20:04/91	05:55 18:43-20:06/83 20:54
19	07:42 17:27	07:13 07:44-08:02/18 18:04	06:31 07:10-07:13/3 18:34 07:33-08:47/74	06:42 07:53-09:46/113 20:05 18:50-19:43/53	06:07 08:24-09:15/51 20:35 18:34-20:05/91	05:55 18:43-20:06/83 20:55
20	07:42 17:28	07:11 07:42-08:03/21 18:05	06:29 07:04-07:17/13 18:35 07:31-08:48/77	06:41 07:54-09:45/111 20:06 18:49-19:44/55	06:06 08:24-09:14/50 20:35 18:34-20:04/90	05:56 18:43-20:06/83 20:55
21	07:41 17:30	07:10 07:42-08:04/22 18:06	06:27 07:02-07:20/18 18:36 07:29-08:49/80	06:39 07:55-09:45/110 20:07 18:48-19:46/58	06:05 08:25-09:12/47 20:36 18:34-20:04/90	05:56 18:43-20:06/83 20:55
22	07:40 17:31	07:09 07:40-08:04/24 18:07	06:26 07:00-07:21/21 18:37 07:27-08:50/83	06:38 07:56-09:43/107 20:08 18:46-19:46/60	06:04 08:26-09:10/44 20:37 18:34-20:04/90	05:56 18:44-20:07/83 20:55
23	07:40 17:32	07:07 07:40-08:05/25 18:08	06:24 06:58-07:21/23 18:38 07:25-08:50/85	06:36 07:57-09:43/106 20:09 18:45-19:47/62	06:03 08:29-09:10/41 20:38 18:35-20:04/89	05:56 18:44-20:07/83 20:56
24	07:39 17:33	07:06 07:40-08:06/26 18:09	06:23 06:57-07:22/25 18:39 07:25-08:52/87	06:35 07:58-09:41/103 20:10 18:43-19:48/65	06:03 08:30-09:08/38 20:39 18:35-20:04/89	05:56 18:44-20:07/83 20:56
25	07:38 17:34	07:04 07:39-08:06/27 18:10	06:21 06:56-08:52/116 18:40	06:33 08:00-09:41/101 20:11 18:42-19:49/67	06:02 08:32-09:07/35 20:40 18:35-20:05/90	05:57 18:45-20:08/83 20:56
26	07:38 17:35	07:03 07:39-08:06/27 18:12	06:19 06:56-08:52/116 18:41	06:32 08:03-09:40/97 20:12 18:41-19:50/69	06:01 08:33-09:05/32 20:41 18:35-20:04/89	05:57 18:44-20:08/84 20:56
27	07:37 17:37	07:01 07:38-08:05/27 18:13	06:18 06:55-08:53/118 18:42	06:31 08:07-09:39/92 20:13 18:40-19:50/70	06:01 08:34-09:03/29 20:41 18:35-20:04/89	05:57 18:44-20:08/84 20:56
28	07:36 17:38	07:00 07:39-08:05/26 18:14	06:16 06:54-08:53/119 18:43	06:29 08:08-09:38/90 20:14 18:39-19:52/73	06:00 08:37-09:02/25 20:42 18:36-20:04/88	05:58 18:45-20:08/83 20:56
29	07:35 17:39	07:00 07:39-08:05/26 18:14	06:14 07:55-09:54/119 19:44	06:28 08:08-09:37/89 20:15 18:39-19:53/74	06:00 08:39-08:59/20 20:43 18:36-20:04/88	05:58 18:45-20:08/83 20:56
30	07:35 17:40	07:00 07:39-08:05/26 18:14	06:13 07:54-09:54/120 19:45	06:27 08:09-09:36/87 20:16 18:38-19:54/76	05:59 08:42-08:57/15 20:44 18:36-20:04/88	05:59 18:44-20:08/84 20:56
31	07:34 17:41	07:00 07:39-08:05/26 18:14	06:11 07:54-09:54/120 19:46	06:25 08:09-09:36/87 20:17 18:38-19:54/76	05:58 08:43-08:58/14 20:45 18:36-20:04/88	05:59 18:44-20:08/84 20:56
Potential sun hours	301	299	370	397	445	448
Sum of minutes with flicker	0	265	1959	4383	4434	2525

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

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

Project:

Windpro Isili - shadow flickering

Printed/Page

2023-12-04 10:49 / 13

Licensed user:

Ing. Bruno Manca
 Via Vittorio Veneto 231
 IT-09028 Sestu
 +390702358125
 Bruno Manca / ingbrunomanca@gmail.com

Calculated:

2023-12-04 10:43/2.8.579

SHADOW - Calendar per WTG

Calculation: IsiliWTG: 7 - V162 5600 162.0 !O! hub: 119.0 m (TOT: 200.0 m) (7) IS_07

