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COMUNI DI ACERENZA E OPPIDO LUCANO (PZ)  
LOCALITA' "TORRE VOSA"

PROGETTO PER LA REALIZZAZIONE DI  
**IMPIANTO EOLICO**  
**"DONNA MARIANNA"**

REDAZIONE / PROGETTISTA:



**AREN Electric Power S.p.A.**

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TIMBRO E FIRMA PROGETTISTA:



TITOLO ELABORATO:

**RELAZIONE EVOLUZIONE OMBRA – FENOMENO SHADOW  
FLICKERING**

CODICE ELABORATO:

**DMADT\_GENR02500\_00**

FORMATO:

**A4**

Nr. EL.:

**/**

FASE:

**PROGETTO  
DEFINITIVO**

REV.	DESCRIZIONE	DATA	REDATTO	VERIFICATO	APPROVATO
00	Prima emissione	30/07/2024	A. Micolucci	A. Micolucci	A. Micolucci
01					
02					
03					
04					

Committente: <b>AREN Green S.r.l.</b> Via Dell'Arrigoni 308 47522 Cesena (FC)	PROGETTO PER LA REALIZZAZIONE DI UN PARCO EOLICO NEI COMUNI DI ACERENZA E OPPIDO LUCANO (PZ) DENOMINATO "DONNA MARIANNA"	Nome del file: <b>DMADT_GENR02500_00</b>
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## 1 PREMESSA

Il presente studio ha come scopo la valutazione dell'eventuale impatto generato dal fenomeno dello shadow flickering indotto dalla realizzazione e dal funzionamento dell'impianto eolico in progetto denominato "Donna Marianna", nei comuni di Acerenza e Oppido Lucano (PZ) in località "Torre Vosa" composto da 9 aerogeneratori da 6 MW da installare su di un'area che interessa le località di "Torre Vosa" con opere di connessione ricadenti nei medesimi comuni, commissionato dalla società **AREN Green S.r.l.**

## 2 CENNI SUL FENOMENO DELLO SHADOW FLICKERING

Le turbine eoliche, come altre strutture fortemente sviluppate in altezza, proiettano un'ombra sulle aree adiacenti in presenza della luce solare diretta. Il cosiddetto fenomeno del "flickering" indica l'effetto di lampeggiamento che si verifica quando le pale del rotore in movimento "tagliano" la luce solare in maniera intermittente. Tale variazione alternata di intensità luminosa, a lungo andare, può provocare fastidio agli occupanti delle abitazioni le cui finestre risultano esposte al fenomeno stesso.

I più recenti aerogeneratori tripala operano ad una velocità di rotazione inferiore ai 35 giri al minuto, corrispondente ad una frequenza di passaggio delle pale sulla verticale inferiore a 1.75 Hz, minore, quindi, della frequenza critica di 2.5 Hz. Inoltre, i generatori di grande potenza (dal MW in su) raramente superano la velocità di rotazione di 20 giri al minuto, corrispondente a frequenze di passaggio delle pale ampiamente minori di quelle ritenute fastidiose per la maggioranza degli individui.

In generale, l'area soggetta a shadow flickering non si estende oltre i 500÷1.000 m dall'aerogeneratore e le zone maggiormente impattate ricadono generalmente entro i 300 m di distanza dalle turbine, con durata del fenomeno dell'ordine delle 300 ore all'anno.

## 3 NORMATIVA DI RIFERIMENTO

Dal punto di vista normativo, in Italia non esistono dei precisi limiti di tolleranza sulle ore/anno di impatto del fenomeno. Pertanto, come di consueto in questo tipo di studi, nel presente lavoro ci si riferisce alle linee guida della Germania (WEA-Schattenwurf-Hinweise), che in via cautelativa dettano come limite quello delle 30 h/anno: ogni singolo recettore sensibile che superi tale limite dovrebbe essere analizzato per ulteriori approfondimenti. Generalmente, i fattori che permettono la diminuzione o direttamente l'annullamento del fenomeno potrebbero essere la presenza di alberi interposti tra turbina e recettore e/o posizionamento delle abitazioni e dei propri infissi rispetto alla fonte, abitazioni poste a quote inferiori a quelle apprezzabili dal DTM (Digital Terrain Model) inserito nel codice di calcolo.

Si ribadisce tuttavia che questo tipo di limite (preso in considerazione anche in questo studio) è comunque pur sempre un limite "fittizio" e preso come riferimento di letteratura, poiché esso si riferisce ad

una normativa non vigente in Italia, ove non esiste alcun riferimento legislativo che detti delle soglie alle quali attenersi.

Premesso ciò, questo studio vuole dare delle indicazioni utili a dimostrare la bontà progettuale dell'impianto, tale da evitare il manifestarsi di questo spiacevole fenomeno, anche se, come detto, il reale impatto sul benessere delle persone risulta di per sé trascurabile.

## 4 CALCOLO DELLO SHADOW FLICKERING

### 4.1 CONFIGURAZIONE D'IMPIANTO E UBICAZIONE OPERE DI PROGETTO

L'impianto sarà costituito, come detto in premessa, da n. 9 aerogeneratori di potenza unitaria 6 MW, per una potenza complessiva dell'impianto di 54 MW e delle relative opere di connessione con la RTN.

Il tracciato del cavidotto di collegamento alla Stazione utente attraversa i Comuni di Acerenza e Oppido Lucano (PZ).

L'impianto sarà allacciato all'ampliamento a 36 kV della già esistente Stazione Elettrica Terna, denominata "Oppido Lucano", tramite connessione a 36 kV.

Nella seguente tabella si elencano le posizioni degli aerogeneratori che costituiscono il Progetto, espresse in coordinate WGS 84, fuso UTM 33:

WTG	X	Y
DM01	583742	4515466
DM02	583511	4516007
DM03	584199	4515727
DM04	584121	4516256
DM05	584865	4516556
DM06	585714	4516209
DM07	585337	4515908
DM08	586017	4515607
DM09	586405	4516020

*Tabella 1 : Coordinate puntuali turbine d'impianto (WGS 84 UTM 33)*

I 9 aerogeneratori si trovano ubicati, al Catasto terreni, ai seguenti Fogli:

WTG	Comune	Foglio
DM01	Oppido Lucano	3
DM02	Acerenza	52
DM03	Acerenza	53
DM04	Acerenza	42
DM05	Acerenza	42
DM06	Acerenza	54
DM07	Acerenza	54
DM08	Acerenza	54
DM09	Acerenza	54

*Tabella 2 : Riferimenti catastali turbine d'impianto*

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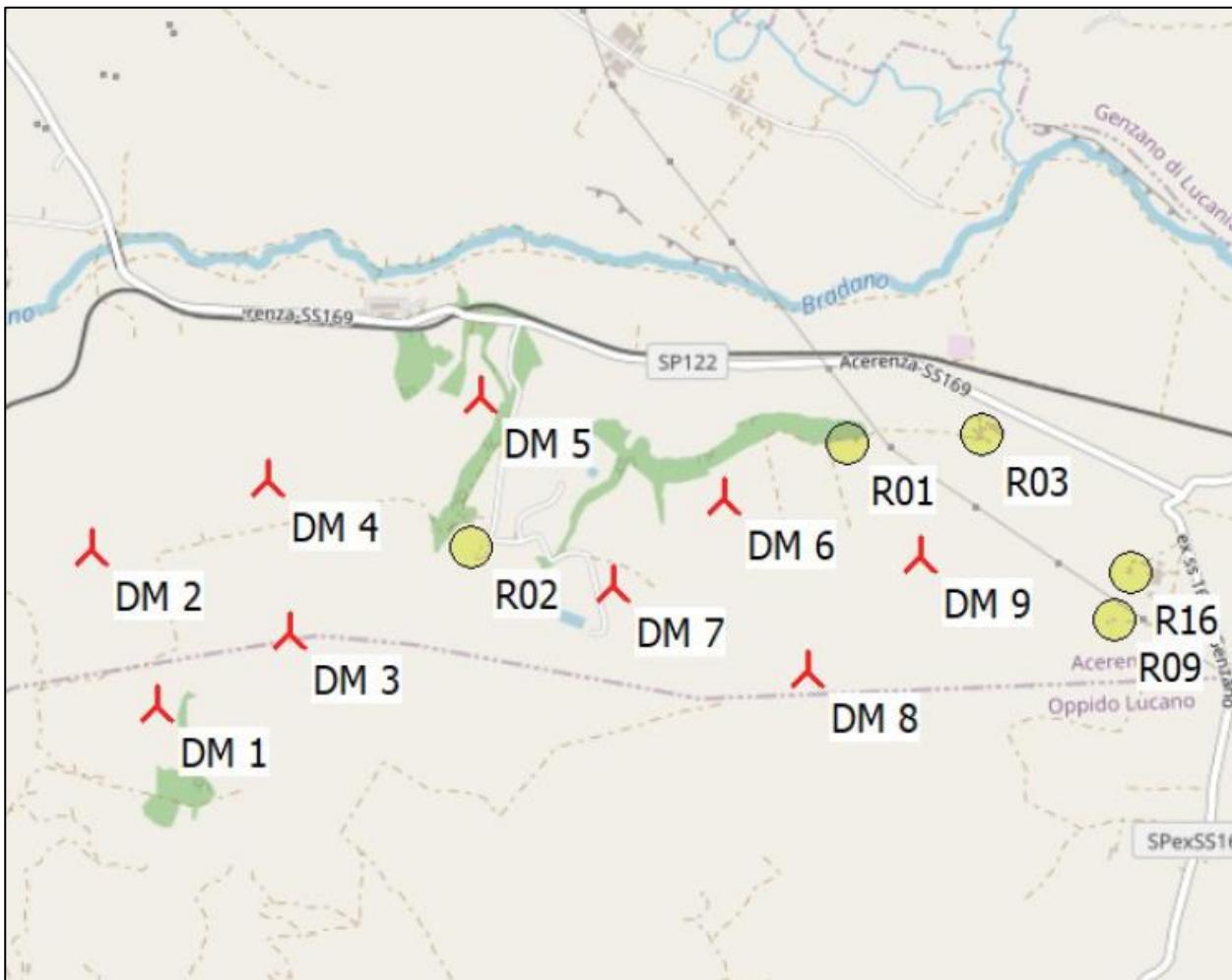
Il posizionamento degli aerogeneratori è stato effettuato tenendo conto, principalmente, delle condizioni di ventosità dell'area. In particolare, si sono raccolti dati sulla direzione, sull'intensità, sulla durata e sulla continuità del vento. Si è poi tenuto conto della natura geologica del terreno, nonché del suo andamento piano-altimetrico.

L'intera area è ad uso generalmente agricolo e di pascolo, con prevalenza di seminativi; sono presenti aree boscate, soprattutto in corrispondenza delle aste torrentizie e qualche sparso insediamento umano.

#### **4.2 METODOLOGIA DI ANALISI**

La valutazione tecnica è stata eseguita con l'ausilio di un software di simulazione specifico per la progettazione degli impianti eolici WIND PRO®, costituito da un insieme di moduli di elaborazione orientati alla simulazione di una moltitudine di aspetti che caratterizzano le diverse fasi progettuali. Il modulo SHADOW è quello specifico per la valutazione dell'evoluzione dell'ombra e del flickering. I dati di input sono:

- modello DTM del terreno (fonte: *Project Wizard Elevation Data Grid - SRTM: Shuttle DTM 1 arc-second*) ;
- posizione degli aerogeneratori di progetto, con relativi modelli e caratteristiche dimensionali;
- posizione geografica dei recettori;
- dati meteorologici di una stazione di riferimento per il calcolo del "real case".



*Figura 1 : Disposizione planimetrica degli aerogeneratori di progetto e dei recettori*

Nel modello di calcolo dell'ombra utilizzato da windPRO 4.0® (Figura 2) i seguenti parametri definiscono la propagazione dell'ombra dietro il disco del rotore:

- Diametro del Sole, D: 1.390.000 km
- Distanza dal Sole, d: 150.000.000 km
- Angolo di attacco: 0.531 gradi

Teoricamente, ciò comporterebbe un impatto di ombra fino a 4,8 km con un rotore di 45 metri di diametro. In realtà le ombre non raggiungono mai il massimo teorico a causa delle caratteristiche ottiche dell'atmosfera. Quando il sole diventa troppo basso all'orizzonte e la distanza diventa troppo lunga, l'ombra si disperde prima che raggiunga il suolo (o il recettore). Per tale motivo il modulo SHADOW del software WindPRO assume 2 km come valore di default della distanza massima di propagazione dell'ombra.

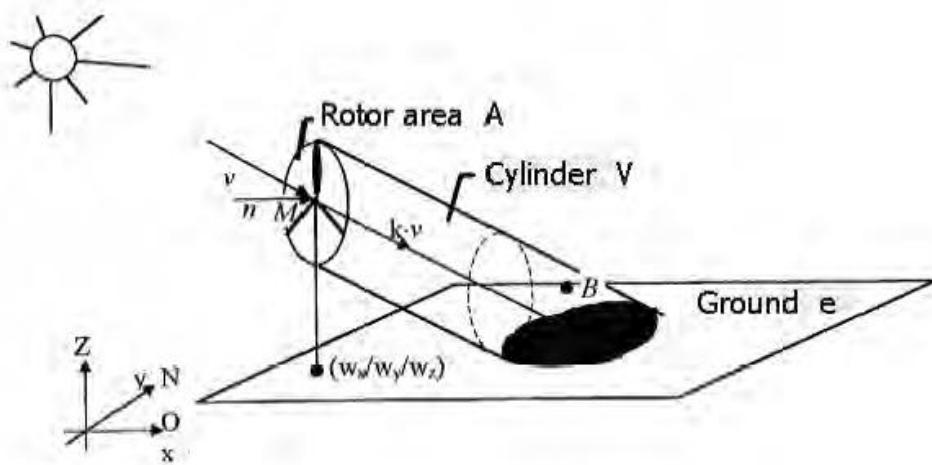


Figura 2 : Schema di calcolo del modulo Shadow

Il modulo SHADOW di WINDPRO®, nella definizione dei recettori permette di definire sia la dimensione della finestra che l'orientazione direzionale e angolare (inclinazione rispetto al piano orizzontale). Per i dettagli sullo studio dei recettori si rimanda al paragrafo 4.3.

Il modulo permette di effettuare il calcolo in due modalità definite rispettivamente “worst case” e “real case”.

Il calcolo nella modalità definita “worst case” viene effettuato nelle condizioni più sfavorevoli possibili, in quanto viene assunto che:

- il sole splende 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 direttrice sole-aerogeneratore (ovvero si assume che l'aerogeneratore “insegue” il sole);
- l'aerogeneratore è sempre operativo.

Sulla base di tali assunzioni, si evidenzia come la modalità definita “worst case” sia rappresentativa di una condizione irreale, e costituisca lo scenario peggiore possibile.

Il calcolo nella modalità definita “real case”, invece, consente di avvicinarsi maggiormente alle condizioni effettive e quindi al reale effetto del disturbo, in quanto permette di tener conto nei calcoli di dati statistici ricavati da una stazione anemometrica sita nella stessa area e di una stazione meteo che fornisce i dati di copertura nuvolosa della zona. In tal modo, viene ricavato un numero di ore di ombreggiamento più realistico poiché, a differenza del caso precedente, si tiene conto della reale presenza del sole e delle

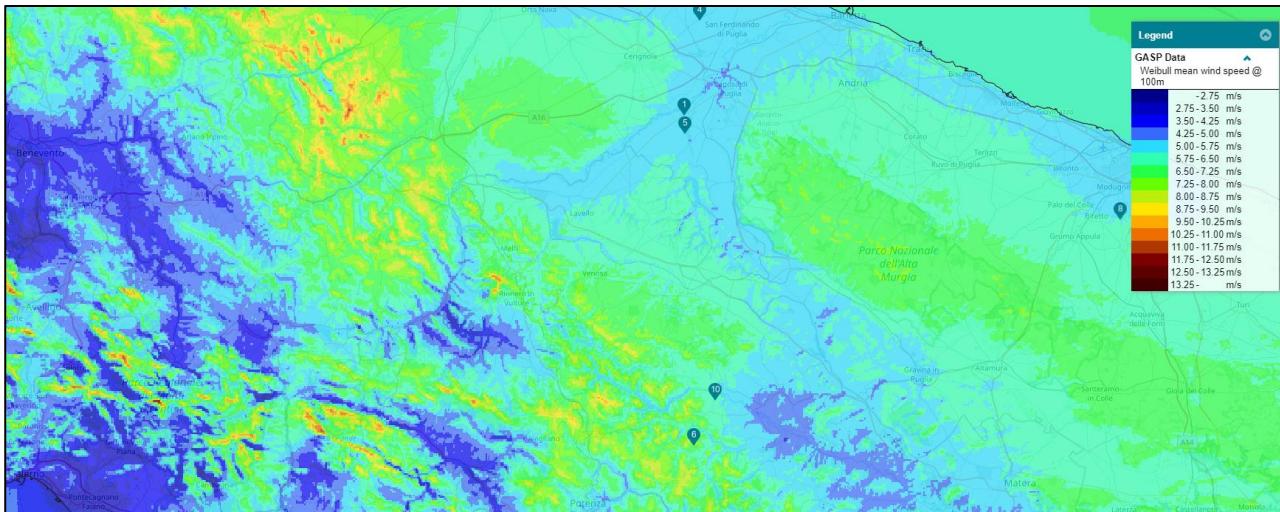
reali ore di funzionamento della turbina nell'arco di un anno anche in funzione della direzione del vento, ovvero vengono considerati tutti i fattori che influiscono sull'orientamento delle turbine rispetto al sole e dunque sull'ombra proiettata sui recettori.

Sulla base di tali assunzioni, si evidenzia come la modalità definita "real case" sia rappresentativa di una condizione di certo più realistica rispetto alla modalità "worst case", ma comunque non ancora pienamente rappresentativa dell'effettivo fenomeno di ombreggiamento che si ottiene nella realtà, in quanto non tiene conto della presenza di eventuali ostacoli fonte di ombra (quali alberi, lampioni ecc) e in quanto soggetto anche alle assunzioni sull'esposizione dei recettori spiegate precedentemente.

Pertanto, nel corso del presente studio, qualsiasi riferimento alla dicitura "real case" dovrà considerarsi semplicemente come indicativo della modalità di calcolo del software, e sulla base delle considerazioni appena esposte, non dovrà intendersi come reale effetto del fenomeno.

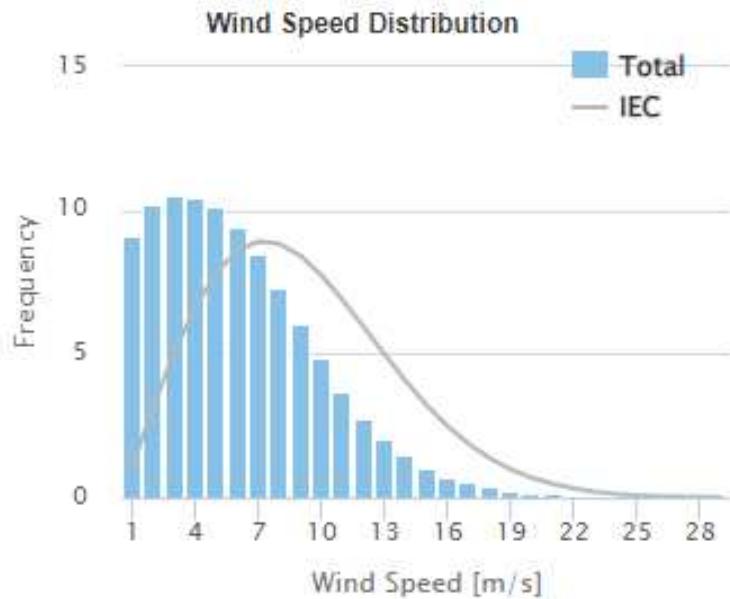
Per lo studio relativo all'impianto eolico di progetto, i dati forniti per la stima delle ore di operatività degli aerogeneratori sono stati ottenuti tramite un calcolo sulla base di due dati di ingresso:

- Cut in (velocità del vento minima misurata in m/s a cui la turbina inizia a produrre energia e quindi si muove) : 3 m/s;
- Cut out (soglia massima di velocità del vento, oltre la quale l'impianto si ferma): 25 m/s;
- Tabella del vento ricavata dal tool "Wind Prospecting" di WIND PRO®; tale dato è stato ricavato esattamente nel punto baricentrico dell'impianto (punto 10 della figura 3):



*Figura 3 : Estratto mappa del vento dal tool "Wind Prospecting"*

In tale punto è stata generata la tabella del vento di seguito mostrata:



*Tabella 3 : Tabella del vento dal tool "Wind Prospecting"*

L'obiettivo del calcolo, come detto, è la stima delle ore di operatività degli aerogeneratori ("ore utili"); quindi si è considerato il numero di ore di cui è composto un anno (8760 ore) ed è stato sottratto il numero di ore rispettivamente al di sotto ed al di sopra delle soglie di Cut in e Cut Out. Il risultato ottenuto è stato che gli aerogeneratori saranno in movimento per 7.074 ore all'anno, pari a circa il 81 % del totale numero di ore.

Per l'indicazione, invece, della reale presenza del sole nel corso di un anno è stata considerata la stazione meteorologica di Amendola posta a 86 km di distanza dall'impianto (Figura 4):

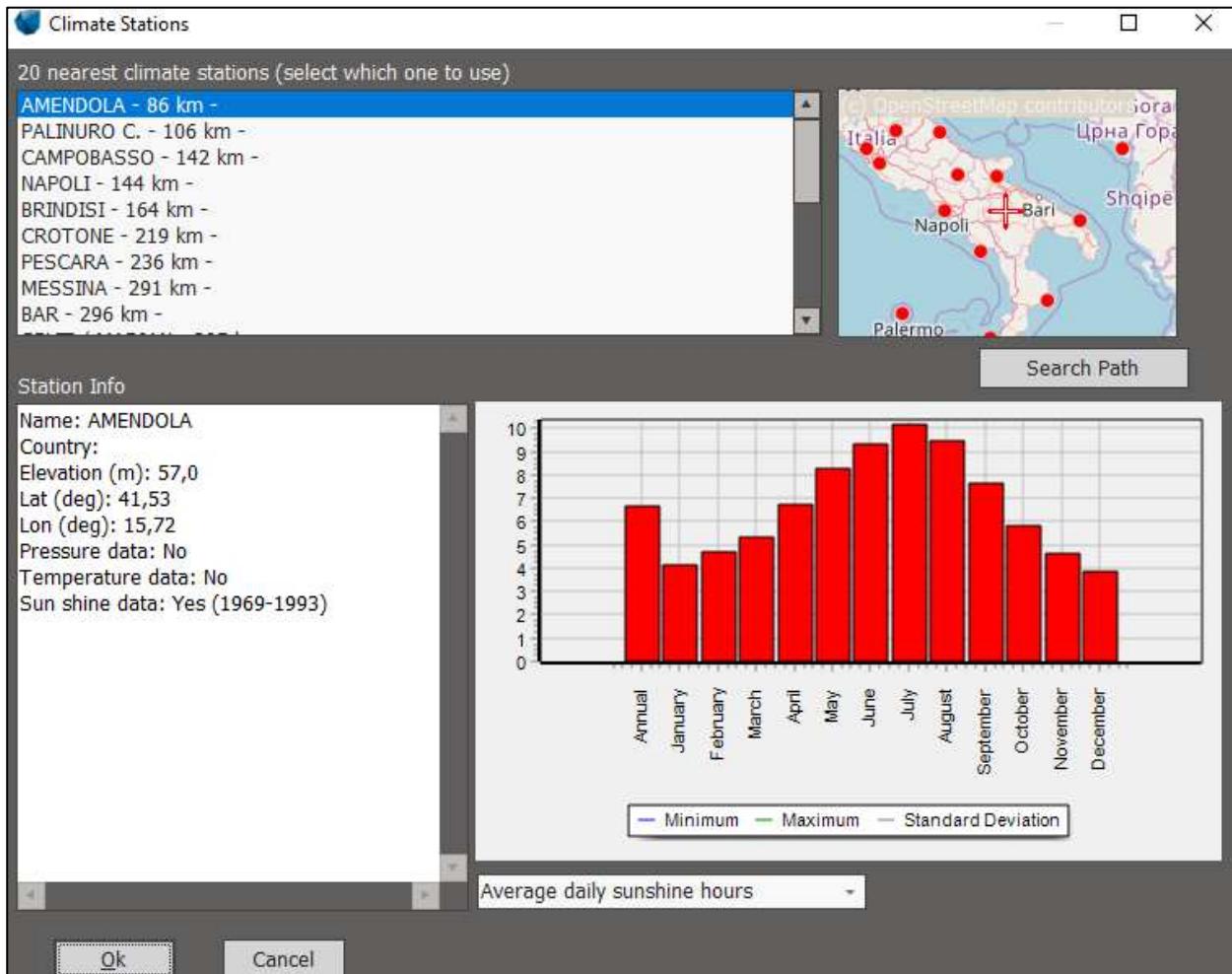


Figura 4 : Caratteristiche della stazione meteorologica di riferimento per i valori di probabilità di soleggiamento mensile per il calcolo "real case"

L'ultima sezione di WINPRO dedicata all'inserimento dei dati della simulazione, prevede la suddivisione del valore delle reali ore di movimento delle pale nei vari settori angolari di vento.

