

REGIONE PUGLIA
PROVINCIA DI FOGGIA
COMUNE DI APRICENA

LOCALITÀ INCORONATA - SAN SABINO

Oggetto:

PROGETTO DEFINITIVO PER LA COSTRUZIONE E L'ESERCIZIO DI UN IMPIANTO EOLICO AVENTE POTENZA PARI A 99,2 MW E RELATIVE OPERE DI CONNESSIONE - 16 AEROGENERATORI

Sezione:

SEZIONE SF - ANALISI DEL FENOMENO DI SHADOW FLICKERING

Elaborato:

RELAZIONE DI SHADOW FLICKERING

Nome file sorgente:

SEZIONE SF/EO.APR01.PD.SF.SIA.01.dwg

Numero elaborato:

EO.APR01.PD.SF.SIA.01

Scala:

Formato di stampa:

A4

Nome file stampa:

EO.APR01.PD.SF.SIA.01

Tipologia:

R

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CODICE	REV. n.	DATA REV.	REDAZIONE	VERIFICA	VALIDAZIONE
EO.APR01.PD.SF.SIA.01	00	12/2021	D. Franconiero	D. Franconiero	A. Bottone

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1 PREMESSA

Il presente elaborato è riferito al progetto per la costruzione e l'esercizio di un impianto di produzione di energia elettrica da fonte eolica, ed opere di connessione annesse, denominato "Incoronata - San Sabino", sito in agro di Apricena (FG).

In particolare, il progetto è relativo ad un impianto eolico avente potenza nominale pari a 99,2 MW e costituito da:

- N° 16 aerogeneratori aventi diametro 162 m e altezza al mozzo pari a 119 m (per un'altezza complessiva di 200 m), ciascuno avente potenza nominale pari a 6,2 MW (aerogeneratore tipo modello Vestas V162);
- Due Cabine di Raccolta e Misura in MT a 30 kV;
- Linee elettriche in MT a 30 kV in cavo interrato necessaria per l'interconnessione di 6 aerogeneratori alla prima Cabina di Raccolta e Misura;
- Linee elettriche in MT a 30 kV in cavo interrato necessaria per l'interconnessione di 10 aerogeneratori alla seconda Cabina di Raccolta e Misura;
- Una Stazione Elettrica (SE) di trasformazione 150/30 kV Utente;
- Linee elettriche in MT a 30 kV in cavo interrato necessari per l'interconnessione delle due Cabine di Raccolta e Misura alla SE Utente di cui sopra;
- Una sezione di impianto elettrico comune con due impianti fotovoltaico in sviluppo (altro operatore), necessaria per la condivisione dello Stallo AT a 150 kV, assegnato dal Gestore della Rete di Trasmissione Nazionale (RTN) all'interno della futura SE della RTN denominata "Torremaggiore". Tale sezione è localizzata in una zona adiacente alla SE Utente e contiene tutte le apparecchiature elettromeccaniche in AT necessarie per la condivisione della connessione.
- Tutte le apparecchiature elettromeccaniche in AT di competenza dell'Utente da installare all'interno della futura SE Terna "Torremaggiore", in corrispondenza dello stallo assegnato;
- Una linea elettrica in AT a 150 kV in cavo interrato di interconnessione tra la sezione di impianto comune e la futura SE RTN "Torremaggiore".

Titolare dell'iniziativa proposta è la società E-Way Finance S.p.A., avente sede legale in Via Po 23, 00198 Roma, P.IVA 15773121007.

2 INTRODUZIONE

L'elaborato in oggetto si propone di analizzare il fenomeno dello Shadow/Flickering prodotto da aerogeneratori onde poter valutare in maniera tecnica l'eventuale impatto che l'installazione dell'impianto eolico oggetto di studio potrebbe indurre nei confronti di strutture ricettive considerate ed individuate a seguire come "recettori sensibili".

Il fenomeno denominato Shadow/Flickering considera l'evoluzione diurna dell'ombreggiamento (shadow) e del "lampeggiamento" (flickering) che il movimento rotatorio delle eliche degli aerogeneratori possono produrre in determinate circostanze e condizioni meteorologiche. La proiezione al suolo dell'ombra ed il fenomeno stroboscopico di "sfarfallio" sono infatti legati a condizioni ambientali dipendenti da una molteplicità di fattori (alcuni di essi concomitanti) quali: latitudine e posizione del sole, periodo dell'anno ed ora del giorno, durata delle ore di luce giornaliera, condizioni di nuvolosità, posizione dell'aerogeneratore (sorgente) rispetto ai fabbricati, e contestuale presenza di vento utile alla rotazione delle pale ed assenza di eventuali ostacoli o corpi schermanti quali alberature o similari.

L'analisi del fenomeno in oggetto, e le relative valutazioni, è effettuata attraverso l'utilizzo dello specifico software di settore Wind Pro® che rappresenta uno degli elementi attualmente disponibili sul mercato, considerato, tra i più validi e completi strumenti di analisi per la simulazione e valutazione della maggior parte degli aspetti progettuali che caratterizzano gli impianti eolici.

Il Software Wind Pro è infatti costituito da differenti moduli sviluppati per le diverse elaborazioni e modellazioni specialistiche progettuali. Il modulo "SHADOW" è quello che nello specifico tratta il fenomeno oggetto di tale valutazione.

3 IL FENOMENO DI SHADOW-FLICKERING

Lo “Shadow”, ossia il fenomeno di ombreggiamento (dalla letterale traduzione inglese) ed il “flickering”, ossia l’effetto di lampeggiamento risultante dal movimento rotatorio delle eliche in determinate condizioni meteorologiche, sono fenomeni che si possono verificare singolarmente o simultaneamente quando i raggi solari, con la loro incidenza ed inclinazione, attraversano il rotore degli aerogeneratori.

Mentre lo “shadow” (fenomeno generato da qualsiasi elemento che si erge in altezza come ad es. tralicci elettrici, edifici etc.) può presentarsi con una più elevata frequenza dettata ad es. dal particolare periodo dell’anno, il flickering si verifica solo in particolari condizioni di incidenza solare, contestualmente alla presenza di vento etc., e coinvolge aree territoriali ristrette e poco estese nell’intorno di un singolo aerogeneratore o di un’intera wind farm. Tale fenomeno, tuttavia, potrebbe generare un effetto disturbante nei confronti delle strutture, dei loro residenti o degli ambienti esterni. Per tale motivo, sebbene ad oggi non esista una specifica normativa che individui dei riferimenti precisi, o fissi dei limiti univoci per il disturbo generato da tali fenomeni, alcuni paesi della comunità europea ed extraeuropea individuano in circa 30 ore/anno di effettiva incidenza nei confronti dei recettori sollecitati, un valore soglia di riferimento nell’ottica di attribuire un grado di rilevanza al fenomeno. Non essendo previste classificazioni di tipo numerico, alcuni paesi valutano le incidenze più elevate con una particolare terminologia quale ad es. “significant” o “unreasonable”.

L’immagine a seguire schematizza graficamente l’effetto dell’ombreggiamento indotto da un aerogeneratore nei confronti di una struttura ricettiva.



Figura 1: Esempio grafico del potenziale effetto di ombreggiamento di un aerogeneratore nei confronti di un edificio

Mentre il fenomeno dell'ombreggiamento può verificarsi con maggiore semplicità, perché il flickering si generi e produca effetti realmente percepibili, è necessario che sussistano simultaneamente alcune condizioni. In particolare, deve esserci un'intensità di vento sufficientemente sostenuto da generare il movimento rotatorio delle eliche che sia classificabile come "non lento", deve esservi la condizione di "fondo chiaro" del cielo, l'asse del rotore della turbina deve essere posizionato lungo la linea di taglio rispetto al punto di vista dell'osservatore, e deve verificarsi l'assenza di ostacoli tra il sole ed il punto di osservazione. Inoltre, perché l'effetto prodotto possa essere considerato come "effettivamente disturbante" (al di là della soggettiva valutazione), la variazione dell'intensità luminosa prodotta dalla rotazione delle pale rispetto all'ombra in movimento, deve essere superiore al livello di percezione dell'occhio umano.

L'intensità del lampeggiamento/sfarfallio legato alla rotazione delle pale diminuisce con la distanza dalla sorgente (aerogeneratore) poiché con l'allontanarsi dalla turbina diminuisce la variabilità dell'intensità luminosa fin quando l'occhio umano non è più in grado di distinguerla, ed il fenomeno risulta pertanto non più visibile. Come l'intensità delle ombre in prossimità di un qualsiasi ostacolo in altezza (turbina o altro) risulta più elevata e tende a dissiparsi e sfocarsi all'aumentare della distanza, allo stesso modo il flickering appare più intenso in prossimità della turbina poiché risulta più marcato ed evidente il movimento rotatorio ed il passaggio delle eliche rispetto alla superficie del disco radiante del sole.

In linea generale, l'intensità dello "sfarfallio" delle ombre generate dalla rotazione delle pale si smorza notevolmente diventando poco percepibile all'occhio umano, ad una distanza di circa 10 volte il diametro del rotore della turbina anche in considerazione del fatto che porzioni sempre minori del disco radiante del sole, risultano interessate dal passaggio delle eliche.

L'ambiente nel quale è collocato l'osservatore gioca inoltre un ruolo determinante nella percezione del fenomeno poiché, laddove vi sono maggiori condizioni di luminosità (es. in ambiente esterno o vani abitativi ben esposti ed illuminati), l'occhio tende a percepire in modo meno marcato la differenza di intensità del flickering rispetto a quanto non faccia se inserito in un vano poco luminoso e rivolto in direzione della sorgente. Naturalmente l'intensità e la percezione del fenomeno è correlata anche alla velocità di rotazione delle pale e quindi al numero di giri/min del rotore, e di conseguenza, alla velocità del vento.

Un valore di rotazione indicativo che alcuni paesi esteri identificano come valore soglia, risulta essere 3 passaggi al secondo (limite per il flicker), corrispondenti ad una velocità del rotore pari a circa 60 rpm (rotazioni per minuto).

Per turbine di grande taglia (che sostanzialmente presentano altezze del mozzo più rilevanti e influenti per il fenomeno in oggetto) tali velocità sono difficilmente raggiungibili, attestandosi su valori che non superano i 20 rpm (gli attuali e più moderni modelli in commercio si attestano infatti su velocità comprese tra 12 e 16 rpm), mentre valori simili sono più probabili da ottenere per impianti di mini e micro eolico che però generalmente non presentano altezze del mozzo superiori i 37- 40 m s.l.t.

Nel corso degli anni diversi studi sono stati condotti al fine di verificare la potenziale correlazione tra il fenomeno di epilessia fotosensibile e la velocità di riproduzione del flickering, e a tal proposito l'associazione Britannica di epilessia ritiene che frequenze inferiori i 3Hz non sono responsabili di tali insorgenze. Considerato che velocità di circa 20 rpm sono comparabili a valori di frequenza pari a 1Hz (ossia un ciclo al secondo), si deduce facilmente che il flickering prodotto dagli aerogeneratori attualmente in produzione, possono generare un senso di fastidio ma non possono costituire minaccia per la salute umana e non sono responsabili di epilessia per fotosensibilità.

Gli attuali strumenti informatici ed i modelli fisici e matematici implementati in specifici software di settore, sono in grado oggi di prevedere e modellare il fenomeno del flickering con dettaglio anche dell'ora e del minuto in funzione dei dati di input quali: distanza e relazioni dimensionali tra aerogeneratori e strutture (recettori), distribuzione, spaziale, geografica e dimensionale degli elementi (latitudine, longitudine, quota altimetrica, geometria ed elevazione rispetto al suolo), statistica della meteorologia locale e delle condizioni anemologiche caratteristica dell'area oggetto di analisi.

L'elaborazione di tutti i dati in input porta ad risultati di tipo numerico (in termini di numero di ore o minuti cui il fenomeno può manifestarsi), ma anche di tipo grafico come nell'immagine proposta a seguire che individua la caratteristica distribuzione annuale dell'ombra generata da una turbina in uno scenario che viene individuato come "worst case", ossia la peggiore condizione possibile che prevede l'ipotesi della turbina disposta sempre in modo ortogonale al sole e con le eliche in rotazione costante per tutti i giorni dell'anno (condizione di fatto impossibile a realizzarsi).