Assumptions for shadow calculations

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4.40	5.05	5.88	7.00	8.45	9.88	10.82	10.03	8.08	6.09	5.07	4.27

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
130	93	150	171	259	145	62	26	52	150	493	347	2,078

Idle start wind speed: Cut in wind speed from power curve

	July		August		September		October		November		December	
1	05:59	18:45-20:09/84	06:22	08:26-09:33/67	06:51	07:51-09:50/119	07:19	08:30-09:12/42	06:51	07:25	07:23	17:00
	20:56		20:38	18:44-20:14/90	19:57		19:08		17:23	17:00		
2	05:59	18:45-20:09/84	06:23	08:25-09:35/70	06:52	07:50-09:50/120	07:20	08:35-09:07/32	06:53	07:26	06:53	17:00
	20:56		20:37	18:44-20:14/90	19:55		19:06		17:22	17:00		
3	06:00	18:45-20:10/85	06:24	08:24-09:36/72	06:53	07:50-09:50/120	07:21	08:41-09:00/19	06:54	07:27	06:54	17:00
	20:56		20:36	18:44-20:13/89	19:54		19:05		17:21	17:00		
4	06:00	18:45-20:09/84	06:25	08:23-09:37/74	06:54	07:50-09:50/120	07:22		06:55	07:28	06:55	17:00
	20:56		20:35	18:44-20:12/88	19:52		19:03		17:20	16:59		
5	06:01	18:45-20:10/85	06:26	08:23-09:38/75	06:55	07:50-09:50/120	07:23		06:56	07:29	06:56	17:00
	20:55		20:34	18:44-20:11/87	19:50		19:01		17:18	16:59		
6	06:02	18:46-20:11/85	06:26	08:22-09:39/77	06:56	07:50-09:50/120	07:24		06:57	07:30	06:57	17:00
	20:55		20:33	18:44-20:10/86	19:49		19:00		17:17	16:59		
7	06:02	18:45-20:11/86	06:27	08:21-09:40/79	06:57	07:50-09:49/119	07:25	08:26-08:27/1	06:58	07:31	06:58	17:00
	20:55		20:31	18:45-20:09/84	19:47		18:58		17:16	16:59		
8	06:03	18:45-20:11/86	06:28	08:21-09:41/80	06:57	07:51-09:48/117	07:26	08:20-08:32/12	06:59	07:32	06:59	17:00
	20:55		20:30	18:45-20:08/83	19:46		18:57		17:15	16:59		
9	06:03	18:45-20:11/86	06:29	08:20-09:42/82	06:58	07:50-09:48/118	07:27	08:17-08:34/17	07:01	07:32	07:01	17:00
	20:54		20:29	18:45-20:07/82	19:44		18:55		17:14	16:59		
10	06:04	18:45-20:12/87	06:30	08:18-09:42/84	06:59	07:49-09:47/118	07:28	08:16-08:36/20	07:02	07:33	07:02	17:00
	20:54		20:28	18:45-20:05/80	19:42		18:54		17:13	16:59		
11	06:05	18:45-20:12/87	06:31	08:18-09:42/84	07:00	07:48-09:47/119	07:29	08:14-08:37/23	07:03	07:34	07:03	17:00
	20:53		20:27	18:45-20:04/79	19:41		18:52		17:12	16:59		
12	06:05	18:45-20:12/87	06:32	08:17-09:43/86	07:01	07:46-09:46/120	07:30	08:13-08:37/24	07:04	07:35	07:04	17:00
	20:53		20:25	18:45-20:03/78	19:39		18:51		17:11	16:59		
13	06:06	08:52-09:03/11	06:33	08:16-09:44/88	07:02	07:46-09:45/119	07:31	08:12-08:37/25	07:05	07:36	07:05	17:00
	20:53	18:45-20:12/87	20:24	18:46-20:01/75	19:37		18:49		17:11	17:00		
14	06:07	08:49-09:07/18	06:34	08:16-09:45/89	07:03	07:45-09:44/119	07:32	08:11-08:38/27	07:06	07:37	07:06	17:00
	20:52	18:45-20:13/88	20:23	18:46-20:00/74	19:36		18:48		17:10	17:00		
15	06:08	08:46-09:09/23	06:35	08:15-09:46/91	07:04	07:45-09:44/119	07:33	08:11-08:38/27	07:07	07:37	07:07	17:00
	20:52	18:44-20:13/89	20:21	18:47-19:59/72	19:34		18:46		17:09	17:00		
16	06:08	08:45-09:11/26	06:36	08:12-09:46/94	07:05	07:44-09:43/119	07:34	08:10-08:37/27	07:09	07:38	07:09	17:00
