

INTEGRALE RICOSTRUZIONE PARCHI EOLICI "Vulturara - Motta Montecorvino"

**ADEGUAMENTO TECNICO IMPIANTO EOLICO MEDIANTE INTERVENTO DI REPOWERING
DELLE TORRI ESISTENTI E RIDUZIONE NUMERICA DEGLI AEROGENERATORI**



Edison Rinnovabili Spa
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Opera	B Progetto di Integrale Ricostruzione di n. 1 impianto eolico composto da 8 aerogeneratori da 6,6 MW per una potenza complessiva di 52,8 MW nei Comuni di Vulturara Appula - Motta Montecorvino ed opere di connessione nel comune di Vulturara alle località "Coppa S.Pietro - Toppo Crocella" con smantellamento di n. 19 aerogeneratori di potenza in esercizio pari a 11,4 MW.						
Oggetto	Nome Elaborato: VIA_03_86VTAD7-SHFCK_Shadow flickering			Folder: VIA_03_Relazioni Specialistiche			
	Descrizione Elaborato: Shadow flickering						
00	Ottobre 2023	Emissione per progetto definitivo	VEGA	Arch. A. Demaio	Edison Rinnovabili Spa		
Rev.	Data	Oggetto della revisione	Elaborazione	Verifica	Approvazione		
Scala:	B) Integrale Ricostruzione Vulturara - Motta Montecorvino						
Formato:	Codice progetto AU [86VTAD7]						

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1. PREMESSA

La presente relazione è relativa alla progettazione definitiva in seno al procedimento autorizzativo del “Progetto per il rifacimento e potenziamento di un parco eolico” che la **Edison Rinnovabili Spa** intende realizzare nei comuni Vulturara Appula e Motta Montecorvino (FG), nello specifico la proposta progettuale prevede la dismissione dell’ impianto esistente costituito da n. 19 aerogeneratori (modello Enercon E40, diametro 44m, hub 46m e potenza unitaria 600 kW/WTG), di cui 14 nel comune di Vulturara Appula e 5 nel comune di Motta Montecorvino, per una potenza totale di 11,4 MW e la realizzazione di un nuovo impianto costituito da n. 8 aerogeneratori di diametro rotore 155m, altezza al mozzo 102,5 m, per una potenza nominale di 6,6 MW e complessiva 52,8 MW)

Nome WTG	Coordinate WGS84 – UTM33N	
	Est	Nord
1	506702	4595411
2	506640	4594881
3	506741	4594445
4	506729	4594031
5	506680	4593372
6	506895	4592855
7	507388	4592914
8	507214	4592424

Il presente elaborato ha lo scopo di valutare in maniera tecnica l'eventuale impatto generato dall'evoluzione dell'ombra derivante dalla futura installazione dell’impianto eolico sopra descritto.

2. LO SHADOW FLICKERING

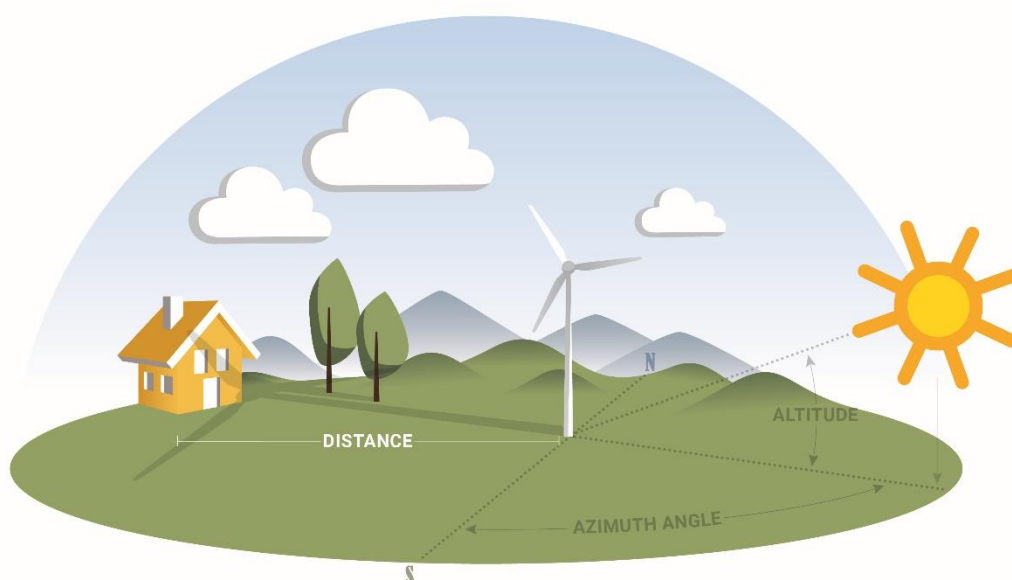
Per lo studio dello Shadow Flicker è stata presa in considerazione una SG 6.6 155 che ha le medesime caratteristiche dimensionali dell’aerogeneratore di progetto avente un’altezza al mozzo pari a 102,5 metri ed un diametro del rotore pari a 155 metri.

Lo Shadow-Flickering è l’ espressione comunemente impiegata in ambito specialistico per descrivere l’effetto stroboscopico delle ombre proiettate dalle pale rotanti degli aerogeneratori eolici quando sussistono le condizioni meteorologiche opportune; infatti la possibilità e la durata di tali effetti dipendono da una serie di condizioni ambientali, tra cui : la posizione del sole, l’ora del giorno, il giorno dell’anno, le condizioni atmosferiche ambientali e la posizione della turbina eolica rispetto ad un recettore sensibile. La valutazione tecnica è eseguita con l'ausilio di un software di simulazione specifico per la progettazione degli

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impianti eolici WIND PRO®, costituito da un insieme di moduli di elaborazione orientati alla simulazione di una serie di aspetti che caratterizzano le diverse fasi progettuali. Il modulo SHADOW è quello specifico per la valutazione dell'evoluzione dell'ombra e del flickering. In tale report è riportata:

- *La descrizione del caso studio con le posizioni delle turbine e loro caratteristiche tecniche*
- *Una breve descrizione tecnica del fenomeno di shadow flickering*
- *La descrizione dei recettori soggetti al fenomeno per i quali è stata richiesta questa analisi*
- *Sintesi della metodologia di analisi seguita per lo studio*
- *Sintesi dei risultati ottenuti, con allegati grafici ed analitici di dettaglio che descrivono il fenomeno su ognuno dei recettori e da parte di ognuna delle turbine per tutto l'anno solare.*



3. STUDIO DELL'EVOLUZIONE DELL'OMBRA GIORNALIERA GENERATA DAGLI AEROGENERATORI

Le turbine eoliche, come altre strutture fortemente sviluppate in altezza, proiettano un'ombra sulle aree adiacenti in presenza della luce solare diretta. Per chi vive in tali zone prossime all'insediamento eolico può essere molto fastidioso il cosiddetto fenomeno del "flicker" che consiste in un effetto di lampeggiamento che si verifica quando le pale del rotore in movimento "tagliano" la luce solare in maniera intermittente. Una progettazione attenta a questa problematica permette di evitare questo spiacevole fenomeno semplicemente prevedendo il luogo di incidenza dell'ombra e disponendo le turbine in maniera tale che

l'ombra sulle zone sensibili non superi un certo numero di ore all'anno. Il grafico in figura 2 riporta l'evoluzione annuale dell'ombra di una turbina considerando il caso peggiore di pale sempre in rotazione intorno al mozzo, e orientate sempre ortogonalmente al sole durante la sua evoluzione giornaliera.

Come è evidente dal grafico e dalla legenda le ore annue di ombra sono sempre minori con l'aumentare della distanza dal pilone secondo una particolare geometria dettata dalla posizione geografica; da osservare che l'ombra arriva a proiettarsi anche sino ad una distanza di 1 km, anche se solo per pochi minuti all'anno.

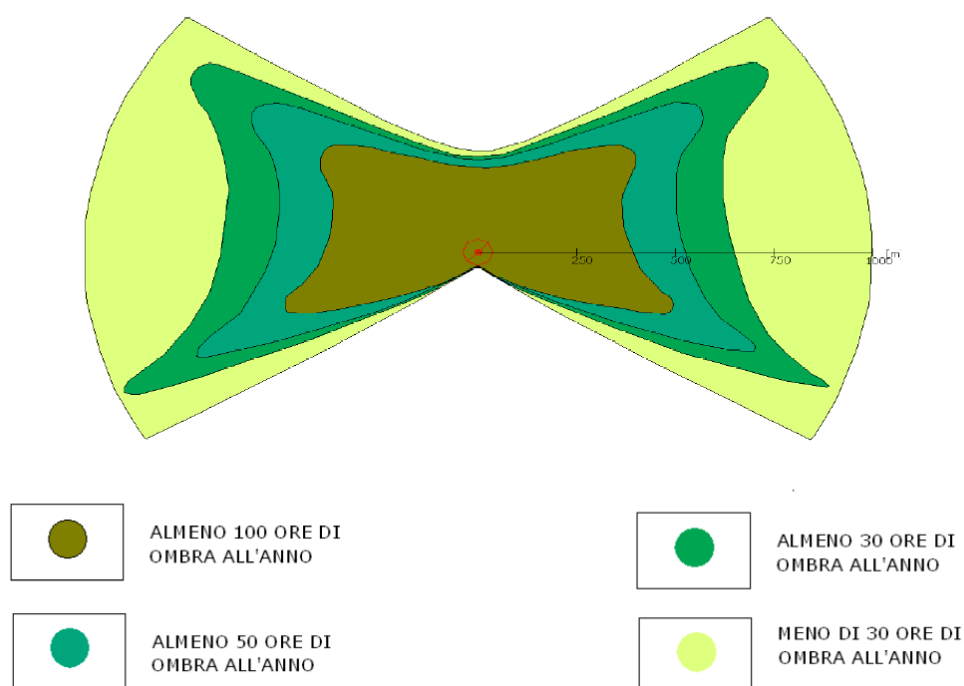
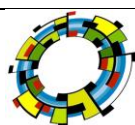


Figura 2: Evoluzione annuale tipo dell'ombra di una pala

Considerati i pochi precedenti esistenti (Germania) e le ipotesi così penalizzanti con cui è stata calcolato tale grafico si è ritenuto opportuno effettuare una sovrapposizione sull'impianto della parte più interna del grafico ovvero dell'area **che supera le 100 ore all'anno di ombra dei punti di installazione, intendendo questo come limite da non superarsi.**

In Italia, così come nella maggior parte dei paesi Europei ed extraeuropei non esiste una normativa specifica in relativa al disturbo generato dal fenomeno di Shadow – Flickering. Esistono delle regolamentazioni locali ma quasi mai comprendono limiti numerici specifici, quanto piuttosto delle raccomandazioni tese a sottolineare che il fenomeno non sia “unreasonable” o “significant”.

4. INDIVIDUAZIONE DEI RECETTORI ED IPOTESI DI CALCOLO



L’analisi di shadow-flickering di cui al presente studio è stata elaborata per specifici 7 recettori che circondano l’impianto; tuttavia, alcune strutture inserite nel modello di simulazione potrebbero essere ruderi non abitati e sostanzialmente privi di caratteristiche minime di abitabilità o agibilità; il che sarà analizzato nel seguito. Lo studio, i cui risultati in dettaglio sono riportati nei report allegati alla presente relazione, è stato condotto con uno specifico software (WindPRO).

Nello studio ci si è posti nella condizione più sfavorevole possibile, in quanto si è considerato che:

- il sole risplende per tutta la giornata dall'alba al tramonto (cioè si è **sempre** in assenza di copertura nuvolosa);
- il piano di rotazione delle pale è sempre perpendicolare alla linea che passa per il sole e per l'aerogeneratore (l'aerogeneratore “insegue” il sole);
- l'aerogeneratore è sempre operativo.

Allo stesso tempo, si è trascurata la presenza degli alberi e di altri ostacoli che bordano le strade “intercettando” l’ombra degli aerogeneratori riducendo il fenomeno del flickering sui recettori.

Ciò significa che i risultati forniti dal calcolo sono ampiamente cautelativi.

In base alla metodologia descritta nei paragrafi precedenti, sono stati utilizzati i seguenti dati di input per impostare il modello di simulazione per la valutazione del fenomeno di Shadow-Flickering degli aerogeneratori di progetto:

- a) **Il DTM o Modello del terreno digitale** per caratterizzare l'orografia è stato estrapolato dal grid disponibile in download dal SIT della Regione Puglia, georeferenziato, sovrapposto, confrontato e adeguato con le curve di livello presenti sulla cartografia ufficiale CTR 1:5.000 con uno step di 5 m. Il modello digitale ottenuto copre un’area sufficiente ad inglobare l’area del parco eolico di progetto e trova un ottimo riscontro con l’andamento orografico verificato in sito.
- b) **Posizioni geografiche di recettori con dettaglio dimensionale delle aree più esposte.** Sono i ricettori individuati dallo studio acustico e in quello della gittata massima degli elementi rotanti; essi sono classificati secondo la loro abitabilità e destinazione d’uso. Per tutti i ricettori si è ritenuto opportuno usare l'ipotesi di cautela della modalità “green house mode”. Questa scelta è stata operata poiché in talune circostanze anche lo spazio antistante le strutture può essere considerato o adibito a luogo di riposo e relax. La scelta di una singola finestra o di una facciata in alcune condizioni potrebbe risultare riduttiva allo scopo di una vera valutazione d'impatto.

c) Posizioni geografiche delle turbine eoliche e loro caratteristiche dimensionali

Gli aerogeneratori di progetto con le loro caratteristiche dimensionali e tecnologiche

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d) Nessun ostacolo naturale o artificiale è stato modellato.

Ricettore	Name WindPro		Coordinate		Ore di ombra x anno	Giorni di ombra x anno	Max ore ombra x giorno
	ID	Name	E	N			
R16	1	A	506949	4593184	0:00	0	0:00
R19	2	B	506851	4593156	0:00	0	0:00
R20	3	C	506851	4593209	0:00	0	0:00
R23	4	D	505523	4594386	52:41	103	0:29
R33	5	E	506441	4595873	80:00	120	1:09
R45	6	F	507591	4593394	118:25	133	1:04
R56	7	G	507366	4594211	0:00	0	0:00

Tab. 1 – Coordinate ricettori UTM-WGS84

5. I RISULTATI DEL CALCOLO DELL'EVOLUZIONE DELL'OMBRA

Come sopra accennato, nella procedura “Worst case”, (quella di cui ai calcoli effettuati), il fenomeno di shadow/flickering viene calcolato non tenendo conto di una serie di fattori, i cui dati allo stato dell'arte per il sito in questione non sono disponibili. Se fossero considerati tali fattori si potrebbe calcolare il fenomeno di shadow/flickering con la metodologia “real case”, nel qual caso, da quanto riportato nella letteratura specialistica secondo altri casi simili, si avrebbero risultati indicanti una riduzione del fenomeno ad 1/3 dei valori.

Cautelativamente assumiamo per effetto di tali fattori una riduzione del fenomeno del flickering di 1/2.