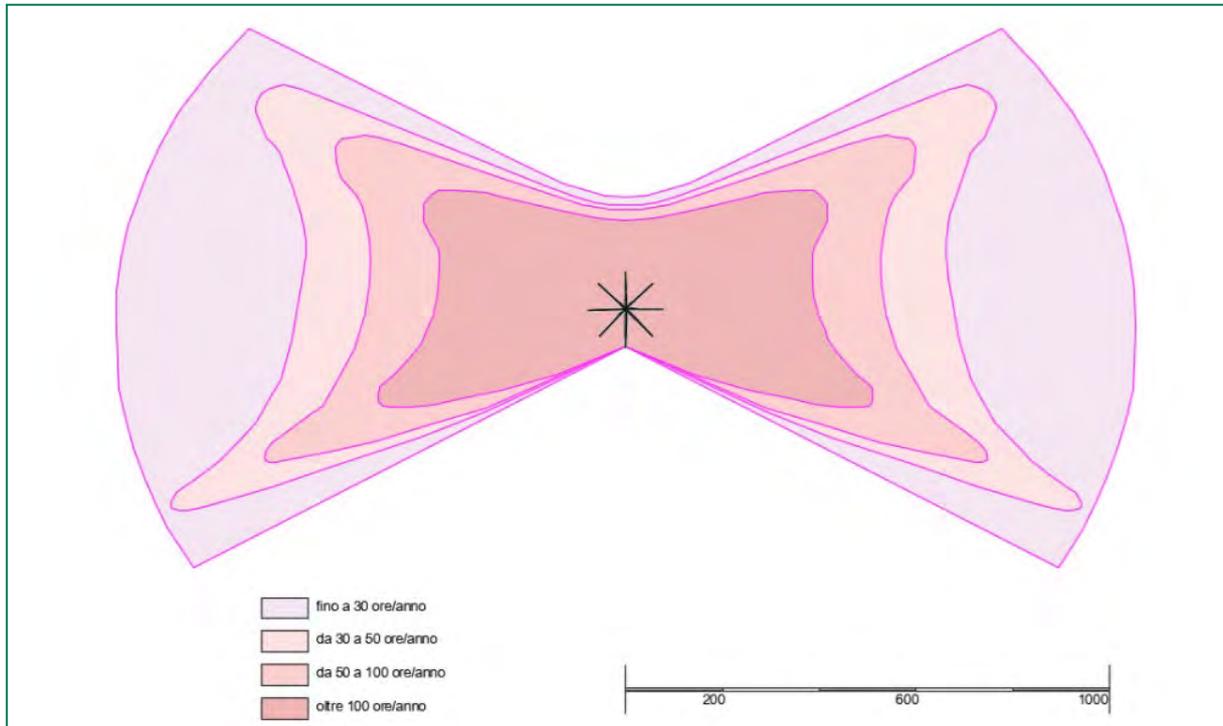


Figura 2: Evoluzione annuale tipo dell'ombra di un aerogeneratore.

Dall'immagine appare evidente come, tanto il fattore di forma, quanto il valore temporale dell'ombreggiamento generato dalla turbina, diminuisca proporzionalmente con l'aumentare della distanza dalla base torre (individuata dall'asterisco di colore nero) posta al centro di quella che individua la tipica "forma a farfalla" che ne identifica l'evoluzione annuale. In alcuni casi, tuttavia, per quanto molto limitato nel tempo, il fenomeno potrebbe manifestarsi anche a distanze superiori i 1000 m dalla sorgente ma solo in particolari condizioni al contorno relativamente a posizione geografica e stagionalità (in funzione quindi del periodo dell'anno).

4 INQUADRAMENTO TERRITORIALE

4.1 Descrizione ed inquadramento area di impianto

L'area interessata dalla proposta di intervento progettuale è localizzata in agro del Comune di Apricena, individuabile in località "Incoronata" e "San Sabino", al confine con i territori comunali di Poggio Imperiale (FG) e San Severo (FG). L'area dista circa 1,5 km in direzione sud dal centro abitato di Apricena e circa 3 km in direzione sud-ovest dal centro abitato di Poggio Imperiale.

L'orografia della zona di sviluppo è tipicamente pianeggiante e non eccessivamente variabile dal punto di vista altimetrico (dai 33,4 ai 65 m s.l.t. con eccezione di due turbine rispettivamente a 110,8 e 125 m s.l.t.). I suoli risultano essere quasi esclusivamente adibiti ad uso agricolo sostanzialmente priva di alberature di medio o alto fusto.

L'impianto in oggetto è costituito da 16 aerogeneratori di potenza nominale pari a 6,2 MW per una potenza di impianto pari a 99,2 MW.

Le turbine di progetto si inseriscono in un contesto territoriale prevalentemente privo impianti eolici ad eccezione di sporadiche singole applicazioni di tipo minieolico (potenza nominale < 60 kW). Rispetto all'estensione della totalità dell'area di sviluppo progettuale, soltanto nella zona a nord ovest, individuabile in località "Incoronata", è attualmente presente una wind farm costituita da 15 aerogeneratori.

Tabella 1: Caratteristiche impianto di progetto

Wind Farm Comune Località	N° WTG	Potenza unitaria WTG [MW]	Potenza totale impianto [MW]	Modello WTG [m]	Altezza mozzo WTG [m]	Diametri rotore WTG [m]	Altezza massima TIP (Hmozzo + D.rot/2) [m]
"Apricena"	16	6,2	99,2	Vestas - V162	119	162	200

Le turbine di progetto si inseriscono in un contesto territoriale prevalentemente privo impianti eolici ad eccezione di sporadiche singole applicazioni di tipo minieolico (potenza nominale < 60 kW). Rispetto all'estensione della totalità dell'area di sviluppo progettuale, soltanto nella zona a nord ovest, individuabile in località "Incoronata", è attualmente presente una wind farm costituita da 15 aerogeneratori.

Le immagini a seguire individuano l'area in oggetto proposta su differenti planimetrie e basi cartografiche.

Le immagini seguenti mostrano l'inquadramento geografico generale dell'area di sviluppo progettuale su base ortofoto (Google Earth) e su stralcio cartografico IGM 1:25000.

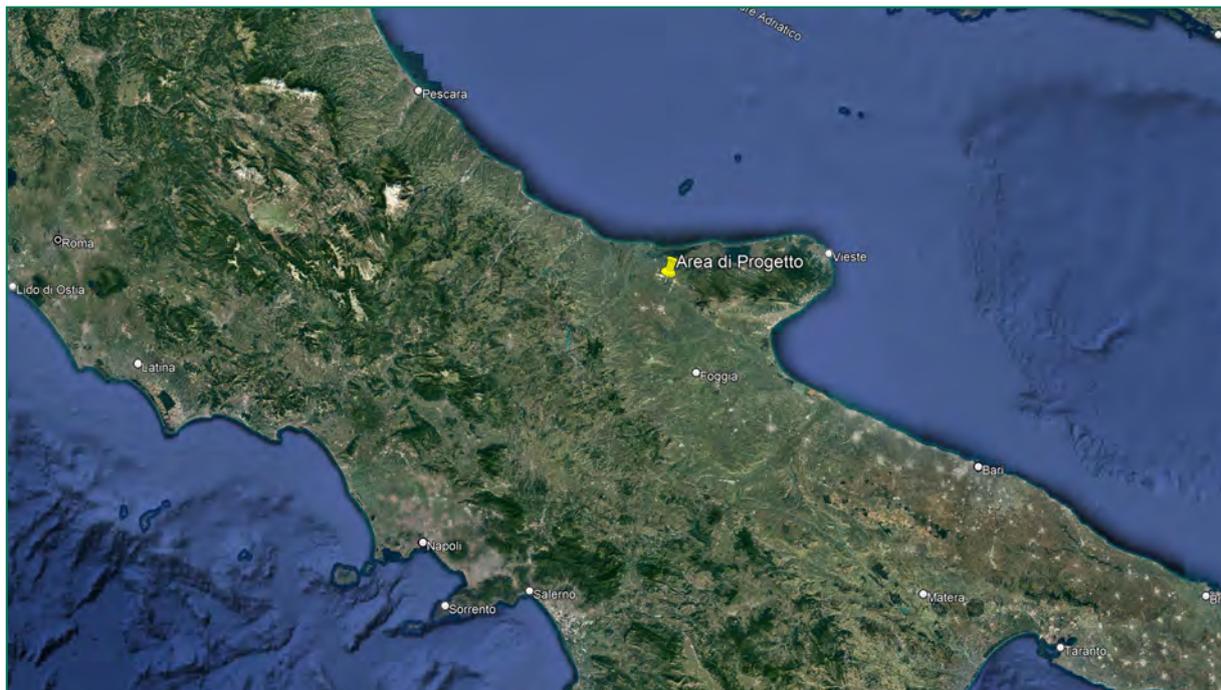


Figura 3: Inquadramento geografico generale area di impianto: Regione Puglia, Provincia di Foggia (fonte immagine satellitare Google Earth).

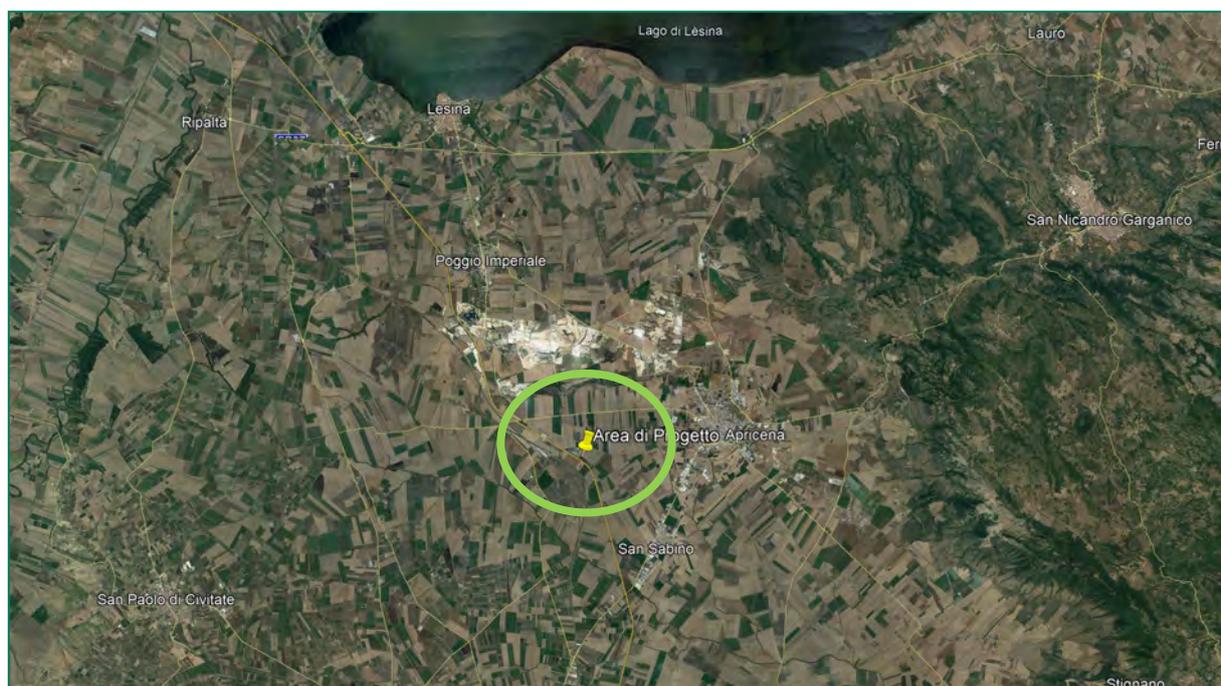


Figura 4: Inquadramento geografico: area di impianto (fonte immagine satellitare Google)

Si riporta di seguito l'inquadratura territoriale su stralcio cartografico Open-Topo-Map (proposto nella versione con e senza base cartografica per semplicità di visualizzazione) e su ortofoto (nella versione 2D e 3D fonte Google Earth). Insieme alle turbine di progetto sono rappresentate anche le turbine già presenti sul territorio e quelle in iter autorizzativo. Gli aerogeneratori di progetto sono individuabili con icone di colore rosso (▲), mentre le icone di differenti forme e colori (*) individuano gli impianti esistenti e/o di potenziale futura installazione di diversi produttori o proponenti iniziative.