	20:51	18:45-20:13/88	20:20	18:48-19:58/70	19:32		18:45		17:08	17:00		
17	06:09	08:43-09:14/31	06:37	08:09-09:47/98	07:06	07:44-09:42/118	07:35	08:10-08:37/27	07:10	07:39	07:10	17:00
	20:50	18:45-20:14/89	20:19	18:48-19:57/69	19:31		18:43		17:07	17:01		
18	06:10	08:42-09:16/34	06:38	08:06-09:48/102	07:07	07:44-09:40/116	07:36	08:10-08:36/26	07:11	07:39	07:11	17:00
	20:50	18:45-20:14/89	20:17	18:49-19:55/66	19:29		18:42		17:07	17:01		
19	06:11	08:41-09:18/37	06:39	08:04-09:48/104	07:08	07:44-08:09/25	07:37	08:11-08:37/26	07:12	07:40	07:12	17:00
	20:49	18:44-20:13/89	20:16	18:50-19:54/64	19:28	08:11-09:38/87	18:40		17:06	17:01		
20	06:11	08:39-09:18/39	06:40	08:03-09:48/105	07:09	07:44-08:08/24	07:38	08:12-08:36/24	07:13	07:40	07:13	17:00
	20:48	18:44-20:14/90	20:15	18:50-19:52/62	19:26	08:11-09:37/86	18:39		17:05	17:02		
21	06:12	08:38-09:20/42	06:41	08:00-09:48/108	07:10	07:45-08:06/21	07:39	08:12-08:35/23	07:14	07:41	07:14	17:00
	20:48	18:44-20:14/90	20:13	18:51-19:51/60	19:24	08:12-09:36/84	18:37		17:05	17:02		
22	06:13	08:37-09:22/45	06:42	07:59-09:49/110	07:10	07:46-08:05/19	07:40	08:13-08:33/20	07:15	07:42	07:15	17:00
	20:47	18:44-20:14/90	20:12	18:52-19:49/57	19:23	08:13-09:34/81	18:36		17:04	17:03		
23	06:14	08:36-09:23/47	06:42	07:58-09:49/111	07:11	07:48-08:02/14	07:42	08:15-08:32/17	07:16	07:42	07:16	17:00
	20:46	18:45-20:15/90	20:10	18:53-19:48/55	19:21	08:15-09:32/77	18:35		17:03	17:03		
24	06:15	08:35-09:25/50	06:43	07:57-09:49/112	07:12	07:51-07:59/8	07:43	08:16-08:29/13	07:18	07:43	07:18	17:00
	20:45	18:45-20:15/90	20:09	18:55-19:47/52	19:19	08:16-09:31/75	18:33		17:03	17:04		
25	06:16	08:33-09:25/52	06:44	07:56-09:50/114	07:13	08:17-09:29/72	06:44	07:20-07:25/5	07:19	07:43	07:19	17:00
	20:45	18:44-20:14/90	20:07	18:56-19:45/49	19:18		17:32		17:02	17:04		
26	06:16	08:32-09:27/55	06:45	07:55-09:50/115	07:14	08:19-09:27/68	06:45		07:20	07:43	06:45	17:00
	20:44	18:44-20:14/90	20:06	18:58-19:44/46	19:16		17:31		17:02	17:05		
27	06:17	08:31-09:28/57	06:46	07:54-09:50/116	07:15	08:20-09:24/64	06:46		07:21	07:44	06:46	17:00
	20:43	18:44-20:14/90	20:04	19:00-19:43/43	19:14		17:29		17:01	17:06		
28	06:18	08:30-09:30/60	06:47	07:54-09:51/117	07:16	08:22-09:22/60	06:47		07:22	07:44	06:47	17:00
	20:42	18:44-20:15/91	20:03	19:02-19:41/39	19:13		17:28		17:01	17:06		
29	06:19	08:29-09:31/62	06:48	07:53-09:51/118	07:17	08:25-09:19/54	06:48		07:23	07:44	06:48	17:00
	20:41	18:44-20:15/91	20:01	19:05-19:40/35	19:11		17:27		17:01	17:07		
30	06:20	08:28-09:32/64	06:49	07:51-09:50/119	07:18	08:27-09:16/49	06:49		07:24	07:45	06:49	17:00
	20:40	18:44-20:15/91	20:00	19:07-19:37/30	19:09		17:25		17:00	17:08		
31	06:21	08:27-09:33/66	06:50	07:51-09:50/119			06:50			07:45	06:50	17:00
	20:39	18:43-20:14/91	19:58	19:12-19:32/20			17:24			17:08	17:24	17:00
Potential sun hours	455		425		374		347		301		292	
Sum of minutes with flicker	3548		5014		3108		477		0		0	

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

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