Come detto, l'analisi del vento per sezioni è stata ricavata dalla tabella di "Wind Prospecting":

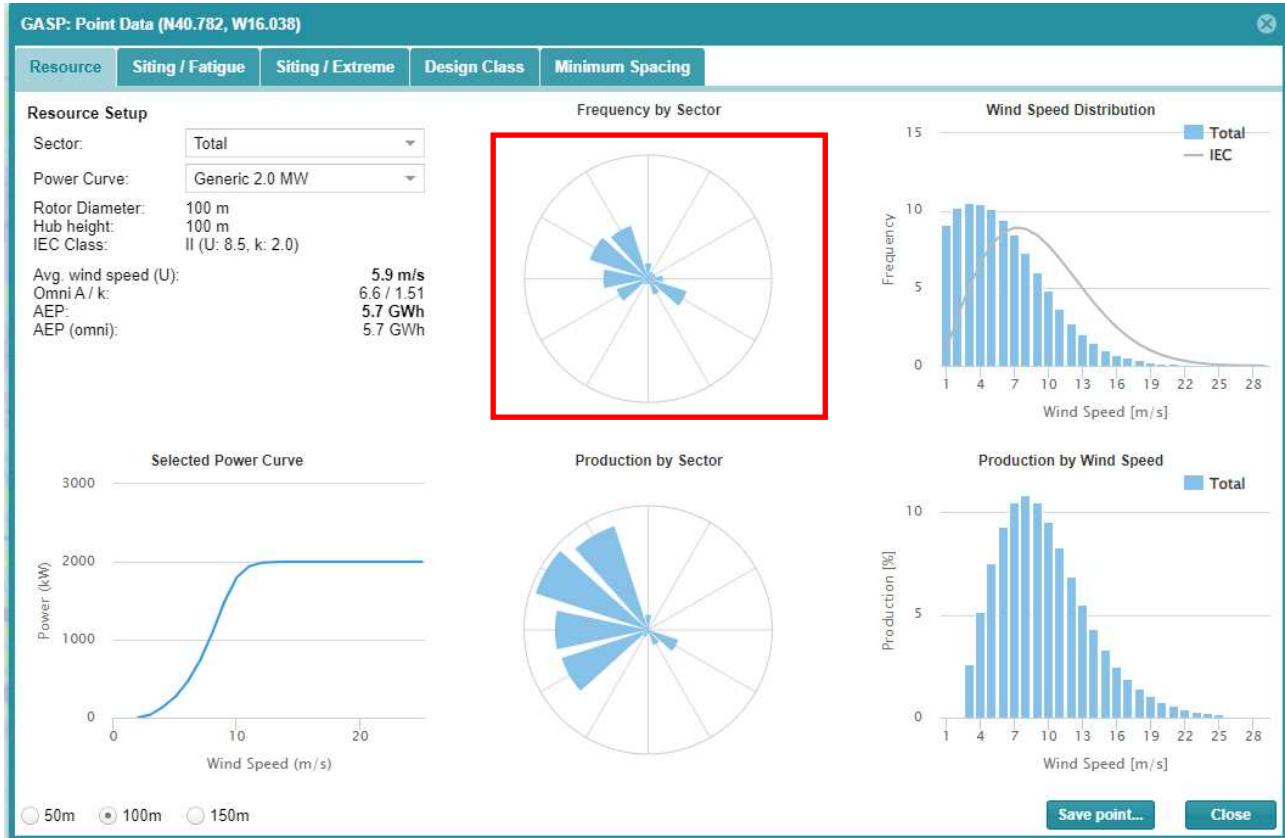


Figura 5 : Frequenza del vento per settore dal tool "Wind Prospecting"

Incrociando quindi i dati delle ore utili alla frequenza del vento per settore, è stata redatta la seguente tabella:

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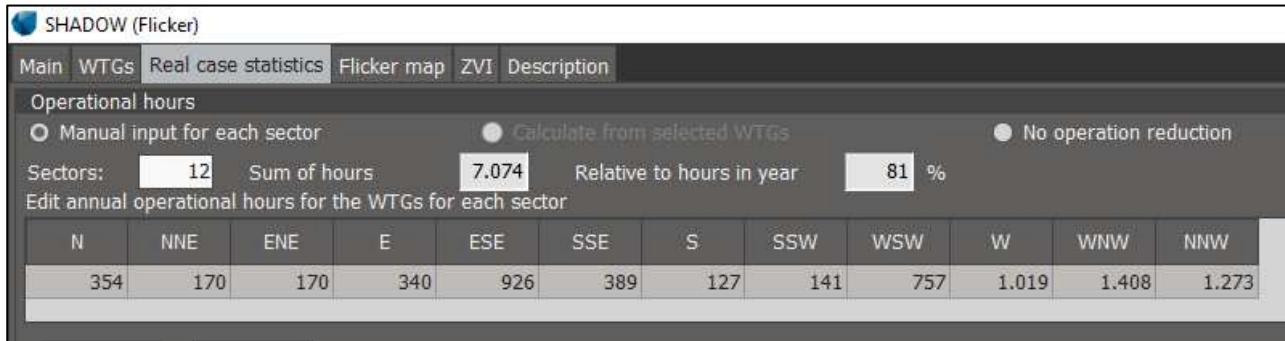
Nome del file:

**DMADT\_GENR02500\_00**

SETTORE	FREQUENZA VENTO PER SETTORE	ORE PER SETTORE/ANNO
<b>N</b>	5,0%	<b>354</b>
<b>NNE</b>	2,4%	<b>170</b>
<b>ENE</b>	2,4%	<b>170</b>
<b>E</b>	4,8%	<b>340</b>
<b>ESE</b>	13,1%	<b>927</b>
<b>SSE</b>	5,5%	<b>389</b>
<b>S</b>	1,8%	<b>127</b>
<b>SSW</b>	2,0%	<b>141</b>
<b>WSW</b>	10,7%	<b>757</b>
<b>W</b>	14,4%	<b>1019</b>
<b>WNW</b>	19,9%	<b>1408</b>
<b>NNW</b>	18,0%	<b>1273</b>

*Tabella 4 : Calcolo ore utili di funzionamento per settore di vento*

Tale calcolo è servito alla compilazione della seguente tabella di WINDPRO:



*Tabella 5 : Tabella WINDPRO compilata con i dati di operatività per settore di vento*

#### 4.4 INDIVIDUAZIONE E CLASSIFICAZIONE DEI RECETTORI

Ai fini della previsione degli impatti indotti sulle abitazioni dall'impianto eolico in progetto, sono stati individuati i recettori presenti nei pressi degli aerogeneratori.

La sensibilità di un recettore rispetto al fenomeno di ombreggiamento dipende, oltre che alla sua posizione, anche dall'esposizione delle sue parti vetrate (finestre o altro) rispetto alla direttrice sole-turbina: infatti, nel caso in cui un edificio non abbia alcuna finestratura sul lato esposto al fenomeno di ombreggiamento, il fastidio per gli occupanti dello stesso sarà nullo.

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Nella simulazione di WINDPRO è stato considerato il caso più cautelativo impostando i recettori in modalità serra ("green house mode"). Con questa impostazione si ipotizza che tutte le pareti siano vetrate e quindi potenzialmente esposte al fenomeno di ombreggiamento.

Inoltre, è stata trascurata la presenza di alberi o altri ostacoli che, intercettando le ombre prodotte dagli aerogeneratori, potrebbero ridurre il fenomeno.

Di seguito sono riportati i riferimenti geografici dei fabbricati con classe catastale A (sensibili) riscontrati all'interno dell'intera area di analisi:

ID_REC	X	Y	TIPOLOGIA	USO	STATO	COMUNE	FOGLIO	PARTICELLA	CAT_CATAST
R01	586150,18	4516408,37	generica	residenziale	costruito	Acerenza	54	148	A04
R02	584835,2	4516031,07	edificio tipico - masseria	residenziale	costruito	Acerenza	53	167	A02
R03	586616,51	4516447,66	generica	residenziale	costruito	Acerenza	55	260	A03
R04	587081,87	4514334,91	edificio tipico - masseria	residenziale	costruito	Oppido Lucano	6	484	A03
R05	587088,27	4514972,07	generica	residenziale	costruito	Oppido Lucano	6	469	A03
R06	588001,53	4514298,77	generica	residenziale	costruito	Oppido Lucano	8	330	A02
R07	587675,28	4516099,83	generica	residenziale	costruito	Acerenza	55	245	A02
R08	587086,2	4514983,4	baracca		costruito	Oppido Lucano	6	455	A04
R09	587089,7	4515804,98	generica	residenziale	costruito	Acerenza	55	224	A03
R10	586773,96	4514323,73	generica	residenziale	costruito	Oppido Lucano	6	468	A03
R11	586769,7	4514300,3	generica	residenziale	costruito	Oppido Lucano	6	468	A03
R12	587608,85	4516222,51	generica	residenziale	costruito	Acerenza	55	255	A04
R13	587666,62	4516185,07	generica	residenziale	diruto. rudere	Acerenza	55	305	A03
R14	587678,46	4516241,17	generica	strutture ricettive	costruito	Acerenza	55	215	A02
R15	587597,41	4516220,91	generica	residenziale	costruito	Acerenza	55	255	A04
R16	587142,02	4515969,46	generica	residenziale	costruito	Acerenza	55	297	A04

*Tabella 6 : Tabella recettori sensibili*

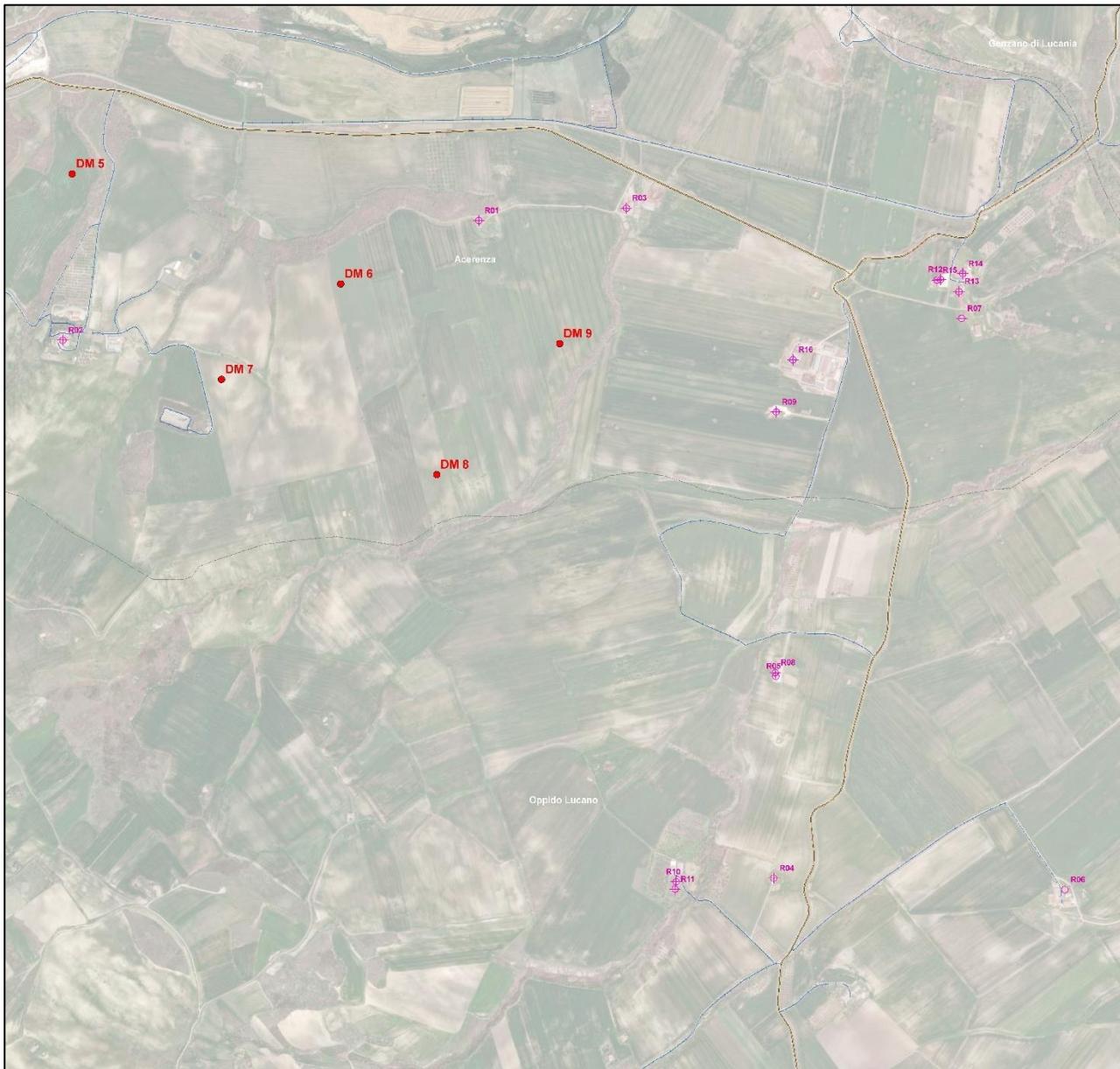
La posizione prevista per gli aerogeneratori e l'indicazione dei recettori sensibili sono mostrati nel seguente estratto di mappa:

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**Tratto stradale (DBSN-IGM Classe :TR\_STR - 010109)**

**Classifica funzionale**

- 01-autostrada
- 02-strada extraurbana principale
- 03-strada extraurbana secondaria
- 04-strada urbana di scorrimento
- 05-strada urbana di quartiere
- 06-strada locale

 Recettori - Classe accatastamento : A

**Interventi in progetto**

- Areogeneratore in progetto

*Figura 6 : Estratto di mappa con indicazione dei recettori sensibili*

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## 5 DESCRIZIONE DELLA STIMA DEGLI IMPATTI E REPORT WINDPRO (ALLEGATO A)

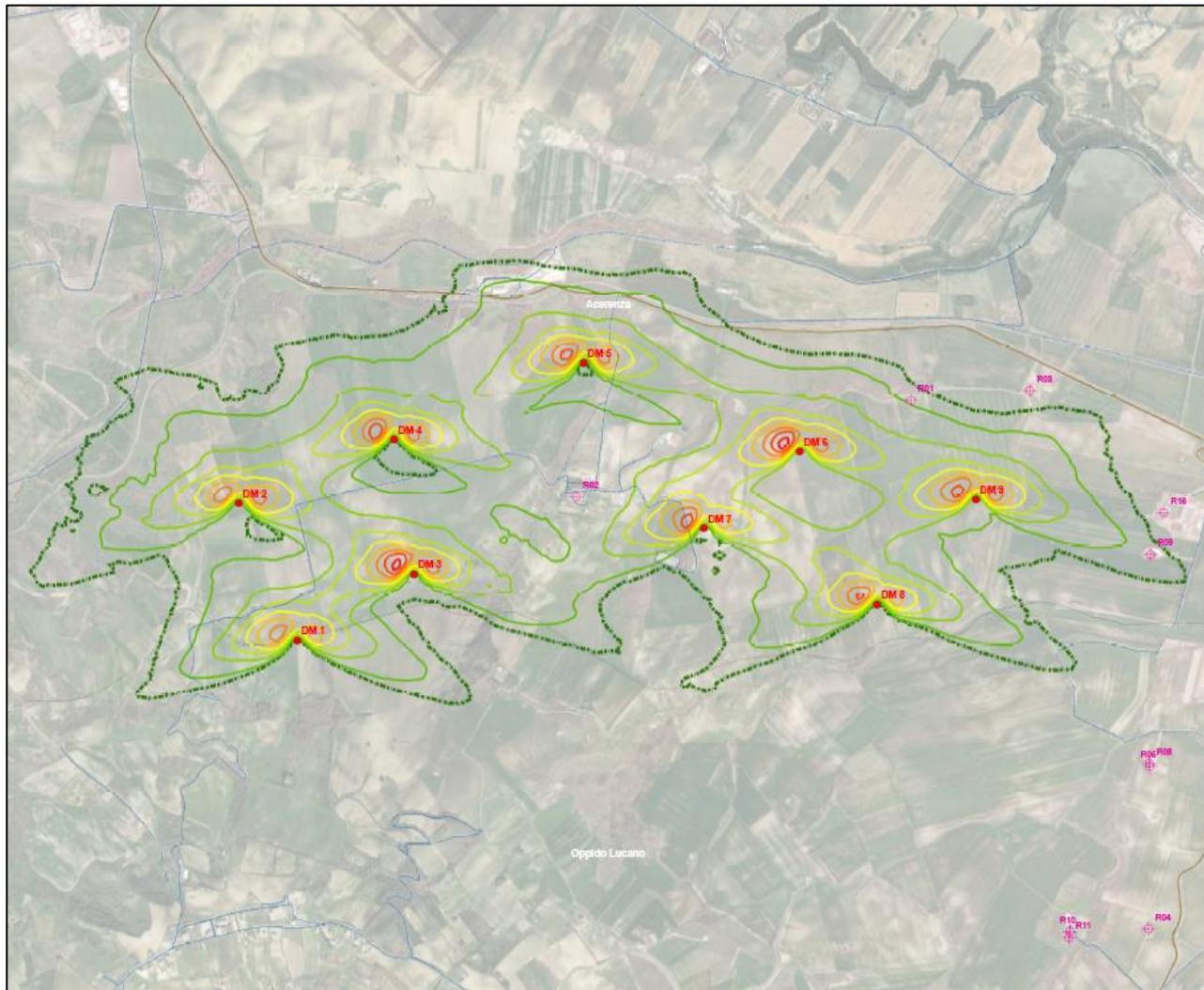
Grazie al Modulo SHADOW di WindPro è stato possibile individuare sia in forma grafica, sia in forma tabellare, l'ombreggiamento generato dagli aerogeneratori di impianto, potendo cogliere le potenziali criticità derivanti dall'installazione dell'impianto sull'area oggetto di indagine.

Le considerazioni che seguono trovano fondamento dal calcolo e dall'esame del caso "Real case", ovvero quello eseguito ponderando lo sfracollo con le ore stimate di operatività dell'aerogeneratore, le direzioni del vento e l'eliofania rilevata (nel caso in esame, quella constatata dalla stazione di Amendola). Nel mondo reale, infatti, il sole non splende sempre (e di conseguenza non sempre si intercorre nella generazione del fenomeno) e la turbina non sempre è in movimento.

I calcoli effettuati sulla base di tali considerazioni, hanno determinato che 11 recettori sensibili sui 16 presi in esame sono situati al di fuori del cono d'ombra, riportando meno di 30 h/anno di ombreggiamento.

Nei restanti casi va analizzato l'impatto perché tali edifici si trovano in prossimità delle perimetrazioni di 30 h/anno.

Il massimo impatto potenziale può essere visualizzato nella seguente Figura 7 realizzato tramite il software WINDPRO:



**Ombre impianto di progetto**

Ore all'anno (caso statistiche reali)

- 30
- 50
- 100
- 150
- 200
- 250
- 300
- 350
- 400

**Tratto stradale (DBSN-IGM Classe :TR\_STR - 010109)**

Classifica funzionale

- 01-autostrada
- 02-strada extraurbana principale
- 03-strada extraurbana secondaria
- 04-strada urbana di scorrimento
- 05-strada urbana di quartiere
- + 06-strada locale

**Interventi in progetto**

- Areogeneratore in progetto

*Figura 7 : Mappa shadow flickering "Real case" con indicazione recettori*

Committente:  
**AREN Green S.r.l.**  
 Via Dell'Arrigoni 308  
 47522 Cesena (FC)

PROGETTO PER LA REALIZZAZIONE DI UN  
 PARCO EOLICO NEI COMUNI DI ACERENZA E  
 OPPIDO LUCANO (PZ) DENOMINATO "DONNA  
 MARIANNA"

Nome del file:

**DMADT\_GENR02500\_00**

La Tabella 6 riporta i risultati dell'effetto di ombreggiamento generato dall'impianto di progetto su ogni recettore identificato, modellati in modalità "green-house", ovvero senza indicare le dimensioni e le orientazioni delle singole finestre, ma considerando il recettore cautelativamente come se tutte le pareti esterne fossero esposte al fenomeno.

Come detto, si sono considerati unicamente i 5 recettori più prossimi alla linea di 30 ore/anno (i restanti 11 edifici sono completamente al di fuori dell'area di impatto scelta).

La tabella è composta dalle seguenti colonne:

- ID RECETTORE : identificativo del recettore;
- Ore all'anno di shadow flickering (ore/anno).

Il limite che si è scelto come riferimento è di 30 ore/anno (in rosso i valori oltre il limite definito nelle linee guida WEA-Schattenwurf-Hinweise). Per il report del calcolo effettuato si rimanda all'allegato A.

ID RECETTORE	Ore all'anno di shadow flickering (ore/anno)	STATO
<b>R01</b>	<b>44:54</b>	costruito
<b>R02</b>	<b>71:48</b>	costruito
<b>R03</b>	17:21	costruito
<b>R09</b>	<b>40:15</b>	costruito
<b>R16</b>	23:28	costruito

*Tabella 7 : N° ore all'anno di shadow flickering interferenti con recettori sensibili*

I recettori che sono all'interno della fascia di attenzione sono quindi R01, R02 e R9

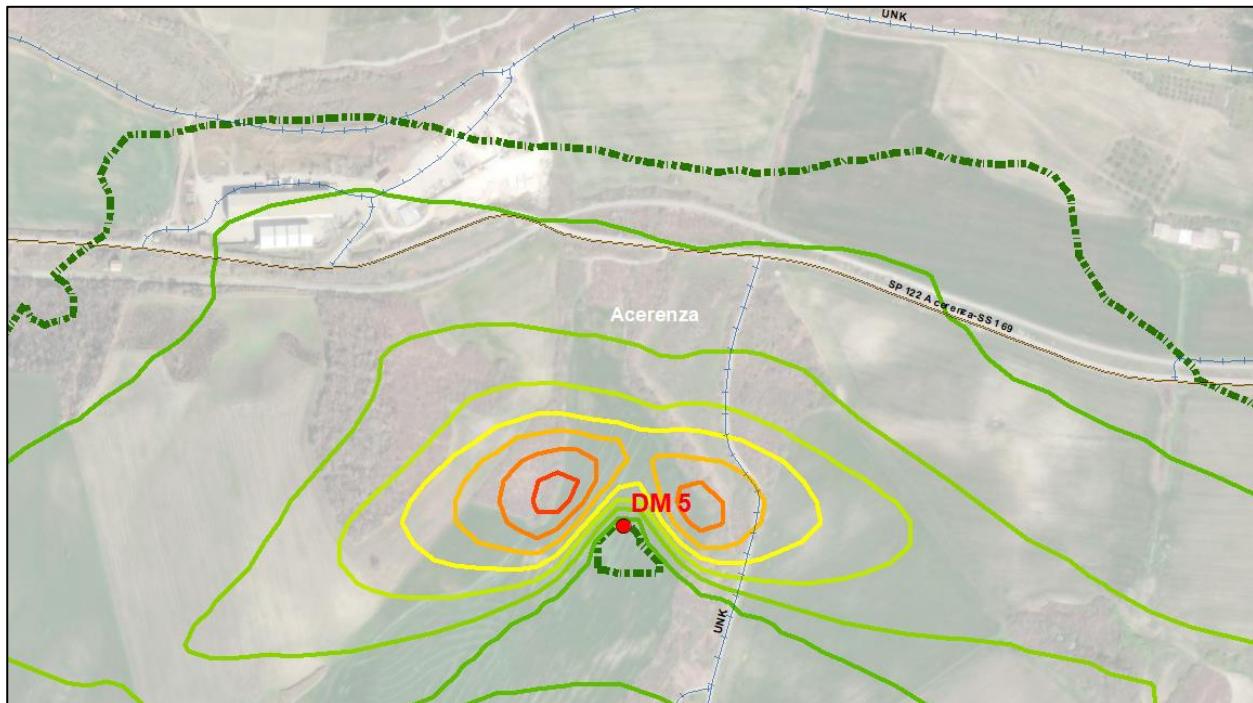
Un'altra stima utile è quella riportata nella seguente tabella 7 che riporta il numero di ore che colpiscono i recettori per areogeneratori:

ID WTG	N° ore di flickering sui recettori prodotto da ciascun WTG (ore/anno)
DM1	3:58
DM2	3:56
DM3	10:55
DM4	<b>30:09</b>
DM5	5:22
DM6	<b>41:30</b>
DM7	<b>36:16</b>
DM8	12:05
DM9	<b>67:32</b>

*Tabella 8 : N° ore di flickering sui recettori prodotto da ciascun WTG (ore/anno)*

Tale tabella evidenzia che i contributi alle ombre sono dati principalmente dagli aerogeneratori 4, 6, 7 e 9 ; le altre torri risultano pressoché ininfluenti sui recettori sensibili.

Per quanto riguarda le strade, risulta impattata la SP122, come mostrato nella seguente immagine:



*Figura 8 : Grafico ombre su SP122*

La distanza minima dalla strada in questione è di circa 270 m (torre DM5).