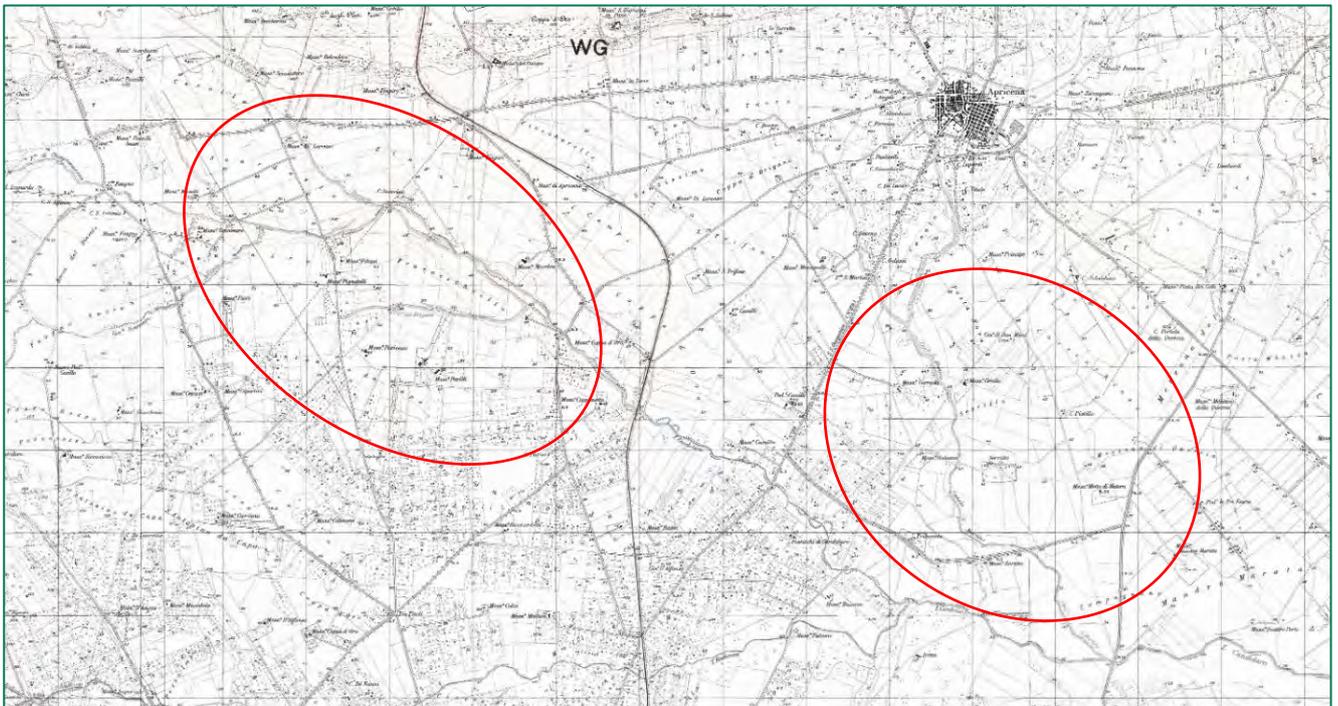


Figura 5: Inquadramento geografico – area di sviluppo progettuale su stralcio di base cartografica IGM.

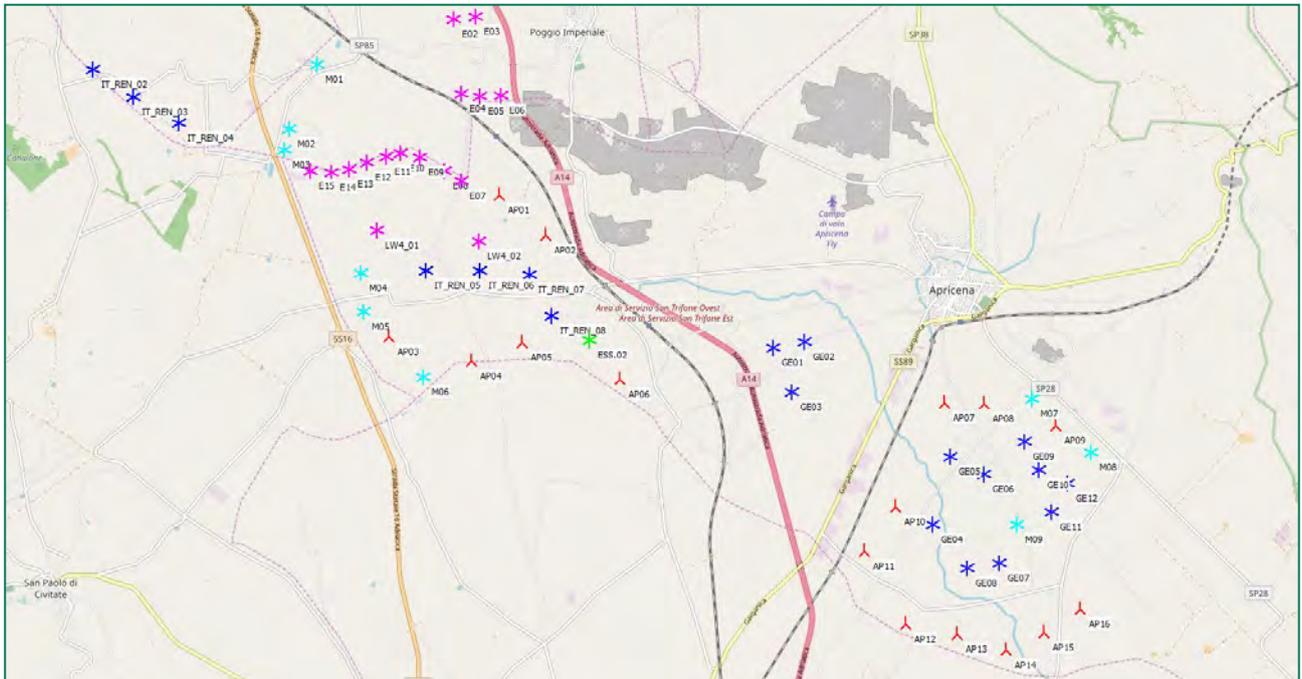


Figura 6: Inquadramento territoriale del parco eolico di progetto proposto su stralcio cartografico Open Topo Map. Le icone in colore rosso individuano le turbine di progetto.

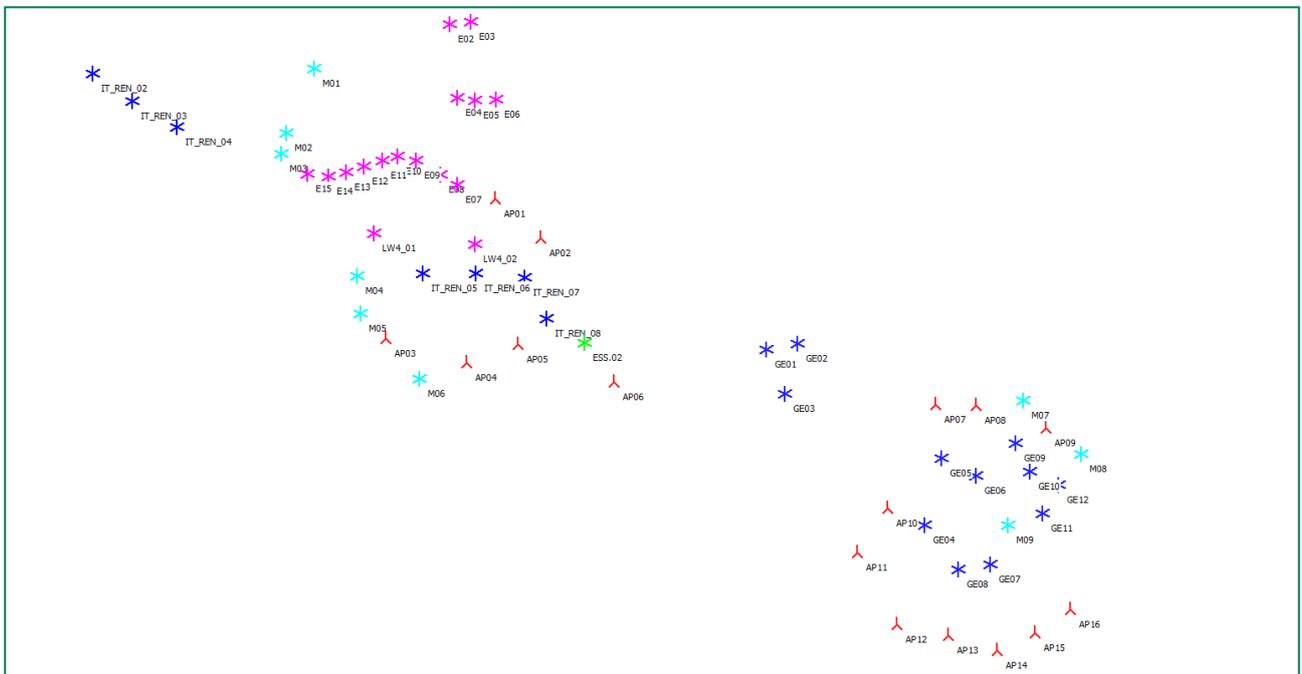


Figura 7: Inquadramento territoriale del parco eolico di progetto in assenza di cartografia di base per una più immediata identificazione dei punti. Le icone in colore rosso individuano le turbine di progetto.



Figura 8: Layout di progetto (icone in rosso loc. "Incoronata") con evidenza di tutti gli impianti considerati su stralcio ortofoto Google Earth (2D)



Figura 9: Layout di progetto (icone in rosso loc. "San Sabino") con evidenza di tutti gli impianti considerati su stralcio ortofoto Google Earth (2D)



Figura 10: Layout di progetto (Incoronata) con evidenza di tutti gli impianti considerati su stralcio ortofoto Google Earth (3D)



Figura 11 Layout di progetto (San Sabino) con evidenza di tutti gli impianti considerati su stralcio ortofoto Google Earth (3D)

4.2 Sorgenti e recettori (aerogeneratori e strutture)

Il modello di turbina ipotizzato per l'impianto di progetto è Vestas V162, con altezza al mozzo 119,0 m s.l.t. e potenza unitaria della macchina 6,2 MW. La potenza totale di impianto è pari a 99,2 MW.

Le caratteristiche geometriche e dimensionali delle turbine di progetto, unitamente ad altre caratteristiche meccaniche e prestazionali, sono utilizzate come dati di input per la modellazione software e l'elaborazione dei risultati attesi per l'evoluzione dell'ombra.

Le analisi vengono condotte nei confronti di precisi recettori preliminarmente individuati per la cui scelta e determinazione, si rimanda ai preposti elaborati progettuali.

In relazione alle strutture considerate, ed alla loro distribuzione sul territorio, vengono tenute in debita considerazione anche tutte le eventuali ulteriori turbine di grande e piccola taglia già insistenti sul territorio, autorizzate o con noto iter procedurale in stato avanzato, la cui installazione (anche potenzialmente futura) possa in qualche modo produrre effetti di tipo cumulativo con l'iniziativa progettuale in questione.

4.2.1 Turbine sorgenti

Le informazioni riportanti identificativi delle macchine, coordinate e specifiche di tutte le turbine inserite nel modello di simulazione (di progetto, esistenti ed eventualmente di notoria fase autorizzativa), sono riportate nelle tabelle a seguire.