Dalle simulazioni effettuate, i cui risultati sono riportati nella **Tab. 1**, si evince che gli aerogeneratori di progetto generano maggiormente il fenomeno di shadow/flickering sui seguenti recettori, considerando solo quelli di categoria catastale più interessante per il fenomeno (recettori con categoria catastale A e con più di 30 ore/anno nel “Worst Case”:

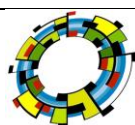
R23,R33

Per tali recettori si ha un massimo di ore di ombra calcolato pari a 80:00 ore/anno.

In riferimento alle considerazioni sopra fatte circa i fattori attenuanti, nel “Real Case” tale valore diventa pari alla metà e quindi di 40:00 ore/anno.

Tale valore è certamente inferiore alle 100 ore/anno, sopra citato quale limite da non superare, ma di poco superiore alle 30 ore/anno quale valore ancora più restrittivo che in alcune valutazioni più severe viene considerato.

Solo da osservare che:

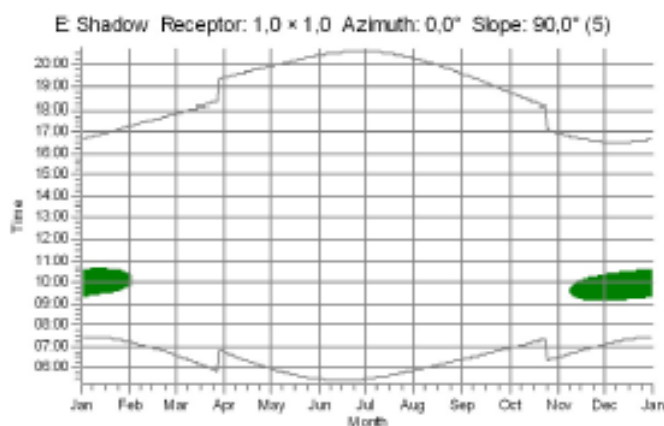


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1. prendendo a riferimento il valore limite di 100 ore/anno, non considerando i fattori di attenuazione del "real case" e considerando **tutti** i recettori indistintamente, solo il recettore R45 supera tale valore: tuttavia trattasi di recettori classificati come fabbricato rurale.
2. Considerando i recettori "**R23, R33**" anche senza considerare i fattori di attenuazione il valore massimo delle ore di ombra è di 80:00 fondamentalmente molto inferiore al valore limite di 100 ore/anno e di poco superiore a quello limite assunto in valutazioni più severe di 30 ore/anno.

E' stato elaborato un calendario dell'ombra riportato in appendice (rif. Appendice Calendar), che riporta in maniera grafica giorno per giorno, per tutto l'anno, la durata giornaliera del fenomeno, l'orario di inizio e di fine del fenomeno, nelle condizioni di caso reale. Dalla lettura del "Calendar" si legge che il fenomeno dell'ombreggiamento, si esplica sui recettori con intensità maggiore nel periodo compreso tra Gennaio-Febbraio e Novembre-Dicembre nelle ore di metà mattinata. Nella figura che segue è riportato a titolo di esempio il grafico "calendar" di un recettore: le macchie individuano i momenti di shadow, la posizione nel grafico individua tempo e durata del fenomeno, il colore della macchia individua la turbina che causa il fenomeno.



1: Siemens Gamesa SG 6.6-155 6600 155.0 IOL hub: 102,5 m (TOT: 180,0 m) (9)

L'allegato 2 riporta il dettaglio analitico di quanto espresso dal grafico precedente con gli specifici orari di inizio e di fine del fenomeno. A seguire è altresì riportata la sintesi grafica annuale (come mostra l'immagine precedente) dell'apporto di ombreggiamento a carico di ogni recettore ed il/gli aerogeneratore/i responsabile/i del fenomeno.

E' stata inoltre elaborata una mappa (report Map, Allegato 3) in cui vengono riportate, con diverse gradazioni di colore, le zone soggette ad una determinata durata del fenomeno dell'ombreggiamento oltre all'estensione areale nella quale il fenomeno risulta significativo.

Il fenomeno dell’ombreggiamento interessa marginalmente tratti di strade provinciali e strade comunali e/o private per un numero di ore all’anno del tutto irrilevanti e cioè pari ad un massimo di 30 ore/anno, ma solo in alcuni tratti. Preme tuttavia evidenziare che nelle simulazioni non si è tenuto conto della possibile presenza di vegetazione capace di offrire un effetto “barriera” ai recettori e/o alle strade limitrofe. Inoltre, la percezione dell’impianto dalla strada risulterebbe essere “in movimento” e quindi legata alla breve permanenza delle automobili in transito, per cui il fastidio indotto sarebbe temporalmente limitato. A questo si aggiunge che le simulazioni sono state effettuate assumendo le “condizioni peggiori”, sovrastimando pertanto l’effetto di flickering.

6. CONCLUSIONI E RACCOMANDAZIONI

In conclusione, si può affermare che i risultati ottenuti dell’elaborazione evidenziano, pur considerando le condizioni più sfavorevoli, che le turbine di progetto generano effetti di shadow flickering **i cui impatti risultano essere nulli per la maggior parte dei recettori individuati, e piuttosto modesti per gli altri e comunque questi sono interessati per un numero massimo di ore l’anno inferiore al limite accettabile sia di tipo ordinario ma anche in valutazioni più severe e restrittive.**

In ogni caso è comunque da rimarcare l’effetto di sovrastima dovuto al grado di cautela utilizzato per la simulazione che non tiene in conto di tutte le possibili fonti di attenuazione dell’effetto cui ogni recettore è (o può essere) soggetto quali presenza di alberi, ostacoli, siepi e quant’altro possa attenuare il fenomeno dell’evoluzione giornaliera dell’ombra.

7. ELENCO ALLEGATI

Di seguito vengono riportati i risultati dello Shadow Flicker elaborati con il software *WindPro*

1. Main result: quadro sintetico dei risultati di calcolo;
2. Calendar: analisi giornaliera dell’effetto “flickering” ricevuto da ogni recettore;
3. Calendar, graphical: grafico dell’analisi giornaliera dell’effetto “flickering” ricevuto da ogni recettore;
4. Calendar per WTG: analisi giornaliera dell’effetto “flickering” indotto da ogni aerogeneratore sui recettori;
5. Calendar per WTG, graphical: grafico dell’analisi giornaliera dell’effetto “flickering” indotto da ogni aerogeneratore sui recettori;
6. Map: mappa delle aree soggette ad ombreggiamento.

SHADOW - Main Result

Calculation: VM

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Elevation Grid Data Object: IR_VolturinoVolturaraMotta

Obstacles used in calculation

Receptor grid resolution: 1,0 m

All coordinates are in

UTM (north)-WGS84 Zone: 33

WTGs

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM
			[m]									[RPM]
1	506.701	4.595.410	828,1	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
2	506.639	4.594.881	843,8	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
3	506.741	4.594.445	821,3	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
4	506.728	4.594.031	798,5	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
5	506.680	4.593.372	790,9	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
6	506.894	4.592.854	785,2	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
7	507.387	4.592.913	725,3	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8
8	507.214	4.592.423	741,8	Siemens Gamesa SG 6.6-...	Yes	Siemens Gamesa	SG 6.6-155-6.600	6.600	155,0	102,5	2.042	8,8

Shadow receptor-Input

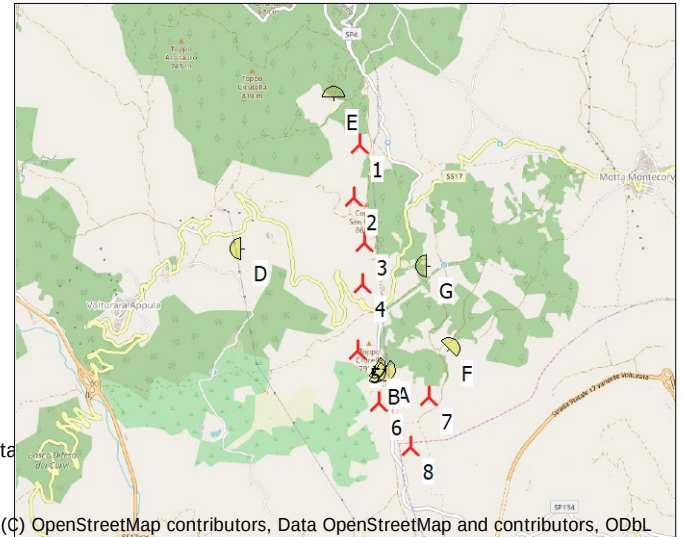
No.	Easting	Northing	Z	Width	Height	Elevation	Degrees from	Slope of	Direction mode	Eye height
						a.g.l.	south cw	window		(ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]	[°]		[m]
A	506.949	4.593.184	787,9	1,0	1,0	1,0	120,0	90,0	Fixed direction	2,0
B	506.851	4.593.156	786,1	1,0	1,0	1,0	120,0	90,0	Fixed direction	2,0
C	506.851	4.593.209	782,7	1,0	1,0	1,0	120,0	90,0	Fixed direction	2,0
D	505.523	4.594.386	613,2	1,0	1,0	1,0	-90,0	90,0	Fixed direction	2,0
E	506.441	4.595.873	755,9	1,0	1,0	1,0	0,0	90,0	Fixed direction	2,0
F	507.591	4.593.394	657,5	1,0	1,0	1,0	45,0	90,0	Fixed direction	2,0
G	507.366	4.594.211	722,6	1,0	1,0	1,0	-90,0	90,0	Fixed direction	2,0

Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	52:41	148	0:29
E	80:00	83	1:09
F	118:25	172	1:04
G	0:00	0	0:00



Scale 1:75.000

▲ New WTG

● Shadow receptor

Project:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Main Result

Calculation: VM

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

No.	Name	Worst case [h/year]
1	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (9)	80:00
2	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (10)	0:00
3	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (11)	15:26
4	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (12)	12:45
5	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (13)	50:09
6	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (14)	35:37
7	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (15)	57:09
8	Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (16)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Calendar

Calculation: VMShadow receptor: A - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (1)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:32
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:17	06:26 19:33	06:57 18:42	06:32 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 18:40	06:33 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:37	05:57 20:15	06:28 19:30	06:59 18:39	06:34 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:36 16:52	07:10 16:31
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7	07:27 16:46	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 18:34	06:38 16:49	07:12 16:30
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31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		06:30 16:58		07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Total, worst case												

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

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

SHADOW - Calendar

Calculation: VMShadow receptor: B - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (2)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:32
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31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37	06:30 16:58			07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Total, worst case												

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

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

SHADOW - Calendar

Calculation: VMShadow receptor: C - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (3)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:32
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19	07:23 16:59	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:16	05:26 20:37	05:42 20:30	06:12 19:55	06:43 19:04	07:16 18:15	06:52 16:38	07:22 16:32
20	07:22 17:00	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:16	05:26 20:37	05:43 20:30	06:13 19:54	06:45 19:03	07:17 18:13	06:54 16:37	07:22 16:33
21	07:22 17:01	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:17	05:26 20:37	05:44 20:29	06:14 19:52	06:46 19:01	07:18 18:12	06:55 16:37	07:23 16:33
22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:34
23	07:20 17:04	06:46 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	05:45 20:27	06:16 19:49	06:48 18:57	07:20 18:09	06:57 16:35	07:24 16:34
24	07:20 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:26	06:17 19:48	06:49 18:56	07:21 18:07	06:58 16:35	07:24 16:35
25	07:19 17:06	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	05:47 20:26	06:18 19:46	06:50 18:54	07:22 17:06	07:00 16:34	07:25 16:35
26	07:18 17:08	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:28 20:38	05:48 20:25	06:19 19:45	06:51 18:52	07:23 17:04	07:01 16:34	07:25 16:36
27	07:17 17:09	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	07:24 17:03	07:02 16:33	07:25 16:36
28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:25 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11		06:50 19:21	06:01 19:55	05:31 20:25	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	07:26 17:00	07:04 16:32	07:26 16:38
30	07:15 17:13		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	07:27 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		06:30 16:58		07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Total, worst case												

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

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

SHADOW - Calendar

Calculation: VMShadow receptor: D - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (4)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