Come però appare evidente dalla seguente immagine estratta da Google maps (Street view), la SP122 risulta essere di scarsa percorribilità e circondata da vegetazione che rende l'impatto molto attenuato (figura 9):

Committente:  
**AREN Green S.r.l.**  
Via Dell'Arrigoni 308  
47522 Cesena (FC)

PROGETTO PER LA REALIZZAZIONE DI UN  
PARCO EOLICO NEI COMUNI DI ACERENZA E  
OPPIDO LUCANO (PZ) DENOMINATO "DONNA  
MARIANNA"

Nome del file:

**DMADT\_GENR02500\_00**



Figure 9 : Street view SP122

Per quanto riguarda gli impatti con i recettori sensibili, si procede all'analisi dettagliata dei recettori R01, R02 e R09 ; R03 e R016 non verranno quindi analizzati poiché al di fuori dell'area di impatto.

Nell'immagine seguente viene mostrato un estratto di mappa del recettore R01 e delle torri maggiormente impattanti (DM6 e DM9):

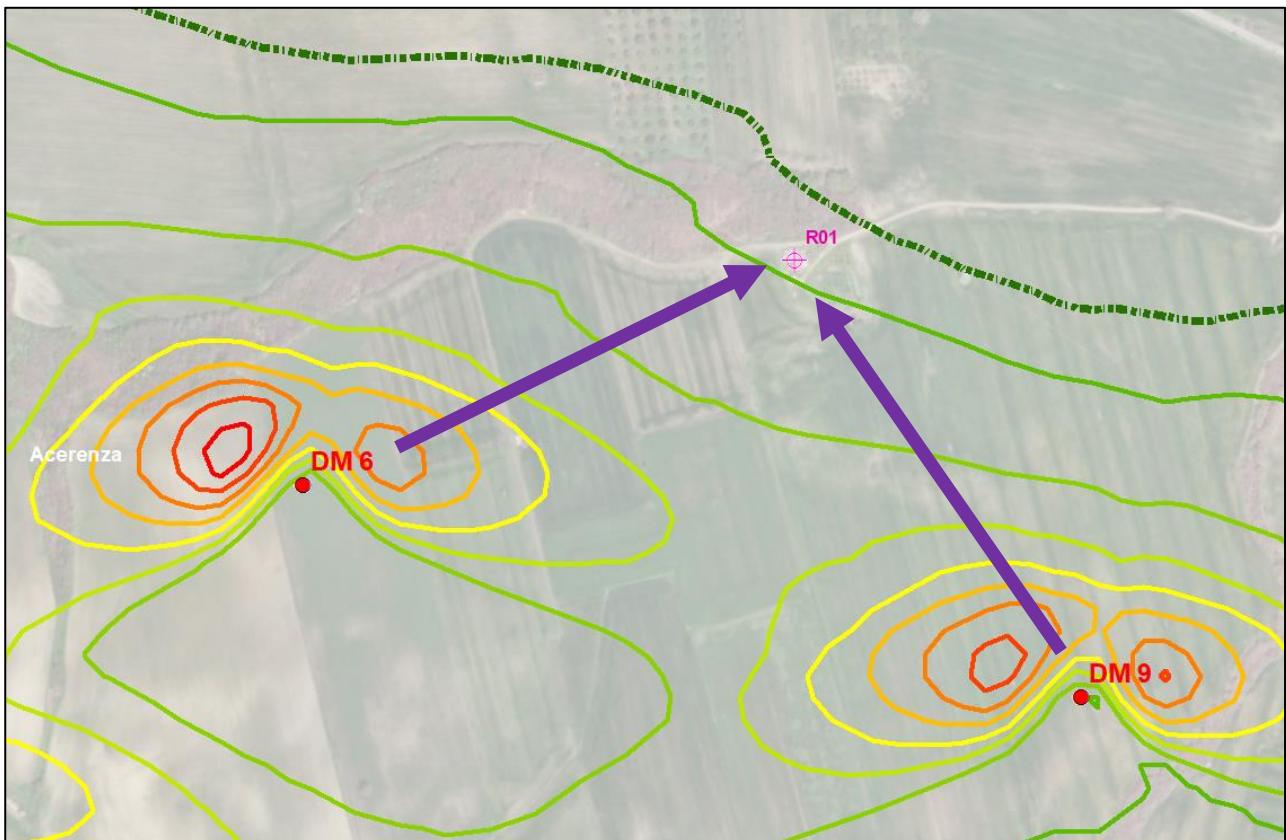


Figura 10 : Estratto di mappa del recettore R01



*Figura 11 : Estratto di mappa del recettore R01*

È utile ricordare che le distanze tra recettore 1 e torri è la seguente:

- R01 – DM6 : 480 m;
- R01 – DM9 : 463 m.

Poiché nella realtà le zone maggiormente impattate ricadono generalmente entro i 300 m di distanza dalle turbine, l'interferenza risulta trascurabile.

Dai grafici realizzati con il software WindPro, si evince di come l'effetto dello shadow flickering (anche se trascurabile, come detto) è una combinazione di contributi delle varie torri; le maggiormente impattanti sono la DM6 e la DM9 :

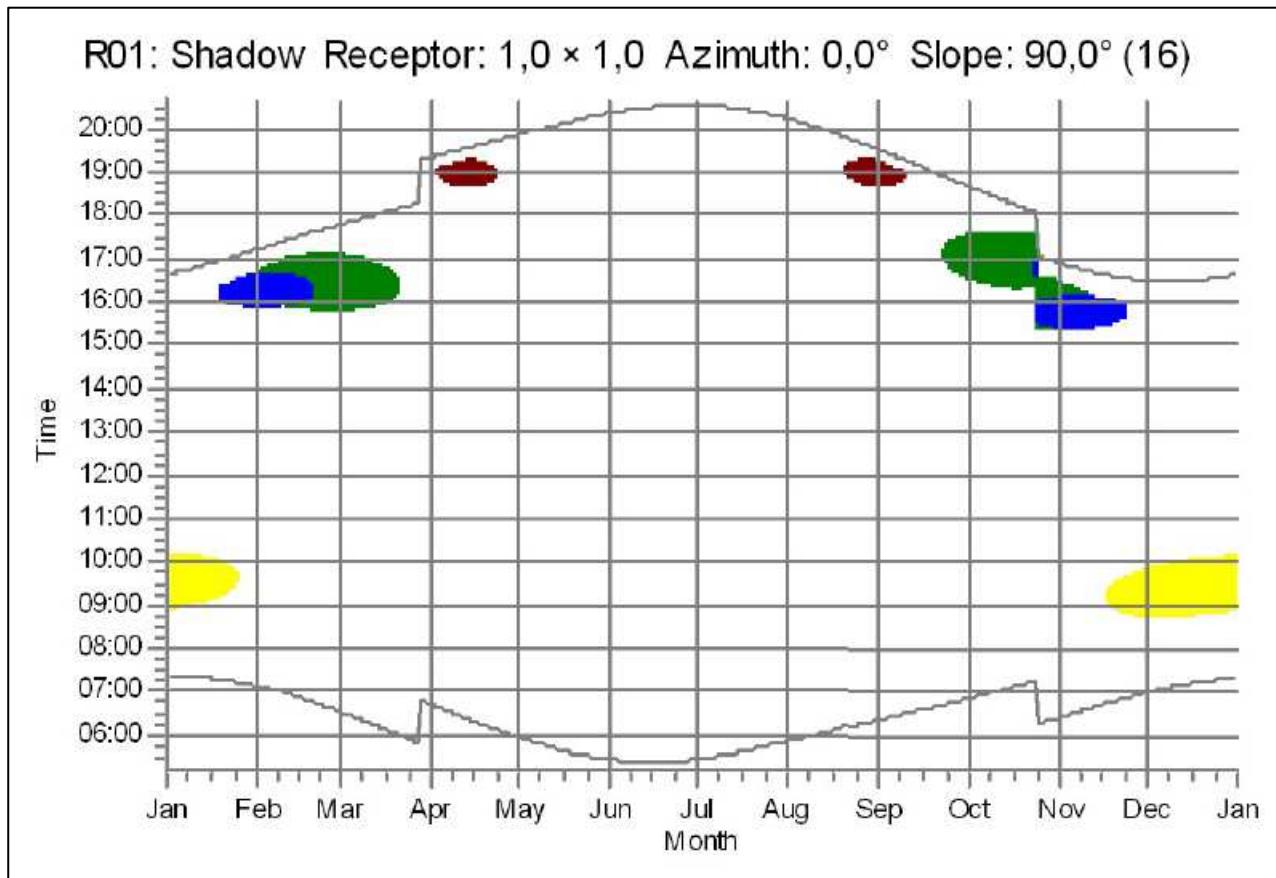


Figura 12 : Grafico ombre su recettore R01

Nell'immagine seguente viene mostrato un estratto di mappa del recettore R02 che subisce gli impatti delle torri 3, 4, 5, 6 e 7:

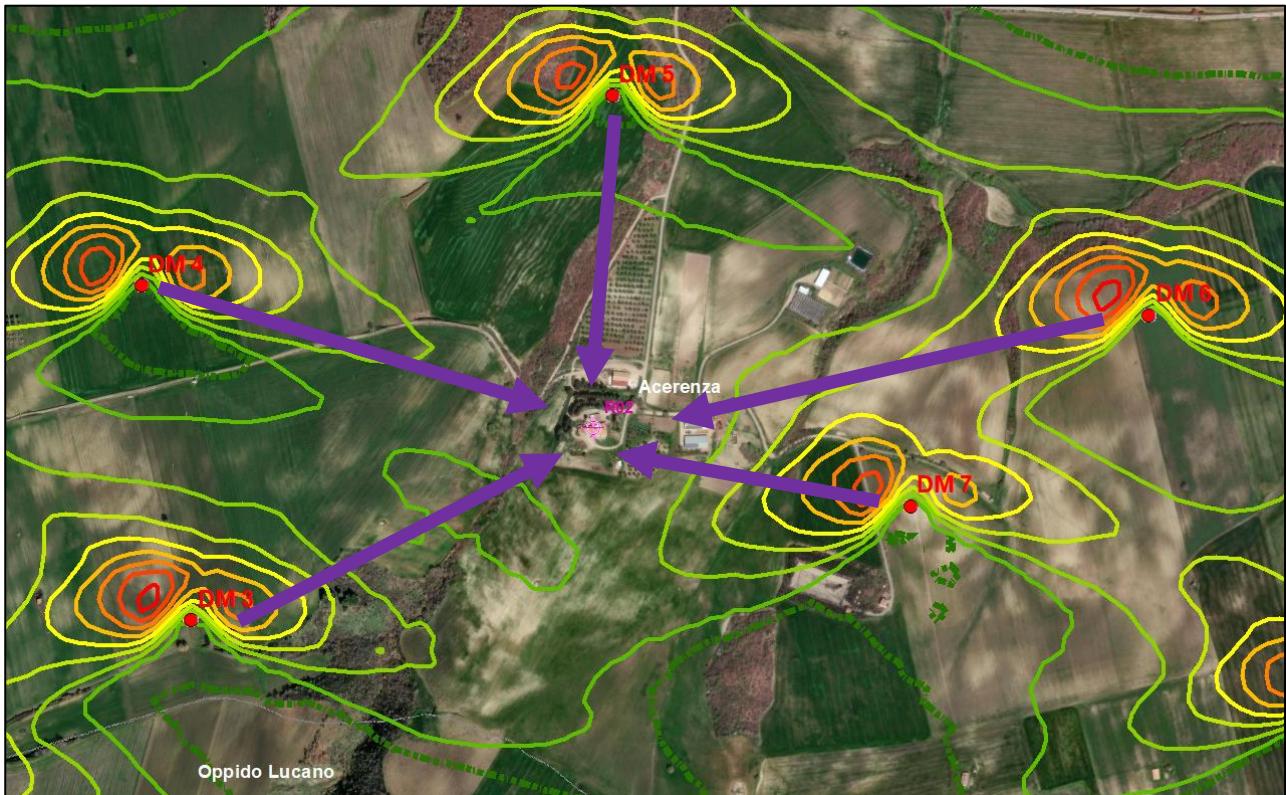


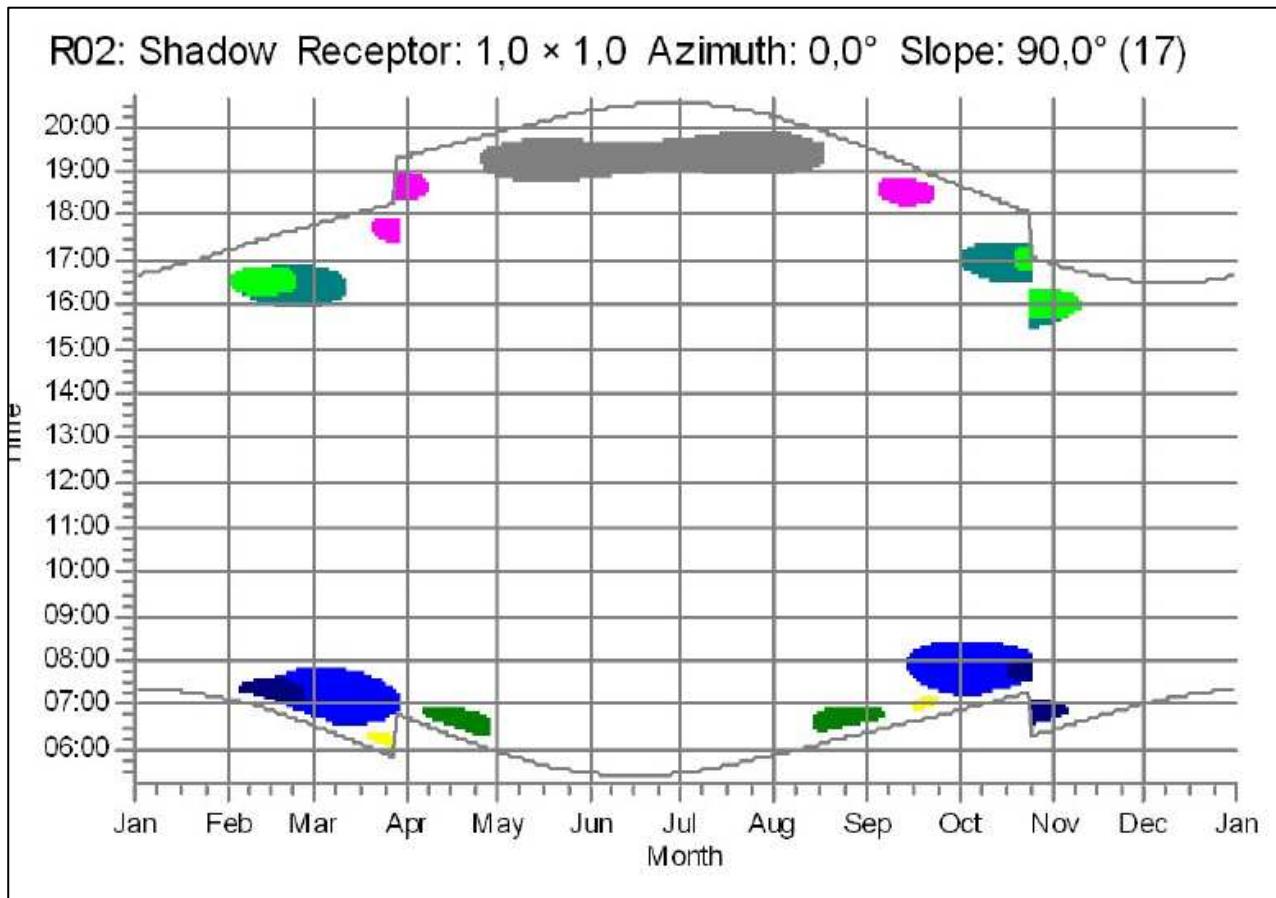
Figura 13 : Estratto di mappa del ricevitore R02

È utile ricordare che le distanze tra ricevitore 2 e torri è la seguente:

- R02 – DM3 : 706 m;
- R02 – DM4 : 749 m;
- R02 – DM5 : 520 m;
- R02 – DM6 : 894 m;
- R02 – DM7 : 521 m;

Poiché nella realtà le zone maggiormente impattate ricadono generalmente entro i 300 m di distanza dalle turbine, l'interferenza risulta trascurabile.

Dai grafici realizzati con il software WindPro, si evince di come l'effetto dello shadow flickering (anche se trascurabile, come detto) è una combinazione di contributi delle varie torri; le maggiormente impattanti sono la DM4 e la DM7 :



WTGs

DM 6: VESTAS V150-6.0 6000 150.0 !O!	hub: 105,0 m (TOT: 180,0 m)	(9)
DM 9: VESTAS V150-6.0 6000 150.0 !O!	hub: 105,0 m (TOT: 180,0 m)	(10)
DM 7: VESTAS V150-6.0 6000 150.0 !O!	hub: 105,0 m (TOT: 180,0 m)	(11)
DM 4: VESTAS V150-6.0 6000 150.0 !O!	hub: 105,0 m (TOT: 180,0 m)	(12)
DM 3: VESTAS V150-6.0 6000 150.0 IO!	hub: 105,0 m (TOT: 180,0 m)	(14)
DM 8: VESTAS V150-6.0 6000 150.0 IO!	hub: 105,0 m (TOT: 180,0 m)	(15)
DM 5: VESTAS V150-6.0 6000 150.0 IO!	hub: 105,0 m (TOT: 180,0 m)	(16)
DM 1: VESTAS V150-6.0 6000 150.0 IO!	hub: 105,0 m (TOT: 180,0 m)	(17)
DM 2: VESTAS V150-6.0 6000 150.0 !O!	hub: 105,0 m (TOT: 180,0 m)	(13)

*Figura 14 : Grafico ombre su recettore R02*

Nell'immagine seguente viene mostrato un estratto di mappa del recettore R09 e della torre maggiormente impattante, ovvero la DM9:

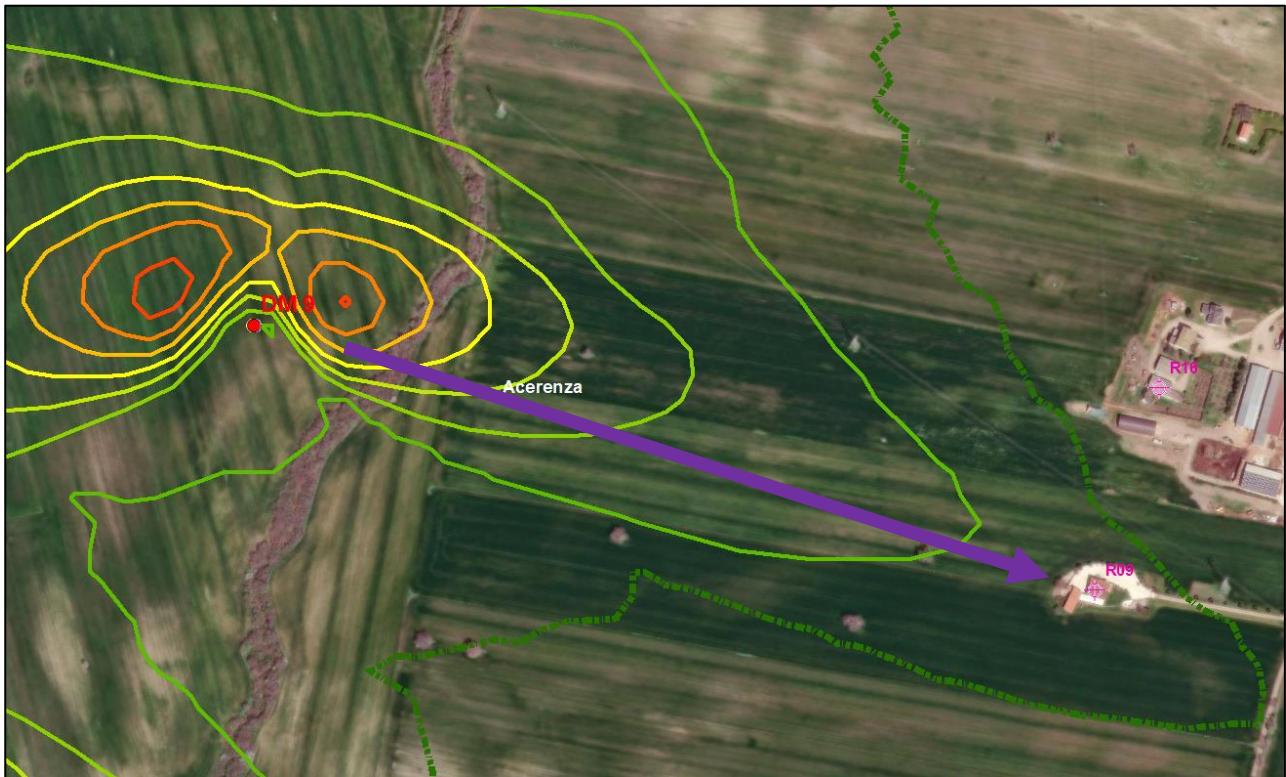
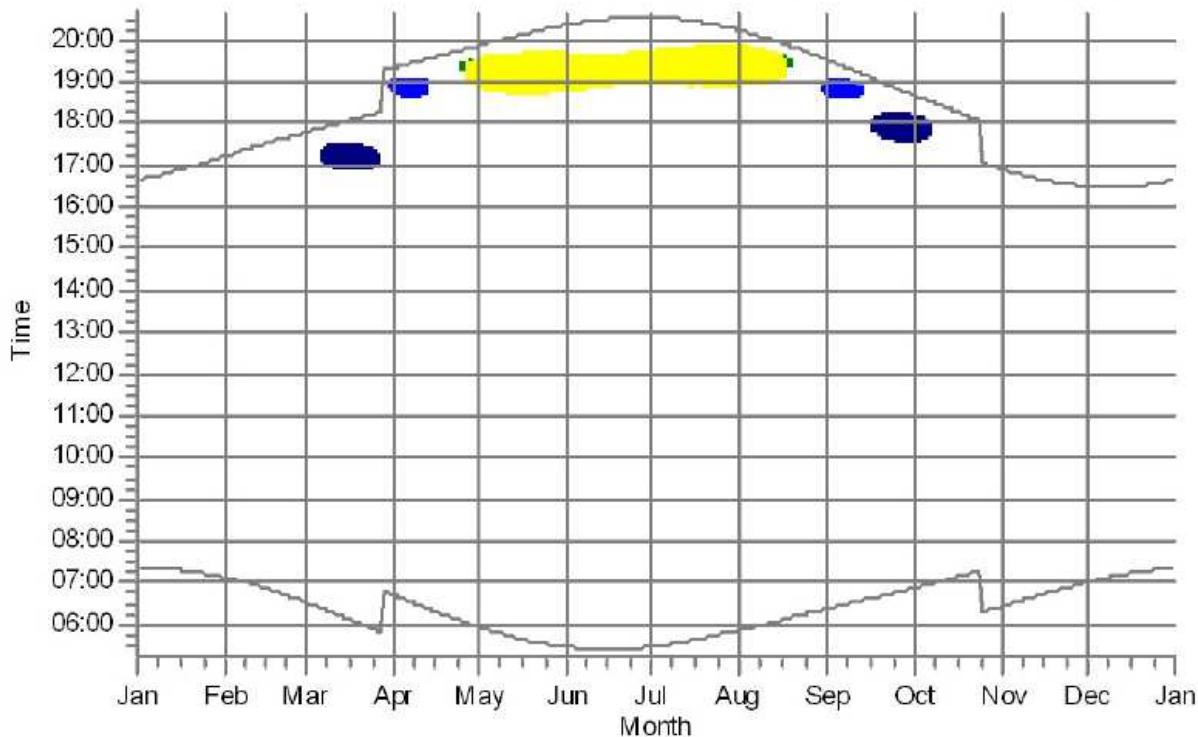


Figura 15 : Estratto di mappa del ricevitore R09

È utile ricordare che le distanze tra ricevitore 9 e la torre DM9 è pari a 716 m; poiché nella realtà le zone maggiormente impattate ricadono generalmente entro i 300 m di distanza dalle turbine, l'interferenza risulta trascurabile.

Dai grafici realizzati con il software WindPro, si evince di come l'effetto dello shadow flickering (anche se trascurabile, come detto) è il seguente:

**R09: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (14)**



WTGs

DM 6: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)	DM 3: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (14)
DM 9: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)	DM 8: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (15)
DM 7: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11)	DM 5: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (16)
DM 4: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (12)	DM 1: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (17)
DM 2: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (13)	

*Figura 16 : Grafico ombre su recettore R09*

La situazione, pertanto, qualora accertata da appositi rilievi in fase esecutiva, non pone problemi in termini di contrasto al problema dello shadow flickering.

Inoltre va anche considerato che i più recenti aerogeneratori con rotore tripala operano con velocità inferiori ai 35 giri al minuto (rpm), corrispondenti ad una frequenza di passaggio delle pale sulla verticale inferiore a 1.7 Hz, quindi minore della frequenza critica dei 2.5Hz.

Nelle pagine seguenti vengono riportati i report WINDPRO della simulazione descritta (ALLEGATO A).