Tabella 2: Coordinate della wind farm di progetto

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
AP01	529208	4627453	123	VESTAS V162-6.2-6.200	6.200	119,0
AP02	529995	4626779	112	VESTAS V162-6.2-6.200	6.200	119,0
AP03	527347	4625052	64	VESTAS V162-6.2-6.200	6.200	119,0
AP04	528738	4624648	60	VESTAS V162-6.2-6.200	6.200	119,0
AP05	529602	4624962	56	VESTAS V162-6.2-6.200	6.200	119,0
AP06	531250	4624334	55	VESTAS V162-6.2-6.200	6.200	119,0
AP07	536745	4623972	50	VESTAS V162-6.2-6.200	6.200	119,0
AP08	537427	4623958	50	VESTAS V162-6.2-6.200	6.200	119,0
AP09	538636	4623589	50	VESTAS V162-6.2-6.200	6.200	119,0
AP10	535936	4622202	40	VESTAS V162-6.2-6.200	6.200	119,0
AP11	535413	4621439	40	VESTAS V162-6.2-6.200	6.200	119,0
AP12	536107	4620215	35	VESTAS V162-6.2-6.200	6.200	119,0
AP13	536984	4620039	36	VESTAS V162-6.2-6.200	6.200	119,0
AP14	537818	4619786	30	VESTAS V162-6.2-6.200	6.200	119,0
AP15	538459	4620085	30	VESTAS V162-6.2-6.200	6.200	119,0
AP16	539063	4620485	30	VESTAS V162-6.2-6.200	6.200	119,0

Tabella 3: Coordinate della wind farm esistente grand eolico ERG

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
E01	527818	4631365	50	VESTAS V90-2.000	2.000	80,0
E02	528416	4630433	64	VESTAS V90-2.000	2.000	80,0
E03	528788	4630480	59	VESTAS V90-2.000	2.000	80,0
E04	528556	4629179	100	VESTAS V90-2.000	2.000	80,0
E05	528864	4629131	100	VESTAS V90-2.000	2.000	80,0
E06	529224	4629146	100	VESTAS V90-2.000	2.000	80,0
E07	528558	4627691	120	VESTAS V90-2.000	2.000	80,0
E08	528271	4627865	116	VESTAS V90-2.000	2.000	80,0
E09	527863	4628094	110	VESTAS V90-2.000	2.000	80,0
E10	527537	4628168	110	VESTAS V90-2.000	2.000	80,0
E11	527282	4628103	100	VESTAS V90-2.000	2.000	80,0
E12	526967	4627999	100	VESTAS V90-2.000	2.000	80,0
E13	526669	4627894	108	VESTAS V90-2.000	2.000	80,0
E14	526365	4627826	110	VESTAS V90-2.000	2.000	80,0
E15	526003	4627861	120	VESTAS V90-2.000	2.000	80,0

Tabella 4: Coordinate della wind farm esistente minieolico Northern

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
M01	526110	4629669	89	NORTHERN -60	60	37,0
M02	525648	4628568	120	NORTHERN -60	60	37,0
M03	525561	4628208	125	NORTHERN -60	60	37,0
M04	526864	4626123	80	NORTHERN -60	60	37,0
M05	526917	4625479	70	NORTHERN -60	60	37,0
M06	527928	4624374	64	NORTHERN -60	60	37,0
M07	538234	4624046	57	NORTHERN -60	60	37,0
M08	539237	4623138	49	NORTHERN -60	60	37,0
M09	537988	4621920	40	NORTHERN -60	60	37,0

Tabella 5: Coordinate della wind farm in iter grande eolico Lucky Wind

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
LW4_01	527138	4626853	90	VESTAS V100-2.0-2.000	2.000	95,0
LW4_02	528866	4626675	102	VESTAS V100-2.0-2.000	2.000	95,0

Tabella 6 Coordinate della wind farm in iter grande eolico Renvico

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
IT_REN_02	522328	4629564	136	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_03	523007	4629098	134	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_04	523780	4628660	124	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_05	527974	4626175	82	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_06	528879	4626173	78	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_07	529725	4626114	68	VESTAS V150-4.2-4.200	4.200	166,0
IT_REN_08	530101	4625418	60	VESTAS V150-4.2-4.200	4.200	166,0

Tabella 7: Coordinate della wind farm in iter grande eolico Wind Energy Apricena

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
GE01	533846	4624899	60	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE02	534383	4625001	58	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE03	534172	4624140	60	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE04	536564	4621912	40	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE05	536854	4623057	43	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE06	537433	4622769	42	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE07	537698	4621253	38	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE08	537151	4621167	40	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE09	538108	4623326	45	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE10	538358	4622839	41	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE11	538579	4622124	40	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9
GE12	538847	4622614	41	GE WIND ENERGY 5.5-158 GT120-5.500	5.500	120,9

Tabella 8: Coordinate della turbina di applicazione singola ESS

ID WTG	UTM WGS 84 E [m]	UTM WGS 84 N [m]	ELEVATION [m s.l.m.]	WTG TYPE	POWER [kW]	HUB HEIGHT [m s.l.t.]
ESS.02	530741	4625002	60	VESTAS V52-850	850	86,0

Le immagini a seguire riportano gli stralci delle schede tecniche (data-sheet) di tutte le tipologie di turbine coinvolte nell'elaborazione ed inserite nel modello di simulazione dalle quali si evincono caratteristiche dimensionali, meccaniche ed aerodinamiche utilizzate come dati di input per il modello previsionale dell'evoluzione dell'ombra.

Si precisa che per gli aerogeneratori di tipo "minieolico" (di taglia ≤ 60 kW), per semplicità di simulazione ove non disponibili i datasheet delle case produttrici, è stato associato un modello di turbina aventi similari caratteristiche dimensionali e potenza nominale individuata in aerogeneratore Northern Power NPS 60-21.

Document no.: 0081-5017 V07
2021-06-28

General Description

EnVentus™



Vestas Wind Systems A/S · Hedeager 42 · 8200 Aarhus N · Denmark · www.vestas.com
Classification: Restricted

Vestas

3 Mechanical Design

3.1 Rotor

The wind turbine is equipped with a rotor consisting of three blades and a hub. The blades are controlled by the microprocessor pitch control system OptiTip®. Based on the prevailing wind conditions, the blades are continuously positioned to optimise the pitch angle.

Rotor	V150	V162
Diameter	150 m	162 m
Swept Area	17671 m ²	20612 m ²
Speed, Dynamic Operation Range	4.9 - 12.6 rpm	4.3 -12.1 rpm
Rotational Direction	Clockwise (front view)	
Orientation	Upwind	
Tilt	6°	
Hub Coning	6°	
No. of Blades	3	
Aerodynamic Brakes	Full feathering	

Table 3-1: Rotor data

3.2 Blades

The blades are made of carbon and fibreglass and consist of two airfoil shells with embedded structure.

Blades	V150	V162
Blade Length	73.65 m	79.35 m
Maximum Chord	4.2 m	4.3 m
Chord at 90% blade radius	1.4 m	1.68 m
Type Description	Structural airfoil shell	
Material	Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT)	
Blade Connection	Steel roots inserted	
Airfoils	High-lift profile	

Table 3-2: Blades data

3.3 Blade Bearing

The blade bearings allow the blades to operate at varying pitch angles.

Blade Bearing	
Blade bearing type	High-capacity slewing bearing
Lubrication	Manual grease lubrication

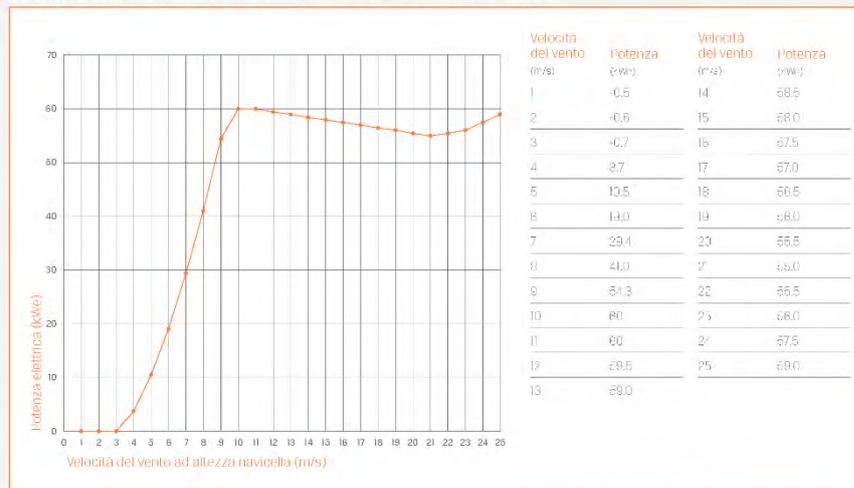
Table 3-3: Blade bearing data

Figura 12: Caratteristiche aerogeneratori della proposta progettuale Vestas V162

Specifiche

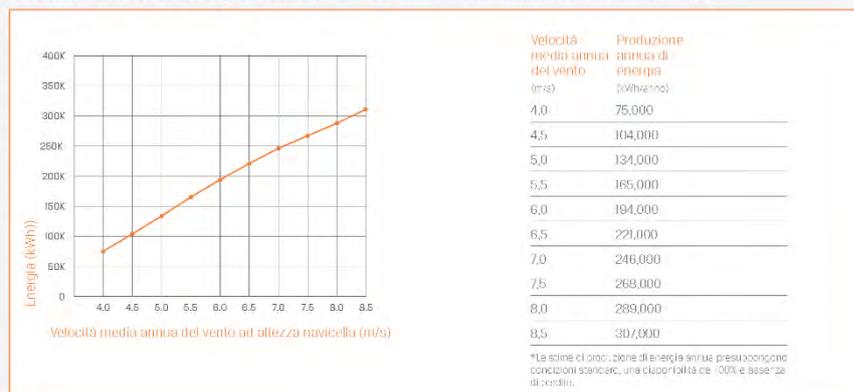


Curva di potenza: rotore di 21 metri Densità standard dell'aria (1,225 kg/m³)



La curva di potenza e la produzione annua di energia sono approssimazioni preliminari basate sulla previsione di una densità di 1,225 kg/m³ basata sui dati disponibili da misurazione in loco per i prossimi operazioni di collaudo e energia sul campo che avranno luogo da novembre a dicembre del 2023.

Produzione annua di energia*: rotore di 21 metri Densità standard dell'aria, distribuzione di Rayleigh



*Le stime di produzione di energia annua presuppongono condizioni standard, una capacità di 100% e assenza di ostacoli.



Specifiche

CONFIGURAZIONE GENERALE	DESCRIZIONE
Modello	Northwind 60
Classe di progetto	IEC IIIA (densità aria: 1,225 kg/m ³ ; veloc. media annua vento inferiore a 8,5 m/s; raffiche di vento di picco 50 anni inf. a 59,5 m/s)
Vita progetto	20 anni
Altezza navicella	37 m / 30 m
Tipologia torre	Singolo palo tubolare in acciaio
Orientamento	Controvento
Diametro rotore	21 m
Regolazione potenza	Controllo di stallo a velocità variabile
Certificazioni	UL1741, VU1004-4, CSA C22.2-N 107.1-01, CSA C22.2-N 100.04 e conformità CE
PRESTAZIONI	DESCRIZIONE
Potenza elettrica nominale	(condizioni standard: densità dell'aria di 1,225 kg/m ³ , equivalente a 15 °C sul livello del mare) 60 kW, trifase, 480 VAC, 50 Hz
Velocità del vento nominale	14,5 m/s
Velocità di rotazione max.	59 giri/min.
Velocità di cut-in	3,5 m/s
Velocità di cut-out	25 m/s
Velocità di sopravvivenza	59,5 m/s
PESO	DESCRIZIONE
Rotore (21 metri)	1.400 kg
Gondola (standard)	5.800 kg
Torre (37 metri)	13.800 kg
TRASMISSIONI	DESCRIZIONE
Tipologia moltiplicatore di giri	Nessun moltiplicatore di giri (trasmissione diretta)
Tipologia generatore	A magnete permanente con raffreddamento passivo
SISTEMA DI FREMATURA	DESCRIZIONE
Tipologia freno di servizio	Due pinze a controllo motorizzato
Freno di arresto normale	Freno dinamico a generatore e due pinze a controllo motorizzato
Freno di arresto di emergenza	Freno dinamico a generatore e due pinze con inserimento a molle
SISTEMA DI IMBARCATA	DESCRIZIONE
Controllo	Attivo, elettromeccanico guidato dai sensori di velocità e direzione del vento; sistema automatico di sciolimento del cavo
SISTEMA DI CONTROLLO ELETTRICO	DESCRIZIONE
Tipologia controller	Piattaforma integrata a microprocessore basato su DSP
Tipologia convertitore	Convertitore di frequenza IGBT con tecnologia PWM
Sistema di monitoraggio	Sistema di monitoraggio remoto SmartView, Modbus TCP via Ethernet
Fattore di potenza	3et-point regolabile tra 0,9 induttivo e 0,9 capacitivo
Potenza reattiva	+/- 45 kVAR
RUMORE	DESCRIZIONE
Livello rumore apparente	inferiore a 55 dBA alla base della torre
SPECIFICHE AMBIENTALI	DESCRIZIONE
Intervallo temperatura in funzionamento	da -20 °C a 50 °C
Intervallo temperatura in deposito	da -40 °C a 55 °C
Classe IP generatore/gondola	IP55/IP54
Protezione antifulmini	Ricettori installati nelle pale, asta parafulmine sulla gondola e protezione contro le sovratensioni
Protezione contro il ghiaccio	Turbina progettata ai sensi delle direttive Germanischer Lloyd Wind, edizione 2009
Tutte le specifiche sono soggette a cambiamenti senza preavviso.	

SS-09/005-03-IT

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Direttamente.