January		February		March		April		May		June	
1	07:27	08:21 (5)	07:13	06:37		06:45		05:59		05:29	
	16:40	08:43 (5)	17:15	17:50		19:25		19:57		20:27	
2	07:27	08:21 (5)	07:12	06:35		06:43		05:57		05:29	
	16:41	08:43 (5)	17:16	17:51		19:26		19:58		20:28	
3	07:27	08:22 (5)	07:11	06:33		07:32 (4)	06:42	05:56		05:28	
	16:42	08:44 (5)	17:18	17:52	3	07:35 (4)	19:27	19:59		20:29	
4	07:27	08:21 (5)	07:10	06:32		07:27 (4)	06:40	05:55		05:28	
	16:43	08:44 (5)	17:19	17:53	14	07:41 (4)	19:28	20:00		20:29	
5	07:27	08:21 (5)	07:09	06:30		07:24 (4)	06:38	05:53		05:28	
	16:44	08:44 (5)	17:20	17:54	18	07:42 (4)	19:29	20:01		20:30	
6	07:27	08:22 (5)	07:08	06:29		07:23 (4)	06:37	05:52		05:27	
	16:45	08:45 (5)	17:21	17:56	21	07:44 (4)	19:30	20:02		20:31	
7	07:27	08:22 (5)	07:07	06:27		07:21 (4)	06:35	05:51		05:27	
	16:46	08:46 (5)	17:23	17:57	24	07:45 (4)	19:31	20:03		20:31	
8	07:27	08:23 (5)	07:06	06:25		07:20 (4)	06:33	05:50		05:27	
	16:47	08:46 (5)	17:24	17:58	25	07:45 (4)	19:32	20:04		20:32	
9	07:27	08:23 (5)	07:04	06:24		07:20 (4)	06:32	05:49		05:26	
	16:48	08:47 (5)	17:25	17:59	26	07:46 (4)	19:33	20:06		20:32	
10	07:26	08:23 (5)	07:03	06:22		07:19 (4)	06:30	07:34 (3)	05:47	05:26	
	16:49	08:47 (5)	17:27	18:00	27	07:46 (4)	19:34	07:40 (3)	20:07	20:33	
11	07:26	08:23 (5)	07:02	06:20		07:18 (4)	06:29	07:30 (3)	05:46	05:26	
	16:50	08:48 (5)	17:28	18:01	27	07:45 (4)	19:35	07:44 (3)	20:08	20:34	
12	07:26	08:24 (5)	07:01	06:19		07:18 (4)	06:27	07:28 (3)	05:45	05:26	
	16:51	08:49 (5)	17:29	18:02	28	07:46 (4)	19:36	07:46 (3)	20:09	20:34	
13	07:26	08:24 (5)	06:59	06:17		07:18 (4)	06:25	07:26 (3)	05:44	05:26	
	16:52	08:48 (5)	17:30	18:04	27	07:45 (4)	19:38	07:47 (3)	20:10	20:35	
14	07:25	08:25 (5)	06:58	06:15		07:17 (4)	06:24	07:24 (3)	05:43	05:26	
	16:53	08:49 (5)	17:32	18:05	27	07:44 (4)	19:39	07:47 (3)	20:11	20:35	
15	07:25	08:25 (5)	06:57	06:14		07:18 (4)	06:22	07:23 (3)	05:42	05:26	
	16:54	08:49 (5)	17:33	18:06	26	07:44 (4)	19:40	07:48 (3)	20:12	20:35	
16	07:24	08:26 (5)	06:55	06:12		07:19 (4)	06:21	07:22 (3)	05:41	05:26	
	16:56	08:49 (5)	17:34	18:07	23	07:42 (4)	19:41	07:48 (3)	20:13	20:36	
17	07:24	08:26 (5)	06:54	06:10		07:19 (4)	06:19	07:21 (3)	05:40	05:26	
	16:57	08:49 (5)	17:35	18:08	22	07:41 (4)	19:42	07:49 (3)	20:14	20:36	
18	07:24	08:27 (5)	06:53	06:09		07:20 (4)	06:17	07:20 (3)	05:39	05:26	
	16:58	08:50 (5)	17:37	18:09	19	07:39 (4)	19:43	07:49 (3)	20:15	20:37	
19	07:23	08:27 (5)	06:51	06:07		07:22 (4)	06:16	07:20 (3)	05:38	05:26	
	16:59	08:49 (5)	17:38	18:10	15	07:37 (4)	19:44	07:49 (3)	20:16	20:37	
20	07:22	08:29 (5)	06:50	06:05		07:25 (4)	06:14	07:20 (3)	05:37	05:26	
	17:00	08:49 (5)	17:39	18:11	8	07:33 (4)	19:45	07:48 (3)	20:17	20:37	
21	07:22	08:29 (5)	06:48	06:04			06:13	07:20 (3)	05:37	05:26	
	17:01	08:49 (5)	17:40	18:13			19:46	07:48 (3)	20:18	20:37	
22	07:21	08:30 (5)	06:47	06:02			06:11	07:19 (3)	05:36	05:26	
	17:03	08:48 (5)	17:41	18:14			19:47	07:47 (3)	20:18	20:38	
23	07:21	08:31 (5)	06:46	06:00			06:10	07:20 (3)	05:35	05:27	
	17:04	08:47 (5)	17:43	18:15			19:48	07:47 (3)	20:19	20:38	
24	07:20	08:34 (5)	06:44	05:59			06:08	07:20 (3)	05:34	05:27	
	17:05	08:47 (5)	17:44	18:16			19:49	07:46 (3)	20:20	20:38	
25	07:19	08:36 (5)	06:43	05:57			06:07	07:21 (3)	05:33	05:27	
	17:06	08:45 (5)	17:45	18:17			19:51	07:45 (3)	20:21	20:38	
26	07:18		06:41	05:55			06:06	07:22 (3)	05:33	05:28	
	17:08		17:46	18:18			19:52	07:44 (3)	20:22	20:38	
27	07:17		06:40	05:53			06:04	07:22 (3)	05:32	05:28	
	17:09		17:47	18:19			19:53	07:42 (3)	20:23	20:38	
28	07:17		06:38	05:52			06:03	07:24 (3)	05:31	05:28	
	17:10		17:49	18:20			19:54	07:41 (3)	20:24	20:38	
29	07:16			06:50			06:01	07:26 (3)	05:31	05:29	
	17:11			19:21			19:55	07:39 (3)	20:25	20:38	
30	07:15			06:48			06:00	07:28 (3)	05:30	05:29	
	17:13			19:22			19:56	07:35 (3)	20:25	20:38	
31	07:14			06:47				05:30			
	17:14			19:23				20:26			
Potential sun hours	296		296	369		399		450		454	
Total, worst case	539			380		459					

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)

SHADOW - Calendar

Calculation: VMShadow receptor: D - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (4)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	July	August	September		October		November		December		
1	05:30 20:38	05:54 20:19		06:25 19:35	07:29 (3) 14 07:43 (3)	06:56 18:44	07:57 (4) 27 08:24 (4)	06:31 16:56		07:06 16:32	08:05 (5) 25 08:30 (5)
2	05:30 20:38	05:55 20:18		06:26 19:33	07:32 (3) 6 07:38 (3)	06:57 18:42	07:56 (4) 28 08:24 (4)	06:32 16:55		07:07 16:31	08:06 (5) 24 08:30 (5)
3	05:31 20:38	05:56 20:16		06:27 19:32		06:58 18:40	07:56 (4) 27 08:23 (4)	06:33 16:54		07:08 16:31	08:06 (5) 24 08:30 (5)
4	05:31 20:38	05:57 20:15		06:28 19:30		06:59 18:39	07:56 (4) 27 08:23 (4)	06:34 16:53		07:09 16:31	08:07 (5) 24 08:31 (5)
5	05:32 20:37	05:58 20:14		06:29 19:28		07:00 18:37	07:56 (4) 26 08:22 (4)	06:36 16:52		07:10 16:31	08:07 (5) 24 08:31 (5)
6	05:32 20:37	05:59 20:13		06:30 19:27		07:01 18:35	07:58 (4) 24 08:22 (4)	06:37 16:50		07:11 16:30	08:08 (5) 23 08:31 (5)
7	05:33 20:37	06:00 20:12		06:31 19:25		07:02 18:34	07:58 (4) 22 08:20 (4)	06:38 16:49		07:12 16:30	08:08 (5) 23 08:31 (5)
8	05:34 20:36	06:01 20:10		06:32 19:23		07:03 18:32	07:59 (4) 20 08:19 (4)	06:39 16:48		07:13 16:30	08:09 (5) 23 08:32 (5)
9	05:34 20:36	06:02 20:09		06:33 19:22		07:05 18:30	08:01 (4) 16 08:17 (4)	06:41 16:47		07:14 16:30	08:10 (5) 22 08:32 (5)
10	05:35 20:36	06:03 20:08		06:34 19:20		07:06 18:29	08:03 (4) 10 08:13 (4)	06:42 16:46		07:15 16:30	08:10 (5) 22 08:32 (5)
11	05:36 20:35	06:04 20:07		06:35 19:18		07:07 18:27		06:43 16:45		07:16 16:30	08:11 (5) 22 08:33 (5)
12	05:36 20:35	06:05 20:05		06:36 19:16		07:08 18:26		06:44 16:44		07:17 16:30	08:12 (5) 21 08:33 (5)
13	05:37 20:34	06:06 20:04		06:37 19:15		07:09 18:24		06:45 16:43		07:17 16:31	08:12 (5) 21 08:33 (5)
14	05:38 20:34	06:07 20:02	10	07:35 (3) 07:45 (3)	06:38 19:13	07:10 18:22	06:47 16:42	07:18 16:31		07:18 16:30	08:13 (5) 20 08:33 (5)
15	05:39 20:33	06:08 20:01	14	07:47 (3)	06:39 19:11	07:11 18:21	06:48 16:41	07:19 16:31		07:19 16:31	08:14 (5) 20 08:34 (5)
16	05:39 20:33	06:09 20:00	18	07:49 (3)	06:41 19:10	07:12 18:19	06:49 16:40	07:20 16:31		07:20 16:31	08:15 (5) 19 08:34 (5)
17	05:40 20:32	06:10 19:58	21	07:50 (3)	06:42 19:08	07:13 18:18	06:50 16:40	08:09 (5) 9 08:18 (5)		07:20 16:32	08:15 (5) 19 08:34 (5)
18	05:41 20:31	06:11 19:57	23	07:51 (3)	06:43 19:06	07:14 18:16	06:51 16:39	08:08 (5) 13 08:21 (5)		07:21 16:32	08:16 (5) 19 08:35 (5)
19	05:42 20:31	06:12 19:55	25	07:52 (3)	06:44 19:04	07:16 18:15	06:53 16:38	08:06 (5) 16 08:22 (5)		07:22 16:32	08:15 (5) 19 08:34 (5)
20	05:43 20:30	06:13 19:54	26	07:53 (3)	06:45 19:03	07:17 18:13	06:54 16:37	08:21 (5) 18 08:23 (5)		07:22 16:33	08:16 (5) 19 08:35 (5)
21	05:44 20:29	06:14 19:52	27	07:54 (3)	06:46 19:01	07:18 18:12	06:55 16:37	08:04 (5) 20 08:24 (5)		07:23 16:33	08:16 (5) 19 08:35 (5)
22	05:45 20:28	06:15 19:51	28	07:55 (3)	06:47 18:59	07:19 18:10	06:56 16:36	08:05 (5) 20 08:25 (5)		07:23 16:34	08:17 (5) 19 08:36 (5)
23	05:45 20:27	06:16 19:49	28	07:53 (3)	06:48 18:57	07:20 18:09	06:57 16:35	08:04 (5) 22 08:26 (5)		07:24 16:34	08:17 (5) 19 08:36 (5)
24	05:46 20:27	06:17 19:48	29	07:24 (3)	06:49 18:56	08:11 (4) 14 08:20 (4)	07:21 18:07	08:04 (5) 23 08:27 (5)		07:24 16:35	08:18 (5) 19 08:37 (5)
25	05:47 20:26	06:18 19:46	29	07:23 (3)	06:50 18:54	08:04 (4) 17 08:21 (4)	06:23 17:06	08:05 (5) 23 08:27 (5)		07:25 16:35	08:18 (5) 20 08:38 (5)
26	05:48 20:25	06:19 19:45	28	07:51 (3)	06:51 18:52	08:02 (4) 21 08:23 (4)	06:24 17:04	08:04 (5) 23 08:27 (5)		07:25 16:36	08:19 (5) 19 08:38 (5)
27	05:49 20:24	06:20 19:43	27	07:24 (3)	06:52 18:51	08:00 (4) 23 08:23 (4)	06:25 17:03	08:05 (5) 24 08:29 (5)		07:25 16:36	08:20 (5) 19 08:39 (5)
28	05:50 20:23	06:21 19:41	26	07:50 (3)	06:53 18:49	07:59 (4) 25 08:24 (4)	06:26 17:02	08:05 (5) 24 08:29 (5)		07:26 16:37	08:20 (5) 19 08:39 (5)
29	05:51 20:22	06:22 19:40	25	07:49 (3)	06:54 18:47	07:58 (4) 26 08:24 (4)	06:27 17:00	08:05 (5) 24 08:29 (5)		07:26 16:38	08:20 (5) 20 08:40 (5)
30	05:52 20:21	06:23 19:38	23	07:48 (3)	06:55 18:45	07:57 (4) 27 08:24 (4)	06:28 16:59	08:05 (5) 25 08:30 (5)		07:26 16:39	08:20 (5) 20 08:40 (5)
31	05:53 20:20	06:24 19:37	21	07:47 (3)	06:56 18:45	07:58 (4) 27 08:24 (4)	06:29 16:58	08:05 (5) 25 08:30 (5)		07:27 16:39	08:20 (5) 21 08:41 (5)
Potential sun hours	460	429	18	07:45 (3)			16:58		297	286	
Total, worst case			447		375	178	345	227	284		647

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

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

Project:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar

Calculation: VMShadow receptor: E - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (5)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	09:25 (1) 10:33 (1)	07:13 17:15	06:36 17:50	06:45 19:24	05:59 20:27	05:29 20:38	05:30 20:19	05:54 19:35	06:25 18:44	06:56 16:56	07:06 16:31
2	07:27 16:41	09:26 (1) 10:34 (1)	07:12 17:16	06:35 17:51	06:43 19:26	05:57 20:28	05:29 20:38	05:30 20:18	05:55 19:33	06:26 18:42	06:57 16:55	07:07 16:31
3	07:27 16:42	09:26 (1) 10:34 (1)	07:11 17:18	06:33 17:52	06:42 19:27	05:56 20:29	05:28 20:38	05:31 20:16	05:56 19:32	06:27 18:40	06:58 16:54	07:08 16:31
4	07:27 16:43	09:26 (1) 10:33 (1)	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:38	05:31 20:15	05:57 19:30	06:28 18:39	06:59 16:53	07:09 16:31
5	07:27 16:44	09:27 (1) 10:34 (1)	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:27 20:30	05:58 20:37	05:58 19:28	06:29 18:37	06:59 16:51	07:10 16:31
6	07:27 16:45	09:27 (1) 10:34 (1)	07:08 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:31	05:59 20:37	05:59 19:27	06:30 18:35	06:59 16:50	07:11 16:30
7	07:27 16:46	09:28 (1) 10:34 (1)	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:59 20:37	06:00 19:25	06:31 18:34	06:59 16:49	07:12 16:30
8	07:27 16:47	09:29 (1) 10:35 (1)	07:05 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	06:01 20:36	06:01 19:23	06:32 18:32	06:59 16:48	07:13 16:30
9	07:27 16:48	09:30 (1) 10:35 (1)	07:04 17:25	06:24 17:59	06:32 19:33	05:49 20:06	05:26 20:32	06:02 20:36	06:02 19:22	06:33 18:30	07:04 16:47	07:14 16:30
10	07:26 16:49	09:30 (1) 10:35 (1)	07:03 17:26	06:22 18:00	06:30 19:34	05:47 20:07	05:26 20:33	06:03 20:36	06:03 19:20	06:34 18:29	07:06 16:46	07:15 16:30
11	07:26 16:50	09:31 (1) 10:35 (1)	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:08	05:26 20:34	06:04 20:35	06:04 19:18	06:35 18:27	07:07 16:45	07:16 16:30
12	07:26 16:51	09:32 (1) 10:35 (1)	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	06:05 20:35	06:05 19:16	06:36 18:25	07:08 16:44	07:17 16:30
13	07:26 16:52	09:32 (1) 10:35 (1)	06:59 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:35	06:06 20:34	06:06 19:15	06:37 18:24	07:09 16:43	07:17 16:31
14	07:25 16:53	09:33 (1) 10:35 (1)	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	06:07 20:34	06:07 19:13	06:38 18:22	07:10 16:42	07:18 16:31
15	07:25 16:54	09:33 (1) 10:34 (1)	06:57 17:33	06:14 18:06	06:22 19:40	05:42 20:12	05:26 20:35	06:08 20:33	06:08 19:11	06:39 18:21	07:11 16:41	07:19 16:31
16	07:24 16:55	09:34 (1) 10:35 (1)	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	06:09 20:33	06:09 19:10	06:40 18:19	07:12 16:40	07:20 16:31
17	07:24 16:57	09:35 (1) 10:34 (1)	06:54 17:35	06:10 18:08	06:19 19:42	05:40 20:14	05:26 20:36	06:10 20:32	06:10 19:08	06:41 18:18	07:13 16:39	07:21 16:31
18	07:24 16:58	09:36 (1) 10:34 (1)	06:53 17:36	06:09 18:09	06:17 19:43	05:39 20:15	05:26 20:37	06:11 20:31	06:11 19:57	06:42 18:16	07:14 16:39	07:21 16:32
19	07:23 16:59	09:37 (1) 10:33 (1)	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:16	05:26 20:37	06:12 20:31	06:12 19:55	06:44 18:15	07:16 16:38	07:22 16:32
20	07:22 17:00	09:38 (1) 10:33 (1)	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:17	05:26 20:37	06:13 20:30	06:13 19:54	06:45 18:13	07:17 16:37	07:22 16:33
21	07:22 17:01	09:39 (1) 10:32 (1)	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:18	05:26 20:37	06:14 20:29	06:14 19:52	06:46 18:12	07:18 16:36	07:23 16:33
22	07:21 17:03	09:40 (1) 10:31 (1)	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	06:15 20:28	06:15 19:51	06:47 18:09	07:19 16:36	07:23 16:33
23	07:21 17:04	09:40 (1) 10:30 (1)	06:46 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	06:16 20:27	06:16 19:49	06:48 18:57	07:20 16:35	07:24 16:34
24	07:20 17:05	09:42 (1) 10:30 (1)	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	06:17 20:27	06:17 19:48	06:49 18:56	07:21 16:35	07:24 16:35
25	07:19 17:06	09:44 (1) 10:29 (1)	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	06:18 20:26	06:18 19:46	06:50 18:54	07:22 16:34	07:25 16:35
26	07:18 17:07	09:45 (1) 10:27 (1)	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:27 20:38	06:19 20:25	06:19 19:45	06:51 18:52	07:23 16:34	07:26 16:36
27	07:17 17:09	09:46 (1) 10:26 (1)	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	06:20 20:24	06:20 19:43	06:52 18:51	07:24 16:33	07:27 16:36
28	07:17 17:10	09:48 (1) 10:24 (1)	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	06:21 20:23	06:21 19:41	06:53 18:49	07:25 16:33	07:28 16:37
29	07:16 17:11	09:50 (1) 10:22 (1)		06:50 19:21	06:01 19:55	05:31 20:25	05:29 20:38	06:22 20:22	06:22 19:40	06:54 18:47	07:26 16:32	07:29 16:38
30	07:15 17:12	09:53 (1) 10:19 (1)		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	06:23 20:21	06:23 19:38	06:55 18:45	07:27 16:32	07:30 16:39
31	07:14 17:14	09:57 (1) 10:15 (1)		06:47 19:23	06:00 19:26	05:30 20:26	05:29 20:20	06:24 20:37	06:24 19:37	06:56 16:58	07:28 16:30	07:31 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Total, worst case	1710									984		2106