Committente: <b>AREN Green S.r.l.</b> Via Dell'Arrigoni 308 47522 Cesena (FC)	PROGETTO PER LA REALIZZAZIONE DI UN PARCO EOLICO NEI COMUNI DI ACERENZA E OPPIDO LUCANO (PZ) DENOMINATO "DONNA MARIANNA"	Nome del file: <b>DMADT_GENR02500_00</b>
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**ALLEGATO A**  
**REPORT SIMULAZIONE WINDPRO**

## SHADOW - Main Result

### 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

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

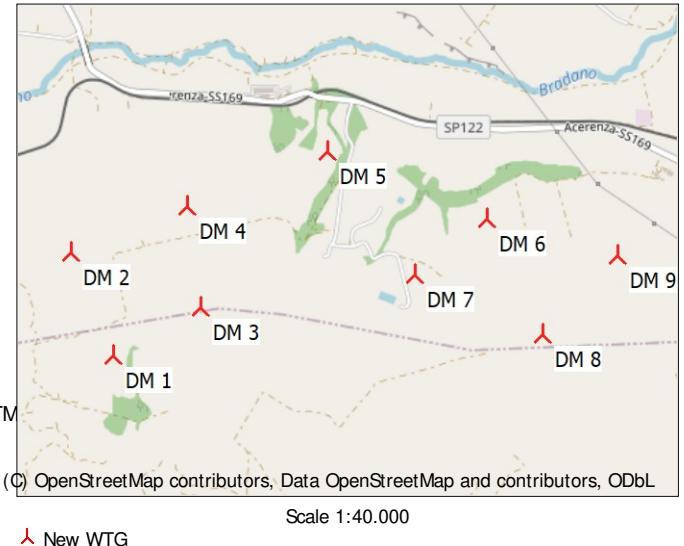
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4,12	4,66	5,30	6,72	8,25	9,35	10,16	9,45	7,64	5,82	4,65	3,82

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

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: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM)

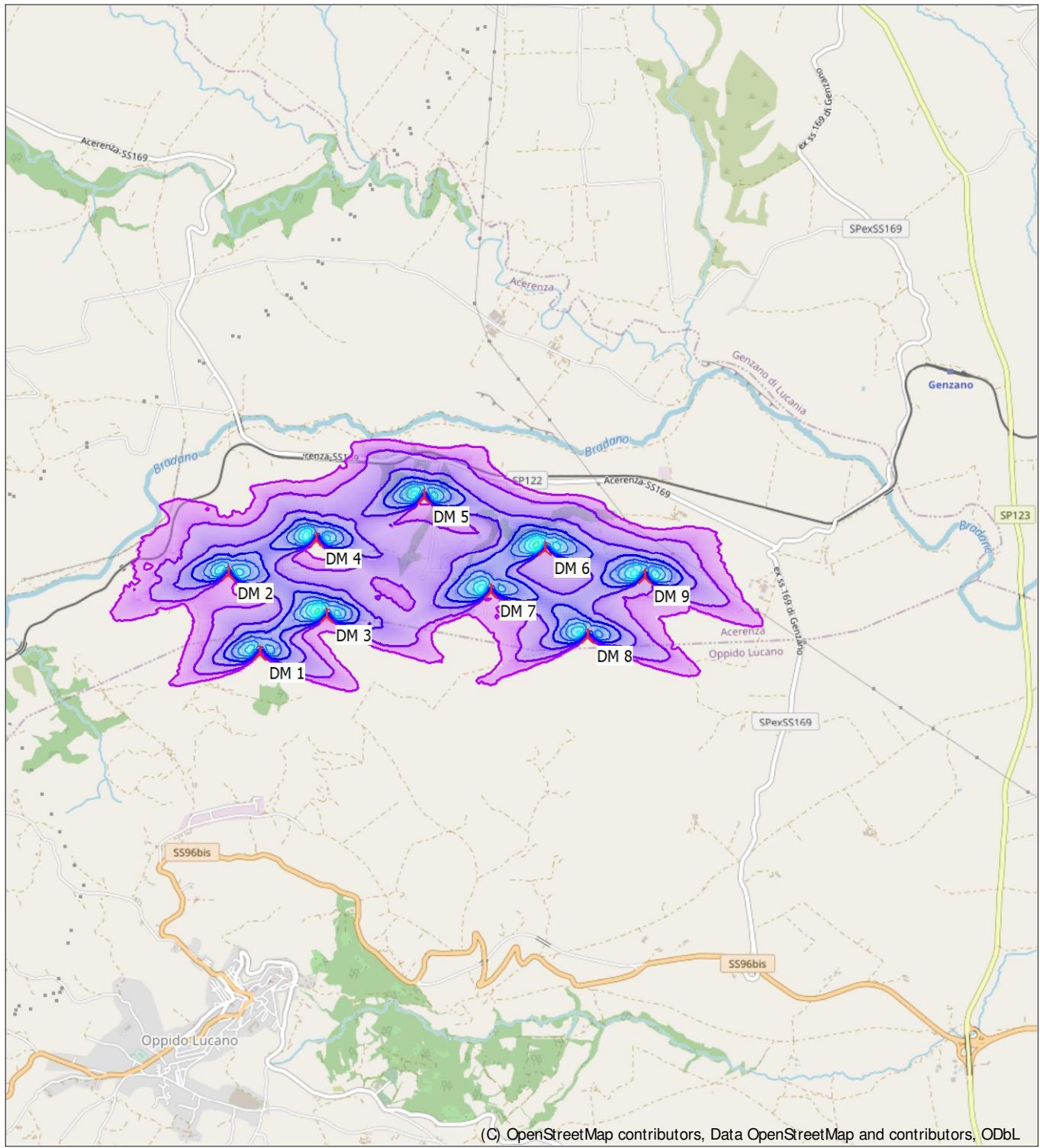
All coordinates are in  
UTM (north)-WGS84 Zone: 33



### WTGs

Easting	Northing	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
				Valid	Manufact.	Type-generator					
DM 1	583.742	4.515.466	494,5 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 2	583.511	4.516.007	441,1 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 3	584.199	4.515.727	455,7 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 4	584.121	4.516.256	408,4 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 5	584.865	4.516.556	334,6 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 6	585.714	4.516.209	324,7 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 7	585.337	4.515.908	376,6 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 8	586.017	4.515.607	380,9 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-
DM 9	586.405	4.516.020	324,0 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	1.902	-

## SHADOW - Map



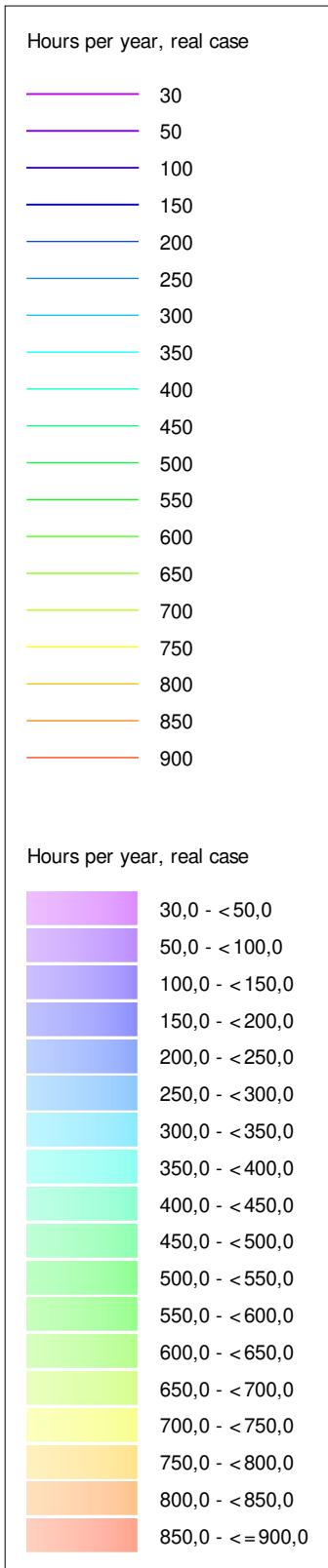
(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 500 1000 1500 2000 m

Map: EMD OpenStreetMap , Print scale 1:40.000, Map center UTM (north)-WGS84 Zone: 33 East: 585.500 North: 4.515.980  
New WTG

Flicker map level: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM 1 arc-second)  
Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

## SHADOW - Map



## SHADOW - Main Result

### Assumptions for shadow calculations

Maximum distance for influence

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

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

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

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

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

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:

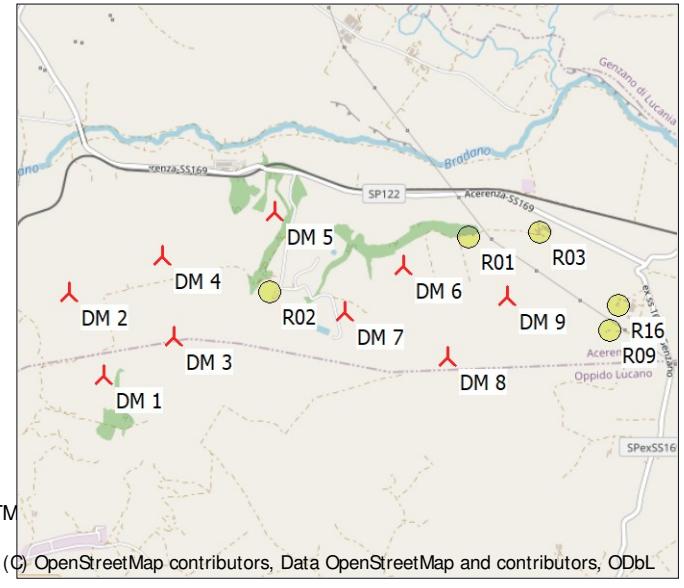
Height contours used: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM)  
Receptor grid resolution: 1,0 m

All coordinates are in

UTM (north)-WGS84 Zone: 33

### WTGs

Easting	Northing	Z	Row data/Description	WTG type				Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
				Valid	Manufact.	Type-generator						
DM 1	583.742	4.515.466	494,5 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 2	583.511	4.516.007	441,1 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 3	584.199	4.515.727	455,7 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 4	584.121	4.516.256	408,4 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 5	584.865	4.516.556	334,6 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 6	585.714	4.516.209	324,7 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 7	585.337	4.515.908	376,6 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 8	586.017	4.515.607	380,9 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-
DM 9	586.405	4.516.020	324,0 VESTAS V150-6.0 6000 150.0 !... Yes	VESTAS	V150-6.0-6.000	6.000	150,0	105,0	105,0	105,0	1.902	-



### Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.	[m]
	[m]	[m]	[m]	[m]	[m]		[°]			
R01	586.150	4.516.408	316,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0	
R02	584.835	4.516.031	400,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0	
R03	586.617	4.516.448	304,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0	
R09	587.090	4.515.805	313,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0	
R16	587.142	4.515.969	307,4	1,0	1,0	1,0	90,0	"Green house mode"	2,0	

### Calculation Results

#### Shadow receptor

Shadow, expected values

No. Shadow hours

per year

[h/year]

R01	44:54
R02	71:48
R03	17:21
R09	40:15
R16	23:28

## SHADOW - Main Result

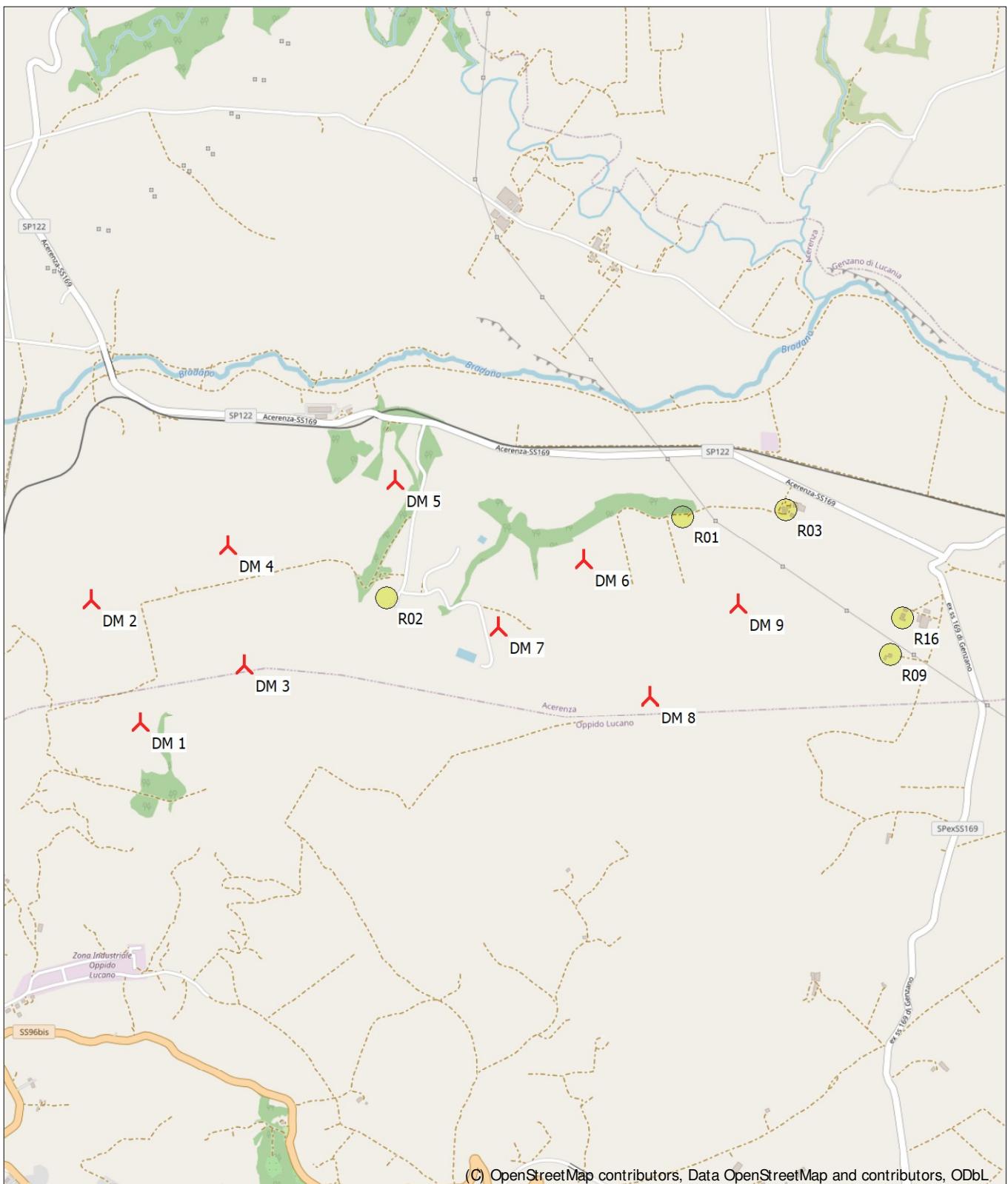
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
DM 1	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (17)	3:58
DM 2	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (13)	3:56
DM 3	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (14)	10:55
DM 4	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (12)	30:09
DM 5	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (16)	5:22
DM 6	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)	41:30
DM 7	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11)	36:16
DM 8	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (15)	12:05
DM 9	VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)	67:32

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.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

## SHADOW - Map



Map: EMD OpenStreetMap , Print scale 1:25.000, Map center UTM (north)-WGS84 Zone: 33 East: 585.327 North: 4.516.011

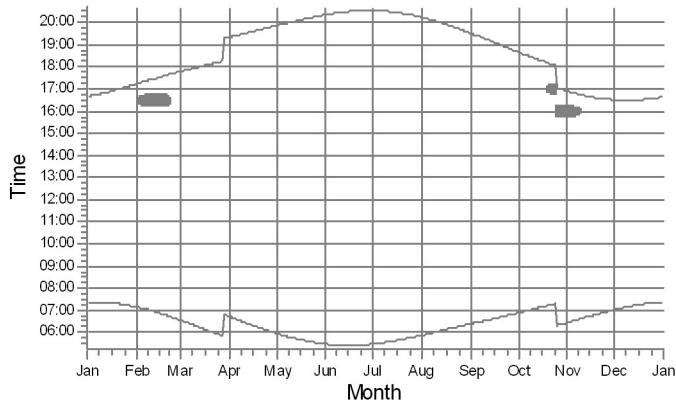
>New WTG

Shadow receptor

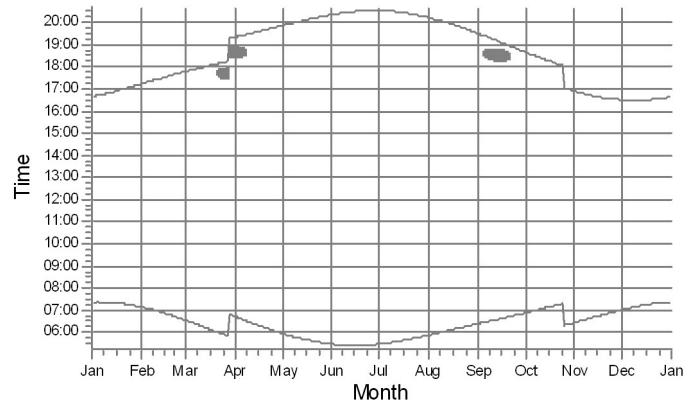
Flicker map level: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM 1 arc-second)

## SHADOW - Calendar per WTG, graphical

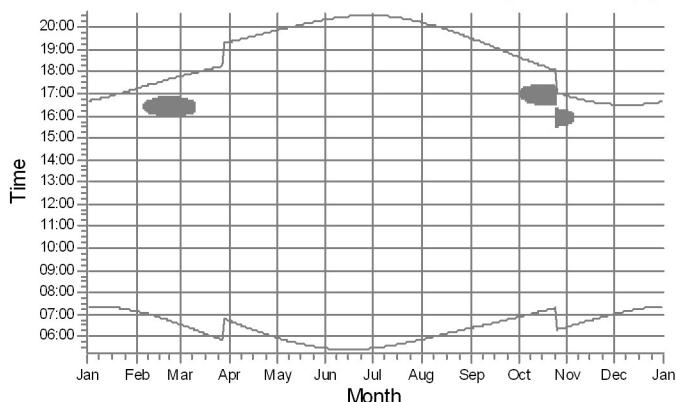
DM 1: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (17)



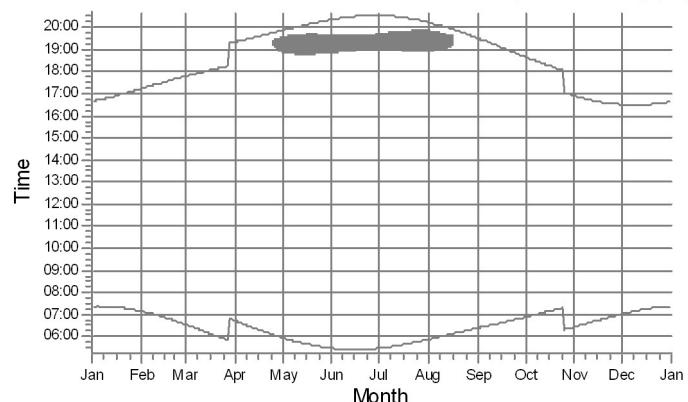
DM 2: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (13)



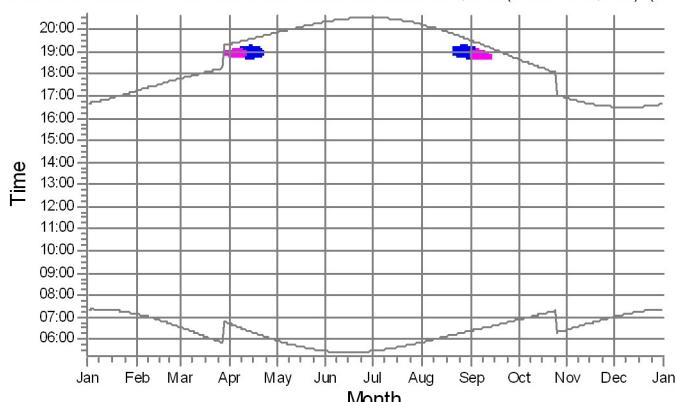
DM 3: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (14)



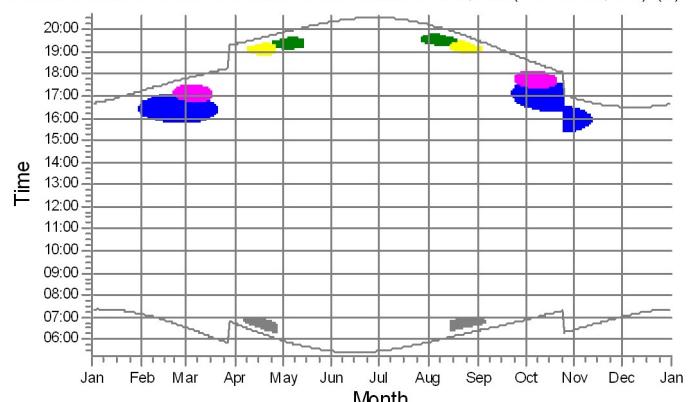
DM 4: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (12)



DM 5: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (16)



DM 6: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)

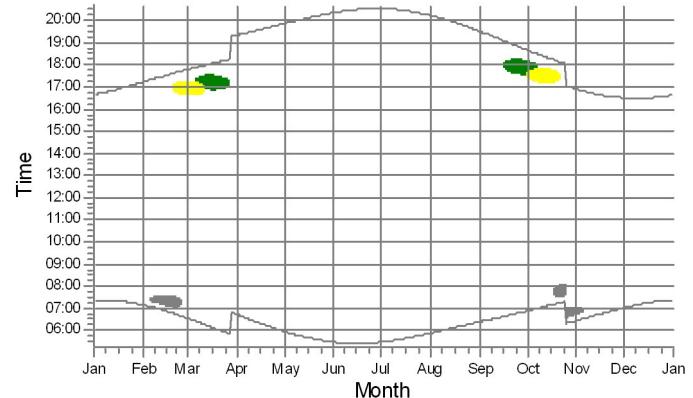
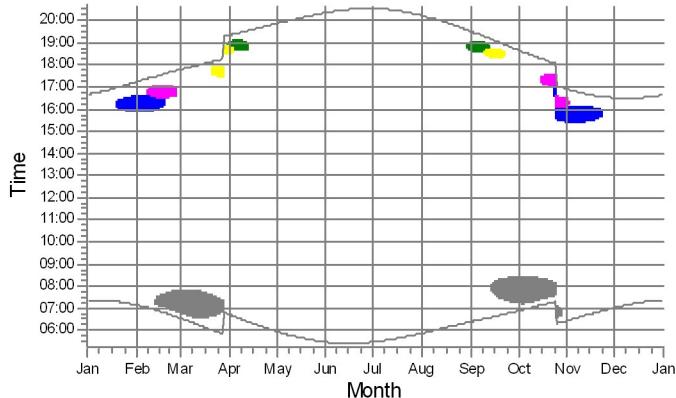


### Shadow receptors

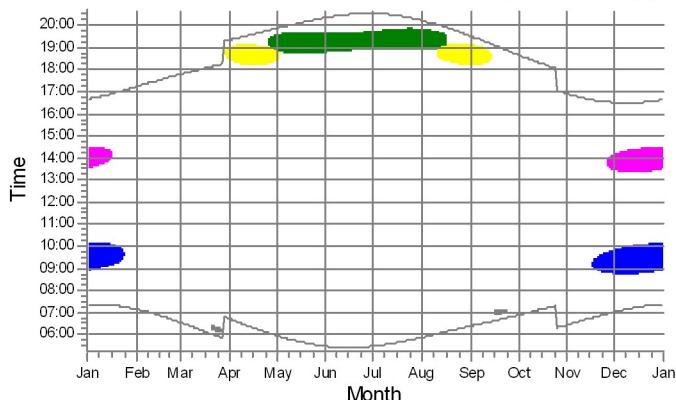
- R09: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (14)
- R16: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (15)
- R01: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (16)
- R02: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (17)
- R03: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (18)

## SHADOW - Calendar per WTG, graphical

DM 7: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11) DM 8: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (15)



DM 9: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)

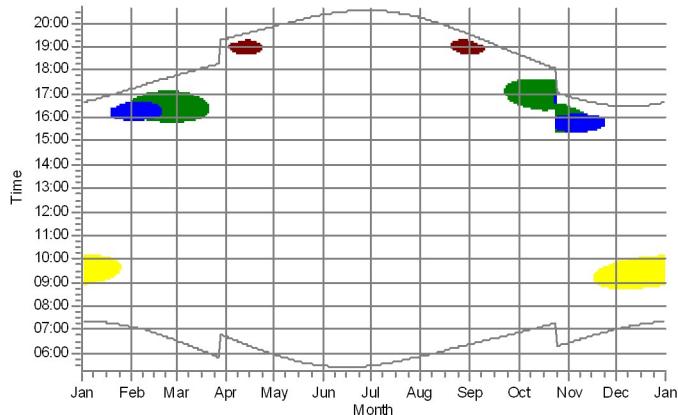


### Shadow receptors

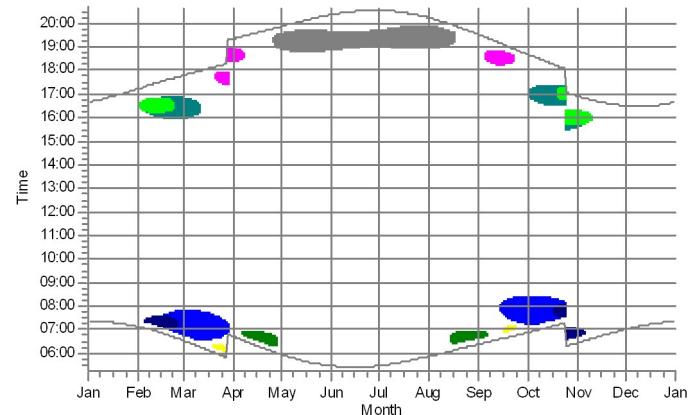
<span style="background-color: green; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	R09: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (14)
<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	R16: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (15)
<span style="background-color: blue; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	R01: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (16)
<span style="background-color: gray; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	R02: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (17)
<span style="background-color: magenta; border: 1px solid black; display: inline-block; width: 15px; height: 15px;"></span>	R03: Shadow Receptor: 1,0 x 1,0 Azimuth: 0,0° Slope: 90,0° (18)