Northwind è un marchio registrato di Northern Power Systems

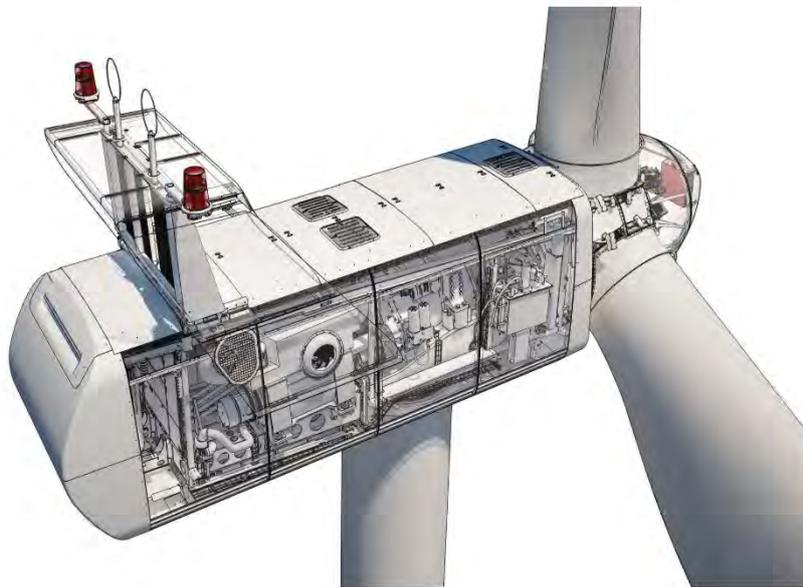
Figura 13: Caratteristiche aerogeneratori esistenti minieolico (≤ 60kW)

PUBLIC

Class 1
Document no.: 0004-8618 V03
2010-10-20

General Specification

V90-1.8 MW 60 Hz VCS



0105 0001 V03 2003 09-01

Vestas Wind Systems A/S · Alsvej 21 · 8940 Randers SV · Denmark · www.vestas.com



T05 0004-8618 Ver 03 - Approved - Exported from DMS: 2010-11-20 by RAKUK

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PUBLIC

Document no.: 0004-8618 V03
 Issued by: Technology R&D
 Type: T05 - General Description

General Specification
 General Description

Date: 2010-10-20
 Class: 1
 Page 5 of 57

1 General Description

The Vestas V90-1.80 MW wind turbine is a pitch regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V90-1.8 MW turbine has a rotor diameter of 90 m with a generator rated at 1.8 MW. The turbine utilises the OptiTip[®] and the OptiSpeed[™] concepts. With these features, the wind turbine is able to operate the rotor at variable speed (rpm), helping to maintain the output at or near rated power.

2 Mechanical Design

2.1 Rotor

The V90-1.8 MW is equipped with a 90 metre rotor consisting of three blades and the hub. Based on the prevailing wind conditions, the blades are continuously positioned to help optimise the pitch angle.

Rotor	
Diameter	90 m
Swept Area	6362 m ²
Rotational Speed Static, Rotor	14.5 rpm
Speed, Dynamic Operation Range	9.3-16.6 rpm
Rotational Direction	Clockwise (front view)
Orientation	Upwind
Tilt	6°
Hub Coning	2°
Number of Blades	3
Aerodynamic Brakes	Full feathering

Table 2-1: Rotor data.

2.2 Blades

The 44 m Prepreg (PP) blades are made of carbon and fibre glass and consist of two airfoil shells bonded to a supporting beam.

PP Blades	
Type Description	Airfoil shells bonded to supporting beam
Blade Length	44 m
Material	Fibre glass of reinforced epoxy and carbon fibres
Blade Connection	Steel inserts
Air Foils	RISØ P + FFA -W3
Maximum Chord	3.512 m

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T05 0004-8618 Ver 03 - Approved - Exported from DMS; 2010-11-20 by RAKUK

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Figura 14: Caratteristiche aerogeneratori wind farm esistente ERG

Document no.: 0067-7060 V00
2017-06-21

General Description

4MW Platform



Vestas Wind Systems A/S · Hedeager 42 · 8200 Aarhus N · Denmark · www.vestas.com

Vestas

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Operating the wind turbine in 4.2 MW Power Optimized Mode (PO1) is achieved by applying an extended ambient temperature derate strategy and reduced reactive power capability compared with 4.0 MW Mode 0 operation.

3 Mechanical Design

3.1 Rotor

The wind turbine is equipped with a rotor consisting of three blades and a hub. The blades are controlled by the microprocessor pitch control system OptiTip®. Based on the prevailing wind conditions, the blades are continuously positioned to optimise the pitch angle.

Rotor	V117	V136	V150
Diameter	117 m	136 m	150 m
Swept Area	10751 m ²	14527 m ²	17671 m ²
Speed, Dynamic Operation Range	6.7-17.5	5.6-14.0	4.9-12.0
Rotational Direction	Clockwise (front view)		
Orientation	Upwind		
Tilt	6°		
Hub Coning	4°	4°	5.5°
No. of Blades	3		
Aerodynamic Brakes	Full feathering		

Table 3-1: Rotor data

3.2 Blades

The blades are made of carbon and fibreglass and consist of two airfoil shells bonded to a supporting beam or with embedded structure.

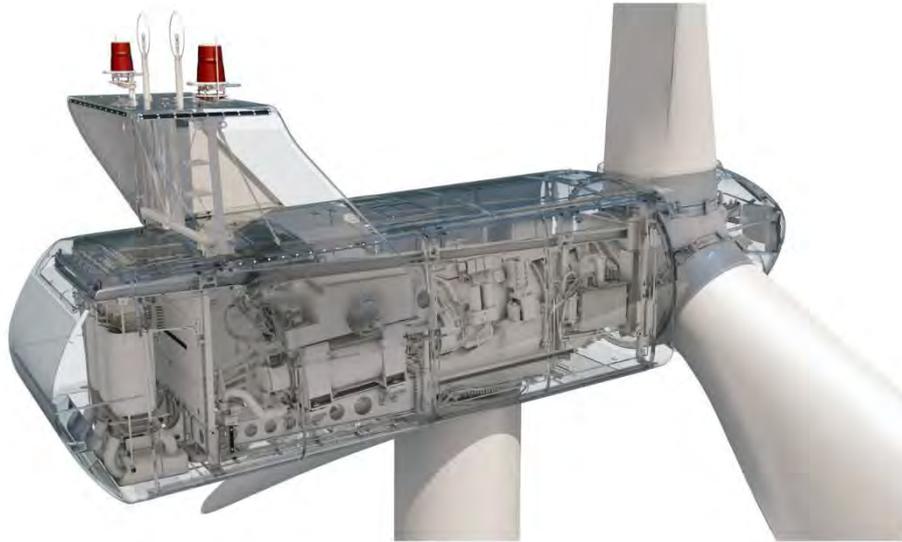
Blades	V117	V136	V150
Type Description	Airfoil shells bonded to supporting beam	Prepreg or infused structural airfoil shell	Prepreg or infused structural airfoil shell
Blade Length	57.15 m	66.66 m	73.66 m
Material	Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT)		
Blade Connection	Steel roots inserted		
Airfoils	High-lift profile		
Maximum Chord	4.0 m	4.1 m	4.2 m
Chord at 90% blade radius	1.1 m	1.2 m	1.4 m

Table 3-2: Blades data

Class 1
Document no.: 0004-0153 V16
2012-05-28

General Specification

V100-1.8/2.0 MW 50 Hz VCS



1 General Description

The Vestas V100-1.8/2.0 MW wind turbine is a pitch-regulated upwind turbine with active yaw and a three-blade rotor. The Vestas V100-1.8/2.0 MW turbine has a rotor diameter of 100 m with a generator rated at 1.8 MW. The turbine utilises a microprocessor pitch control system called OptiTip[®] and variable speed concepts (VCS: Vestas Converter System). With these features, the wind turbine is able to operate the rotor at variable speed revolutions per minute (rpm), helping to maintain the output at or near rated power.

2 Mechanical Design

2.1 Rotor

The V100-1.8/2.0 MW turbine is equipped with a 100-metre rotor consisting of three blades and the hub. Based on the prevailing wind conditions, the blades are continuously positioned to help optimise the pitch angle.

Rotor	
Diameter	100 m
Swept Area	7850 m ²
Rotational Speed Static, Rotor	14.9 rpm
Speed, Dynamic Operation Range	9.3–16.6 rpm
Rotational Direction	Clockwise (front view)
Orientation	Upwind
Tilt	6°
Hub Coning	2°
Number of Blades	3
Aerodynamic Brakes	Full feathering

Table 2-1: Rotor data.

2.2 Blades

The 49 m Prepreg (PP) blades are made of carbon and fibreglass. They consist of two airfoil shells bonded to a supporting beam.

PP Blades	
Type	Airfoil shells bonded to supporting beam
Blade Length	49 m
Material	Fibreglass reinforced epoxy and carbon fibres
Blade Connection	Steel roots inserted
Air Foils	RISØ P + FFA –V3
Chord	3.9 m
Blade Root Outer Diameter	1.88 m

Figura 16: Caratteristiche wind farm in iter Lucky Wind

2.1 Rotor

Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clockwise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90 degrees, with the zero degree position being with the blade flat to the prevailing wind. Pitching the blades to a full feather pitch angle of approximately 90 degrees accomplishes aerodynamic braking of the rotor, thus reduces the rotor speed.

2.2 Blades

There are three logistics optimized rotor blades used on the 5.3-158 wind turbine. The airfoils transition along the blade span and with the thicker airfoils being located inboard towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip. Values below are typically needed to perform shadow casting calculations.

	Rotor Diameter
	158 m
Longest chord	4.0 m
Chord at 0.9 x rotor radius	1.35 m

In order to optimize noise emissions, the rotor blades are equipped with Low-Noise-Trailing-Edges (LNTEs) at the pressure side of the blade's rear edge. LNTEs are thin jagged plastic strips. The rotor blades of the 5.3-158 are equipped with these strips at the factory.



Fig. 1: LNTEs at the wind turbine rotor blade

3 Technical Data for the 5.3-158

Turbine	5.3-158
Rated output [MW]	5.3
Rotor diameter [m]	158
Number of blades	3
Swept area [m ²]	19607
Rotational direction (viewed from an upwind location)	Clockwise
Maximum speed of the blade tips [m/s]	80.3
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brake	Full feathering
Color of outer components	RAL 7035 (light grey) and RAL 7023 (concrete grey, for concrete sections of hybrid tower only)
Reflection degree/Gloss degree Steel tower	30 - 60 gloss units measured at 60° as per ISO 2813
Reflection degree/Gloss degree Rotor blades, Nacelle, Hub	60 - 80 gloss units measured at 60° as per ISO 2813
Reflection degree/Gloss degree Hybrid Tower	Concrete gray (similar RAL 7023); gloss matte

Table 1: Technical data 5.3-158 wind turbine

Figura 18: Caratteristiche wind farm in iter Wind Energy Apricena

4.2.2 Recettori (Shadow Receptor)

Per quanto raro e di improbabile casistica, il fenomeno dello Shadow/Flickering, potrebbe manifestarsi anche a distanze dell'ordine dei mille metri dalle sorgenti sebbene, affinché questo possa accadere, debbano verificarsi in contemporanea delle particolari condizioni al contorno legate alla posizione geografica (latitudine), all'assenza di copertura nuvolosa e ad un particolare periodo dell'anno (stagionalità). Per tale motivo sono state individuate le strutture interne ad un buffer di 1 km in linea d'aria rispetto alle posizioni delle turbine. Una valutazione ed analisi preliminare relativamente alle strutture più prossime all'impianto in esame, e rientranti in un raggio di 500 m dalle sorgenti può comunque ritenersi già altamente cautelativo e soddisfacente. Laddove dovessero manifestarsi evidenze o criticità particolari presso qualcuna delle strutture analizzate, si potrebbe ritenere eventualmente necessario estendere le indagini anche per le strutture ricettive poste a distanze superiori.