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

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

SHADOW - Calendar

Calculation: VMShadow receptor: F - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (7)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January		February		March		April		May		June
1	07:27		13:10 (7)	07:13	15:24 (6)	06:36	06:45		18:07 (5)	05:59	05:29
	16:40	62	14:12 (7)	17:15	16:03 (6)	17:50	19:24	20	18:27 (5)	19:57	20:27
2	07:27		13:11 (7)	07:12	15:24 (6)	06:35	06:43		18:04 (5)	05:57	05:29
	16:41	61	14:12 (7)	17:16	16:04 (6)	17:51	19:25	24	18:28 (5)	19:58	20:28
3	07:27		13:12 (7)	07:11	15:24 (6)	06:33	06:42		18:02 (5)	05:56	05:28
	16:42	60	14:12 (7)	17:18	16:04 (6)	17:52	19:27	27	18:29 (5)	19:59	20:28
4	07:27		13:13 (7)	07:10	15:24 (6)	06:32	06:40		18:01 (5)	05:55	05:28
	16:43	60	14:13 (7)	17:19	16:05 (6)	17:53	19:28	30	18:31 (5)	20:00	20:29
5	07:27		13:14 (7)	07:09	15:24 (6)	06:30	06:38		17:59 (5)	05:53	05:28
	16:44	59	14:13 (7)	17:20	16:05 (6)	17:54	19:29	33	18:32 (5)	20:01	20:30
6	07:27		13:15 (7)	07:08	15:25 (6)	06:28	06:37		17:58 (5)	05:52	05:27
	16:45	58	14:13 (7)	17:21	16:05 (6)	17:56	19:30	34	18:32 (5)	20:02	20:30
7	07:27		13:16 (7)	07:07	15:24 (6)	06:27	06:35		17:57 (5)	05:51	05:27
	16:46	57	14:13 (7)	17:23	16:04 (6)	17:57	19:31	36	18:33 (5)	20:03	20:31
8	07:27		13:17 (7)	07:05	15:25 (6)	06:25	06:33		17:56 (5)	05:50	05:27
	16:47	57	14:14 (7)	17:24	16:04 (6)	17:58	19:32	37	18:33 (5)	20:04	20:32
9	07:27		13:18 (7)	07:04	15:26 (6)	06:24	06:32		17:55 (5)	05:49	05:26
	16:48	56	14:14 (7)	17:25	16:04 (6)	17:59	19:33	37	18:32 (5)	20:05	20:32
10	07:26		13:19 (7)	07:03	15:27 (6)	06:22	06:30		17:55 (5)	05:47	05:26
	16:49	54	14:13 (7)	17:26	16:04 (6)	18:00	19:34	38	18:33 (5)	20:06	20:33
11	07:26		13:20 (7)	07:02	15:28 (6)	06:20	06:28		17:55 (5)	05:46	05:26
	16:50	53	14:13 (7)	17:28	16:04 (6)	18:01	19:35	37	18:32 (5)	20:07	20:33
12	07:26		13:22 (7)	07:01	15:28 (6)	06:19	06:27		17:54 (5)	05:45	05:26
	16:51	51	14:13 (7)	17:29	16:02 (6)	18:02	19:36	38	18:32 (5)	20:09	20:34
13	07:26		13:22 (7)	06:59	15:29 (6)	06:17	06:25		17:55 (5)	05:44	05:26
	16:52	50	14:12 (7)	17:30	16:02 (6)	18:04	19:37	37	18:32 (5)	20:10	20:34
14	07:25		13:24 (7)	06:58	15:31 (6)	06:15	06:24		17:54 (5)	05:43	05:26
	16:53	48	14:12 (7)	17:31	16:01 (6)	18:05	19:38	37	18:31 (5)	20:11	20:35
15	07:25		13:25 (7)	06:57	15:32 (6)	06:14	06:22		17:55 (5)	05:42	05:26
	16:54	46	14:11 (7)	17:33	15:59 (6)	18:06	19:40	36	18:31 (5)	20:12	20:35
16	07:24		13:27 (7)	06:55	15:34 (6)	06:12	06:20		17:55 (5)	05:41	05:26
	16:55	47	15:41 (6)	17:34	15:58 (6)	18:07	19:41	35	18:30 (5)	20:13	20:36
17	07:24		13:28 (7)	06:54	15:35 (6)	06:10	06:19		17:56 (5)	05:40	05:26
	16:57	54	15:45 (6)	17:35	15:55 (6)	18:08	19:42	34	18:30 (5)	20:14	20:36
18	07:23		13:31 (7)	06:53	15:39 (6)	06:09	06:17		17:56 (5)	05:39	05:26
	16:58	55	15:49 (6)	17:36	15:53 (6)	18:09	19:43	32	18:28 (5)	20:15	20:36
19	07:23		13:33 (7)	06:51		06:07	06:16		17:57 (5)	05:38	05:26
	16:59	55	15:50 (6)	17:38		18:10	19:44	31	18:28 (5)	20:15	20:37
20	07:22		13:35 (7)	06:50		06:05	06:14		17:57 (5)	05:37	05:26
	17:00	54	15:52 (6)	17:39		18:11	19:45	29	18:26 (5)	20:16	20:37
21	07:22		13:38 (7)	06:48		06:04	06:13		17:59 (5)	05:37	05:26
	17:01	53	15:54 (6)	17:40		18:12	19:46	26	18:25 (5)	20:17	20:37
22	07:21		13:41 (7)	06:47		06:02	06:11		18:00 (5)	05:36	05:26
	17:03	49	15:55 (6)	17:41		18:14	19:47	23	18:23 (5)	20:18	20:37
23	07:20		13:46 (7)	06:45		06:00	06:10		18:02 (5)	05:35	05:27
	17:04	42	15:56 (6)	17:43		18:15	19:48	19	18:21 (5)	20:19	20:38
24	07:20		15:26 (6)	06:44		05:58	06:08		18:04 (5)	05:34	05:27
	17:05	31	15:57 (6)	17:44		18:16	19:49	14	18:18 (5)	20:20	20:38
25	07:19		15:26 (6)	06:43		05:57	06:07		18:10 (5)	05:33	05:27
	17:06	33	15:59 (6)	17:45		18:17	19:50	3	18:13 (5)	20:21	20:38
26	07:18		15:25 (6)	06:41		05:55	06:05			05:33	05:27
	17:07	35	16:00 (6)	17:46		18:18	19:51			20:22	20:38
27	07:17		15:25 (6)	06:39		05:53	06:04			05:32	05:28
	17:09	36	16:01 (6)	17:47		18:19	19:53			20:23	20:38
28	07:17		15:24 (6)	06:38		05:52	06:03			05:31	05:28
	17:10	37	16:01 (6)	17:48		18:20	19:54			20:24	20:38
29	07:16		15:24 (6)			06:50	06:01			05:31	05:29
	17:11	38	16:02 (6)			19:21	19:55			20:24	20:38
30	07:15		15:24 (6)			06:48	06:00			05:30	05:29
	17:12	38	16:02 (6)			19:22	19:56			20:25	20:38
31	07:14		15:24 (6)			06:47				05:30	
	17:14	39	16:03 (6)			19:23	18:09 (5)			20:26	
Potential sun hours	296		296		369	14	18:23 (5)	399		450	454
Total, worst case	1528		613		14		747				

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)

SHADOW - Calendar

Calculation: VMShadow receptor: F - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (7)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	July	August	September	October	November	December			
1	05:30 20:38	05:54 20:19	06:25 19:35	17:54 (5) 18:31 (5)	06:56 18:44	06:31 16:56	14:55 (6) 15:33 (6)	07:06 16:31	13:02 (7) 13:55 (7)
2	05:30 20:38	05:55 20:17	06:26 19:33	17:53 (5) 18:31 (5)	06:57 18:42	06:32 16:55	14:55 (6) 15:34 (6)	07:07 16:31	13:02 (7) 13:56 (7)
3	05:31 20:38	05:56 20:16	06:27 19:32	17:53 (5) 18:30 (5)	06:58 18:40	06:33 16:54	14:55 (6) 15:34 (6)	07:08 16:31	13:01 (7) 13:57 (7)
4	05:31 20:37	05:57 20:15	06:28 19:30	17:53 (5) 18:30 (5)	06:59 18:39	06:34 16:53	14:54 (6) 15:34 (6)	07:09 16:31	13:01 (7) 13:58 (7)
5	05:32 20:37	05:58 20:14	06:29 19:28	17:53 (5) 18:29 (5)	07:00 18:37	06:36 16:51	14:55 (6) 15:35 (6)	07:10 16:31	13:01 (7) 13:58 (7)
6	05:32 20:37	05:59 20:13	06:30 19:27	17:54 (5) 18:28 (5)	07:01 18:35	06:37 16:50	14:54 (6) 15:35 (6)	07:11 16:30	13:01 (7) 13:59 (7)
7	05:33 20:37	06:00 20:12	06:31 19:25	17:54 (5) 18:27 (5)	07:02 18:34	06:38 16:49	14:54 (6) 15:34 (6)	07:12 16:30	13:01 (7) 14:00 (7)
8	05:34 20:36	06:01 20:10	06:32 19:23	17:55 (5) 18:25 (5)	07:03 18:32	06:39 16:48	14:55 (6) 15:35 (6)	07:13 16:30	13:01 (7) 14:01 (7)
9	05:34 20:36	06:02 20:09	06:33 19:21	17:56 (5) 18:24 (5)	07:04 18:30	06:40 16:47	14:55 (6) 15:35 (6)	07:14 16:30	13:01 (7) 14:02 (7)
10	05:35 20:36	06:03 20:08	06:34 19:20	17:57 (5) 18:22 (5)	07:05 18:29	06:42 16:46	14:55 (6) 15:34 (6)	07:15 16:30	13:01 (7) 14:02 (7)
11	05:36 20:35	06:04 20:06	06:35 19:18	17:59 (5) 18:19 (5)	07:07 18:27	06:43 16:45	14:55 (6) 15:34 (6)	07:16 16:30	13:02 (7) 14:03 (7)
12	05:36 20:35	06:05 20:05	06:36 19:16	18:01 (5) 18:16 (5)	07:08 18:25	06:44 16:44	14:56 (6) 15:34 (6)	07:17 16:30	13:01 (7) 14:03 (7)
13	05:37 20:34	06:06 20:04	06:37 19:15	18:07 (5) 18:09 (5)	07:09 18:24	06:45 16:43	14:56 (6) 15:34 (6)	07:17 16:31	13:01 (7) 14:04 (7)
14	05:38 20:34	06:07 20:02	06:38 19:13	18:10 (5) 18:22	07:10 18:22	06:46 16:42	14:56 (6) 15:33 (6)	07:18 16:31	13:02 (7) 14:05 (7)
15	05:39 20:33	06:08 20:01	06:39 19:11	18:11 (5) 18:21	07:11 18:21	06:48 16:41	14:58 (6) 15:33 (6)	07:19 16:31	13:02 (7) 14:05 (7)
16	05:39 20:32	06:09 20:00	06:40 19:09	18:12 (5) 18:19	07:12 18:19	06:49 16:40	14:58 (6) 15:33 (6)	07:20 16:31	13:02 (7) 14:05 (7)
17	05:40 20:32	06:10 19:58	06:41 19:08	18:13 (5) 18:18	07:13 18:18	06:50 16:39	14:59 (6) 15:32 (6)	07:20 16:31	13:03 (7) 14:06 (7)
18	05:41 20:31	06:11 19:57	18:14 (5) 18:21 (5)	06:42 19:06	07:14 18:16	06:51 16:39	15:00 (6) 15:31 (6)	07:21 16:32	13:03 (7) 14:07 (7)
19	05:42 20:30	06:12 19:55	18:10 (5) 18:25 (5)	06:43 19:04	07:15 18:14	06:52 16:38	13:21 (7) 15:31 (6)	07:22 16:32	13:03 (7) 14:07 (7)
20	05:43 20:30	06:13 19:54	18:07 (5) 18:27 (5)	06:44 19:03	07:17 18:13	06:54 16:37	13:16 (7) 15:30 (6)	07:22 16:33	13:04 (7) 14:08 (7)
21	05:44 20:29	06:14 19:52	18:04 (5) 18:28 (5)	06:45 19:01	07:18 18:11	06:55 16:36	13:13 (7) 15:29 (6)	07:23 16:33	13:04 (7) 14:08 (7)
22	05:44 20:28	06:15 19:51	18:02 (5) 18:29 (5)	06:47 18:59	07:19 18:10	06:56 16:36	13:11 (7) 15:28 (6)	07:23 16:33	13:05 (7) 14:09 (7)
23	05:45 20:27	06:16 19:49	18:01 (5) 18:30 (5)	06:48 18:57	07:20 18:09	06:57 16:35	13:10 (7) 15:27 (6)	07:24 16:34	13:05 (7) 14:09 (7)
24	05:46 20:26	06:17 19:48	18:00 (5) 18:31 (5)	06:49 18:56	07:21 18:07	06:58 16:35	13:08 (7) 15:26 (6)	07:24 16:35	13:06 (7) 14:10 (7)
25	05:47 20:26	06:18 19:46	17:58 (5) 18:31 (5)	06:50 18:54	06:22 17:06	15:05 (6) 15:27 (6)	06:59 16:34	13:07 (7) 15:24 (6)	13:06 (7) 16:35
26	05:48 20:25	06:19 19:45	17:57 (5) 18:32 (5)	06:51 18:52	06:24 17:04	15:03 (6) 15:28 (6)	07:01 16:34	13:05 (7) 16:36	13:07 (7) 14:10 (7)
27	05:49 20:24	06:20 19:43	17:56 (5) 18:32 (5)	06:52 18:50	06:25 17:03	15:01 (6) 15:29 (6)	07:02 16:33	13:04 (7) 13:50 (7)	13:08 (7) 16:36
28	05:50 20:23	06:21 19:41	17:56 (5) 18:32 (5)	06:53 18:49	06:26 17:02	14:59 (6) 15:30 (6)	07:03 16:33	13:04 (7) 13:52 (7)	13:08 (7) 16:37
29	05:51 20:22	06:22 19:40	17:55 (5) 18:32 (5)	06:54 18:47	06:27 17:00	14:59 (6) 15:32 (6)	07:04 16:32	13:03 (7) 13:53 (7)	13:09 (7) 16:38
30	05:52 20:21	06:23 19:38	17:54 (5) 18:32 (5)	06:55 18:45	06:28 16:59	14:57 (6) 15:32 (6)	07:05 16:32	13:03 (7) 13:54 (7)	13:09 (7) 16:39
31	05:53 20:20	06:24 19:36	17:54 (5) 18:32 (5)		06:30 16:58	14:56 (6) 15:33 (6)		07:26 16:39	13:10 (7) 14:12 (7)
Potential sun hours	460	429	375	345	297	286			
Total, worst case		406	372	234	1288	1903			