## SHADOW - Calendar, graphical

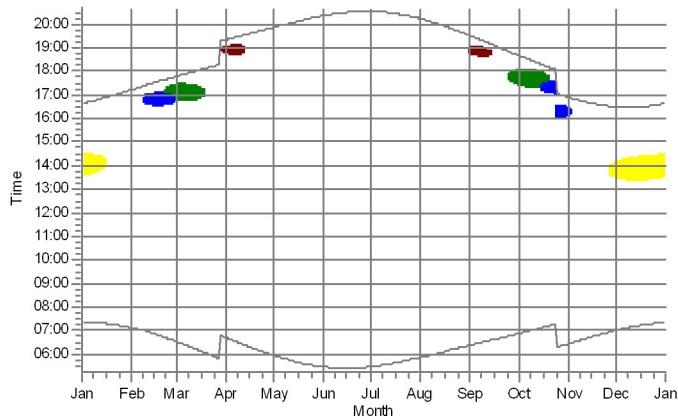
R01: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (16)



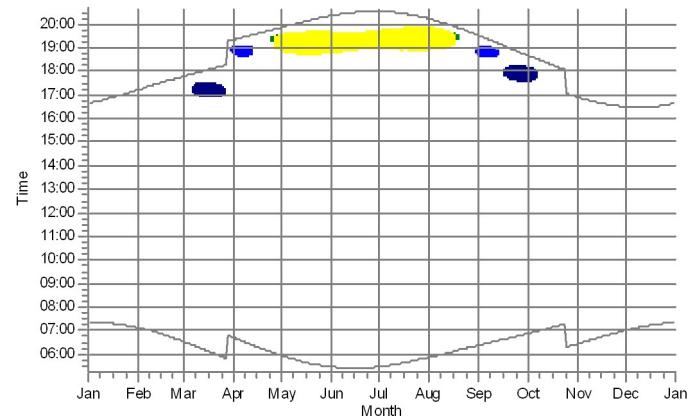
R02: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (17)



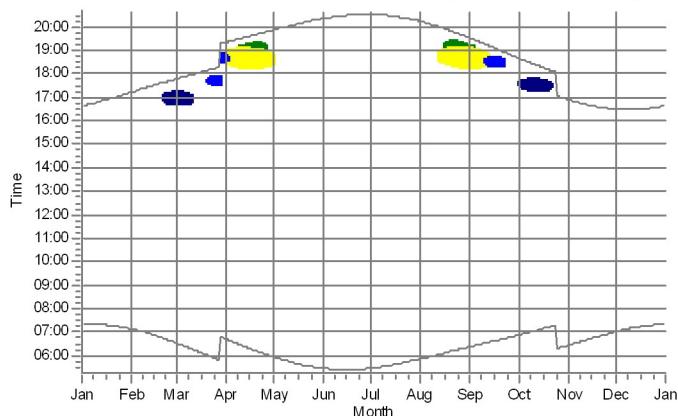
R03: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (18)



R09: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (14)



R16: Shadow Receptor: 1,0 × 1,0 Azimuth: 0,0° Slope: 90,0° (15)



WTGs

	DM 6: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)
	DM 9: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)
	DM 7: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11)
	DM 4: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (12)
	DM 2: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (13)

	DM 3: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (14)
	DM 8: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (15)
	DM 5: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (16)
	DM 1: VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (17)

## SHADOW - Calendar per WTG

WTG: DM 1 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (17)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:21	07:08	06:32	06:42	05:56	05:28	05:28	05:52	06:22	06:52	06:26	15:46-16:13/27
	16:39	17:13	17:47	19:20	19:52	20:21	20:32	20:13	19:30	18:40	16:54	16:30
2	07:21	07:07	16:27-16:33/6	06:31	06:40	05:55	05:27	05:29	05:53	06:23	06:27	15:47-16:13/26
	16:40	17:14	17:48	19:21	19:53	20:22	20:32	20:12	19:29	18:39	16:53	16:30
3	07:21	07:06	16:23-16:36/13	06:29	06:38	05:54	05:27	05:29	05:54	06:24	06:28	15:47-16:12/25
	16:41	17:15	17:49	19:22	19:54	20:23	20:32	20:11	19:27	18:37	16:52	16:29
4	07:21	07:05	16:22-16:38/16	06:28	06:37	05:53	05:27	05:30	05:55	06:25	06:29	15:48-16:11/23
	16:42	17:17	17:50	19:24	19:55	20:23	20:32	20:10	19:26	18:35	16:50	16:29
5	07:21	07:04	16:19-16:39/20	06:26	06:35	05:51	05:26	05:30	05:56	06:26	06:31	15:48-16:10/22
	16:42	17:18	17:51	19:25	19:56	20:24	20:31	20:09	19:24	18:34	16:49	16:29
6	07:21	07:03	16:18-16:41/23	06:24	06:34	05:50	05:26	05:31	05:57	06:27	06:32	15:50-16:10/20
	16:43	17:19	17:52	19:26	19:57	20:25	20:31	20:08	19:22	18:32	16:48	16:29
7	07:21	07:02	16:18-16:42/24	06:23	06:32	05:49	05:26	05:32	05:58	06:28	06:33	15:52-16:08/16
	16:44	17:20	17:53	19:27	19:58	20:25	20:31	20:06	19:21	18:30	16:47	16:29
8	07:21	07:00	16:17-16:43/26	06:21	06:30	05:48	05:25	05:32	05:59	06:29	06:34	15:54-16:06/12
	16:45	17:22	17:55	19:28	19:59	20:26	20:30	20:05	19:19	18:29	16:46	16:29
9	07:21	06:59	16:17-16:44/27	06:20	06:29	05:47	05:25	05:33	06:00	06:30	06:35	15:57-16:02/5
	16:46	17:23	17:56	19:29	20:00	20:26	20:30	20:04	19:17	18:27	16:45	16:29
10	07:21	06:58	16:17-16:44/27	06:18	06:27	05:45	05:25	05:34	06:01	06:31	06:36	07:09
	16:47	17:24	17:57	19:30	20:01	20:27	20:30	20:03	19:16	18:26	16:44	16:29
11	07:20	06:57	16:16-16:44/28	06:16	06:26	05:44	05:25	05:34	06:02	06:32	06:38	07:10
	16:48	17:25	17:58	19:31	20:02	20:27	20:29	20:01	19:14	18:24	16:43	16:29
12	07:20	06:56	16:16-16:44/28	06:15	06:24	05:43	05:25	05:35	06:03	06:33	06:39	07:11
	16:49	17:27	17:59	19:32	20:03	20:28	20:29	20:00	19:12	18:22	16:42	16:29
13	07:20	06:54	16:16-16:45/29	06:13	06:22	05:42	05:25	05:36	06:04	06:34	06:40	07:12
	16:51	17:28	18:00	19:33	20:04	20:28	20:28	19:59	19:11	18:21	16:41	16:29
14	07:20	06:53	16:17-16:45/28	06:12	06:21	05:41	05:24	05:36	06:05	06:35	06:41	07:12
	16:52	17:29	18:01	19:34	20:05	20:29	20:28	19:57	19:09	18:19	16:40	16:29
15	07:19	06:52	16:16-16:44/28	06:10	06:19	05:40	05:24	05:37	06:06	06:36	06:42	07:13
	16:53	17:30	18:02	19:35	20:06	20:29	20:27	19:56	19:07	18:18	16:39	16:30
16	07:19	06:51	16:17-16:44/27	06:08	06:18	05:39	05:24	05:38	06:07	06:37	06:44	07:14
	16:54	17:31	18:03	19:36	20:07	20:30	20:27	19:55	19:06	18:16	16:38	16:30
17	07:18	06:49	16:18-16:44/26	06:07	06:16	05:38	05:25	05:39	06:08	06:38	06:45	07:14
	16:55	17:33	18:04	19:37	20:08	20:30	20:26	19:53	19:04	18:15	16:38	16:30
18	07:18	06:48	16:18-16:42/24	06:05	06:15	05:37	05:25	05:40	06:09	06:39	06:46	07:15
	16:56	17:34	18:06	19:38	20:09	20:30	20:25	19:52	19:02	18:13	16:37	16:30
19	07:17	06:47	16:20-16:42/22	06:03	06:13	05:37	05:25	05:40	06:10	06:40	06:47	07:16
	16:57	17:35	18:07	19:39	20:10	20:31	20:25	19:50	19:01	18:12	16:36	16:31
20	07:17	06:45	16:20-16:40/20	06:02	06:12	05:36	05:25	05:41	06:11	06:41	07:12	16:55-17:07/12
	16:58	17:36	18:08	19:40	20:11	20:31	20:24	19:49	18:59	18:10	16:35	16:31
21	07:16	06:44	16:22-16:38/16	06:00	06:10	05:35	05:25	05:42	06:12	06:42	07:13	16:52-17:09/17
	17:00	17:37	18:09	19:41	20:12	20:31	20:23	19:47	18:57	18:09	16:35	16:32
22	07:16	06:42	16:25-16:35/10	05:58	06:09	05:34	05:25	05:43	06:13	06:43	07:14	16:50-17:11/21
	17:01	17:39	18:10	19:42	20:13	20:31	20:23	19:46	18:55	18:07	16:34	16:32
23	07:15	06:41	05:57	06:07	05:33	05:25	05:44	06:14	06:44	07:16	16:49-17:11/22	06:52
	17:02	17:40	18:11	19:43	20:14	20:32	20:22	19:44	18:54	18:06	16:33	16:33
24	07:14	06:40	05:55	06:06	05:33	05:26	05:45	06:15	06:45	07:17	16:47-17:12/25	06:53
	17:03	17:41	18:12	19:45	20:14	20:32	20:21	19:43	18:52	18:05	16:33	16:33
25	07:14	06:38	05:53	06:04	05:32	05:26	05:46	06:16	06:46	06:18	15:47-16:13/26	06:54
	17:04	17:42	18:13	19:46	20:15	20:32	20:20	19:41	18:50	17:03	16:32	16:34
26	07:13	06:37	05:52	06:03	05:31	05:26	05:46	06:17	06:47	06:19	15:47-16:14/27	06:55
	17:06	17:43	18:14	19:47	20:16	20:32	20:19	19:40	18:49	17:02	16:32	16:34
27	07:12	06:35	05:50	06:02	05:31	05:27	05:47	06:18	06:48	06:20	15:46-16:14/28	06:56
	17:07	17:44	18:15	19:48	20:17	20:32	20:18	19:38	18:47	17:00	16:31	16:35
28	07:11	06:34	05:48	06:00	05:30	05:27	05:48	06:18	06:49	06:21	15:45-16:14/29	06:57
	17:08	17:46	18:16	19:49	20:18	20:32	20:17	19:37	18:45	16:59	16:31	16:36
29	07:10		06:47	05:59	05:29	05:27	05:49	06:19	06:50	06:22	15:46-16:14/28	06:58
	17:09		19:17	19:50	20:19	20:32	20:16	19:35	18:44	16:58	16:31	16:36
30	07:10		06:45	05:58	05:29	05:28	05:50	06:20	06:51	06:24	15:46-16:14/28	06:59
	17:10		19:18	19:51	20:20	20:32	20:15	19:34	18:42	16:56	16:30	16:37
31	07:09		06:43		05:28		05:51	06:21		06:25	15:46-16:14/28	07:21
	17:12		19:19		20:20		20:14	19:32		16:55		16:38
			298	468	369	448	451	458	427	375	346	299
			0	0	0	0	0	0	0	0	291	176
												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

WTG: DM 2 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (13)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December		
1	07:21	07:08	06:32	06:42	18:27-18:53/26	05:56	05:28	05:28	05:52	06:22	06:52	06:26	07:00	
	16:39	17:13	17:47	19:20		19:52	20:21	20:32	20:13	19:30	18:40	16:54	16:30	
2	07:21	07:07	06:31	06:40	18:27-18:51/24	05:55	05:27	05:29	05:53	06:23	06:53	06:27	07:01	
	16:40	17:14	17:48	19:21		19:53	20:22	20:32	20:12	19:29	18:39	16:53	16:30	
3	07:21	07:06	06:29	06:38	18:28-18:51/23	05:54	05:27	05:29	05:54	06:24	06:54	06:28	07:03	
	16:41	17:15	17:49	19:22		19:54	20:23	20:32	20:11	19:27	18:37	16:52	16:29	
4	07:21	07:05	06:28	06:37	18:29-18:49/20	05:53	05:27	05:30	05:55	06:25	06:55	06:29	07:04	
	16:42	17:17	17:50	19:24		19:55	20:23	20:32	20:10	19:26	18:35	16:50	16:29	
5	07:21	07:04	06:26	06:35	18:30-18:48/18	05:51	05:26	05:30	05:56	06:26	18:31-18:39/8	06:56	06:31	07:04
	16:42	17:18	17:51	19:25		19:56	20:24	20:31	20:09	19:24	18:34	16:49	16:29	
6	07:21	07:03	06:24	06:34	18:32-18:46/14	05:50	05:26	05:31	05:57	06:27	18:28-18:42/14	06:57	06:32	07:05
	16:43	17:19	17:52	19:26		19:57	20:25	20:31	20:08	19:22	18:32	16:48	16:29	
7	07:21	07:02	06:23	06:32	18:34-18:42/8	05:49	05:26	05:32	05:58	06:28	18:26-18:43/17	06:58	06:33	07:06
	16:44	17:20	17:54	19:27		19:58	20:25	20:31	20:06	19:21	18:30	16:47	16:29	
8	07:21	07:00	06:21	06:30		05:48	05:25	05:32	05:59	06:29	18:24-18:44/20	06:59	06:34	07:07
	16:45	17:22	17:55	19:28		19:59	20:26	20:30	20:05	19:19	18:29	16:46	16:29	
9	07:21	06:59	06:20	06:29		05:47	05:25	05:33	06:00	06:30	18:23-18:45/22	07:00	06:35	07:08
	16:46	17:23	17:56	19:29		20:00	20:26	20:30	20:04	19:17	18:27	16:45	16:29	
10	07:21	06:58	06:18	06:27		05:45	05:25	05:34	06:01	06:31	18:21-18:45/24	07:01	06:37	07:09
	16:47	17:24	17:57	19:30		20:01	20:27	20:30	20:03	19:16	18:26	16:44	16:29	
11	07:20	06:57	06:16	06:26		05:44	05:25	05:34	06:02	06:32	18:20-18:45/25	07:02	06:38	07:10
	16:48	17:25	17:58	19:31		20:02	20:27	20:29	20:01	19:14	18:24	16:43	16:29	
12	07:20	06:56	06:15	06:24		05:43	05:25	05:35	06:03	06:33	18:19-18:45/26	07:04	06:39	07:11
	16:49	17:27	17:59	19:32		20:03	20:28	20:29	20:00	19:12	18:22	16:42	16:29	
13	07:20	06:55	06:13	06:22		05:42	05:25	05:36	06:04	06:34	18:18-18:44/26	07:05	06:40	07:12
	16:51	17:28	18:00	19:33		20:04	20:28	20:28	19:59	19:11	18:21	16:41	16:29	
14	07:20	06:53	06:12	06:21		05:41	05:24	05:36	06:05	06:35	18:18-18:44/26	07:06	06:41	07:12
	16:52	17:29	18:01	19:34		20:05	20:29	20:28	19:57	19:09	18:19	16:40	16:29	
15	07:19	06:52	06:10	06:19		05:40	05:24	05:37	06:06	06:36	18:18-18:44/26	07:07	06:42	07:13
	16:53	17:30	18:02	19:35		20:06	20:29	20:27	19:56	19:07	18:18	16:39	16:30	
16	07:19	06:51	06:08	06:18		05:39	05:24	05:38	06:07	06:37	18:18-18:43/25	07:08	06:44	07:14
	16:54	17:31	18:03	19:36		20:07	20:30	20:27	19:55	19:06	18:16	16:38	16:30	
17	07:18	06:49	06:07	06:16		05:38	05:25	05:39	06:08	06:38	18:19-18:41/22	07:09	06:45	07:14
	16:55	17:33	18:04	19:37		20:08	20:30	20:26	19:53	19:04	18:15	16:38	16:30	
18	07:18	06:48	06:05	06:15		05:37	05:25	05:40	06:09	06:39	18:19-18:40/21	07:10	06:46	07:15
	16:56	17:34	18:06	19:38		20:09	20:30	20:25	19:52	19:02	18:13	16:37	16:30	
19	07:17	06:47	06:03	06:13		05:37	05:25	05:40	06:10	06:40	18:20-18:38/18	07:11	06:47	07:16
	16:57	17:35	18:07	19:39		20:10	20:31	20:25	19:50	19:01	18:12	16:36	16:31	
20	07:17	06:45	06:02	06:12		05:36	05:25	05:41	06:11	06:41	18:21-18:36/15	07:12	06:48	07:16
	16:58	17:36	18:08	19:40		20:11	20:31	20:24	19:49	18:59	18:10	16:35	16:31	
21	07:16	06:44	06:00	06:10		05:35	05:25	05:42	06:12	06:42	18:24-18:34/10	07:13	06:49	07:17
	17:00	17:37	18:09	19:41		20:12	20:31	20:23	19:47	18:57	18:09	16:35	16:32	
22	07:16	06:42	05:58	17:40-17:47/7	06:09	05:34	05:25	05:43	06:13	06:43	18:14	07:14	06:51	07:17
	17:01	17:39	18:10	19:42		20:13	20:31	20:23	19:46	18:55	18:07	16:34	16:32	
23	07:15	06:41	05:57	17:36-17:50/14	06:07	05:33	05:25	05:44	06:14	06:44	07:16	06:52	07:18	
	17:02	17:40	18:11	19:43		20:14	20:32	20:22	19:44	18:54	18:06	16:33	16:33	
24	07:14	06:40	05:55	17:33-17:51/18	06:06	05:33	05:26	05:45	06:15	06:45	07:17	06:53	07:18	
	17:03	17:41	18:12	19:45		20:15	20:32	20:21	19:43	18:52	18:05	16:33	16:33	
25	07:14	06:38	05:53	17:32-17:52/20	06:04	05:32	05:26	05:46	06:16	06:46	06:18	06:54	07:19	
	17:04	17:42	18:13	19:46		20:15	20:32	20:20	19:41	18:50	17:03	16:32	16:34	
26	07:13	06:37	05:52	17:30-17:53/23	06:03	05:31	05:26	05:46	06:17	06:47	06:19	06:55	07:19	
	17:06	17:43	18:14	19:47		20:16	20:32	20:19	19:40	18:49	17:02	16:32	16:34	
27	07:12	06:35	05:50	17:29-17:53/24	06:02	05:31	05:27	05:47	06:18	06:48	06:20	06:56	07:20	
	17:07	17:44	18:15	19:48		20:17	20:32	20:18	19:38	18:47	17:00	16:31	16:35	
28	07:11	06:34	05:48	17:29-17:54/25	06:00	05:30	05:27	05:48	06:18	06:49	06:21	06:57	07:20	
	17:08	17:46	18:16	19:49		20:18	20:32	20:17	19:37	18:45	16:59	16:31	16:36	
29	07:10	06:47	05:47	18:28-18:54/26	05:59	05:29	05:27	05:49	06:19	06:50	06:22	06:58	07:20	
	17:09	19:17	19:50	20:19		20:32	20:16	19:35	18:44	16:58	16:31	16:36		
30	07:10	06:45	05:45	18:27-18:53/26	05:58	05:29	05:28	05:50	06:20	06:51	06:24	06:59	07:20	
	17:10	19:18	19:51	20:20		20:32	20:15	19:34	18:42	16:56	16:30	16:37		
31	07:09	06:43	05:43	18:28-18:54/26	05:58	05:28	05:27	05:51	06:21	06:52	06:25	07:21		
	17:12	19:19	19:52	20:20		20:20	20:14	19:32	18:41	16:55	16:31	16:38		
Potential sun hours	298	298	369	398	448	451	458	427	375	346	299	289		
Sum of minutes with flicker	0	0	209	133	0	0	0	0	345	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

WTG: DM 3 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (14)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:21	07:08	06:32 16:02-16:46/44	06:42	05:56	05:28	05:28	05:52	06:22	06:52	06:26 15:39-16:09/30	07:00
	16:39	17:13	17:47	19:20	19:52	20:21	20:32	20:13	19:30	18:40	16:54	16:30
2	07:21	07:07	06:31 16:02-16:45/43	06:40	05:55	05:27	05:29	05:53	06:23	06:53	06:27 15:42-16:08/26	07:01
	16:40	17:14	17:48	19:21	19:53	20:22	20:32	20:12	19:29	18:39	16:53	16:30
3	07:21	07:06	06:29 16:03-16:45/42	06:38	05:54	05:27	05:29	05:54	06:24	06:54 16:56-17:06/10	06:28 15:44-16:05/21	07:02
	16:41	17:15	17:49	19:22	19:54	20:22	20:32	20:11	19:27	18:37	16:52	16:29
4	07:21	07:05	06:28 16:04-16:43/39	06:37	05:53	05:27	05:30	05:55	06:25	06:55 16:51-17:10/19	06:29 15:47-16:02/15	07:03
	16:42	17:17	17:50	19:23	19:55	20:23	20:31	20:10	19:26	18:35	16:50	16:29
5	07:21	07:04	06:26 16:05-16:43/38	06:35	05:51	05:26	05:30	05:56	06:26	06:56 16:48-17:13/25	06:31	07:04
	16:42	17:18	17:51	19:25	19:56	20:24	20:31	20:09	19:24	18:34	16:49	16:29
6	07:21	07:03 16:22-16:27/5	06:24 16:06-16:41/35	06:34	05:50	05:26	05:31	05:57	06:27	06:57 16:45-17:14/29	06:32	07:05
	16:43	17:19	17:52	19:26	19:57	20:25	20:31	20:08	19:22	18:32	16:48	16:29
7	07:21	07:02 16:16-16:33/17	06:23 16:08-16:40/32	06:32	05:49	05:26	05:32	05:58	06:28	06:58 16:43-17:16/33	06:33	07:06
	16:44	17:20	17:53	19:27	19:58	20:25	20:31	20:06	19:21	18:30	16:47	16:29
8	07:21	07:00 16:14-16:36/22	06:21 16:10-16:37/27	06:30	05:48	05:25	05:32	05:59	06:29	06:59 16:41-17:17/36	06:34	07:07
	16:45	17:22	17:55	19:28	19:59	20:26	20:30	20:05	19:19	18:29	16:46	16:29
9	07:21	06:59 16:12-16:38/26	06:20 16:12-16:34/22	06:29	05:47	05:25	05:33	06:00	06:30	07:00 16:39-17:17/38	06:35	07:08
	16:46	17:23	17:56	19:29	20:00	20:26	20:30	20:04	19:17	18:27	16:45	16:29
10	07:21	06:58 16:10-16:41/31	06:18 16:16-16:31/15	06:27	05:45	05:25	05:34	06:01	06:31	07:01 16:38-17:18/40	06:36	07:09
	16:47	17:24	17:57	19:30	20:01	20:27	20:30	20:03	19:16	18:26	16:44	16:29
11	07:20	06:57 16:08-16:41/33	06:16	06:26	05:44	05:25	05:34	06:02	06:32	07:02 16:37-17:20/43	06:38	07:10
	16:48	17:25	17:58	19:31	20:02	20:27	20:29	20:01	19:14	18:24	16:43	16:29
12	07:20	06:56 16:07-16:43/36	06:15	06:24	05:43	05:25	05:35	06:03	06:33	07:03 16:36-17:20/44	06:39	07:11
	16:49	17:27	17:59	19:32	20:03	20:28	20:29	20:00	19:12	18:22	16:42	16:29
13	07:20	06:54 16:06-16:44/38	06:13	06:22	05:42	05:25	05:36	06:04	06:34	07:05 16:35-17:20/45	06:40	07:11
	16:50	17:28	18:00	19:33	20:04	20:28	20:28	19:59	19:11	18:21	16:41	16:29
14	07:20	06:53 16:05-16:46/41	06:12	06:21	05:41	05:24	05:36	06:05	06:35	07:06 16:34-17:20/46	06:41	07:12
	16:52	17:29	18:01	19:34	20:05	20:29	20:28	19:57	19:09	18:19	16:40	16:29
15	07:19	06:52 16:04-16:46/42	06:10	06:19	05:40	05:24	05:37	06:06	06:36	07:07 16:33-17:20/47	06:42	07:13
	16:53	17:30	18:02	19:35	20:06	20:29	20:27	19:56	19:07	18:18	16:39	16:30
16	07:19	06:51 16:03-16:47/44	06:08	06:18	05:39	05:24	05:38	06:07	06:37	07:08 16:33-17:20/47	06:44	07:14
	16:54	17:31	18:03	19:36	20:07	20:30	20:27	19:55	19:06	18:16	16:38	16:30
17	07:18	06:49 16:03-16:48/45	06:07	06:16	05:38	05:24	05:39	06:08	06:38	07:09 16:32-17:20/48	06:45	07:14
	16:55	17:33	18:04	19:37	20:08	20:30	20:26	19:53	19:04	18:15	16:38	16:30
18	07:18	06:48 16:02-16:48/46	06:05	06:15	05:37	05:25	05:39	06:09	06:39	07:10 16:32-17:20/48	06:46	07:15
	16:56	17:34	18:06	19:38	20:09	20:30	20:25	19:52	19:02	18:13	16:37	16:30
19	07:17	06:47 16:02-16:49/47	06:03	06:13	05:37	05:25	05:40	06:10	06:40	07:11 16:32-17:20/48	06:47	07:16
	16:57	17:35	18:07	19:39	20:10	20:31	20:25	19:50	19:00	18:12	16:36	16:31
20	07:17	06:45 16:01-16:48/47	06:02	06:12	05:36	05:25	05:41	06:11	06:41	07:12 16:32-17:20/48	06:48	07:16
	16:58	17:36	18:08	19:40	20:11	20:31	20:24	19:49	18:59	18:10	16:35	16:31
21	07:16	06:44 16:01-16:49/48	06:00	06:10	05:35	05:25	05:42	06:12	06:42	07:13 16:32-17:19/47	06:49	07:17
	17:00	17:37	18:09	19:41	20:12	20:31	20:23	19:47	18:57	18:09	16:35	16:32
22	07:16	06:42 16:00-16:48/48	05:58	06:09	05:34	05:25	05:43	06:13	06:43	07:14 16:32-17:19/47	06:51	07:17
	17:01	17:39	18:10	19:42	20:13	20:31	20:22	19:46	18:55	18:07	16:34	16:32
23	07:15	06:41 16:01-16:49/48	05:57	06:07	05:33	05:25	05:44	06:14	06:44	07:16 16:32-17:18/46	06:52	07:18
	17:02	17:40	18:11	19:43	20:14	20:32	20:22	19:44	18:54	18:06	16:33	16:33
24	07:14	06:40 16:01-16:49/48	05:55	06:06	05:33	05:26	05:45	06:15	06:45	07:17 16:32-17:17/45	06:53	07:18
	17:03	17:41	18:12	19:44	20:14	20:32	20:21	19:43	18:52	18:04	16:33	16:33
25	07:14	06:38 16:01-16:48/47	05:53	06:04	05:32	05:26	05:45	06:16	06:46	06:18 15:33-16:17/44	06:54	07:19
	17:04	17:42	18:13	19:46	20:15	20:32	20:20	19:41	18:50	17:03	16:32	16:34
26	07:13	06:37 16:01-16:49/48	05:52	06:03	05:31	05:26	05:46	06:16	06:47	06:19 15:33-16:16/43	06:55	07:19
	17:06	17:43	18:14	19:47	20:16	20:32	20:19	19:40	18:49	17:02	16:32	16:34
27	07:12	06:35 16:01-16:48/47	05:50	06:02	05:31	05:27	05:47	06:17	06:48	06:20 15:34-16:15/41	06:56	07:19
	17:07	17:44	18:15	19:48	20:17	20:32	20:18	19:38	18:47	17:00	16:31	16:35
28	07:11	06:34 16:02-16:48/46	05:48	06:00	05:30	05:27	05:48	06:18	06:49	06:21 15:34-16:14/40	06:57	07:20
	17:08	17:46	18:16	19:49	20:18	20:32	20:17	19:37	18:45	16:59	16:31	16:36
29	07:10		06:47	05:59	05:29	05:27	05:49	06:19	06:50	06:22 15:36-16:14/38	06:58	07:20
	17:09		19:17	19:50	20:19	20:32	20:16	19:35	18:44	16:58	16:31	16:36
30	07:10		06:45	05:58	05:29	05:28	05:50	06:20	06:51	06:24 15:37-16:12/35	06:59	07:20
	17:10		19:18	19:51	20:19	20:32	20:15	19:34	18:42	16:56	16:30	16:37
31	07:09		06:43		05:28	05:51	06:21		06:25 15:38-16:11/33		07:21	
	17:12		19:19		20:20	20:14	19:32		16:55		16:38	
Potential sun hours	298	298	369	398	448	451	458	427	375	346	299	289
Sum of minutes with flicker	0	900	337	0	0	0	0	0	0	1153	92	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