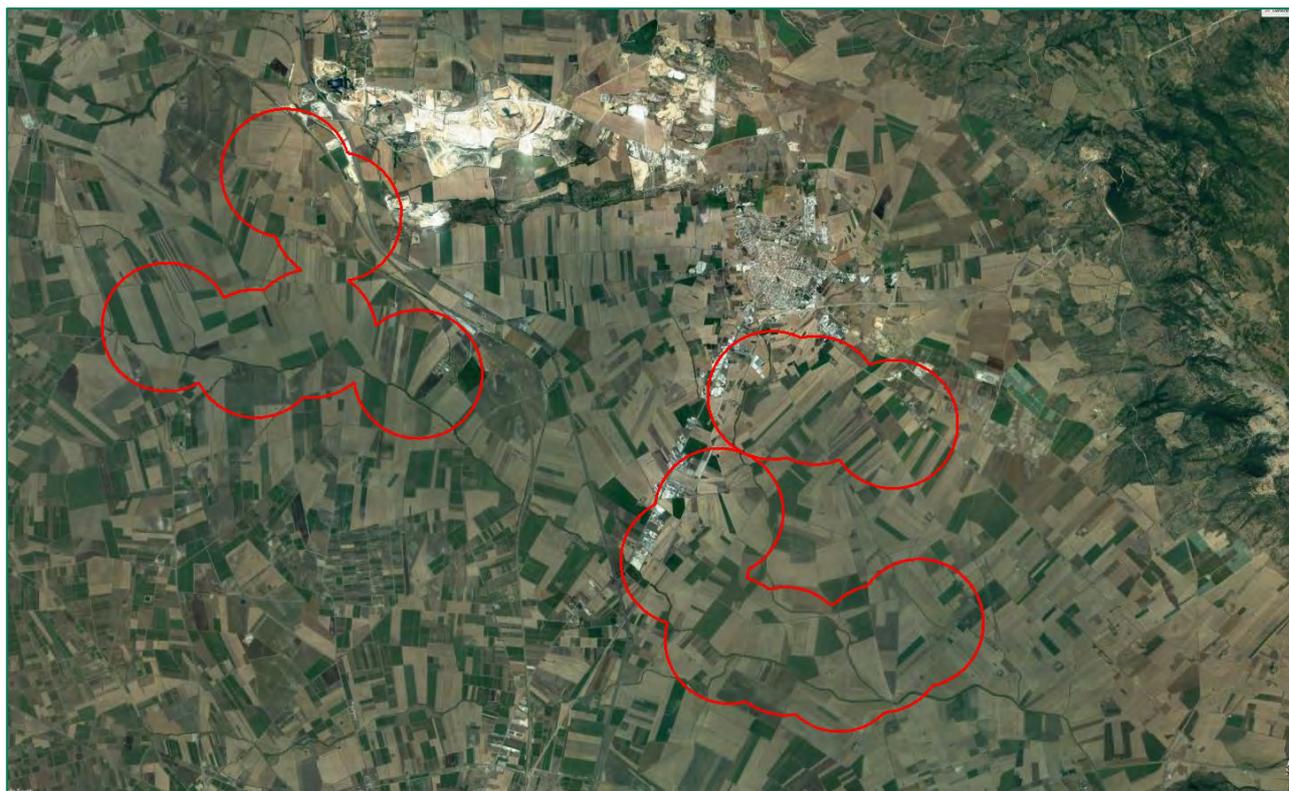


Figura 19: Buffer di 1000 m rispetto ai punti di inserimento delle turbine di progetto



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Relativamente a quanto anticipato e sulla base delle classificazioni catastali e verifiche puntuali sullo stato di conservazione ed utilizzo delle strutture in esame, sono state considerati recettori sensibili una serie di edifici (la maggior parte a carattere abitativo) per i quali è stata effettuata la valutazione e stima previsionale del potenziale effetto di Shadow/Flickering indotto dagli aerogeneratori di progetto, unitamente ad eventuali effetti cumulativi ad opera di turbine già insistenti sul territorio.

Rimandando allo specifico elaborato progettuale relativamente la scelta di tali recettori, a seguire sono presentate le tabelle di inquadramento che, oltre all'assegnazione di un identificativo, ne individuano la posizione geografica attraverso il sistema di coordinate UTM WGS 84 fuso 33.

ID STRUTTURA <Shadow Receptor>	Longitudine Est [m]	Latitudine Nord [m]	Quota altimetrica [m]
SHR_01	526923	4624380	80,0
SHR_02	527225	4626008	79,0
SHR_03	529675	4626998	130,0
SHR_04	530906	4625428	71,8
SHR_05	531801	4624245	60,0
SHR_06	531790	4624222	60,0
SHR_07	531780	4624209	60,0
SHR_08	538640	4624389	90,0
SHR_09	538704	4624357	90,0
SHR_10	538689	4624331	90,0
SHR_11	538581	4624323	82,4
SHR_12	538680	4624113	72,1
SHR_13	538778	4624018	67,1
SHR_14	538782	4623927	61,0
SHR_15	538842	4623955	65,4
SHR_16	538792	4623904	60,2
SHR_17	538895	4623931	66,3
SHR_18	538894	4623898	64,6
SHR_19	538901	4623896	64,6
SHR_20	538973	4623825	62,4
SHR_21	538933	4623779	59,2
SHR_22	539081	4623725	59,5
SHR_23	539043	4623658	57,6
SHR_24	539173	4623632	58,5
SHR_25	539202	4623613	58,3
SHR_26	539127	4623584	56,6
SHR_27	538279	4623763	50,0
SHR_28	537066	4623643	47,3
SHR_29	536007	4622552	40,0
SHR_30	539429	4621365	34,7
SHR_31	539642	4621108	33,1
SHR_32	539861	4620913	31,5
SHR_33	539819	4620893	31,3
SHR_34	539900	4620862	31,1

Tabella 9: Inquadramento geografico dei recettori considerati nel modello di simulazione

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4.2.3 Quadro d'insieme

Le immagini a seguire individuano geograficamente le posizioni delle strutture elencate in tabella rispetto alle turbine di progetto ed agli impianti esistenti (ed eventualmente in fase autorizzativa nota). Le immagini sono proposte su differenti stralci cartografici e basi disponibili al fine di rendere chiara l'interpretazione e la distribuzione sul territorio degli elementi "sorgenti" e "recettori" considerati nel modello di simulazione. Icone con diverse colorazioni e relative etichette, individuano i differenti impianti, mentre i recettori sono sempre individuati con l'acronimo SHR (Shadow Receptor) e numerazione progressiva.

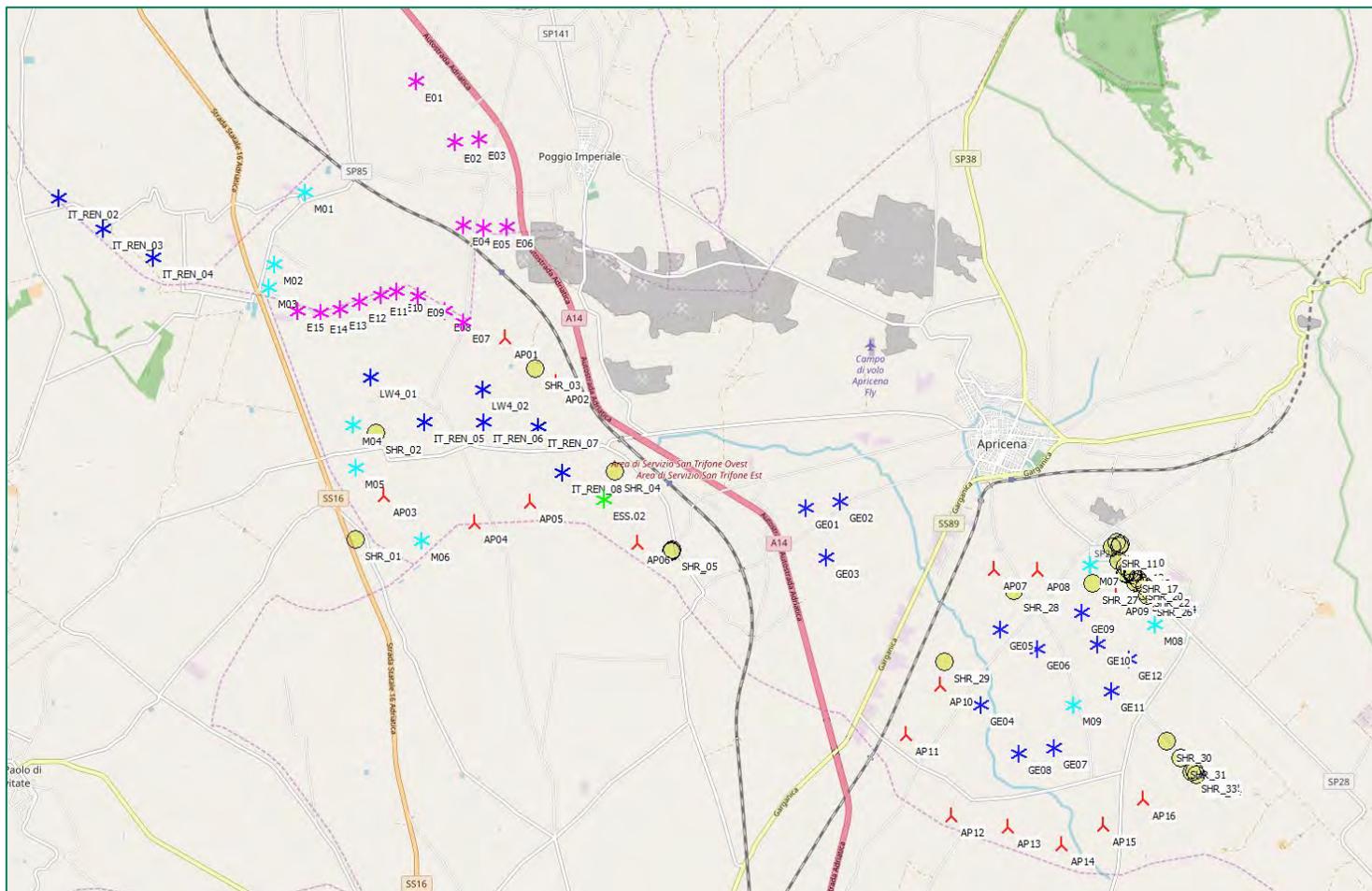


Figura 20: Distribuzione dei recettori (in giallo) su stralcio di cartografia stradale con evidenza delle turbine di progetto (in rosso) e di tutti gli impianti già esistenti sul territorio o attualmente in fase di iter procedurale

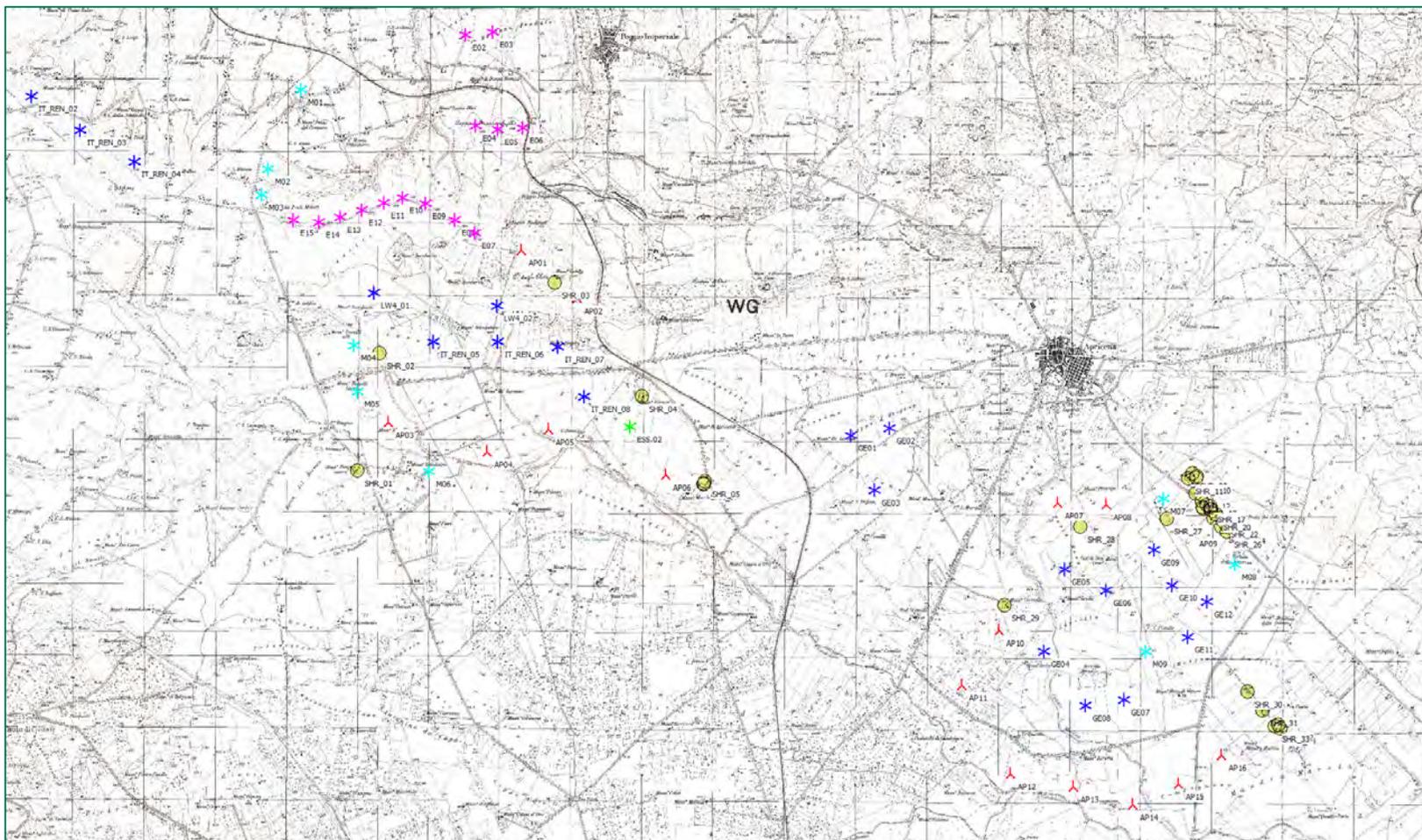


Figura 21: Distribuzione dei recettori (in giallo) su stralcio cartografico IGM 1:25000 con evidenza delle turbine di progetto (in rosso) e di tutti gli impianti già esistenti sul territorio o attualmente in fase di iter procedurale

Tabella 9: Matrice inter-distanze: recettori-turbine di progetto parte 1.