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

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

SHADOW - Calendar

Calculation: VMShadow receptor: G - Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (8)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:31
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:17	06:26 19:33	06:57 18:42	06:32 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 18:40	06:33 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:37	05:57 20:15	06:28 19:30	06:59 18:39	06:34 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:27 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:36 16:51	07:10 16:31
6	07:27 16:45	07:08 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:30	05:32 20:37	05:59 20:13	06:30 19:27	07:01 18:35	06:37 16:50	07:11 16:30
7	07:27 16:46	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 18:34	06:38 16:49	07:12 16:30
8	07:27 16:47	07:05 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	05:34 20:36	06:01 20:10	06:32 19:23	07:03 18:32	06:39 16:48	07:13 16:30
9	07:27 16:48	07:04 17:25	06:24 17:59	06:32 19:33	05:49 20:05	05:26 20:32	05:34 20:36	06:02 20:09	06:33 19:21	07:04 18:30	06:40 16:47	07:14 16:30
10	07:26 16:49	07:03 17:26	06:22 18:00	06:30 19:34	05:47 20:06	05:26 20:33	05:35 20:36	06:03 20:08	06:34 19:20	07:05 18:29	06:42 16:46	07:15 16:30
11	07:26 16:50	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:08	05:26 20:33	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 16:45	07:16 16:30
12	07:26 16:51	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 16:44	07:17 16:30
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14	07:25 16:53	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:46 16:42	07:18 16:31
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16	07:24 16:55	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	05:39 20:32	06:09 20:00	06:40 19:09	07:12 18:19	06:49 16:40	07:20 16:31
17	07:24 16:57	06:54 17:35	06:10 18:08	06:19 19:42	05:40 20:14	05:26 20:36	05:40 20:32	06:10 19:58	06:41 19:08	07:13 18:18	06:50 16:39	07:20 16:31
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22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:33
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25	07:19 17:06	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	05:47 20:26	06:18 19:46	06:50 18:54	07:22 17:06	07:00 16:34	07:25 16:35
26	07:18 17:07	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:27 20:38	05:48 20:25	06:19 19:45	06:51 18:52	07:23 17:04	07:01 16:34	07:25 16:36
27	07:17 17:09	06:39 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	07:24 17:03	07:02 16:33	07:25 16:36
28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:25 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11		06:50 19:21	06:01 19:55	05:31 20:25	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	07:26 17:00	07:04 16:32	07:26 16:38
30	07:15 17:12		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	07:27 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37	06:30 16:58			07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Total, worst case												

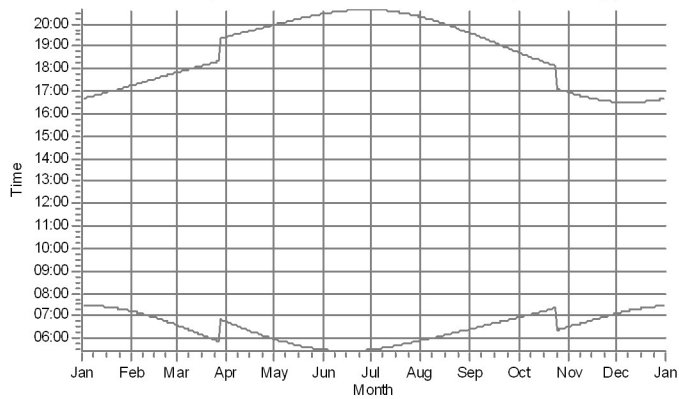
Table layout: For each day in each month the following matrix apply

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)

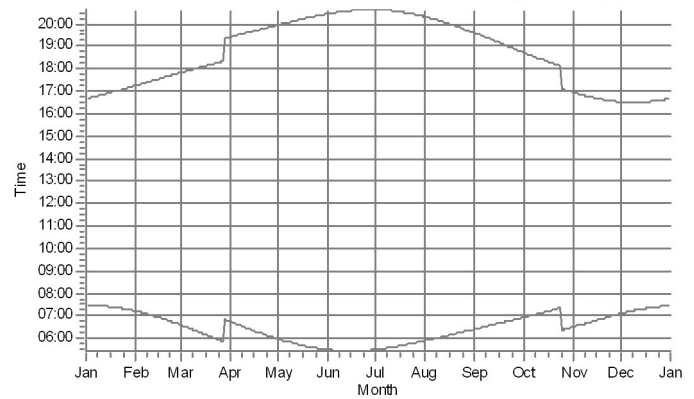
SHADOW - Calendar, graphical

Calculation: VM

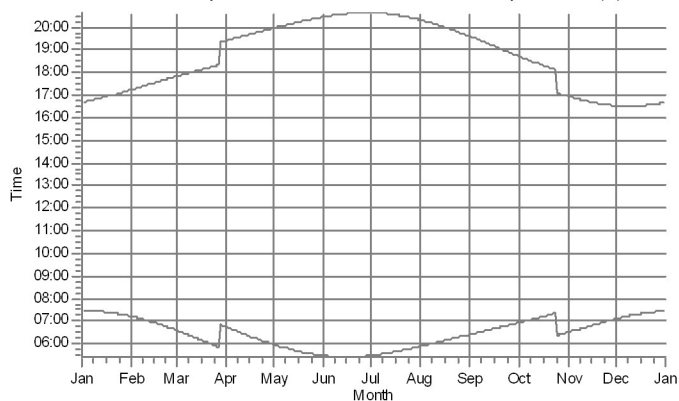
A: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (1)



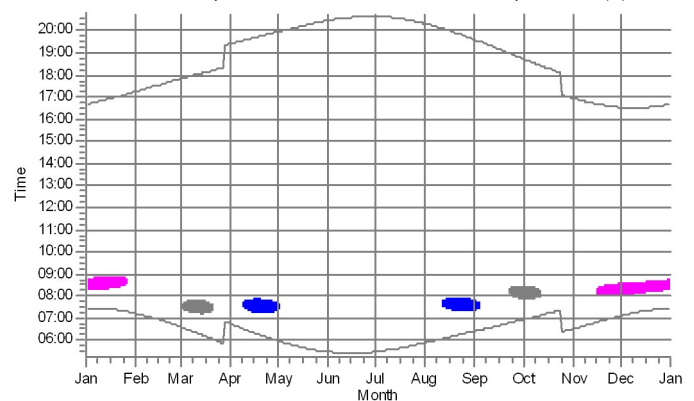
B: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (2)



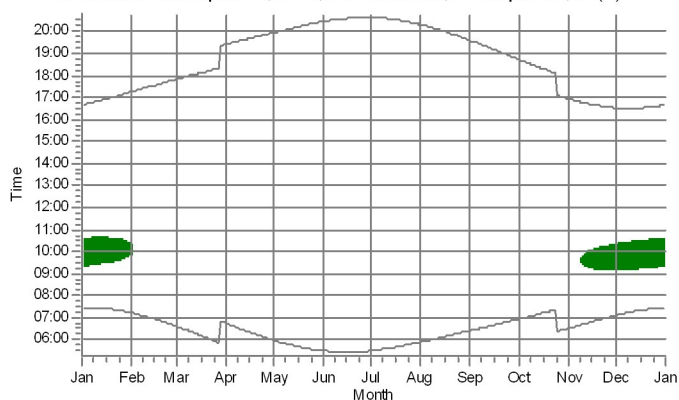
C: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (3)



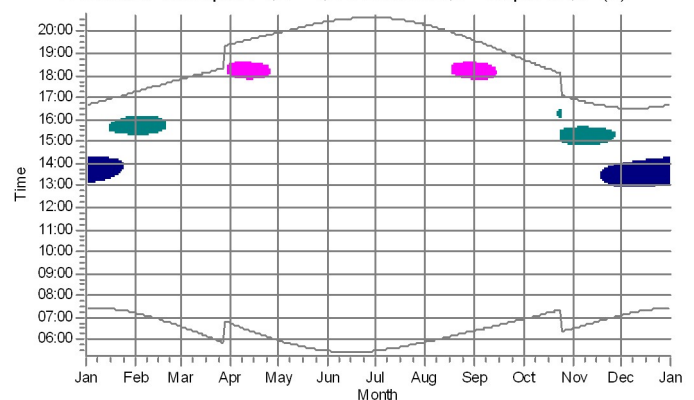
D: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (4)



E: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (5)



F: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (7)

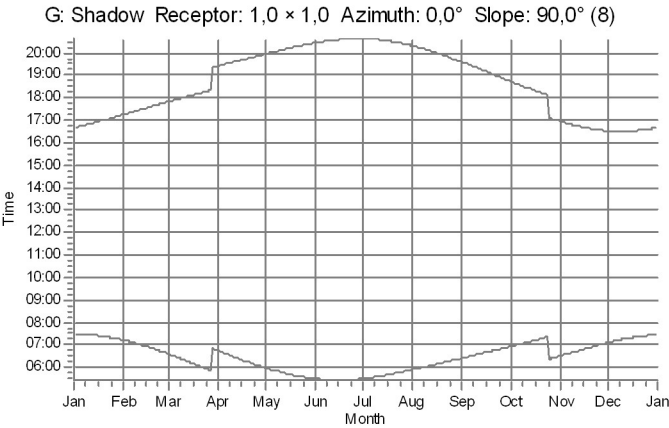


WTGs

- 1: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (9)
- 3: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (11)
- 4: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (12)
- 5: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (13)
- 6: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (14)
- 7: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (15)

SHADOW - Calendar, graphical

Calculation: VM



WTGs

Project:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar per WTG

Calculation: VMWTG: 1 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (9)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 09:25-10:33/68 16:40	07:13 17:50 17:15	06:36 19:24 17:50	06:45 19:24 19:24	05:59 19:57 19:57	05:29 20:38 20:38	05:30 20:19 20:19	05:54 19:35 19:35	06:25 18:44 18:44	06:56 16:56 16:56	06:31 16:31 16:31	07:06 09:13-10:17/64 16:31
2	07:27 09:26-10:34/68 16:41	07:12 17:51 17:16	06:35 19:26 17:51	06:43 19:26 19:26	05:57 19:58 19:58	05:29 20:38 20:38	05:55 20:18 20:18	05:56 19:33 19:33	06:26 18:42 18:42	06:57 16:55 16:55	06:32 16:31 16:31	07:07 09:13-10:18/65 16:31
3	07:27 09:26-10:34/68 16:42	07:11 17:52 17:18	06:33 19:27 17:52	06:42 19:27 19:27	05:56 19:59 19:59	05:28 20:38 20:38	05:56 20:16 20:16	05:57 19:32 19:32	06:27 18:40 18:40	06:58 16:54 16:54	06:33 16:31 16:31	07:08 09:13-10:18/65 16:31
4	07:27 09:26-10:33/67 16:43	07:10 17:53 17:19	06:32 19:28 17:53	06:40 19:28 19:28	05:55 20:00 20:00	05:28 20:38 20:38	05:57 20:15 20:15	05:57 19:30 19:30	06:28 18:39 18:39	06:59 16:53 16:53	06:34 16:31 16:31	07:09 09:13-10:19/66 16:31
5	07:27 09:27-10:34/67 16:44	07:09 17:54 17:20	06:30 19:29 17:54	06:38 20:01 19:29	05:53 20:30 20:01	05:27 20:37 20:30	05:58 20:14 20:14	05:58 19:28 19:28	06:29 18:37 18:37	07:00 16:51 16:51	06:36 16:31 16:31	07:10 09:13-10:19/66 16:31
6	07:27 09:27-10:34/67 16:45	07:08 17:56 17:21	06:29 19:30 17:56	06:37 20:02 19:30	05:52 20:31 20:02	05:27 20:37 20:31	05:59 20:13 20:13	05:59 19:27 19:27	06:30 18:35 18:35	07:01 16:50 16:50	06:37 16:31 16:31	07:11 09:13-10:20/67 16:31
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8	07:27 09:29-10:35/66 16:47	07:05 17:58 17:24	06:25 19:32 17:58	06:33 20:04 19:32	05:50 20:32 20:04	05:27 20:36 20:32	06:01 20:10 20:10	06:32 19:23 19:23	07:03 18:32 18:32	06:39 16:48 16:48	06:39 16:31 16:31	07:13 09:14-10:21/67 16:31
9	07:27 09:30-10:35/65 16:48	07:04 17:59 17:25	06:24 19:33 17:59	06:32 20:05 19:33	05:49 20:32 20:05	05:26 20:36 20:32	06:02 20:09 20:09	06:33 19:22 19:22	07:04 18:30 18:30	06:40 16:47 16:47	06:40 16:31 16:31	07:14 09:14-10:22/68 16:31
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28	07:17 09:48-10:24/36 17:10	07:00 17:59 17:49	06:00 19:52 18:20	06:03 20:24 19:54	05:31 20:38 20:24	05:28 20:38 20:23	06:21 19:41 19:41	06:53 18:49 18:49	07:25 17:02 17:02	07:03 16:33 16:33	09:13-10:15/62 16:31	07:26 09:23-10:31/68 16:31
29	07:16 09:50-10:22/32 17:11	07:00 17:59 19:21	06:00 19:53 18:21	06:01 20:25 19:55	05:31 20:38 20:25	05:29 20:38 20:22	06:22 19:40 19:40	06:54 18:47 18:47	07:26 17:00 17:00	07:04 16:32 16:32	09:13-10:16/63 16:31	07:26 09:23-10:32/69 16:31
30	07:15 09:53-10:19/26 17:12	07:00 17:59 19:22	06:00 19:54 18:22	06:00 20:26 19:56	05:30 20:38 20:25	05:29 20:38 20:21	06:23 19:38 19:38	06:55 18:45 18:45	07:27 16:59 16:59	07:05 16:32 16:32	09:13-10:16/63 16:31	07:26 09:23-10:32/69 16:31
31	07:14 09:57-10:15/18 17:14	07:00 17:59 19:23	06:00 19:55 18:23	06:00 20:27 19:57	05:30 20:38 20:26	05:29 20:38 20:20	06:24 19:37 19:37	06:56 16:58 16:58	07:28 16:58 16:58	07:06 16:32 16:32	09:13-10:16/63 16:31	07:27 09:24-10:32/68 16:31
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	1710	0	0	0	0	0	0	0	0	0	984	2106