WTG: DM 4 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (12)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December
1   07:21   07:08   06:32   06:42   05:56   18:57-19:28/31   05:28   18:54-19:36/42   05:28   19:04-19:39/35   05:52   19:00-19:48/48   06:22   06:26   06:52   07:00												
16:39   17:13   19:20   19:20   19:52   20:21   20:32   20:32   20:32   20:13   19:30   18:40   16:54   16:30												
2   07:21   07:07   06:31   06:40   05:55   18:56-19:30/34   05:27   18:55-19:36/41   05:29   19:04-19:39/35   05:53   19:01-19:47/46   06:23   06:23   06:53   06:27   07:01												
16:40   17:14   17:48   19:21   19:53   20:22   20:32   20:32   20:12   19:29   18:39   16:53   16:30												
3   07:21   07:06   06:29   06:38   05:54   18:55-19:31/36   05:27   18:55-19:35/40   05:29   19:04-19:40/36   05:54   19:01-19:47/46   06:24   06:24   06:54   06:28   07:02												
16:41   17:15   17:49   19:22   19:54   20:23   20:32   20:32   20:11   19:27   18:37   16:52   16:29												
4   07:21   07:05   06:28   06:37   05:53   18:54-19:32/38   05:27   18:56-19:35/39   05:30   19:03-19:40/37   05:55   19:01-19:47/46   06:25   06:55   06:29   07:03												
16:42   17:17   17:50   19:23   19:55   20:23   20:32   20:32   20:10   19:26   18:35   16:50   16:29												
5   07:21   07:04   06:26   06:35   05:51   18:54-19:33/39   05:26   18:57-19:36/39   05:30   19:04-19:41/37   05:56   19:02-19:46/44   06:26   06:56   06:31   07:04												
16:42   17:18   17:51   19:25   19:56   20:24   20:31   20:31   20:09   19:24   18:34   16:49   16:29												
6   07:21   07:03   06:24   06:34   05:50   18:53-19:34/41   05:26   18:57-19:35/38   05:31   19:03-19:41/38   05:57   19:02-19:45/43   06:27   06:57   06:32   07:05												
16:43   17:19   17:52   19:26   19:57   20:25   20:31   20:31   20:08   19:22   18:32   16:48   16:29												
7   07:21   07:02   06:23   06:32   05:49   18:51-19:34/43   05:26   18:57-19:35/38   05:32   19:03-19:42/39   05:58   19:03-19:44/41   06:28   06:58   06:33   07:06												
16:44   17:20   17:53   19:27   19:58   20:25   20:31   20:31   20:06   19:21   18:30   16:47   16:29												
8   07:21   07:00   06:21   06:30   05:48   18:51-19:35/44   05:25   18:58-19:35/37   05:32   19:03-19:43/40   05:59   19:03-19:42/39   06:29   06:59   06:34   07:07												
16:45   17:22   17:55   19:28   19:59   20:26   20:30   20:30   20:10   19:19   18:29   16:46   16:29												
9   07:21   06:59   06:20   06:29   05:47   18:51-19:36/45   05:25   18:59-19:35/36   05:33   19:02-19:42/40   06:00   19:03-19:40/37   06:30   07:00   06:35   07:08												
16:46   17:23   17:56   19:29   20:00   20:26   20:30   20:30   20:04   19:17   18:27   16:45   16:29												
10   07:21   06:58   06:18   06:27   05:45   18:50-19:37/47   05:25   18:59-19:35/36   05:33   19:03-19:43/40   06:01   19:04-19:39/35   06:31   07:01   06:36   07:09												
16:47   17:24   17:57   19:30   20:01   20:27   20:30   20:30   20:03   19:16   18:26   16:44   16:29												
11   07:20   06:57   06:16   06:26   05:44   18:50-19:37/47   05:25   19:00-19:35/35   05:34   19:03-19:44/41   06:02   19:05-19:38/33   06:32   07:02   06:38   07:10												
16:48   17:25   17:58   19:31   20:02   20:27   20:29   20:29   20:01   19:14   18:24   16:43   16:29												
12   07:20   06:56   06:15   06:24   05:43   18:50-19:37/47   05:25   19:00-19:35/35   05:35   19:02-19:44/42   06:03   19:06-19:37/31   06:33   07:03   06:39   07:11												
16:49   17:27   17:59   19:32   20:03   20:28   20:29   20:29   20:00   19:12   18:22   16:42   16:29												
13   07:20   06:54   06:13   06:22   05:42   18:50-19:37/47   05:25   19:00-19:34/34   05:36   19:02-19:45/43   06:04   19:08-19:36/28   06:34   07:05   06:40   07:12												
16:50   17:28   18:00   19:33   20:04   20:28   20:28   20:28   20:09   19:11   18:21   16:41   16:29												
14   07:20   06:53   06:12   06:21   05:41   18:49-19:37/48   05:24   19:00-19:34/34   05:36   19:02-19:45/43   06:05   19:09-19:34/25   06:35   07:06   06:41   07:12												
16:52   17:29   18:01   19:34   20:05   20:29   20:28   20:28   19:57   19:09   18:19   16:40   16:29												
15   07:19   06:52   06:10   06:19   05:40   18:49-19:37/48   05:24   19:01-19:34/33   05:37   19:02-19:46/44   06:06   19:12-19:33/21   06:36   07:07   06:42   07:13												
16:53   17:30   18:02   19:35   20:06   20:29   20:27   20:27   20:01   19:14   18:24   16:43   16:29												
16   07:19   06:51   06:08   06:18   05:39   18:49-19:37/48   05:24   19:02-19:35/33   05:38   19:01-19:46/45   06:07   19:15-19:30/15   06:37   07:08   06:44   07:14												
16:54   17:31   18:03   19:36   20:07   20:30   20:27   20:27   20:05   19:06   18:16   16:38   16:30												
17   07:18   06:49   06:07   06:16   05:38   18:50-19:38/48   05:24   19:02-19:35/33   05:39   19:01-19:46/45   06:08   16:38   07:09   06:45   07:14												
16:55   17:33   18:04   19:37   20:08   20:30   20:26   20:26   20:03   19:04   18:15   16:38   16:30												
18   07:18   06:48   06:05   06:15   05:37   18:50-19:38/48   05:25   19:03-19:35/32   05:39   19:01-19:47/46   06:09   16:39   07:10   06:46   07:15												
16:56   17:34   18:06   19:38   20:09   20:30   20:25   20:25   20:02   19:02   18:13   16:37   16:30												
19   07:17   06:47   06:03   06:13   05:37   18:50-19:38/48   05:25   19:03-19:35/32   05:40   19:01-19:47/46   06:10   16:40   07:11   06:47   07:16												
16:57   17:35   18:07   19:39   20:10   20:31   20:25   20:25   19:50   19:00   18:12   16:36   16:31												
20   07:17   06:45   06:02   06:12   05:36   18:50-19:38/48   05:25   19:03-19:35/32   05:41   19:00-19:47/47   06:11   16:41   07:12   06:48   07:16												
16:58   17:36   18:08   19:40   20:11   20:31   20:24   20:24   19:49   18:59   18:10   16:35   16:31												
21   07:16   06:44   06:00   06:10   05:35   18:50-19:37/47   05:25   19:03-19:35/32   05:42   19:00-19:47/47   06:12   16:42   07:13   06:49   07:17												
17:00   17:37   18:09   19:41   20:12   20:31   20:23   20:23   19:47   18:57   18:09   16:35   16:32												
22   07:16   06:42   05:58   06:09   05:34   18:51-19:38/47   05:25   19:03-19:35/32   05:43   19:00-19:48/48   06:13   16:43   07:14   06:51   07:17												
17:01   17:39   18:10   19:42   20:13   20:31   20:23   20:23   19:46   18:55   18:07   16:34   16:32												
23   07:15   06:41   05:57   06:07   05:33   18:51-19:37/46   05:25   19:04-19:36/32   05:44   19:00-19:48/48   06:14   16:44   07:16   06:52   07:18												
17:02   17:40   18:11   19:43   20:14   20:32   20:22   20:22   19:44   18:54   18:06   16:33   16:33												
24   07:14   06:40   05:55   06:06   05:33   18:51-19:37/46   05:26   19:04-19:36/32   05:45   19:00-19:48/48   06:15   16:45   07:17   06:53   07:18												
17:03   17:41   18:12   19:44   20:14   20:32   20:21   20:21   19:43   18:52   18:04   16:33   16:33												
25   07:14   06:38   05:53   06:04   05:32   18:52-19:37/45   05:26   19:04-19:36/32   05:45   19:00-19:48/48   06:16   16:46   07:18   06:54   07:19												
17:04   17:42   18:13   19:46   20:15   20:32   20:20   20:20   19:41   18:50   17:03   16:32   16:34												
26   07:13   06:37   05:52   06:03   19:12-19:18/6   05:31   18:52-19:37/45   05:26   19:04-19:37/33   05:46   19:00-19:49/49   06:16   16:47   07:19   06:55   07:19												
17:06   17:43   18:14   19:47   20:16   20:32   20:19   20:19   19:40   18:49   17:02   16:32   16:34												
27   07:12   06:35   05:50   06:02   19:07-19:24/17   05:31   18:52-19:36/44   05:27   19:04-19:37/33   05:47   19:00-19:48/48   06:17   16:48   07:20   06:56   07:20												
17:07   17:44   18:15   19:48   20:17   20:32   20:18   20:18   19:38   18:47   17:00   16:31   16:35												
28   07:11   06:34   05:48   06:00   19:03-19:26/23   05:30   18:53-19:37/44   05:27   19:04-19:37/33   05:48   19:00-19:48/48   06:18   16:49   07:21   06:57   07:20												
17:08   17:46   18:16   19:49   20:18   20:32   20:17   20:17   19:37   18:45   16:59   16:31   16:36												
29   07:10   06:47   05:59   19:01-19:27/26   05:29   18:53-19:36/43   05:27   19:04-19:38/34   05:49   19:00-19:48/48   06:19   16:50   07:22   06:58   07:20												
17:09   17:47   18:17   19:50   20:19   20:32   20:16   20:16   19:35   18:44   16:58   16:31   16:36												
30   07:10   06:45   05:58   19:00-19:28/28   05:29   18:53-19:36/43   05:28   19:04-19:38/34   05:50   19:00-19:48/48   06:20   16:51   07:24   06:59   07:20												
17:10   17:48   18:18   19:51   20:20   20:32   20:15   20:15   19:34   18:42   16:56   16:30   16:37												
31   07:09   06:43   05:43   05:28   18:53-19:36/43   05:51   19:00-19:48/48   06:21   16:25   07:25   07:21												
17:12   17:49   18:19   20:20   20:32   20:14   19:32   19:32   16:55   16:55   16:31   16:38												
Potential sun hours   298   298   369   398   448   451   458   458   427   375   346   299   289												
Sum of minutes with flicker   0   0   0   100   1368   1046   1347   578   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	Day in month	Sun set (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

WTG: DM 5 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (16)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:21	07:08	06:32	06:42 18:50-18:59/9	05:56	05:28	05:28	05:52	06:22 18:45-19:08/23	06:52	06:26	07:00
	16:39	17:13	17:47	19:20	19:52	20:21	20:32	20:13	19:30	18:40	16:54	16:30
2	07:21	07:07	06:31	06:40 18:48-19:00/12	05:55	05:27	05:29	05:53	06:23 18:45-19:07/22	06:53	06:27	07:01
	16:40	17:14	17:48	19:21	19:53	20:22	20:32	20:12	19:29	18:39	16:53	16:30
3	07:21	07:06	06:29	06:38 18:48-19:01/13	05:54	05:27	05:29	05:54	06:24 18:45-19:05/20	06:54	06:28	07:02
	16:41	17:15	17:49	19:22	19:54	20:22	20:32	20:11	19:27	18:37	16:51	16:29
4	07:21	07:05	06:27	06:37 18:47-19:02/15	05:52	05:26	05:30	05:55	06:25 18:44-19:04/20	06:55	06:29	07:03
	16:41	17:17	17:50	19:23	19:55	20:23	20:31	20:10	19:26	18:35	16:50	16:29
5	07:21	07:04	06:26	06:35 18:46-19:03/17	05:51	05:26	05:30	05:56	06:26 18:43-19:02/19	06:56	06:31	07:04
	16:42	17:18	17:51	19:25	19:56	20:24	20:31	20:09	19:24	18:34	16:49	16:29
6	07:21	07:03	06:24	06:34 18:46-19:04/18	05:50	05:26	05:31	05:57	06:27 18:43-19:00/17	06:57	06:32	07:05
	16:43	17:19	17:52	19:26	19:57	20:25	20:31	20:08	19:22	18:32	16:48	16:29
7	07:21	07:02	06:23	06:32 18:46-19:05/19	05:49	05:25	05:32	05:58	06:28 18:42-18:59/17	06:58	06:33	07:06
	16:44	17:20	17:53	19:27	19:58	20:25	20:31	20:06	19:21	18:30	16:47	16:29
8	07:21	07:00	06:21	06:30 18:47-19:06/19	05:48	05:25	05:32	05:59	06:29 18:42-18:57/15	06:59	06:34	07:07
	16:45	17:22	17:55	19:28	19:59	20:26	20:30	20:05	19:19	18:29	16:46	16:29
9	07:21	06:59	06:20	06:29 18:47-19:07/20	05:47	05:25	05:33	06:00	06:30 18:41-18:55/14	07:00	06:35	07:08
	16:46	17:23	17:56	19:29	20:00	20:26	20:30	20:04	19:17	18:27	16:45	16:29
10	07:21	06:58	06:18	06:27 18:46-19:08/22	05:45	05:25	05:33	06:01	06:31 18:41-18:53/12	07:01	06:36	07:09
	16:47	17:24	17:57	19:30	20:01	20:27	20:30	20:03	19:16	18:26	16:44	16:29
11	07:20	06:57	06:16	06:26 18:46-19:09/23	05:44	05:25	05:34	06:02	06:32 18:42-18:51/9	07:02	06:38	07:10
	16:48	17:25	17:58	19:31	20:02	20:27	20:29	20:01	19:14	18:24	16:43	16:29
12	07:20	06:56	06:15	06:24 18:45-19:10/25	05:43	05:25	05:35	06:03	06:33 18:43-18:50/7	07:03	06:39	07:11
	16:49	17:26	17:59	19:32	20:03	20:28	20:29	20:00	19:12	18:22	16:42	16:29
13	07:20	06:54	06:13	06:22 18:45-19:11/26	05:42	05:24	05:36	06:04	06:34 18:45-18:48/3	07:05	06:40	07:11
	16:50	17:28	18:00	19:33	20:04	20:28	20:28	19:59	19:11	18:21	16:41	16:29
14	07:20	06:53	06:12	06:21 18:45-19:12/27	05:41	05:24	05:36	06:05	06:35	07:06	06:41	07:12
	16:52	17:29	18:01	19:34	20:05	20:29	20:28	19:57	19:09	18:19	16:40	16:29
15	07:19	06:52	06:10	06:19 18:45-19:12/27	05:40	05:24	05:37	06:06	06:36	07:07	06:42	07:13
	16:53	17:30	18:02	19:35	20:06	20:29	20:27	19:56	19:07	18:18	16:39	16:29
16	07:19	06:51	06:08	06:18 18:45-19:10/25	05:39	05:24	05:38	06:07	06:37	07:08	06:44	07:14
	16:54	17:31	18:03	19:36	20:07	20:30	20:27	19:55	19:06	18:16	16:38	16:30
17	07:18	06:49	06:07	06:16 18:46-19:10/24	05:38	05:24	05:39	06:08	06:38	07:09	06:45	07:14
	16:55	17:33	18:04	19:37	20:08	20:30	20:26	19:53	19:04	18:15	16:38	16:30
18	07:18	06:48	06:05	06:15 18:46-19:08/22	05:37	05:25	05:39	06:09	06:39	07:10	06:46	07:15
	16:56	17:34	18:05	19:38	20:09	20:30	20:25	19:52	19:02	18:13	16:37	16:30
19	07:17	06:47	06:03	06:13 18:47-19:08/21	05:36	05:25	05:40	06:10	06:40	07:11	06:47	07:16
	16:57	17:35	18:07	19:39	20:10	20:31	20:25	19:50	19:00	18:12	16:36	16:31
20	07:17	06:45	06:02	06:12 18:48-19:05/17	05:36	05:25	05:41	06:11	06:41	07:12	06:48	07:16
	16:58	17:36	18:08	19:40	20:11	20:31	20:24	19:49	18:59	18:10	16:35	16:31
21	07:16	06:44	06:00	06:10 18:50-19:04/14	05:35	05:25	05:42	06:12 18:58-19:06/8	06:42	07:13	06:49	07:17
	17:00	17:37	18:09	19:41	20:12	20:31	20:23	19:47	18:57	18:09	16:35	16:32
22	07:16	06:42	05:58	06:09 18:53-18:59/6	05:34	05:25	05:43	06:13 18:55-19:09/14	06:43	07:14	06:51	07:17
	17:01	17:38	18:10	19:42	20:13	20:31	20:22	19:46	18:55	18:07	16:34	16:32
23	07:15	06:41	05:57	06:07	05:33	05:25	05:44	06:13 18:53-19:10/17	06:44	07:15	06:52	07:18
	17:02	17:40	18:11	19:43	20:14	20:32	20:22	19:44	18:54	18:06	16:33	16:33
24	07:14	06:40	05:55	06:06	05:32	05:26	05:45	06:14 18:50-19:11/21	06:45	07:17	06:53	07:18
	17:03	17:41	18:12	19:44	20:14	20:32	20:21	19:43	18:52	18:04	16:33	16:33
25	07:14	06:38	05:53	06:04	05:32	05:26	05:45	06:15 18:49-19:11/22	06:46	07:18	06:54	07:19
	17:04	17:42	18:13	19:46	20:15	20:32	20:20	19:41	18:50	17:03	16:32	16:34
26	07:13	06:37	05:52	06:03	05:31	05:26	05:46	06:16 18:48-19:12/24	06:47	06:19	06:55	07:19
	17:06	17:43	18:14	19:47	20:16	20:32	20:19	19:40	18:49	17:02	16:32	16:34
27	07:12	06:35	05:50	06:02	05:30	05:27	05:47	06:17 18:47-19:12/25	06:48	06:20	06:56	07:19
	17:07	17:44	18:15	19:48	20:17	20:32	20:18	19:38	18:47	17:00	16:31	16:35
28	07:11	06:34	05:48	06:00	05:30	05:27	05:48	06:18 18:46-19:12/26	06:49	06:21	06:57	07:20
	17:08	17:45	18:16	19:49	20:18	20:32	20:17	19:37	18:45	16:59	16:31	16:36
29	07:10	06:47	05:59	05:29	05:27	05:49	06:19	18:46-19:12/26	06:50	06:22	06:58	07:20
	17:09	17:47	18:17	19:50	20:19	20:32	20:16	19:35	18:44	16:58	16:30	16:36
30	07:10	06:45	18:54-18:57/3	05:58	05:29	05:28	05:50	06:20 18:45-19:11/26	06:51	06:24	06:59	07:20
	17:10	17:48	18:18	19:51	20:19	20:32	20:15	19:34	18:42	16:56	16:30	16:37
31	07:09	06:43	18:52-18:58/6	05:58	05:28	05:51	06:21	18:45-19:10/25	06:52	06:25	07:21	
	17:12	17:49	18:19	19:52	20:20	20:32	20:14	19:32	18:41	16:55	16:38	
Potential sun hours	298	298	369	398	448	451	458	427	375	346	299	289
Sum of minutes with flicker	0	0	9	421	0	0	0	234	198	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