WTG/REC	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17
AP01	3829	2454	652	2643	4125	4136	4140	9917	9988	9982	9882	10044	10168	10203	10249	10220	10307
AP02	3898	2875	388	1629	3112	3124	3129	8969	9040	9032	8930	9085	9207	9238	9287	9255	9345
AP03	795	964	3034	3579	4527	4520	4512	11312	11378	11365	11258	11372	11478	11490	11547	11502	11602
AP04	1835	2034	2530	2304	3089	3082	3074	9905	9970	9956	9848	9956	10060	10070	10128	10081	10182
AP05	2741	2597	2037	1385	2313	2310	2304	9056	9122	9109	9002	9118	9224	9238	9295	9251	9350
AP06	4327	4359	3095	1147	558	551	545	7390	7454	7439	7331	7433	7535	7543	7601	7554	7656
AP07	9830	9735	7690	6018	4952	4961	4971	1940	1996	1977	1869	1940	2034	2037	2097	2048	2150
AP08	10512	10406	8327	6685	5633	5643	5653	1287	1338	1316	1210	1263	1352	1355	1415	1366	1468
AP09	11740	11665	9588	7946	6866	6875	6884	800	770	744	736	526	452	368	420	352	429
AP10	9272	9506	7887	5976	4612	4612	4615	3478	3507	3480	3390	3344	3373	3328	3394	3325	3427
AP11	8985	9377	7989	6019	4574	4569	4569	4372	4398	4370	4284	4222	4240	4188	4253	4183	4282
AP12	10084	10604	9348	7364	5898	5890	5889	4882	4888	4859	4795	4671	4647	4575	4633	4563	4646
AP13	10958	11440	10092	8123	6675	6669	6669	4655	4647	4618	4572	4413	4365	4284	4334	4267	4336
AP14	11824	12285	10878	8922	7489	7484	7485	4676	4655	4628	4601	4412	4340	4252	4293	4232	4283
AP15	12310	12700	11178	9252	7851	7848	7850	4308	4278	4252	4240	4034	3946	3856	3889	3833	3871
AP16	12750	13063	11426	9538	8178	8177	8180	3927	3888	3864	3868	3648	3544	3453	3477	3430	3450



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Tabella 10: Matrice inter-distanze: recettori-turbine di progetto parte 2.

WTG/REC	SHR_18	SHR_19	SHR_20	SHR_21	SHR_22	SHR_23	SHR_24	SHR_25	SHR_26	SHR_27	SHR_28	SHR_29	SHR_30	SHR_31	SHR_32	SHR_33	SHR_34
AP01	10318	10325	10417	10396	10553	10542	10672	10706	10647	9793	8733	8381	11897	12212	12500	12475	12560
AP02	9354	9361	9451	9428	9586	9571	9703	9736	9675	8816	7735	7349	10877	11190	11478	11452	11538
AP03	11605	11612	11691	11656	11809	11779	11911	11942	11871	11008	9821	9014	12632	12912	13181	13147	13234
AP04	10184	10191	10268	10232	10384	10352	10484	10515	10443	9582	8388	7565	11184	11464	11733	11700	11787
AP05	9353	9360	9440	9406	9559	9531	9663	9694	9624	8759	7580	6843	10465	10754	11029	10997	11084
AP06	7656	7664	7740	7703	7855	7822	7954	7985	7913	7052	5857	5080	8701	8991	9266	9234	9321
AP07	2150	2157	2233	2196	2349	2319	2452	2483	2413	1548	460	1600	3742	4074	4367	4351	4430
AP08	1468	1475	1552	1517	1670	1644	1776	1808	1741	874	479	1998	3276	3610	3898	3888	3962
AP09	403	406	411	353	465	413	539	567	491	397	1571	2826	2361	2677	2943	2944	3006
AP10	3410	3415	3443	3387	3494	3431	3539	3558	3477	2815	1831	357	3592	3864	4131	4098	4184
AP11	4262	4266	4286	4227	4322	4255	4353	4368	4289	3690	2755	1262	4017	4242	4479	4440	4524
AP12	4619	4621	4609	4548	4601	4525	4591	4596	4524	4160	3560	2339	3515	3646	3818	3773	3848
AP13	4306	4307	4277	4217	4241	4164	4207	4206	4142	3943	3605	2696	2781	2865	3007	2961	3030
AP14	4250	4250	4201	4146	4137	4061	4078	4070	4017	4004	3930	3306	2256	2253	2333	2287	2344
AP15	3838	3837	3775	3724	3693	3620	3618	3605	3562	3682	3821	3478	1606	1564	1628	1582	1637
AP16	3417	3415	3341	3297	3240	3173	3149	3131	3100	3370	3736	3689	953	851	906	859	918



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Come evidente dall'immagine e dalla tabella proposta, anche in relazione alla distanza minima fissata in 500 metri da ogni aerogeneratore di progetto, sono state analizzate ed inserite nel modello di simulazione 34 strutture, per ognuna delle quali sarà stimato e calcolato il numero di ore di ombreggiamento previsto sia dall'apporto dei soli aerogeneratori di progetto, sia dal potenziale apporto dell'effetto cumulato con gli impianti esistenti più prossimi alle stesse. Le icone in giallo che individuano i recettori, sono raffigurati da cerchi a simboleggiare una calotta sferica totalmente trasparente che identifica che le strutture in modalità "green house mode". Per tale particolare configurazione l'effetto del flickering potrebbe manifestarsi quindi da ogni direzione non limitando la simulazione alla sola ampiezza di finestre o lucernari. Ciò rappresenta certamente un modo altamente cautelativo per quantificare il fenomeno dell'ombreggiamento, ma la scelta è stata operata nell'ottica della maggiore tutela possibile anche nei confronti di spazi e corti immediatamente esterne alle strutture che possono essere adibite a luoghi di svago e riposo quali giardini e patii.

5 METODOLOGIA ED INPUT ANALISI

Per l'analisi tecnica e la verifica del potenziale effetto di Shadow/Flickering cui le strutture in esame possano essere soggette ad opera delle nuove turbine di sviluppo progettuale, è stato impiegato lo specifico software di settore Wind Pro® considerato tra i più completi strumenti di analisi nel settore eolico. In particolare il modulo di elaborazione preposto all'analisi del fenomeno in esame è denominato "SHADOW" e opera le simulazioni e modellazioni attraverso una serie di dati in input quali:

1. Caratteristiche orografiche (attraverso dati DTM – Digital Terrain Model sulla base del grid estrapolato in download dal satellite);
2. Caratteristiche geometriche e meccaniche delle sorgenti (dislocazione degli aerogeneratori, dimensioni rotore ed altezza mozzo, caratteristiche tecniche di velocità di rotazione delle eliche);
3. Dislocazione e caratteristiche delle strutture ricettive nei confronti delle quali eseguire le simulazioni (Shadow Receptor) con la possibilità di definizione della dimensione delle finestre (altezza/larghezza) ed orientamento rispetto al nord, e dell'eventuale angolo di inclinazione rispetto al piano (angolazione della finestra rispetto all'orizzontale). Modalità alternativa di trattare i recettori in esame è quella di considerarli in "Green House Mode" ossia al pari di strutture prive di pareti a simboleggiare una calotta sferica totalmente trasparente esposto al fenomeno da ogni direzione.
4. Caratteristiche meteorologiche di macroarea per la stima delle ore di soleggiamento locale (con l'utilizzo di dati di stazioni meteorologiche di riferimento e di lungo termine disponibili nel database del software);
5. Caratteristiche anemologiche di sito (attraverso l'elaborazione di una Wind Statistic a partire da dati anemometrici locali che permettono la valutazione del numero di ore/anno di funzionamento delle turbine, il loro orientamento per la valutazione della proiezione dell'ombra in funzione delle frequenze registrate per i diversi settori di direzione di provenienza del vento e la velocità di rotazione delle eliche in base alla suddivisione in frequenza delle differenti classi di velocità del vento);
6. Caratteristiche dimensionali di ostacoli o (strutture non ricettive, siepi, alberature o altro similare) da considerare nel modello fisico per la simulazione (opzione ZVI);

Per l'elaborazione della propagazione dell'ombra dietro al disco descritto dal rotore dell'aerogeneratore, il modello di simulazione utilizza i seguenti parametri:

- ✚ Il diametro del Sole, D : 1.390.000 km;
- ✚ La distanza dal Sole, d : 150.000.000 km;
- ✚ Angolo di attacco: 0.531 gradi;

tenendo al contempo in conto di informazioni quali:

- ✚ Posizione geografica (latitudine e longitudine);
- ✚ Fuso orario ed all'ora legale del sito in esame;
- ✚ orbita rotazione terrestre rispetto alla posizione del sole.

In linea teorica una turbina con diametro di rotore 45 m potrebbe proiettare l'ombra del rotore fino ad una distanza di quasi 5 km (4,8 km), ma nella realtà tale ipotesi non è plausibile a causa dell'effetto ottico dovuto alla presenza dell'atmosfera che incide in modo determinante poiché, quando l'altezza del sole diventa troppo bassa rispetto all'orizzonte, e la distanza della proiezione diventa troppo lunga, l'ombra generata tende a disperdersi prima di raggiungere il suolo (o una struttura ricettiva).

Le immagini a seguire sintetizzano rispettivamente in sequenza:

- il modello di calcolo con evidenza dell'effetto della proiezione al suolo (o nei confronti di una struttura ricettiva) del disco descritto dal rotore dell'aerogeneratore;
- finestra di scelta e impostazione dei parametri geometrici dei recettori;
- finestra di scelta opzione ZVI per considerazione di ostacoli nella simulazione

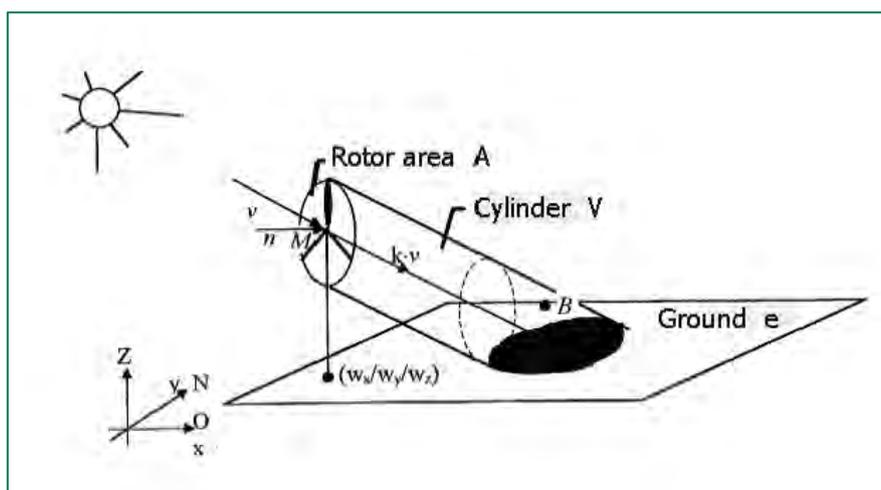


Figura 22: Schema di elaborazione della proiezione dell'ombra a valle del disco del rotore di un aerogeneratore