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

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

SHADOW - Calendar per WTG

Calculation: VMWTG: 2 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (10)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:31
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:18	06:26 19:33	06:57 18:42	06:32 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 18:40	06:33 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:38	05:57 20:15	06:28 19:30	06:59 18:39	06:34 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:36 16:52	07:10 16:31
6	07:27 16:45	07:08 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:31	05:32 20:37	05:59 20:13	06:30 19:27	07:01 18:35	06:37 16:50	07:11 16:30
7	07:27 16:46	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 18:34	06:38 16:49	07:12 16:30
8	07:27 16:47	07:05 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	05:34 20:36	06:01 20:10	06:32 19:23	07:03 18:32	06:39 16:48	07:13 16:30
9	07:27 16:48	07:04 17:25	06:24 17:59	06:32 19:33	05:49 20:05	05:26 20:32	05:34 20:36	06:02 20:09	06:33 19:22	07:04 18:30	06:40 16:47	07:14 16:30
10	07:26 16:49	07:03 17:26	06:22 18:00	06:30 19:34	05:47 20:07	05:26 20:33	05:35 20:36	06:03 20:08	06:34 19:20	07:06 18:29	06:42 16:46	07:15 16:30
11	07:26 16:50	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:08	05:26 20:34	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 16:45	07:16 16:30
12	07:26 16:51	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 16:44	07:17 16:30
13	07:26 16:52	06:59 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:35	05:37 20:34	06:06 20:04	06:37 19:15	07:09 18:24	06:45 16:43	07:17 16:31
14	07:25 16:53	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:47 16:42	07:18 16:31
15	07:25 16:54	06:57 17:33	06:14 18:06	06:22 19:40	05:42 20:12	05:26 20:35	05:39 20:33	06:08 20:01	06:39 19:11	07:11 18:21	06:48 16:41	07:19 16:31
16	07:24 16:55	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	05:39 20:33	06:09 20:00	06:40 19:10	07:12 18:19	06:49 16:40	07:20 16:31
17	07:24 16:57	06:54 17:35	06:10 18:08	06:19 19:42	05:40 20:14	05:26 20:36	05:40 20:32	06:10 19:58	06:41 19:08	07:13 18:18	06:50 16:39	07:20 16:31
18	07:23 16:58	06:53 17:36	06:09 18:09	06:17 19:43	05:39 20:15	05:26 20:37	05:41 20:31	06:11 19:57	06:42 19:06	07:14 18:16	06:51 16:39	07:21 16:32
19	07:23 16:59	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:16	05:26 20:37	05:42 20:31	06:12 19:55	06:43 19:04	07:16 18:15	06:53 16:38	07:22 16:32
20	07:22 17:00	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:17	05:26 20:37	05:43 20:30	06:13 19:54	06:45 19:03	07:17 18:13	06:54 16:37	07:22 16:33
21	07:22 17:01	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:17	05:26 20:37	05:44 20:29	06:14 19:52	06:46 19:01	07:18 18:12	06:55 16:36	07:23 16:33
22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:33
23	07:20 17:04	06:46 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	05:45 20:27	06:16 19:49	06:48 18:57	07:20 18:09	06:57 16:35	07:24 16:34
24	07:20 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:27	06:17 19:48	06:49 18:56	07:21 18:07	06:58 16:35	07:24 16:35
25	07:19 17:06	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	05:47 20:26	06:18 19:46	06:50 18:54	07:22 17:06	07:00 16:34	07:25 16:35
26	07:18 17:07	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:27 20:38	05:48 20:25	06:19 19:45	06:51 18:52	07:23 17:04	07:01 16:34	07:25 16:36
27	07:17 17:09	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	07:24 17:03	07:02 16:33	07:25 16:36
28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:25 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11		06:50 19:21	06:01 19:55	05:31 20:25	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	07:26 17:00	07:04 16:32	07:26 16:38
30	07:15 17:13		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	07:27 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		06:30 16:58		07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

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

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

Project:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar per WTG

Calculation: VMWTG: 3 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (11)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	07:29-07:43/14 18:44	06:31 16:56	07:06 16:31
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:18	06:26 19:33	07:32-07:38/6 18:42	06:57 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	18:40	06:58 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:38	05:57 20:15	06:28 19:30	18:39	06:59 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:56 16:52	07:10 16:31
6	07:27 16:45	07:08 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:31	05:32 20:37	05:59 20:13	06:30 19:27	07:01 18:35	06:57 16:50	07:11 16:30
7	07:27 16:46	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 18:34	06:58 16:49	07:12 16:30
8	07:27 16:47	07:05 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	05:34 20:36	06:01 20:10	06:32 19:23	07:03 18:32	06:59 16:48	07:13 16:30
9	07:27 16:48	07:04 17:25	06:24 17:59	06:32 19:33	05:49 20:05	05:26 20:32	05:34 20:36	06:02 20:09	06:33 19:22	07:04 18:30	06:40 16:47	07:14 16:30
10	07:26 16:49	07:03 17:26	06:22 18:00	06:30 19:34	05:47 20:06	05:26 20:33	05:35 20:36	06:03 20:08	06:34 19:20	07:06 18:29	06:42 16:46	07:15 16:30
11	07:26 16:50	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:08	05:26 20:34	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 16:45	07:16 16:30
12	07:26 16:51	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 16:44	07:17 16:30
13	07:26 16:52	06:59 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:35	05:37 20:34	06:06 20:04	06:37 19:15	07:09 18:24	06:45 16:43	07:17 16:31
14	07:25 16:53	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:47 16:42	07:18 16:31
15	07:25 16:54	06:57 17:33	06:14 18:06	06:22 19:40	05:42 20:12	05:26 20:35	05:39 20:33	06:08 20:01	06:39 19:11	07:11 18:21	06:48 16:41	07:19 16:31
16	07:24 16:55	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	05:39 20:33	06:09 20:00	06:40 19:10	07:12 18:19	06:49 16:40	07:20 16:31
17	07:24 16:57	06:54 17:35	06:10 18:08	06:19 19:42	05:40 20:14	05:26 20:36	05:40 20:32	06:10 19:58	06:41 19:08	07:13 18:18	06:50 16:39	07:20 16:31
18	07:23 16:58	06:53 17:36	06:09 18:09	06:17 19:43	05:39 20:15	05:26 20:37	05:41 20:31	06:11 19:57	06:42 19:06	07:14 18:16	06:51 16:39	07:21 16:32
19	07:23 16:59	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:16	05:26 20:37	05:42 20:30	06:12 19:55	06:43 19:04	07:16 18:15	06:53 16:38	07:22 16:32
20	07:22 17:00	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:17	05:26 20:37	05:43 20:30	06:13 19:54	06:45 19:03	07:17 18:13	06:54 16:37	07:22 16:33
21	07:22 17:01	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:17	05:26 20:37	05:44 20:29	06:14 19:52	06:46 19:01	07:18 18:12	06:55 16:36	07:23 16:33
22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:33
23	07:20 17:04	06:46 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	05:45 20:27	06:16 19:49	06:48 18:57	07:20 18:09	06:57 16:35	07:24 16:34
24	07:20 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:27	06:17 19:48	06:49 18:56	07:21 18:07	06:58 16:35	07:24 16:35
25	07:19 17:06	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	05:47 20:26	06:18 19:46	06:50 18:54	06:22 17:06	07:00 16:34	07:25 16:35
26	07:18 17:07	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:28 20:38	05:48 20:25	06:19 19:45	06:51 18:52	07:04 17:04	07:01 16:34	07:25 16:36
27	07:17 17:09	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	06:25 17:03	07:02 16:33	07:25 16:36
28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	06:26 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11	06:36 17:48	05:50 18:21	06:01 19:55	05:31 20:25	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	06:27 17:00	07:04 16:32	07:26 16:38
30	07:15 17:13	06:35 17:47	05:48 18:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	06:28 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14	06:34 17:46	05:47 18:23	06:00 19:57	05:30 20:26	05:29 20:20	05:53 19:37	06:24 19:37	06:56 18:45	06:30 16:58	07:06 16:33	07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	0	0	0	459	0	0	0	447	20	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:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar per WTG

Calculation: VMWTG: 4 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (12)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 07:57-08:24/27 18:44	06:31 16:56	07:06 16:31
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:18	06:26 19:33	06:57 07:56-08:24/28 18:42	06:32 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 07:56-08:23/27 18:40	06:33 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:38	05:57 20:15	06:28 19:30	06:59 07:56-08:23/27 18:39	06:34 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 07:56-08:22/26 18:37	06:36 16:52	07:10 16:31
6	07:27 16:45	07:08 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:31	05:32 20:37	05:59 20:13	06:30 19:27	07:01 07:58-08:22/24 18:35	06:37 16:50	07:11 16:30
7	07:27 16:46	07:07 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 07:58-08:20/22 18:34	06:38 16:49	07:12 16:30
8	07:27 16:47	07:05 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	05:34 20:36	06:01 20:10	06:32 19:23	07:03 07:59-08:19/20 18:32	06:39 16:48	07:13 16:30
9	07:27 16:48	07:04 17:25	06:24 17:59	06:32 19:33	05:49 20:05	05:26 20:32	05:34 20:36	06:02 20:09	06:33 19:22	07:04 08:01-08:17/16 18:30	06:40 16:47	07:14 16:30
10	07:26 16:49	07:03 17:26	06:22 18:00	06:30 19:34	05:47 20:06	05:26 20:33	05:35 20:36	06:03 20:08	06:34 19:20	07:06 08:03-08:13/10 18:29	06:42 16:46	07:15 16:30
11	07:26 16:50	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:08	05:26 20:33	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 16:45	07:16 16:30
12	07:26 16:51	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 16:44	07:17 16:30
13	07:26 16:52	06:59 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:35	05:37 20:34	06:06 20:04	06:37 19:15	07:09 18:24	06:45 16:43	07:17 16:31
14	07:25 16:53	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:47 16:42	07:18 16:31
15	07:25 16:54	06:57 17:33	06:14 18:06	06:22 19:40	05:42 20:12	05:26 20:35	05:39 20:33	06:08 20:01	06:39 19:11	07:11 18:21	06:48 16:41	07:19 16:31
16	07:24 16:55	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	05:39 20:32	06:09 20:00	06:40 19:10	07:12 18:19	06:49 16:40	07:20 16:31
17	07:24 16:57	06:54 17:35	06:10 18:08	06:19 19:42	05:40 20:14	05:26 20:36	05:40 20:32	06:10 19:58	06:41 19:08	07:13 18:18	06:50 16:40	07:20 16:31
18	07:23 16:58	06:53 17:36	06:09 18:09	06:17 19:43	05:39 20:15	05:26 20:37	05:41 20:31	06:11 19:57	06:42 19:06	07:14 18:16	06:51 16:39	07:21 16:32
19	07:23 16:59	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:16	05:26 20:37	05:42 20:30	06:12 19:55	06:43 19:04	07:16 18:15	06:53 16:38	07:22 16:32
20	07:22 17:00	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:17	05:26 20:37	05:43 20:30	06:13 19:54	06:45 19:03	07:17 18:13	06:54 16:37	07:22 16:33
21	07:22 17:01	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:17	05:26 20:37	05:44 20:29	06:14 19:52	06:46 19:01	07:18 18:12	06:55 16:37	07:23 16:33
22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:38	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:33
23	07:20 17:04	06:46 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	05:45 20:27	06:16 19:49	06:48 18:57	08:11-08:16/5 07:20	06:57 16:35	07:24 16:34
24	07:20 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:27	06:17 19:48	06:49 18:56	08:06-08:20/14 18:07	06:58 16:35	07:24 16:35
25	07:19 17:06	06:43 17:45	05:57 18:17	06:07 19:50	05:33 20:21	05:27 20:38	05:47 20:26	06:18 19:46	06:50 18:54	08:04-08:21/17 17:06	07:00 16:34	07:25 16:35
26	07:18 17:08	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:28 20:38	05:48 20:25	06:19 19:45	06:51 18:52	08:02-08:23/21 17:04	07:01 16:34	07:25 16:36
27	07:17 17:09	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	08:00-08:23/23 17:03	07:02 16:33	07:25 16:36
28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:59-08:24/25 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11		06:50 19:21	06:01 19:55	05:31 20:25	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	07:58-08:24/26 17:00	07:04 16:32	07:26 16:38
30	07:15 17:13		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	07:57-08:24/27 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		06:30 16:58		07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	0	0	380	0	0	0	0	0	158	227	0	0