WTG: DM 6 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April		May		June
1   07:21	07:08 16:16-16:36/20	06:32 15:51-17:25/94	06:42			05:56 19:11-19:28/17	05:28	
16:39	17:13	17:47	19:20			19:52	20:21	
2   07:21	07:07 16:13-16:39/26	06:31 15:51-17:25/94	06:40			05:55 19:11-19:30/19	05:27	
16:40	17:14	17:48	19:21			19:53	20:22	
3   07:21	07:06 16:10-16:42/32	06:29 15:52-17:26/94	06:38			05:54 19:11-19:31/20	05:27	
16:41	17:15	17:49	19:22			19:54	20:22	
4   07:21	07:05 16:07-16:44/37	06:27 15:52-17:26/94	06:37			05:52 19:11-19:32/21	05:26	
16:41	17:17	17:50	19:23			19:55	20:23	
5   07:21	07:04 16:05-16:46/41	06:26 15:53-17:26/93	06:35			05:51 19:11-19:33/22	05:26	
16:42	17:18	17:51	19:24			19:56	20:24	
6   07:21	07:03 16:04-16:48/44	06:24 15:53-17:26/93	06:33			05:50 19:10-19:33/23	05:26	
16:43	17:19	17:52	19:26			19:57	20:24	
7   07:21	07:01 16:03-16:50/47	06:23 15:53-17:25/92	06:32 06:50-06:51/1			05:49 19:11-19:34/23	05:25	
16:44	17:20	17:53	19:27			19:58	20:25	
8   07:21	07:00 16:02-16:51/49	06:21 15:54-17:25/91	06:30 06:49-06:53/4			05:48 19:11-19:34/23	05:25	
16:45	17:22	17:55	19:28			19:59	20:26	
9   07:21	06:59 16:01-16:53/52	06:20 15:54-17:24/90	06:29 06:47-06:52/5			05:47 19:12-19:34/22	05:25	
16:46	17:23	17:56	19:29			20:00	20:26	
10   07:21	06:58 16:00-16:54/54	06:18 15:56-17:24/88	06:27 06:46-06:53/7			05:45 19:13-19:33/20	05:25	
16:47	17:24	17:57	19:30 19:06-19:08/2			20:01	20:27	
11   07:20	06:57 15:58-16:55/57	06:16 15:56-17:23/87	06:25 06:44-06:53/9			05:44 19:14-19:32/18	05:25	
16:48	17:25	17:58	19:31 19:03-19:09/6			20:02	20:27	
12   07:20	06:56 15:57-16:56/59	06:15 15:57-17:22/85	06:24 06:42-06:53/11			05:43 19:15-19:31/16	05:25	
16:49	17:26	17:59	19:32 19:00-19:10/10			20:03	20:28	
13   07:20	06:54 15:57-16:57/60	06:13 16:51-17:21/30	06:22 06:41-06:53/12			05:42 19:16-19:29/13	05:24	
16:50	17:28	18:00 15:59-16:50/51	19:33 18:59-19:11/12			20:04	20:28	
14   07:19	06:53 15:55-16:57/62	06:11 16:52-17:19/27	06:21 06:39-06:52/13			05:41 19:18-19:27/9	05:24	
16:51	17:29	18:01 16:00-16:48/48	19:34 18:57-19:12/15			20:05	20:29	
15   07:19	06:52 15:55-16:58/63	06:10 16:53-17:17/24	06:19 06:38-06:52/14			05:40	05:24	
16:53	17:30	18:02 16:01-16:46/45	19:35 18:57-19:13/16			20:06	20:29	
16   07:19	06:51 15:54-16:59/65	06:08 16:56-17:15/19	06:18 06:36-06:51/15			05:39	05:24	
16:54	17:31	18:03 16:04-16:44/40	19:36 18:56-19:14/18			20:07	20:30	
17   07:18	06:49 15:53-16:59/66	06:07 16:58-17:11/13	06:16 06:35-06:51/16			05:38	05:24	
16:55	17:33	18:04 16:06-16:41/35	19:37 18:56-19:15/19			20:08	20:30	
18   07:18	06:48 15:53-17:00/67	06:05 16:08-16:38/30	06:15 06:33-06:50/17			05:37	05:24	
16:56	17:34	18:05	19:38 18:55-19:16/21			20:09	20:30	
19   07:17	06:47 15:53-17:01/68	06:03 16:12-16:35/23	06:13 06:32-06:50/18			05:36	05:25	
16:57	17:35	18:07	19:39 18:55-19:17/22			20:10	20:31	
20   07:17	06:45 15:52-17:01/69	06:02 16:17-16:29/12	06:12 06:30-06:48/18			05:36	05:25	
16:58	17:36	18:08	19:40 18:55-19:18/23			20:11	20:31	
21   07:16	06:44 15:52-17:01/69	06:00	06:10 06:29-06:48/19			05:35	05:25	
16:59	17:37	18:09	19:41 18:55-19:18/23			20:12	20:31	
22   07:16	06:42 17:07-17:10/3	05:58	06:09 06:27-06:46/19			05:34	05:25	
17:01	17:38 15:51-17:01/70	18:10	19:42 18:55-19:17/22			20:13	20:31	
23   07:15	06:41 17:02-17:17/15	05:57	06:07 06:26-06:45/19			05:33	05:25	
17:02	17:40 15:51-17:01/70	18:11	19:43 18:56-19:16/20			20:14	20:32	
24   07:14	06:39 15:52-17:19/87	05:55	06:06 06:25-06:44/19			05:32	05:26	
17:03	17:41	18:12	19:44 18:57-19:15/18			20:14	20:32	
25   07:14	06:38 15:51-17:20/89	05:53	06:04 06:23-06:42/19	19:18-19:23/5		05:32	05:26	
17:04	17:42	18:13	19:45 18:58-19:13/15			20:15	20:32	
26   07:13	06:37 15:51-17:22/91	05:52	06:03 06:22-06:40/18	19:17-19:24/7		05:31	05:26	
17:05	17:43	18:14	19:47 19:00-19:11/11			20:16	20:32	
27   07:12	06:35 15:51-17:23/92	05:50	06:02 06:23-06:37/14			05:30	05:27	
17:07	17:44	18:15	19:48 19:15-19:25/10			20:17	20:32	
28   07:11	06:34 15:50-17:24/94	05:48	06:00 19:13-19:26/13			05:30	05:27	
17:08	17:45	18:16	19:49			20:18	20:32	
29   07:10		06:47	05:59 19:13-19:27/14			05:29	05:27	
17:09		19:17	19:50			20:19	20:32	
30   07:09		06:45	05:58 19:12-19:28/16			05:29	05:28	
17:10		19:18	19:51			20:19	20:32	
31   07:09	16:22-16:29/7		06:43			05:28		
17:12		19:19				20:20		
Potential sun hours	298	298	369	398		448	451	
Sum of minutes with flicker	7	1718	1492	625		266	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

WTG: DM 6 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (9)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	July	August	September	October	November	December
1	05:28	05:52 19:25-19:42/17	06:22 06:43-06:52/9	06:52 16:37-18:01/84	06:26 15:29-16:23/54	07:00
	20:32	20:13	19:30 19:02-19:08/6	18:40	16:54	16:30
2	05:29	05:53 19:24-19:43/19	06:23 06:44-06:51/7	06:53 16:36-18:01/85	06:27 15:29-16:21/52	07:01
	20:32	20:11	19:29 19:05-19:07/2	18:39	16:53	16:30
3	05:29	05:54 19:23-19:44/21	06:24 06:45-06:51/6	06:54 16:34-18:02/88	06:28 15:32-16:21/49	07:02
	20:32	20:11	19:27	18:37	16:51	16:29
4	05:30	05:55 19:22-19:44/22	06:25 06:46-06:50/4	06:55 16:33-18:02/89	06:29 15:33-16:19/46	07:03
	20:31	20:10	19:26	18:35	16:50	16:29
5	05:30	05:56 19:22-19:45/23	06:26 06:47-06:48/1	06:56 16:31-18:02/91	06:30 15:34-16:17/43	07:04
	20:31	20:09	19:24	18:34	16:49	16:29
6	05:31	05:57 19:20-19:44/24	06:27	06:57 16:30-18:02/92	06:32 15:37-16:16/39	07:05
	20:31	20:07	19:22	18:32	16:48	16:29
7	05:31	05:58 19:20-19:43/23	06:28	06:58 16:29-18:01/92	06:33 15:38-16:14/36	07:06
	20:31	20:06	19:21	18:30	16:47	16:29
8	05:32	05:59 19:20-19:41/21	06:29	06:59 16:28-18:01/93	06:34 15:40-16:12/32	07:07
	20:30	20:05	19:19	18:29	16:46	16:29
9	05:33	06:00 19:20-19:40/20	06:30	07:00 16:27-18:01/94	06:35 15:43-16:09/26	07:08
	20:30	20:04	19:17	18:27	16:45	16:29
10	05:33	06:01 19:20-19:39/19	06:31	07:01 16:26-18:00/94	06:36 15:47-16:06/19	07:09
	20:30	20:03	19:16	18:25	16:44	16:29
11	05:34	06:02 19:20-19:38/18	06:32	07:02 16:25-17:59/94	06:38 15:54-15:59/5	07:10
	20:29	20:01	19:14	18:24	16:43	16:29
12	05:35	06:03 19:20-19:37/17	06:33	07:03 16:25-17:59/94	06:39	07:11
	20:29	20:00	19:12	18:22	16:42	16:29
13	05:36	06:04 19:20-19:36/16	06:34	07:04 16:24-17:58/94	06:40	07:11
	20:28	19:59	19:11	18:21	16:41	16:29
14	05:36	06:05 19:21-19:34/13	06:35	07:06 16:24-17:56/92	06:41	07:12
	20:28	19:57	19:09	18:19	16:40	16:29
15	05:37	06:06 06:34-06:40/6	06:36	07:07 16:23-17:55/92	06:42	07:13
	20:27	19:56 19:21-19:33/12	19:07	18:18	16:39	16:29
16	05:38	06:07 06:29-06:45/16 19:22-19:32/10	06:37	07:08 16:23-17:53/90	06:44	07:14
	20:27	19:55 19:10-19:15/5	19:05	18:16	16:38	16:30
17	05:39	06:08 06:29-06:47/18 19:24-19:31/7	06:38	07:09 16:22-17:51/89	06:45	07:14
	20:26	19:53 19:07-19:18/11	19:04	18:15	16:37	16:30
18	05:39	06:09 06:30-06:49/19 19:26-19:29/3	06:39	07:10 16:22-17:49/87	06:46	07:15
	20:25	19:52 19:04-19:20/16	19:02	18:13	16:37	16:30
19	05:40	06:10 06:31-06:50/19	06:40	07:11 17:34-17:46/12	06:47	07:16
	20:25	19:50 19:03-19:21/18	19:00	18:12 16:23-17:33/70	16:36	16:31
20	05:41	06:10 06:32-06:51/19	06:41	07:12 16:23-17:32/69	06:48	07:16
	20:24	19:49 19:02-19:22/20	18:59	18:10	16:35	16:31
21	05:42	06:11 06:33-06:52/19	06:42	07:13 16:23-17:32/69	06:49	07:17
	20:23	19:47 19:01-19:22/21	18:57	18:09	16:35	16:32
22	05:43	06:12 06:34-06:53/19	06:43	07:14 16:23-17:31/68	06:50	07:17
	20:22	19:46 19:00-19:23/23	18:55	18:07	16:34	16:32
23	05:44	06:13 06:35-06:53/18	06:44 17:04-17:10/6	07:15 16:23-17:30/67	06:52	07:18
	20:22	19:44 18:59-19:22/23	18:54	18:06	16:33	16:33
24	05:45	06:14 06:36-06:54/18	06:45 16:57-17:17/20	07:17 16:23-17:29/66	06:53	07:18
	20:21	19:43 18:58-19:20/22	18:52	18:04	16:33	16:33
25	05:45	06:15 06:37-06:54/17	06:46 16:52-17:21/29	06:18 15:24-16:30/66	06:54	07:19
	20:20	19:41 18:58-19:19/21	18:50	17:03	16:32	16:34
26	05:46	06:16 06:37-06:53/16	06:47 17:42-17:52/10	06:19 15:24-16:29/65	06:55	07:19
	20:19	19:40 18:57-19:17/20	18:49 16:49-17:23/34	17:02	16:32	16:34
27	05:47	06:17 06:38-06:53/15	06:48 17:38-17:56/18	06:20 15:24-16:28/64	06:56	07:19
	20:18	19:38 18:58-19:16/18	18:47 16:46-17:25/39	17:00	16:31	16:35
28	05:48	06:18 06:39-06:53/14	06:49 17:35-17:58/23	06:21 15:25-16:27/62	06:57	07:20
	20:17	19:37 18:58-19:14/16	18:45 16:44-17:26/42	16:59	16:31	16:36
29	05:49	06:19 06:40-06:53/13	06:50 17:33-17:59/26	06:22 15:26-16:27/61	06:58	07:20
	20:16	19:35 18:58-19:13/15	18:44 16:41-17:28/47	16:58	16:30	16:36
30	05:50	06:20 06:41-06:53/12	06:51 17:32-18:00/28	06:23 15:27-16:25/58	06:59	07:20
	20:15	19:34 18:59-19:11/12	18:42 16:39-17:29/50	16:56	16:30	16:37
31	05:51	06:21 06:42-06:52/10		06:25 15:28-16:24/56		07:21
	20:14	19:32 19:00-19:10/10		16:55		16:38
	Potential sun hours	458	375	346	299	289
	Sum of minutes with flicker	32	844	407	2487	401
						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

WTG: DM 7 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June
1	07:21	07:08 15:57-16:33/36	06:32 06:51-07:45/54	06:42 18:34-18:45/11	05:56	05:28
	16:39	17:13	17:47	19:20 18:48-18:59/11	19:52	20:21
2	07:21	07:07 15:57-16:33/36	06:31 06:49-07:44/55	06:40 18:37-18:41/4	05:55	05:27
	16:40	17:14	17:48	19:21 18:46-19:00/14	19:53	20:22
3	07:21	07:06 15:57-16:34/37	06:29 06:48-07:45/57	06:38 18:45-19:01/16	05:54	05:27
	16:41	17:15	17:49	19:22	19:54	20:22
4	07:21	07:05 15:56-16:33/37	06:27 06:46-07:45/59	06:37 18:44-19:02/18	05:52	05:26
	16:41	17:17	17:50	19:23	19:55	20:23
5	07:21	07:04 15:56-16:33/37	06:26 06:45-07:45/60	06:35 18:42-19:02/20	05:51	05:26
	16:42	17:18	17:51	19:24	19:56	20:24
6	07:21	07:03 15:57-16:33/36	06:24 06:43-07:45/62	06:34 18:43-19:02/19	05:50	05:26
	16:43	17:19	17:52	19:26	19:57	20:24
7	07:21	07:02 15:57-16:34/37	06:23 06:42-07:45/63	06:32 18:42-19:02/20	05:49	05:25
	16:44	17:20	17:53	19:27	19:58	20:25
8	07:21	07:00 15:57-16:34/37	06:21 06:40-07:44/64	06:30 18:43-19:02/19	05:48	05:25
	16:45	17:22	17:55	19:28	19:59	20:26
9	07:21	06:59 16:46-16:51/5	06:20 06:38-07:44/66	06:29 18:42-19:00/18	05:47	05:25
	16:46	17:23 15:58-16:34/36	17:56	19:29	20:00	20:26
10	07:21	06:58 16:43-16:55/12	06:18 06:38-07:44/66	06:27 18:43-18:59/16	05:45	05:25
	16:47	17:24 15:59-16:33/34	17:57	19:30	20:01	20:27
11	07:20	06:57 16:40-16:56/16	06:16 06:38-07:43/65	06:25 18:44-18:58/14	05:44	05:25
	16:48	17:25 15:59-16:32/33	17:58	19:31	20:02	20:27
12	07:20	06:56 16:39-16:58/19	06:15 06:37-07:42/65	06:24 18:45-18:55/10	05:43	05:25
	16:49	17:26 16:00-16:32/32	17:59	19:32	20:03	20:28
13	07:20	06:54 16:38-16:59/21 16:01-16:31/30	06:13 06:38-07:42/64	06:22	05:42	05:24
	16:50	17:28 07:14-07:17/3	18:00	19:33	20:04	20:28
14	07:19	06:53 16:37-16:59/22 16:02-16:29/27	06:11 06:38-07:40/62	06:21	05:41	05:24
	16:52	17:29 07:13-07:24/11	18:01	19:34	20:05	20:29
15	07:19	06:52 16:36-17:00/24 16:03-16:28/25	06:10 06:38-07:39/61	06:19	05:40	05:24
	16:53	17:30 07:11-07:27/16	18:02	19:35	20:06	20:29
16	07:19	06:51 16:36-17:01/25 16:05-16:27/22	06:08 06:39-07:39/60	06:18	05:39	05:24
	16:54	17:31 07:10-07:31/21	18:03	19:36	20:07	20:30
17	07:18	06:49 16:35-17:01/26 16:07-16:24/17	06:07 06:39-07:37/58	06:16	05:38	05:24
	16:55	17:33 07:09-07:33/24	18:04	19:37	20:08	20:30
18	07:18	06:48 16:36-17:01/25 16:11-16:21/10	06:05 06:39-07:36/57	06:15	05:37	05:25
	16:56	17:34 07:07-07:34/27	18:05	19:38	20:09	20:30
19	07:17	06:47 16:36-17:01/25	06:03 06:41-07:35/54	06:13	05:36	05:25
	16:57	17:35 07:06-07:36/30	18:07	19:39	20:10	20:31
20	07:17 16:07-16:18/11	06:45 16:36-17:00/24	06:02 06:41-07:33/52	06:12	05:36	05:25
	16:58	17:36 07:04-07:37/33	18:08	19:40	20:11	20:31
21	07:16 16:04-16:20/16	06:44 16:37-17:00/23	06:00 06:42-07:31/49	06:10	05:35	05:25
	17:00	17:37 07:03-07:39/36	18:09 17:42-17:44/2	19:41	20:12	20:31
22	07:16 16:02-16:22/20	06:42 16:37-16:59/22	05:58 06:43-07:30/47	06:09	05:34	05:25
	17:01	17:38 07:01-07:40/39	18:10 17:38-17:49/11	19:42	20:13	20:31
23	07:15 16:01-16:23/22	06:41 16:38-16:58/20	05:57 06:44-07:28/44	06:07	05:33	05:25
	17:02	17:40 07:00-07:41/41	18:11 17:36-17:50/14	19:43	20:14	20:32
24	07:14 16:01-16:25/24	06:40 16:39-16:56/17	05:55 06:46-07:25/39	06:06	05:32	05:26
	17:03	17:41 06:59-07:42/43	18:12 17:34-17:50/16	19:44	20:14	20:32
25	07:14 16:00-16:26/26	06:38 16:41-16:55/14	05:53 06:48-07:23/35	06:04	05:32	05:26
	17:04	17:42 06:57-07:43/46	18:13 17:33-17:51/18	19:45	20:15	20:32
26	07:13 15:59-16:27/28	06:37 16:44-16:52/8	05:52 06:50-07:20/30	06:03	05:31	05:26
	17:05	17:43 06:56-07:44/48	18:14 17:32-17:51/19	19:47	20:16	20:32
27	07:12 15:58-16:28/30	06:35 06:54-07:44/50	05:50 06:52-07:16/24	06:02	05:30	05:27
	17:07	17:44	18:15 17:32-17:51/19	19:48	20:17	20:32
28	07:11 15:57-16:29/32	06:34 06:53-07:45/52	05:48 06:58-07:11/13	06:00	05:30	05:27
	17:08	17:45	18:16 17:32-17:51/19	19:49	20:18	20:32
29	07:10 15:57-16:30/33		06:47 18:32-18:50/18	05:59	05:29	05:27
	17:09		19:17	19:50	20:19	20:32
30	07:09 15:58-16:32/34		06:45 18:32-18:49/17	05:58	05:29	05:28
	17:10		19:18	19:51	20:19	20:32
31	07:09 15:57-16:32/35		06:43 18:33-18:48/15		05:28	
	17:12		19:19 18:53-18:56/3		20:20	
Potential sun hours	298	298	369	398	448	451
Sum of minutes with flicker	311	1427	1656	210	0	0

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

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

WTG: DM 7 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (11)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	July	August	September	October	November	December
1	05:28	05:52	06:22 18:43-18:57/14	06:52 07:17-08:21/64	06:26 16:12-16:23/11	07:00
	20:32	20:13	19:30	18:40	16:54 15:28-16:02/34	16:30
2	05:29	05:53	06:23 18:42-18:58/16	06:53 07:16-08:21/65	06:27 16:16-16:19/3	07:01
	20:32	20:12	19:29	18:39	16:53 15:27-16:02/35	16:30
3	05:29	05:54	06:24 18:40-18:58/18	06:54 07:16-08:21/65	06:28 15:27-16:03/36	07:02
	20:32	20:11	19:27	18:37	16:51	16:29
4	05:30	05:55	06:25 18:40-18:59/19	06:55 07:15-08:21/66	06:29 15:27-16:03/36	07:03
	20:31	20:10	19:26	18:35	16:50	16:29
5	05:30	05:56	06:26 18:39-18:59/20	06:56 07:16-08:21/65	06:31 15:26-16:03/37	07:04
	20:31	20:09	19:24	18:34	16:49	16:29
6	05:31	05:57	06:27 18:39-18:58/19	06:57 07:17-08:21/64	06:32 15:27-16:04/37	07:05
	20:31	20:08	19:22	18:32	16:48	16:29
7	05:32	05:58	06:28 18:39-18:58/19	06:58 07:18-08:20/62	06:33 15:27-16:04/37	07:06
	20:31	20:06	19:21	18:30	16:47	16:29
8	05:32	05:59	06:29 18:39-18:57/18	06:59 07:19-08:20/61	06:34 15:27-16:04/37	07:07
	20:30	20:05	19:19	18:29	16:46	16:29
9	05:33	06:00	06:30 18:38-18:55/17	07:00 07:20-08:19/59	06:35 15:27-16:03/36	07:08
	20:30	20:04	19:17	18:27	16:45	16:29
10	05:33	06:01	06:31 18:31-18:34/3	07:01 07:21-08:19/58	06:36 15:28-16:04/36	07:09
	20:30	20:03	19:16 18:39-18:53/14	18:26	16:44	16:29
11	05:34	06:02	06:32 18:27-18:37/10	07:02 07:23-08:19/56	06:38 15:28-16:03/35	07:10
	20:29	20:01	19:14 18:40-18:51/11	18:24	16:43	16:29
12	05:35	06:03	06:33 18:25-18:39/14	07:03 07:24-08:19/55	06:39 15:29-16:03/34	07:11
	20:29	20:00	19:12 18:43-18:48/5	18:22	16:42	16:29
13	05:36	06:04	06:34 18:23-18:40/17	07:04 07:25-08:18/53	06:40 15:29-16:02/33	07:11
	20:28	19:59	19:11	18:21	16:41	16:29
14	05:36	06:05	06:35 18:22-18:40/18	07:06 07:26-08:17/51	06:41 15:30-16:02/32	07:12
	20:28	19:57	19:09	18:19	16:40	16:29
15	05:37	06:06	06:36 07:48-07:59/11	07:07 07:27-08:16/49	06:42 15:31-16:01/30	07:13
	20:27	19:56	19:07 18:21-18:40/19	18:18	16:39	16:29
16	05:38	06:07	06:37 07:43-08:04/21	07:08 17:15-17:25/10	06:44 15:32-16:00/28	07:14
	20:27	19:55	19:06 18:21-18:40/19	18:16 07:28-08:15/47	16:38	16:30
17	05:39	06:08	06:38 07:39-08:08/29	07:09 17:12-17:27/15	06:45 15:33-15:59/26	07:14
	20:26	19:53	19:04 18:21-18:40/19	18:15 07:29-08:14/45	16:38	16:30
18	05:39	06:09	06:39 07:36-08:10/34	07:10 17:10-17:28/18	06:46 15:35-15:59/24	07:15
	20:25	19:52	19:02 18:21-18:39/18	18:13 07:30-08:13/43	16:37	16:30
19	05:40	06:10	06:40 07:33-08:12/39	07:11 17:08-17:29/21	06:47 15:36-15:58/22	07:16
	20:25	19:50	19:00 18:21-18:38/17	18:12 07:32-08:12/40	16:36	16:31
20	05:41	06:11	06:41 07:31-08:14/43	07:12 17:08-17:31/23	06:48 15:37-15:57/20	07:16
	20:24	19:49	18:59 18:22-18:36/14	18:10 07:33-08:11/38	16:35	16:31
21	05:42	06:12	06:42 07:29-08:15/46	07:13 17:07-17:31/24	06:49 15:39-15:55/16	07:17
	20:23	19:47	18:57 18:23-18:35/12	18:09 07:34-08:09/35	16:35	16:32
22	05:43	06:12	06:43 07:27-08:16/49	07:14 17:06-17:31/25	06:50 15:43-15:54/11	07:17
	20:22	19:46	18:55 18:25-18:31/6	18:07 07:35-08:08/33	16:34	16:32
23	05:44	06:13	06:44 07:26-08:17/51	07:15 17:06-17:31/25	06:52	07:18
	20:22	19:44	18:54	18:06 07:36-08:06/30	16:33	16:33
24	05:45	06:14	06:45 07:24-08:18/54	07:17 17:05-17:31/26	06:53	07:18
	20:21	19:43	18:52	18:04 07:37-08:04/27	16:33	16:33
25	05:45	06:15	06:46 07:23-08:19/56	06:18 16:06-16:31/25	06:54	07:19
	20:20	19:41	18:50	17:03 06:39-07:02/23	16:32	16:34
26	05:46	06:16	06:47 07:22-08:19/57	06:19 16:06-16:31/25	06:55	07:19
	20:19	19:40	18:49	17:02 06:40-07:00/20	16:32	16:34
27	05:47	06:17	06:48 07:21-08:20/59	06:20 16:06-16:30/24	06:56	07:19
	20:18	19:38	18:47	17:00 06:41-06:56/15	16:31	16:35
28	05:48	06:18	06:49 07:20-08:20/60	06:21 16:06-16:29/23	06:57	07:20
	20:17	19:37	18:45	16:59 06:42-06:52/10	16:31	16:36
29	05:49	06:19	06:50 07:19-08:21/62	06:22 16:07-16:28/21	06:58	07:20
	20:16	19:35	18:44	16:58 15:31-16:01/30	16:30	16:36
30	05:50	06:20 18:50-18:51/1	06:51 07:18-08:21/63	06:23 16:09-16:27/18	06:59	07:20
	20:15	19:34	18:42	16:56 15:29-16:02/33	16:30	16:37
31	05:51	06:21 18:45-18:55/10		06:25 16:10-16:26/16		07:21
	20:14	19:32		16:55 15:28-16:02/34		16:38
Potential sun hours	458	427	375	346	299	289
Sum of minutes with flicker	0	11	1110	1843	686	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	Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	Minutes with flicker

## SHADOW - Calendar per WTG

WTG: DM 8 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (15)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June	July	August	September	October	November	December
1   07:21	07:08		06:32 16:43-17:12/29	06:42	05:56	05:28	05:52	06:22		06:52 17:38-18:07/29	06:28 06:47-06:57/10	07:00
1   16:39	17:13		17:47	19:20	19:52	20:21	20:32	20:13	19:30	18:40	16:54	16:30
2   07:21	07:07		06:31 16:42-17:11/29	06:40	05:55	05:27	05:29	05:53	06:23	06:53 17:33-17:35/2	06:27 06:49-06:57/8	07:01
1   16:40	17:14		17:48	19:21	19:53	20:22	20:32	20:12	19:29	18:39 17:39-18:06/27	16:53	16:30
3   07:21	07:06		06:29 16:43-17:12/29	06:38	05:54	05:27	05:29	05:54	06:24	06:54 17:27-18:04/37	06:28 06:50-06:56/6	07:02
1   16:41	17:15		17:49	19:22	19:54	20:22	20:32	20:11	19:27	18:37	16:51	16:29
4   07:21	07:05		06:27 16:42-17:11/29	06:37	05:52	05:26	05:30	05:55	06:25	06:55 17:24-18:02/38	06:29 06:51-06:54/3	07:03
1   16:41	17:17		17:50	19:23	19:55	20:23	20:31	20:10	19:26	18:35	16:50	16:29
5   07:21	07:04		06:26 16:43-17:11/28	06:35	05:51	05:26	05:30	05:56	06:26	06:56 17:22-18:00/38	06:30	07:04
1   16:42	17:18		17:51	19:24	19:56	20:24	20:31	20:09	19:24	18:34	16:49	16:29
6   07:21	07:03 07:22-07:23/1		06:24 16:43-17:09/26	06:33	05:50	05:26	05:31	05:57	06:27	06:57 17:21-17:44/23	06:32	07:05
1   16:43	17:19		17:52	19:26	19:57	20:24	20:31	20:07	19:22	18:32 17:45-17:57/12	16:48	16:29
7   07:21	07:01 07:21-07:25/4		06:23 16:43-17:08/25	06:32	05:49	05:25	05:31	05:58	06:28	06:58 17:19-17:45/26	06:33	07:06
1   16:44	17:20		17:53 17:10-17:18/8	19:27	19:58	20:25	20:31	20:09	19:21	18:30	16:47	16:29
8   07:21	07:00 07:20-07:26/6		06:21 16:45-17:22/37	06:30	05:48	05:25	05:32	05:59	06:29	06:59 17:18-17:45/27	06:34	07:07
1   16:45	17:22		17:55	19:28	19:59	20:26	20:30	20:05	19:19	18:29	16:46	16:29
9   07:21	06:59 07:19-07:27/8		06:20 16:46-17:24/38	06:29	05:46	05:25	05:33	06:00	06:30	07:00 17:17-17:45/28	06:35	07:08
10   07:21	06:58 07:18-07:29/11		06:18 16:48-17:26/38	06:27	05:45	05:25	05:33	06:01	06:31	07:01 17:16-17:45/29	06:36	07:09
11   07:20	06:57 07:16-07:28/12		06:16 16:51-17:00/9	06:25	05:44	05:25	05:34	06:02	06:32	07:02 17:16-17:45/29	06:38	07:10
1   16:48	17:25		17:58 17:01-17:27/26	19:31	20:02	20:27	20:29	20:01	19:14	18:24	16:43	16:29
12   07:20	06:56 07:15-07:29/14		06:15 16:59-17:27/28	06:24	05:43	05:25	05:35	06:03	06:33	07:03 17:17-17:46/29	06:39	07:11
1   16:49	17:26		17:59	19:32	20:03	20:28	20:29	20:00	19:12	18:22	16:42	16:29
13   07:20	06:54 07:14-07:30/16		06:13 16:59-17:28/29	06:22	05:42	05:24	05:36	06:04	06:34	07:04 17:16-17:45/29	06:40	07:11
1   16:50	17:28		18:00	19:33	20:04	20:28	20:28	19:59	19:11	18:21	16:41	16:29
14   07:19	06:53 07:13-07:30/17		06:11 16:58-17:28/30	06:21	05:41	05:24	05:36	06:05	06:35	07:06 17:16-17:44/28	06:41	07:12
1   16:51	17:29		18:01	19:34	20:05	20:29	20:28	19:57	19:09	18:19	16:40	16:29
15   07:19	06:52 07:11-07:30/19		06:10 16:57-17:28/31	06:19	05:40	05:24	05:37	06:08	06:36	07:07 17:16-17:44/28	06:42	07:13
1   16:53	17:30		18:02	19:35	20:06	20:29	20:27	19:56	19:07	18:18	16:39	16:29
16   07:19	06:51 07:10-07:30/20		06:08 16:57-17:28/31	06:18	05:39	05:24	05:38	06:07	06:37	07:08 17:17-17:42/25	06:43	07:14
1   16:54	17:31		18:03	19:36	20:07	20:30	20:27	19:55	19:05	18:16	16:38	16:30
17   07:18	06:49 07:09-07:30/21		06:07 16:56-17:28/32	06:16	05:38	05:24	05:39	06:08	06:38 17:54-18:02/8	07:09 17:17-17:41/24	06:45	07:14
1   16:55	17:33		18:04	19:37	20:08	20:30	20:26	19:53	19:04	18:15	16:37	16:30
18   07:18	06:48 07:07-07:29/22		06:05 16:56-17:27/31	06:15	05:37	05:24	05:39	06:09	06:39 17:50-18:05/15	07:10 07:40-07:52/12	06:46	07:15
1   16:56	17:34		18:05	19:38	20:09	20:30	20:25	19:52	19:02	18:13 17:18-17:40/22	16:37	16:30
19   07:17	06:47 07:06-07:29/23		06:03 16:57-17:27/30	06:13	05:36	05:25	05:40	06:09	06:40 17:47-18:07/20	07:11 07:38-07:55/17	06:47	07:16
1   16:57	17:35		18:06	19:39	20:10	20:31	20:25	19:50	19:00	18:12 17:19-17:38/19	16:36	16:31
20   07:17	06:45 07:04-07:27/23		06:02 16:57-17:26/29	06:12	05:36	05:25	05:41	06:10	06:41 17:45-18:08/23	07:12 07:36-07:57/21	06:48	07:16
1   16:58	17:36		18:08	19:40	20:11	20:31	20:24	19:49	18:59	18:10 17:22-17:36/14	16:35	16:31
21   07:16	06:44 07:05-07:26/21		06:00 16:57-17:25/28	06:10	05:35	05:25	05:42	06:11	06:42 17:44-18:09/25	07:13 07:35-07:57/22	06:49	07:17
1   16:59	17:37 16:53-17:03/10		18:00	19:41	20:12	20:31	20:23	19:47	18:57	18:09 17:26-17:32/6	16:35	16:32
22   07:16	06:42 07:05-07:24/19		05:58 16:58-17:24/26	06:09	05:34	05:25	05:43	06:12	06:43 17:42-18:10/28	07:14 07:35-07:58/23	06:50	07:17
1   17:01	17:38 16:50-17:06/16		18:10	19:42	20:13	20:31	20:22	19:46	18:55	18:07	16:34	16:32
23   07:15	06:41 07:08-07:23/15		05:57 16:59-17:22/23	06:07	05:33	05:25	05:44	06:13	06:44 17:41-18:10/29	07:15 07:36-07:58/22	06:52	07:18
1   17:02	17:40 16:48-17:08/20		18:11	19:43	20:13	20:32	20:22	19:44	18:54	18:06	16:33	16:33
24   07:14	06:39 07:11-07:20/9		05:58 17:00-17:20/20	06:06	05:32	05:26	05:45	06:14	06:45 17:40-18:10/30	07:17 07:37-07:59/22	06:53	07:18
1   17:03	17:41 16:46-17:09/23		18:12	19:44	20:14	20:32	20:21	19:43	18:52	18:04	16:33	16:33
25   07:13	06:38 16:45-17:10/25		05:53 17:02-17:18/16	06:04	05:32	05:26	05:45	06:15	06:46 17:40-18:10/30	06:18 06:39-07:00/21	06:54	07:19
1   17:04	17:42		18:13	19:45	20:15	20:32	20:20	19:41	18:50	17:03	16:32	16:34
26   07:13	06:37 16:44-17:10/26		05:52 17:05-17:15/10	06:03	05:31	05:26	05:46	06:16	06:47 17:39-18:10/31	06:19 06:40-07:00/20	06:55	07:19
1   17:05	17:43		18:14	19:46	20:16	20:32	20:21	19:40	18:49	17:02	16:32	16:34
27   07:12	06:35 16:44-17:11/27		05:50	06:02	05:30	05:27	05:47	06:17	06:48 17:39-18:10/31	06:20 06:41-06:59/18	06:56	07:19
1   17:07	17:44		18:15	19:48	20:17	20:32	20:21	19:38	18:47	17:00	16:31	16:35
28   07:11	06:34 16:43-17:11/28		05:48	06:00	05:30	05:27	05:48	06:18	06:49 17:38-18:09/31	06:21 06:42-06:59/17	06:57	07:20
1   17:08	17:45		18:16	19:49	20:18	20:32	20:21	19:37	18:45	16:59	16:31	16:36
29   07:10			06:47	05:59	05:29	05:27	05:49	06:19	06:50 17:38-18:09/31	06:22 06:44-07:00/16	06:58	07:20
1   17:09			19:17	19:50	20:19	20:32	20:21	19:35	18:44	16:58	16:30	16:36
30   07:09			06:45	05:58	05:29	05:28	05:50	06:20	06:51 17:38-18:08/30	06:23 06:45-06:59/14	06:59	07:20
1   17:10			19:18	19:51	20:19	20:32	20:15	19:34	18:42	16:56	16:30	16:37
31   07:09			06:43		05:28		05:51	06:21		06:25 06:46-06:58/12		07:20
1   17:12			19:19		05:20		02:14	19:32		16:55		16:38
Potential sun hours	298	298	369	398	448	451	458	427	375	346	299	289
Sum of minutes with flicker	0	456	745	0	0	0	0	0	362	826	27	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

WTG: DM 9 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	January	February	March	April	May	June
1	07:21 13:36-14:26/50 16:39 08:58-10:04/66	07:08 17:13 17:47	06:32 17:14 17:48	06:42 18:32-18:56/24 19:20 19:52 18:56-19:28/32	05:56 18:31-18:42/11 05:55 18:54-19:30/36	05:28 18:50-19:36/46 20:21 05:27 18:51-19:36/45
2	07:21 13:37-14:26/49	07:07 06:31	06:40 18:29-18:57/28 19:21 19:53	05:55 18:54-19:30/36	05:27 18:51-19:36/45	02:22
3	07:21 13:38-14:26/48	07:06 16:41 09:00-10:04/64	06:29 17:15 17:49	06:38 18:27-18:59/32 19:22 19:54	05:54 18:53-19:31/38	05:27 18:51-19:36/45
4	07:21 13:39-14:26/47	07:05 16:41 09:01-10:05/64	06:27 17:17 17:50	06:37 18:25-19:00/35 19:23 19:55	05:52 18:52-19:32/40	05:26 18:52-19:36/44
5	07:21 13:40-14:26/46	07:04 16:42 09:01-10:05/64	06:26 17:18 17:51	06:35 18:23-19:01/38 19:24 19:56	05:51 18:52-19:33/41	05:26 18:53-19:36/43
6	07:21 13:42-14:26/44	07:03 16:43 09:02-10:05/63	06:24 17:19 17:52	06:33 18:22-19:02/40 19:25 19:57	05:50 18:50-19:33/43	05:26 18:52-19:35/43
7	07:21 13:43-14:25/42	07:01 16:44 09:03-10:05/62	06:23 17:20 17:53	06:32 18:21-19:02/41 19:27 19:58	05:49 18:49-19:34/45	05:25 18:53-19:35/42
8	07:21 13:45-14:25/40	07:00 16:45 09:04-10:05/61	06:21 17:21 17:54	06:30 18:20-19:03/43 19:28 19:59	05:48 18:49-19:34/45	05:25 18:54-19:36/42
9	07:21 13:46-14:24/38	06:59 16:46 09:05-10:04/59	06:20 17:23 17:56	06:29 18:19-19:03/44 19:29 20:00	05:46 18:48-19:35/47	05:25 18:54-19:36/42
10	07:21 13:48-14:23/35	06:58 16:47 09:06-10:04/58	06:18 17:24 17:57	06:27 18:18-19:03/45 19:30 20:01	05:45 18:48-19:35/47	05:25 18:55-19:36/41
11	07:20 13:50-14:23/33	06:57 16:48 09:07-10:04/57	06:16 17:25 17:58	06:25 18:18-19:04/46 19:31 20:02	05:44 18:48-19:36/48	05:25 18:54-19:35/41
12	07:20 13:52-14:21/29	06:56 16:49 09:07-10:02/55	06:15 17:26 17:59	06:24 18:17-19:03/46 19:32 20:03	05:43 18:47-19:36/49	05:24 18:55-19:35/40
13	07:20 13:55-14:19/24	06:54 16:50 09:09-10:02/53	06:13 17:28 18:00	06:22 18:17-19:04/47 19:33 20:04	05:42 18:47-19:36/49	05:24 18:55-19:35/40
14	07:19 13:59-14:17/18	06:53 16:51 09:11-10:02/51	06:11 17:29 18:01	06:21 18:16-19:03/47 19:34 20:05	05:41 18:47-19:36/49	05:24 18:56-19:35/39
15	07:19 14:03-14:13/10	06:52 16:53 09:11-10:01/50	06:10 17:30 18:02	06:19 18:17-19:03/46 19:35 20:06	05:40 18:46-19:36/50	05:24 18:56-19:35/39
16	07:19 09:13-10:00/47	06:51 16:54	06:08 17:31 18:03	06:18 18:16-19:02/46 19:36 20:07	05:39 18:46-19:36/50	05:24 18:56-19:35/39
17	07:18 09:14-09:59/45	06:49 16:55	06:07 17:32 18:04	06:16 18:17-19:02/45 19:37 20:08	05:38 18:46-19:36/50	05:24 18:58-19:36/38
18	07:18 09:16-09:58/42	06:48 16:56	06:05 17:34 18:05	06:15 18:16-19:01/45 19:38 20:09	05:37 18:47-19:37/50	05:24 18:58-19:36/38
19	07:17 09:18-09:56/38	06:47 16:57	06:03 17:35 18:06	06:13 18:17-19:01/44 19:39 20:10	05:36 18:47-19:37/50	05:25 18:58-19:36/38
20	07:17 09:20-09:55/35	06:45 16:58	06:02 17:36 18:08	06:12 18:17-19:00/43 19:40 20:11	05:36 18:47-19:37/50	05:25 18:58-19:36/38
21	07:16 09:22-09:53/31	06:44 16:59	06:00 06:18-06:20/2 17:37 18:09	06:10 18:17-19:00/43 19:41 20:12	05:35 18:47-19:37/50	05:25 18:58-19:36/38
22	07:16 09:25-09:50/25	06:42 17:01	05:58 06:17-06:20/3 17:38 18:10	06:09 18:17-18:58/41 19:42 20:13	05:34 18:48-19:37/49	05:25 18:58-19:36/38
23	07:15 09:28-09:47/19	06:41 17:02	05:57 06:15-06:18/3 17:40 18:11	06:07 18:18-18:58/40 19:43 20:13	05:33 18:47-19:37/50	05:25 18:59-19:37/38
24	07:14 09:36-09:41/5	06:39 17:03	05:55 06:13-06:17/4 17:41 18:12	06:06 18:19-18:57/38 19:44 20:14	05:32 18:47-19:37/50	05:26 18:59-19:37/38
25	07:13 17:04	06:38 17:42	05:53 06:12-06:16/4 18:13	06:04 18:20-18:55/35 19:45 20:15	05:32 18:48-19:37/49	05:26 18:59-19:37/38
26	07:13 17:05	06:37 17:43	05:52 06:10-06:13/3 18:14	06:03 18:21-18:54/33 19:46 20:16	05:31 18:48-19:37/49	05:26 19:00-19:38/38
27	07:12 17:07	06:35 17:44	05:50 18:15	06:02 18:23-18:53/30 19:48 19:07-19:20/13	05:30 18:48-19:36/48	05:27 18:59-19:38/39
28	07:11 17:08	06:34 17:45	05:48 18:16	06:00 18:23-18:51/28 19:49 19:02-19:23/21	05:30 18:49-19:37/48	05:27 18:59-19:38/39
29	07:10 17:09	06:47 19:17	05:59 18:25-18:49/24 19:50 19:00-19:26/26	05:29 18:49-19:36/47 20:19 20:32	05:27 19:00-19:39/39	05:27 18:59-19:38/39
30	07:09 17:10	06:45 19:18	18:41-18:47/6 19:51 18:58-19:28/30	05:58 18:28-18:47/19 20:19 20:32	05:29 18:50-19:37/47 20:19 20:32	05:28 18:59-19:39/40
31	07:09 17:12	06:43 19:19	18:35-18:53/18 20:20	05:28 18:50-19:36/46 20:20 20:20	048 451	1208
	Potential sun hours Sum of minutes with flicker	298 1732	0 43	1246 1453		

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

WTG: DM 9 - VESTAS V150-6.0 6000 150.0 !O! hub: 105,0 m (TOT: 180,0 m) (10)

Assumptions for shadow calculations

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

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

### Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
354	170	170	340	926	389	127	141	757	1.019	1.408	1.273	7.074

	July	August	September	October	November	December
1	05:28 19:00-19:40/40	05:52 18:58-19:46/48	06:22 18:17-19:03/46	06:52 06:26	07:00 13:33-14:04/31	
	20:32	20:13	19:30	18:40 16:54	16:30 08:49-09:46/57	
2	05:29 18:59-19:40/41	05:53 18:58-19:46/48	06:23 18:17-19:02/45	06:53 06:27	07:01 13:31-14:06/35	
	20:32	20:12	19:29	18:38 16:53	16:30 08:49-09:47/58	
3	05:29 19:00-19:41/41	05:54 18:59-19:46/47	06:24 18:17-19:01/44	06:54 06:28	07:02 13:30-14:08/38	
	20:32	20:11	19:27	18:37 16:51	16:29 08:49-09:48/59	
4	05:30 18:59-19:41/42	05:55 18:59-19:45/46	06:25 18:17-19:00/43	06:55 06:29	07:03 13:29-14:09/40	
	20:31	20:10	19:25	18:35 16:50	16:29 08:49-09:49/60	
5	05:30 18:59-19:42/43	05:56 19:00-19:45/45	06:26 18:18-18:59/41	06:56 06:30	07:04 13:29-14:10/41	
	20:31	20:09	19:24	18:34 16:49	16:29 08:48-09:50/62	
6	05:31 18:59-19:41/42	05:57 18:59-19:43/44	06:27 18:18-18:58/40	06:57 06:32	07:05 13:28-14:12/44	
	20:31	20:07	19:22	18:32 16:48	16:29 08:48-09:51/63	
7	05:31 18:59-19:42/43	05:58 19:00-19:42/42	06:28 18:19-18:57/38	06:58 06:33	07:06 13:28-14:13/45	
	20:31	20:06	19:21	18:30 16:47	16:29 08:49-09:52/63	
8	05:32 18:59-19:43/44	05:59 19:01-19:41/40	06:29 18:20-18:55/35	06:59 06:34	07:07 13:27-14:14/47	
	20:30	20:05	19:19	18:29 16:46	16:29 08:49-09:53/64	
9	05:33 18:58-19:43/45	06:00 19:01-19:40/39	06:30 18:20-18:53/33	07:00 06:35	07:08 13:27-14:15/48	
	20:30	20:04	19:17	18:27 16:45	16:29 08:49-09:54/65	
10	05:33 18:59-19:44/45	06:01 19:02-19:39/37	06:31 18:22-18:50/28	07:01 06:36	07:09 13:27-14:16/49	
	20:30	20:03	19:16	18:25 16:44	16:29 08:49-09:54/65	
11	05:34 18:59-19:44/45	06:02 19:03-19:38/35	06:32 18:23-18:48/25	07:02 06:38	07:10 13:26-14:16/50	
	20:29	20:01	19:14	18:24 16:43	16:29 08:48-09:54/66	
12	05:35 18:58-19:44/46	06:03 18:38-18:52/14	06:33 18:26-18:45/19	07:03 06:39	07:11 13:26-14:17/51	
	20:29	20:00 19:05-19:37/32	19:12	18:22 16:42	16:29 08:49-09:55/66	
13	05:36 18:58-19:45/47	06:04 18:35-18:55/20	06:34 18:31-18:39/8	07:04 06:40	07:11 13:26-14:18/52	
	20:28	19:59 19:06-19:35/29	19:11	18:21 16:41	16:29 08:49-09:56/67	
14	05:36 18:58-19:45/47	06:05 18:33-18:57/24	06:35	07:06 06:41	07:12 13:27-14:19/52	
	20:28	19:57 19:08-19:33/25	19:09	18:19 16:40	16:29 08:50-09:57/67	
15	05:37 18:57-19:45/48	06:06 18:31-18:59/28	06:36	07:07 06:42	07:13 13:26-14:19/53	
	20:27	19:56 19:11-19:30/19	19:07	18:18 16:39	16:29 08:49-09:57/68	
16	05:38 18:58-19:45/47	06:07 18:29-19:00/31	06:37	07:08 06:43	07:14 13:27-14:20/53	
	20:27	19:55 19:15-19:26/11	19:05	18:16 16:38	16:30 08:50-09:58/68	
17	05:39 18:58-19:46/48	06:07 18:28-19:01/33	06:38 06:58-07:01/3	07:09 06:45	07:14 13:27-14:21/54	
	20:26	19:53	19:04	18:15 16:37	16:30 08:51-09:59/68	
18	05:39 18:58-19:47/49	06:08 18:26-19:02/36	06:39 06:59-07:03/4	07:10 06:46 09:09-09:15/6	07:15 13:27-14:21/54	
	20:25	19:52	19:02	18:13 16:37	16:30 08:51-09:59/68	
19	05:40 18:58-19:47/49	06:09 18:25-19:03/38	06:40 07:00-07:04/4	07:11 06:47 09:03-09:22/19	07:16 13:28-14:22/54	
	20:25	19:50	19:00	18:12 16:36	16:31 08:51-10:00/69	
20	05:41 18:57-19:46/49	06:10 18:24-19:04/40	06:41 07:01-07:04/3	07:12 06:48 09:00-09:25/25	07:16 13:27-14:22/55	
	20:24	19:49	18:59	18:10 16:35	16:31 08:51-10:00/69	
21	05:42 18:57-19:47/50	06:11 18:23-19:04/41	06:42 07:02-07:05/3	07:13 06:49 09:57-09:28/31	07:17 13:28-14:23/55	
	20:23	19:47	18:57	18:09 16:35	16:32 08:52-10:01/69	
22	05:43 18:57-19:47/50	06:12 18:22-19:05/43	06:43 07:03-07:05/2	07:14 06:50 08:56-09:31/35	07:17 13:28-14:23/55	
	20:22	19:46	18:55	18:07 16:34	16:32 08:52-10:01/69	
23	05:44 18:57-19:47/50	06:13 18:21-19:05/44	06:44 07:04-07:05/1	07:15 06:52 08:55-09:33/38	07:18 13:29-14:24/55	
	20:22	19:44	18:54	18:06 16:33	16:32 08:53-10:02/69	
24	05:44 18:57-19:48/51	06:14 18:20-19:04/44	06:45	07:17 06:53 08:53-09:35/42	07:18 13:30-14:24/54	
	20:21	19:43	18:52	18:04 16:33	16:33 08:53-10:02/69	
25	05:45 18:57-19:48/51	06:15 18:19-19:04/45	06:46	06:18 06:54 08:52-09:37/45	07:19 13:31-14:25/54	
	20:20	19:41	18:50	17:03 16:32	16:34 08:54-10:03/69	
26	05:46 18:57-19:47/50	06:16 18:18-19:04/46	06:47	06:19 06:55 08:51-09:38/47	07:19 13:31-14:25/54	
	20:19	19:40	18:49	17:02 16:32	16:34 08:55-10:03/68	
27	05:47 18:57-19:47/50	06:17 18:18-19:04/46	06:48	06:20 06:56 13:42-13:52/10	07:19 13:31-14:25/54	
	20:18	19:38	18:47	17:00 16:31 08:50-09:40/50	16:35 08:55-10:03/68	
28	05:48 18:57-19:47/50	06:18 18:18-19:04/46	06:49	06:21 06:57 13:39-13:57/18	07:20 13:32-14:25/53	
	20:17	19:37	18:45	16:59 16:31 08:51-09:42/51	16:36 08:56-10:04/68	
29	05:49 18:57-19:47/50	06:19 18:17-19:04/47	06:50	06:22 06:58 13:36-14:00/24	07:20 13:34-14:26/52	
	20:16	19:35	18:43	16:58 16:30 08:50-09:43/53	16:36 08:57-10:04/67	
30	05:50 18:57-19:47/50	06:20 18:17-19:04/47	06:51	06:23 06:59 13:34-14:03/29	07:20 13:34-14:26/52	
	20:15	19:34	18:42	16:56 16:30 08:50-09:44/54	16:37 08:57-10:04/67	
31	05:51 18:58-19:47/49	06:21 18:17-19:03/46		06:25		07:20 13:35-14:26/51
	20:14	19:32		16:55		16:38 08:58-10:04/66
	Potential sun hours	458	427	375	346	289
	Sum of minutes with flicker	1452	1346	465	0	577
						3576

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