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

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

SHADOW - Calendar per WTG

Calculation: VMWTG: 5 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (13)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June
1	07:27 08:21-08:43/22 16:40	07:13 17:15 17:50	06:36 17:50	06:45 18:07-18:27/20 19:24	05:59 19:57 20:27	05:29 20:27
2	07:27 08:21-08:43/22 16:41	07:12 17:16 17:51	06:35 17:51	06:43 18:04-18:28/24 19:26	05:57 19:58 20:28	05:29 20:28
3	07:27 08:22-08:44/22 16:42	07:11 17:18 17:52	06:33 17:52	06:42 18:02-18:29/27 19:27	05:56 19:59 20:28	05:28 20:28
4	07:27 08:21-08:44/23 16:43	07:10 17:19 17:53	06:32 17:53	06:40 18:01-18:31/30 19:28	05:55 20:00 20:29	05:28 20:29
5	07:27 08:21-08:44/23 16:44	07:09 17:20 17:54	06:30 17:54	06:38 17:59-18:32/33 19:29	05:53 20:01 20:30	05:28 20:30
6	07:27 08:22-08:45/23 16:45	07:08 17:21 17:56	06:29 17:56	06:37 17:58-18:32/34 19:30	05:52 20:02 20:31	05:27 20:31
7	07:27 08:22-08:46/24 16:46	07:07 17:23 17:57	06:27 17:57	06:35 17:57-18:33/36 19:31	05:51 20:03 20:31	05:27 20:31
8	07:27 08:23-08:46/23 16:47	07:05 17:24 17:58	06:25 17:58	06:33 17:56-18:33/37 19:32	05:50 20:04 20:32	05:27 20:32
9	07:27 08:23-08:47/24 16:48	07:04 17:25 17:59	06:24 17:59	06:32 17:55-18:32/37 19:33	05:49 20:05 20:32	05:26 20:32
10	07:26 08:23-08:47/24 16:49	07:03 17:26 18:00	06:22 18:00	06:30 17:55-18:33/38 19:34	05:47 20:06 20:33	05:26 20:33
11	07:26 08:23-08:48/25 16:50	07:02 17:28 18:01	06:20 18:01	06:28 17:55-18:32/37 19:35	05:46 20:08 20:33	05:26 20:33
12	07:26 08:24-08:49/25 16:51	07:01 17:29 18:02	06:19 18:02	06:27 17:54-18:32/38 19:36	05:45 20:09 20:34	05:26 20:34
13	07:26 08:24-08:48/24 16:52	06:59 17:30 18:04	06:17 18:04	06:25 17:55-18:32/37 19:37	05:44 20:10 20:34	05:26 20:34
14	07:25 08:25-08:49/24 16:53	06:58 17:32 18:05	06:15 18:05	06:24 17:54-18:31/37 19:39	05:43 20:11 20:35	05:26 20:35
15	07:25 08:25-08:49/24 16:54	06:57 17:33 18:06	06:14 18:06	06:22 17:55-18:31/36 19:40	05:42 20:12 20:35	05:26 20:35
16	07:24 08:26-08:49/23 16:56	06:55 17:34 18:07	06:12 18:07	06:20 17:55-18:30/35 19:41	05:41 20:13 20:36	05:26 20:36
17	07:24 08:26-08:49/23 16:57	06:54 17:35 18:08	06:10 18:08	06:19 17:56-18:30/34 19:42	05:40 20:14 20:36	05:26 20:36
18	07:23 08:27-08:50/23 16:58	06:53 17:36 18:09	06:09 18:09	06:17 17:56-18:28/32 19:43	05:39 20:15 20:36	05:26 20:36
19	07:23 08:27-08:49/22 16:59	06:51 17:38 18:10	06:07 18:10	06:16 17:57-18:28/31 19:44	05:38 20:16 20:37	05:26 20:37
20	07:22 08:29-08:49/20 17:00	06:50 17:39 18:11	06:05 18:11	06:14 17:57-18:26/29 19:45	05:37 20:16 20:37	05:26 20:37
21	07:22 08:29-08:49/20 17:01	06:48 17:40 18:12	06:04 18:12	06:13 17:59-18:25/26 19:46	05:37 20:17 20:37	05:26 20:37
22	07:21 08:30-08:48/18 17:03	06:47 17:41 18:14	06:02 18:14	06:11 18:00-18:23/23 19:47	05:36 20:18 20:38	05:26 20:38
23	07:20 08:31-08:47/16 17:04	06:46 17:43 18:15	06:00 18:15	06:10 18:02-18:21/19 19:48	05:35 20:19 20:38	05:27 20:38
24	07:20 08:34-08:47/13 17:05	06:44 17:44 18:16	05:59 18:16	06:08 18:04-18:18/14 19:49	05:34 20:20 20:38	05:27 20:38
25	07:19 08:36-08:45/9 17:06	06:43 17:45 18:17	05:57 18:17	06:07 18:10-18:13/3 19:50	05:33 20:21 20:38	05:27 20:38
26	07:18 17:08 17:09	06:41 17:46 18:18	05:55 18:18	06:05 19:52 20:22	05:33 20:22 20:38	05:28 20:38
27	07:17 17:09 17:10	06:40 17:47 18:19	05:53 18:19	06:04 19:53 20:23	05:32 20:23 20:38	05:28 20:38
28	07:17 17:10 17:11	06:38 17:49 18:20	05:52 18:20	06:03 19:54 20:24	05:31 20:24 20:38	05:28 20:38
29	07:16 17:11 17:12		06:50 19:21 19:55	06:01 19:55 20:25	05:31 20:25 20:38	05:29 20:38
30	07:15 17:13 17:14		06:48 19:22 19:56	06:00 19:56 20:25	05:30 20:25 20:38	05:29 20:38
31	07:14 17:14		06:47 19:23 18:09-18:23/14		05:30 20:26 20:39	
Potential sun hours	296	296	369	399	450	454
Sum of minutes with flicker	539	0	14	747	0	0

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

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

SHADOW - Calendar per WTG

Calculation: VMWTG: 5 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (13)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	July	August	September	October	November	December
1	05:30 20:38	05:54 20:19	06:25 17:54-18:31/37 19:35	06:56 18:44	06:31 16:56	07:06 08:05-08:30/25 16:32
2	05:30 20:38	05:55 20:18	06:26 17:53-18:31/38 19:33	06:57 18:42	06:32 16:55	07:07 08:06-08:30/24 16:31
3	05:31 20:38	05:56 20:16	06:27 17:53-18:30/37 19:32	06:58 18:40	06:33 16:54	07:08 08:06-08:30/24 16:31
4	05:31 20:37	05:57 20:15	06:28 17:53-18:30/37 19:30	06:59 18:39	06:34 16:53	07:09 08:07-08:31/24 16:31
5	05:32 20:37	05:58 20:14	06:29 17:53-18:29/36 19:28	07:00 18:37	06:36 16:52	07:10 08:07-08:31/24 16:31
6	05:32 20:37	05:59 20:13	06:30 17:54-18:28/34 19:27	07:01 18:35	06:37 16:50	07:11 08:08-08:31/23 16:30
7	05:33 20:37	06:00 20:12	06:31 17:54-18:27/33 19:25	07:02 18:34	06:38 16:49	07:12 08:08-08:31/23 16:30
8	05:34 20:36	06:01 20:10	06:32 17:55-18:25/30 19:23	07:03 18:32	06:39 16:48	07:13 08:09-08:32/23 16:30
9	05:34 20:36	06:02 20:09	06:33 17:56-18:24/28 19:22	07:04 18:30	06:40 16:47	07:14 08:10-08:32/22 16:30
10	05:35 20:36	06:03 20:08	06:34 17:57-18:22/25 19:20	07:06 18:29	06:42 16:46	07:15 08:10-08:32/22 16:30
11	05:36 20:35	06:04 20:06	06:35 17:59-18:19/20 19:18	07:07 18:27	06:43 16:45	07:16 08:11-08:33/22 16:30
12	05:36 20:35	06:05 20:05	06:36 18:01-18:16/15 19:16	07:08 18:25	06:44 16:44	07:17 08:12-08:33/21 16:30
13	05:37 20:34	06:06 20:04	06:37 18:07-18:09/2 19:15	07:09 18:24	06:45 16:43	07:17 08:12-08:33/21 16:31
14	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:47 16:42	07:18 08:13-08:33/20 16:31
15	05:39 20:33	06:08 20:01	06:39 19:11	07:11 18:21	06:48 16:41	07:19 08:14-08:34/20 16:31
16	05:39 20:32	06:09 20:00	06:40 19:10	07:12 18:19	06:49 16:40	07:20 08:15-08:34/19 16:31
17	05:40 20:32	06:10 19:58	06:41 19:08	07:13 18:18	06:50 16:40	08:09-08:18/9 16:31
18	05:41 20:31	06:11 18:14-18:21/7 19:57	06:42 19:06	07:14 18:16	06:51 16:39	08:08-08:21/13 16:32
19	05:42 20:30	06:12 18:10-18:25/15 19:55	06:43 19:04	07:16 18:15	06:53 16:38	08:06-08:22/16 16:32
20	05:43 20:30	06:13 18:07-18:27/20 19:54	06:45 19:03	07:17 18:13	06:54 16:37	08:05-08:23/18 16:33
21	05:44 20:29	06:14 18:04-18:28/24 19:52	06:46 19:01	07:18 18:12	06:55 16:37	08:04-08:24/20 16:33
22	05:44 20:28	06:15 18:02-18:29/27 19:51	06:47 18:59	07:19 18:10	06:56 16:36	08:05-08:25/20 16:34
23	05:45 20:27	06:16 18:01-18:30/29 19:49	06:48 18:57	07:20 18:09	06:57 16:35	08:04-08:26/22 16:34
24	05:46 20:26	06:17 18:00-18:31/31 19:48	06:49 18:56	07:21 18:07	06:58 16:35	08:04-08:27/23 16:35
25	05:47 20:26	06:18 17:58-18:31/33 19:46	06:50 18:54	07:22 17:06	07:00 16:34	08:04-08:27/23 16:35
26	05:48 20:25	06:19 17:57-18:32/35 19:45	06:51 18:52	07:24 17:04	07:01 16:34	08:04-08:27/23 16:36
27	05:49 20:24	06:20 17:56-18:32/36 19:43	06:52 18:51	07:25 17:03	07:02 16:33	08:05-08:29/24 16:36
28	05:50 20:23	06:21 17:56-18:32/36 19:41	06:53 18:49	07:26 17:02	07:03 16:33	08:05-08:29/24 16:37
29	05:51 20:22	06:22 17:55-18:32/37 19:40	06:54 18:47	07:27 17:00	07:04 16:32	08:05-08:29/24 16:38
30	05:52 20:21	06:23 17:54-18:32/38 19:38	06:55 18:45	07:28 16:59	07:05 16:32	08:05-08:30/25 16:39
31	05:53 20:20	06:24 17:54-18:32/38 19:37		06:30 16:58		07:26 08:20-08:41/21 16:39
Potential sun hours	460	429	375	345	297	286
Sum of minutes with flicker	0	406	372	0	284	647

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

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

Project:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar per WTG

Calculation: VMWTG: 6 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (14)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 15:24-16:03/39 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 14:55-15:33/38 16:56	07:06 16:32
2	07:27 16:41	07:12 15:24-16:04/40 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:17	06:26 19:33	06:57 18:42	06:32 14:55-15:34/39 16:55	07:07 16:31
3	07:27 16:42	07:11 15:24-16:04/40 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 18:40	06:33 14:55-15:34/39 16:54	07:08 16:31
4	07:27 16:43	07:10 15:24-16:05/41 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:37	05:57 20:15	06:28 19:30	06:59 18:39	06:34 14:54-15:34/40 16:53	07:09 16:31
5	07:27 16:44	07:09 15:24-16:05/41 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:36 14:55-15:35/40 16:52	07:10 16:31
6	07:27 16:45	07:08 15:25-16:05/40 17:21	06:29 17:56	06:37 19:30	05:52 20:02	05:27 20:30	05:32 20:37	05:59 20:13	06:30 19:27	07:01 18:35	06:37 14:54-15:35/41 16:50	07:11 16:30
7	07:27 16:46	07:07 15:24-16:04/40 17:23	06:27 17:57	06:35 19:31	05:51 20:03	05:27 20:31	05:33 20:37	06:00 20:12	06:31 19:25	07:02 18:34	06:38 14:54-15:34/40 16:49	07:12 16:30
8	07:27 16:47	07:05 15:25-16:04/39 17:24	06:25 17:58	06:33 19:32	05:50 20:04	05:27 20:32	05:34 20:36	06:01 20:10	06:32 19:23	07:03 18:32	06:39 14:55-15:35/40 16:48	07:13 16:30
9	07:27 16:48	07:04 15:26-16:04/38 17:25	06:24 17:59	06:32 19:33	05:49 20:05	05:26 20:32	05:34 20:36	06:02 20:09	06:33 19:22	07:04 18:30	06:40 14:55-15:35/40 16:47	07:14 16:30
10	07:26 16:49	07:03 15:27-16:04/37 17:26	06:22 18:00	06:30 19:34	05:47 20:06	05:26 20:33	05:35 20:36	06:03 20:08	06:34 19:20	07:06 18:29	06:42 14:55-15:34/39 16:46	07:15 16:30
11	07:26 16:50	07:02 15:28-16:04/36 17:28	06:20 18:01	06:28 19:35	05:46 20:07	05:26 20:33	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 14:55-15:34/39 16:45	07:16 16:30
12	07:26 16:51	07:01 15:28-16:02/34 17:29	06:19 18:02	06:27 19:36	05:45 20:09	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 14:56-15:34/38 16:44	07:17 16:30
13	07:26 16:52	06:59 15:29-16:02/33 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:34	05:37 20:34	06:06 20:04	06:37 19:15	07:09 18:24	06:45 14:56-15:34/38 16:43	07:18 16:31
14	07:25 16:53	06:58 15:31-16:01/30 17:32	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:46 14:56-15:33/37 16:42	07:19 16:31
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24	07:20 15:26-15:57/31 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:26	06:17 19:48	06:49 18:56	07:21 16:07-16:23/16 18:07	06:58 15:09-15:26/17 16:35	07:24 16:35
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26	07:18 15:25-16:00/35 17:08	06:41 17:46	05:55 18:18	06:05 19:52	05:33 20:22	05:28 20:38	05:48 20:25	06:19 19:45	06:51 18:52	07:23 15:03-15:28/25 17:04	07:01 15:15-15:20/5 16:34	07:25 16:36
27	07:17 15:25-16:01/36 17:09	06:40 17:47	05:53 18:19	06:04 19:53	05:32 20:23	05:28 20:38	05:49 20:24	06:20 19:43	06:52 18:51	07:24 15:01-15:29/28 17:03	07:02 15:15-15:29/28 16:33	07:25 16:36
28	07:17 15:24-16:01/37 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:25 14:59-15:30/31 17:02	07:03 14:59-15:30/31 16:33	07:26 16:37
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31	07:14 15:24-16:03/39 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		07:28 14:56-15:33/37 16:58		07:26 16:39
Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	446	613	0	0	0	0	0	0	0	234	844	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:

IR_VolturinoVolturaraMotta

Licensed user:

Vega sas

Via delli Carri, 48

IT-71100 Foggia

+39 0881 756251

VEGA / info@studiovega.org

Calculated:

18/10/2023 10:20/3.5.584

SHADOW - Calendar per WTG

Calculation: VMWTG: 7 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (15)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 13:10-14:12/62 16:40	07:13 17:50 17:15	06:36 19:24 17:50	06:45 19:24 19:24	05:59 19:57 19:57	05:29 20:38 20:38	05:30 20:19 20:19	05:54 19:35 19:35	06:25 18:44 18:44	06:56 16:56 16:56	06:31 16:31 16:31	07:06 13:02-13:55/53 16:31
2	07:27 13:11-14:12/61 16:41	07:12 17:50 17:16	06:35 19:25 17:51	06:43 19:25 19:25	05:57 19:58 19:58	05:29 20:38 20:38	05:55 20:17 20:17	06:26 19:33 19:33	06:57 18:42 18:42	06:32 16:55 16:55	07:07 13:02-13:56/54 16:31	07:07 13:02-13:56/54 16:31
3	07:27 13:12-14:12/60 16:42	07:11 17:52 17:18	06:33 19:27 17:52	06:42 19:27 19:27	05:56 19:59 19:59	05:28 20:38 20:38	05:56 20:16 20:16	06:27 19:32 19:32	06:58 18:40 18:40	06:33 16:54 16:54	07:08 13:01-13:57/56 16:31	07:08 13:01-13:57/56 16:31
4	07:27 13:13-14:13/60 16:43	07:10 17:53 17:19	06:32 19:28 17:53	06:40 19:28 19:28	05:55 20:00 20:00	05:28 20:37 20:37	05:57 20:15 20:15	06:28 19:30 19:30	06:59 18:39 18:39	06:34 16:53 16:53	07:09 13:01-13:58/57 16:31	07:09 13:01-13:58/57 16:31
5	07:27 13:14-14:13/59 16:44	07:09 17:54 17:20	06:30 19:29 17:54	06:38 20:01 19:29	05:53 20:30 20:30	05:28 20:37 20:37	05:58 20:14 20:14	06:29 19:28 19:28	07:00 18:37 18:37	06:36 16:51 16:51	07:10 13:01-13:58/57 16:31	07:10 13:01-13:58/57 16:31
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9	07:27 13:18-14:14/56 16:48	07:04 17:59 17:25	06:24 19:33 17:59	06:32 20:05 19:33	05:49 20:32 20:32	05:26 20:36 20:36	06:02 20:09 20:09	06:33 19:21 19:21	07:04 18:30 18:30	06:40 16:47 16:47	07:14 13:01-14:02/61 16:30	07:14 13:01-14:02/61 16:30
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Potential sun hours	296	296	369	399	450	454	460	429	375	345	297	286
Sum of minutes with flicker	1082	0	0	0	0	0	0	0	0	0	444	1903

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

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

SHADOW - Calendar per WTG

Calculation: VMWTG: 8 - Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0 m) (16)

Assumptions for shadow calculations

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:27 16:40	07:13 17:15	06:36 17:50	06:45 19:24	05:59 19:57	05:29 20:27	05:30 20:38	05:54 20:19	06:25 19:35	06:56 18:44	06:31 16:56	07:06 16:32
2	07:27 16:41	07:12 17:16	06:35 17:51	06:43 19:26	05:57 19:58	05:29 20:28	05:30 20:38	05:55 20:17	06:26 19:33	06:57 18:42	06:32 16:55	07:07 16:31
3	07:27 16:42	07:11 17:18	06:33 17:52	06:42 19:27	05:56 19:59	05:28 20:28	05:31 20:38	05:56 20:16	06:27 19:32	06:58 18:40	06:33 16:54	07:08 16:31
4	07:27 16:43	07:10 17:19	06:32 17:53	06:40 19:28	05:55 20:00	05:28 20:29	05:31 20:37	05:57 20:15	06:28 19:30	06:59 18:39	06:34 16:53	07:09 16:31
5	07:27 16:44	07:09 17:20	06:30 17:54	06:38 19:29	05:53 20:01	05:28 20:30	05:32 20:37	05:58 20:14	06:29 19:28	07:00 18:37	06:36 16:52	07:10 16:31
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11	07:26 16:50	07:02 17:28	06:20 18:01	06:28 19:35	05:46 20:07	05:26 20:33	05:36 20:35	06:04 20:06	06:35 19:18	07:07 18:27	06:43 16:45	07:16 16:30
12	07:26 16:51	07:01 17:29	06:19 18:02	06:27 19:36	05:45 20:08	05:26 20:34	05:36 20:35	06:05 20:05	06:36 19:16	07:08 18:25	06:44 16:44	07:17 16:30
13	07:26 16:52	06:59 17:30	06:17 18:04	06:25 19:37	05:44 20:10	05:26 20:34	05:37 20:34	06:06 20:04	06:37 19:15	07:09 18:24	06:45 16:43	07:17 16:31
14	07:25 16:53	06:58 17:31	06:15 18:05	06:24 19:39	05:43 20:11	05:26 20:35	05:38 20:34	06:07 20:02	06:38 19:13	07:10 18:22	06:46 16:42	07:18 16:31
15	07:25 16:54	06:57 17:33	06:14 18:06	06:22 19:40	05:42 20:12	05:26 20:35	05:39 20:33	06:08 20:01	06:39 19:11	07:11 18:21	06:48 16:41	07:19 16:31
16	07:24 16:56	06:55 17:34	06:12 18:07	06:20 19:41	05:41 20:13	05:26 20:36	05:39 20:32	06:09 20:00	06:40 19:09	07:12 18:19	06:49 16:40	07:20 16:31
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18	07:23 16:58	06:53 17:36	06:09 18:09	06:17 19:43	05:39 20:15	05:26 20:36	05:41 20:31	06:11 19:57	06:42 19:06	07:14 18:16	06:51 16:39	07:21 16:32
19	07:23 16:59	06:51 17:38	06:07 18:10	06:16 19:44	05:38 20:15	05:26 20:37	05:42 20:30	06:12 19:55	06:43 19:04	07:15 18:15	06:52 16:38	07:22 16:32
20	07:22 17:00	06:50 17:39	06:05 18:11	06:14 19:45	05:37 20:16	05:26 20:37	05:43 20:30	06:13 19:54	06:44 19:03	07:17 18:13	06:54 16:37	07:22 16:33
21	07:22 17:01	06:48 17:40	06:04 18:12	06:13 19:46	05:37 20:17	05:26 20:37	05:44 20:29	06:14 19:52	06:46 19:01	07:18 18:12	06:55 16:37	07:23 16:33
22	07:21 17:03	06:47 17:41	06:02 18:14	06:11 19:47	05:36 20:18	05:26 20:37	05:44 20:28	06:15 19:51	06:47 18:59	07:19 18:10	06:56 16:36	07:23 16:34
23	07:20 17:04	06:45 17:43	06:00 18:15	06:10 19:48	05:35 20:19	05:27 20:38	05:45 20:27	06:16 19:49	06:48 18:57	07:20 18:09	06:57 16:35	07:24 16:34
24	07:20 17:05	06:44 17:44	05:59 18:16	06:08 19:49	05:34 20:20	05:27 20:38	05:46 20:26	06:17 19:48	06:49 18:56	07:21 18:07	06:58 16:35	07:24 16:35
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28	07:17 17:10	06:38 17:49	05:52 18:20	06:03 19:54	05:31 20:24	05:28 20:38	05:50 20:23	06:21 19:41	06:53 18:49	07:25 17:02	07:03 16:33	07:26 16:37
29	07:16 17:11		06:50 19:21	06:01 19:55	05:31 20:24	05:29 20:38	05:51 20:22	06:22 19:40	06:54 18:47	07:26 17:00	07:04 16:32	07:26 16:38
30	07:15 17:13		06:48 19:22	06:00 19:56	05:30 20:25	05:29 20:38	05:52 20:21	06:23 19:38	06:55 18:45	07:27 16:59	07:05 16:32	07:26 16:39
31	07:14 17:14		06:47 19:23		05:30 20:26		05:53 20:20	06:24 19:37		06:30 16:58		07:26 16:39
Potential sun hours	296	296	369	399	449	454	460	429	375	345	297	286
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

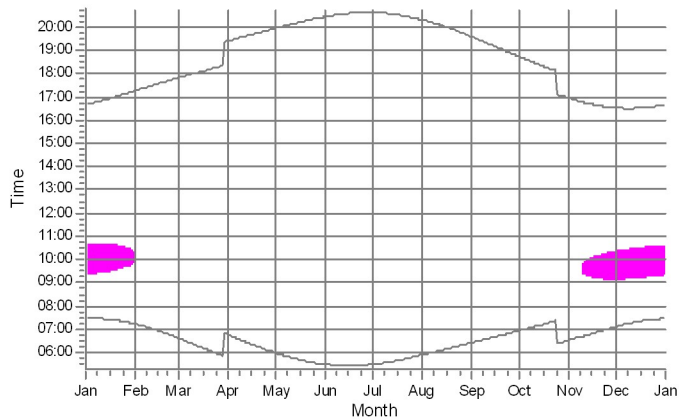
Table layout: For each day in each month the following matrix apply

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

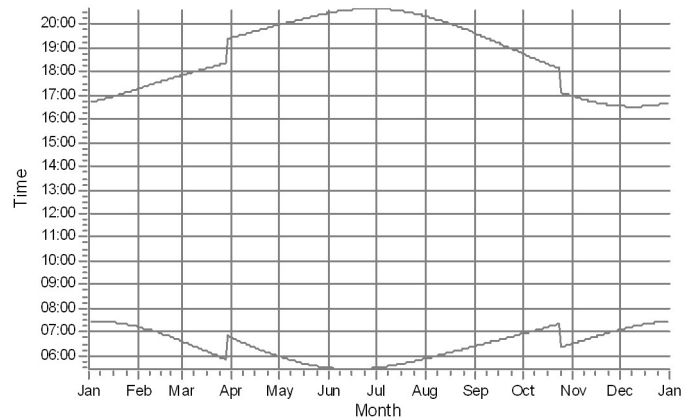
SHADOW - Calendar per WTG, graphical

Calculation: VM

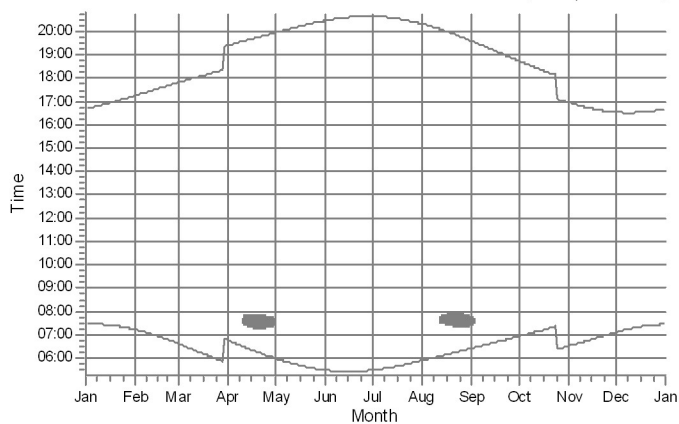
1: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



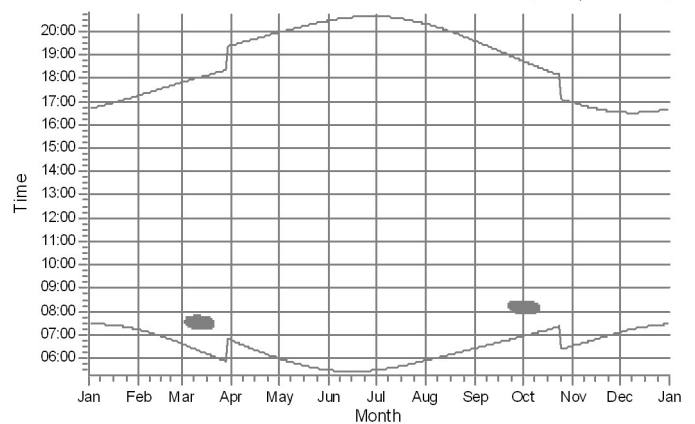
2: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



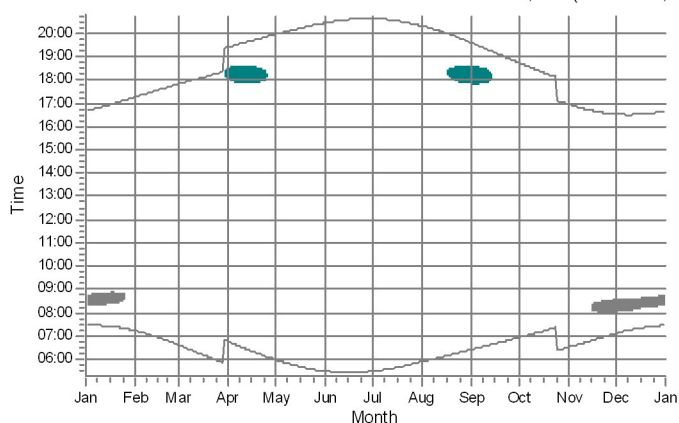
3: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



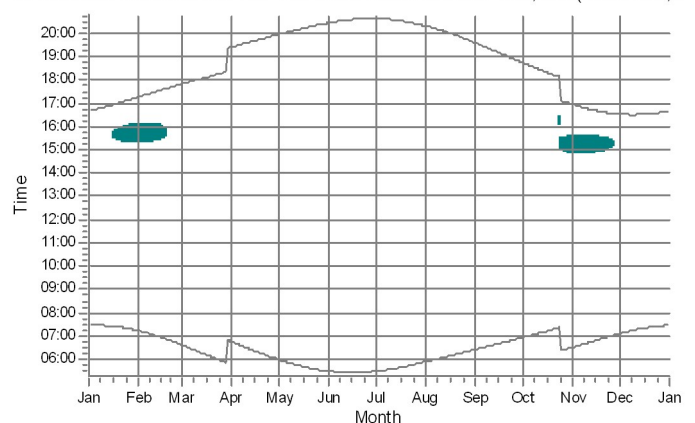
4: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



5: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



6: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



Shadow receptors



D: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (4)

E: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (5)

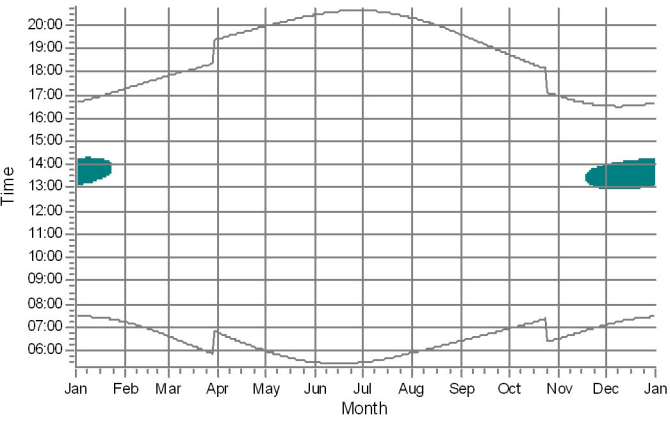


F: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (7)

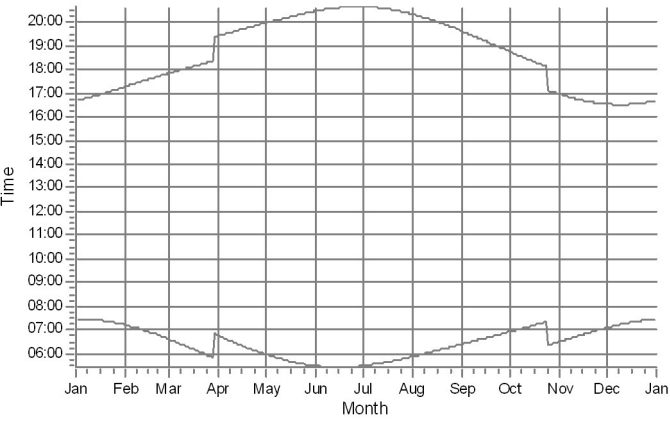
SHADOW - Calendar per WTG, graphical

Calculation: VM

7: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



8: Siemens Gamesa SG 6.6-155 6600 155.0 !O! hub: 102,5 m (TOT: 180,0



Shadow receptors

F: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (7)