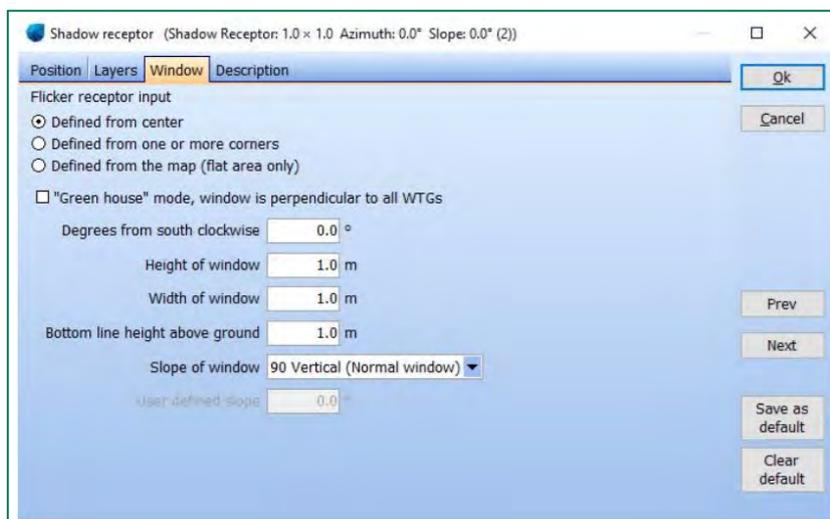


Figura 23: Parametri di input delle caratteristiche geometriche della struttura ricettiva (altezza/larghezza, angolo di inclinazione finestre)

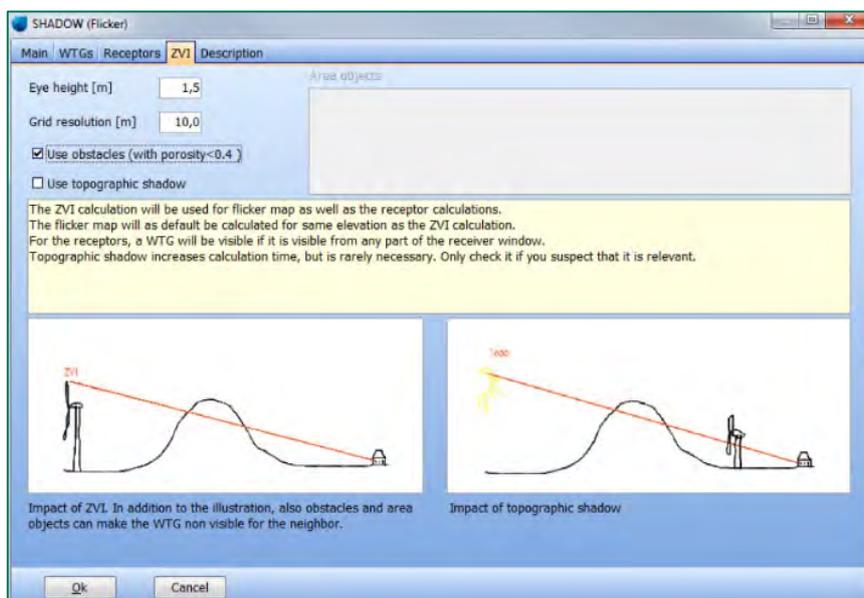


Figura 24: Utilizzo dell'opzione ZVI che tiene conto di eventuali ostacoli inseriti nel modello di simulazione (ostacoli naturali e/o artificiali)

Essendo di fatto impossibile il configurarsi dello scenario “worst case”, condizione che prevede l’ipotesi della turbina disposta sempre in modo ortogonale al sole e con le eliche in costante rotazione per tutti i giorni dell’anno, le simulazioni saranno effettuate per lo scenario “Real Case”, ossia in considerazione dell’aggregazione statistica dei reali registrati da una stazione anemometrica installata in sito o in area limitrofa e rappresentativa della condizione locale, in aggiunta ad una stazione meteorologica per le informazioni relative al soleggiamento annuo e copertura nuvolosa.

Tale scelta fornisce pertanto il risultato più realistico possibile in termini di il numero di ore di ombreggiamento stimato poiché basato su dati reali di ore di soleggiamento medio/annuo dell'area ed ore di funzionamento degli aerogeneratori in funzione di velocità e direzione del vento (tenendo quindi in considerazione anche l'orientamento dei rotori nella direzione di proiezione delle ombre).

Tuttavia, nell'ottica di porsi nelle condizioni più precauzionali possibili, i recettori inseriti nel modello di simulazione saranno considerati nella configurazione "Green House Mode" e sarà trascurata l'eventuale presenza di qualsiasi tipo di ostacolo (naturale o artificiale). I risultati attesi dall'elaborazione saranno pertanto da considerarsi ampiamente cautelativi rispetto alla reale condizione possibile.

5.1 Caratteristiche orografiche (DTM)

È stato realizzato un modello orografico digitale che, sulla base del grid estrapolato in download dal satellite, verificato da sovrapposizione con le curve di livello della cartografia ufficiale dell'Istituto Geografico Militare (IGM), descrive in modo del tutto fedele ed attendibile l'andamento altimetrico dell'area geografica interessata dalla simulazione.

L'immagine a seguire evidenzia il modello DTM utilizzato con la disposizione delle turbine costituenti il layout di proposta progettuale e la disposizione degli "Shadow Receptor" considerati nel modello di simulazione.

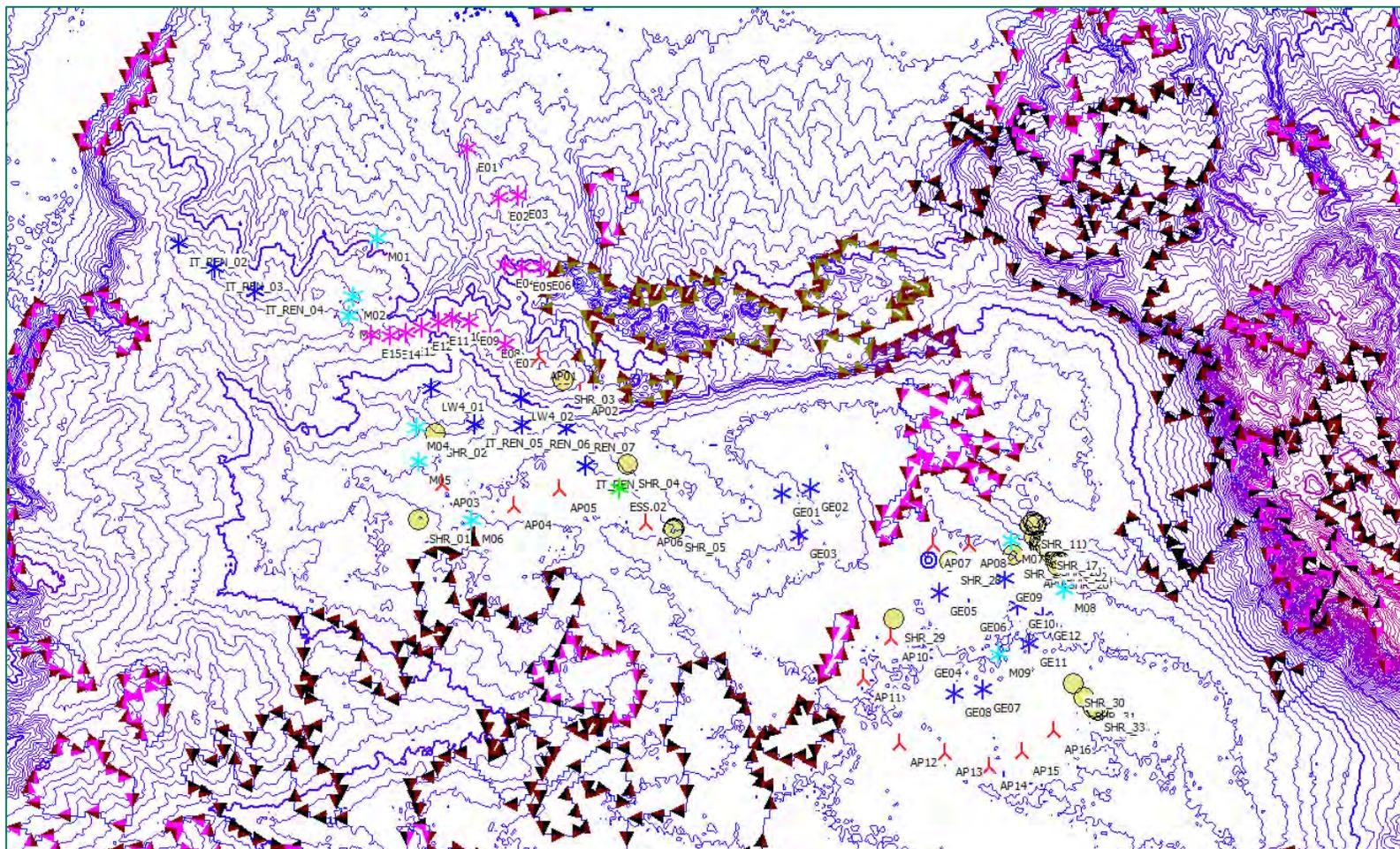


Figura 25: Modello orografico di input con evidenza degli aerogeneratori di progetto (in rosso), e di tutti gli impianti già insistenti sul territorio o attualmente in fase di iter procedurale

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5.2 Caratteristiche geometriche e meccaniche delle sorgenti

L'individuazione geografica insieme alle caratteristiche geometriche, dimensionali e meccaniche degli aerogeneratori di progetto e di altre sorgenti considerate nel modello di simulazione sono riportate nelle tabelle e datasheet tecnici presenti nel preposto paragrafo relativo alle "Turbine Sorgenti".

5.3 Dislocazione e caratteristiche delle strutture ricettive

Le coordinate per l'individuazione geografica dei recettori inseriti nel modello di simulazione (Shadow Receptor) sono riportate in tabella presenti a preposto paragrafo "RECETTORI". Per l'elaborazione dell'ombreggiamento le strutture in esame sono state considerate nella la modalità più cautelativa "Green House Mode", ossia totalmente trasparenti.

5.4 Caratteristiche meteorologiche – soleggiamento locale

Per la caratterizzazione delle condizioni di soleggiamento medio dell'area in esame e della corrispondente copertura nuvolosa, sono utilizzate le informazioni di stazioni meteorologiche disponibili dal database di Wind Pro. In particolare, le informazioni per il caso specifico fanno riferimento alla centralina più prossima corrispondente alla stazione meteo di Foggia Amendola individuata a circa 29 km in direzione Sud-Est dall'area d'impianto.

A seguire l'immagine che individua la stazione meteorologica in oggetto e le informazioni ad essa relative.

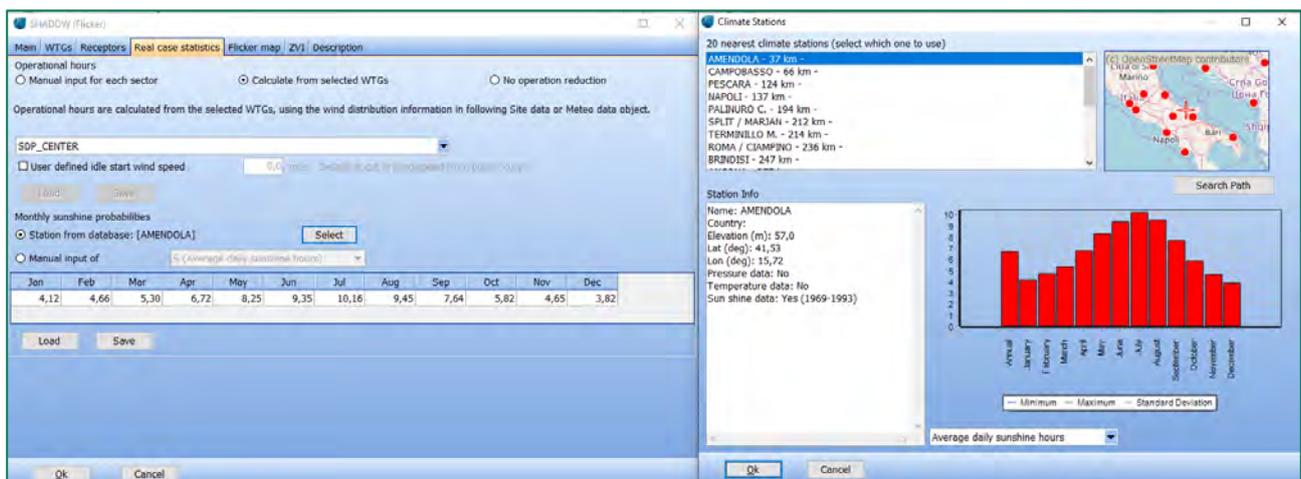


Figura 26: Valori di probabilità di soleggiamento mensile della stazione meteo di Foggia Amendola

5.5 Caratteristiche anemologiche di sito (Wind Statistic)

La *Wind Statistic* utilizzata per la valutazione energetica di produzione delle turbine d’impianto è stata elaborata a partire da dati anemologici riferiti a due set di dati di nodi satellitari: “*ERA-Interim*”, con un’ampiezza del database che supera i 28 anni e “*ERA5_W*” avente un’ampiezza del database che supera i 30 anni.

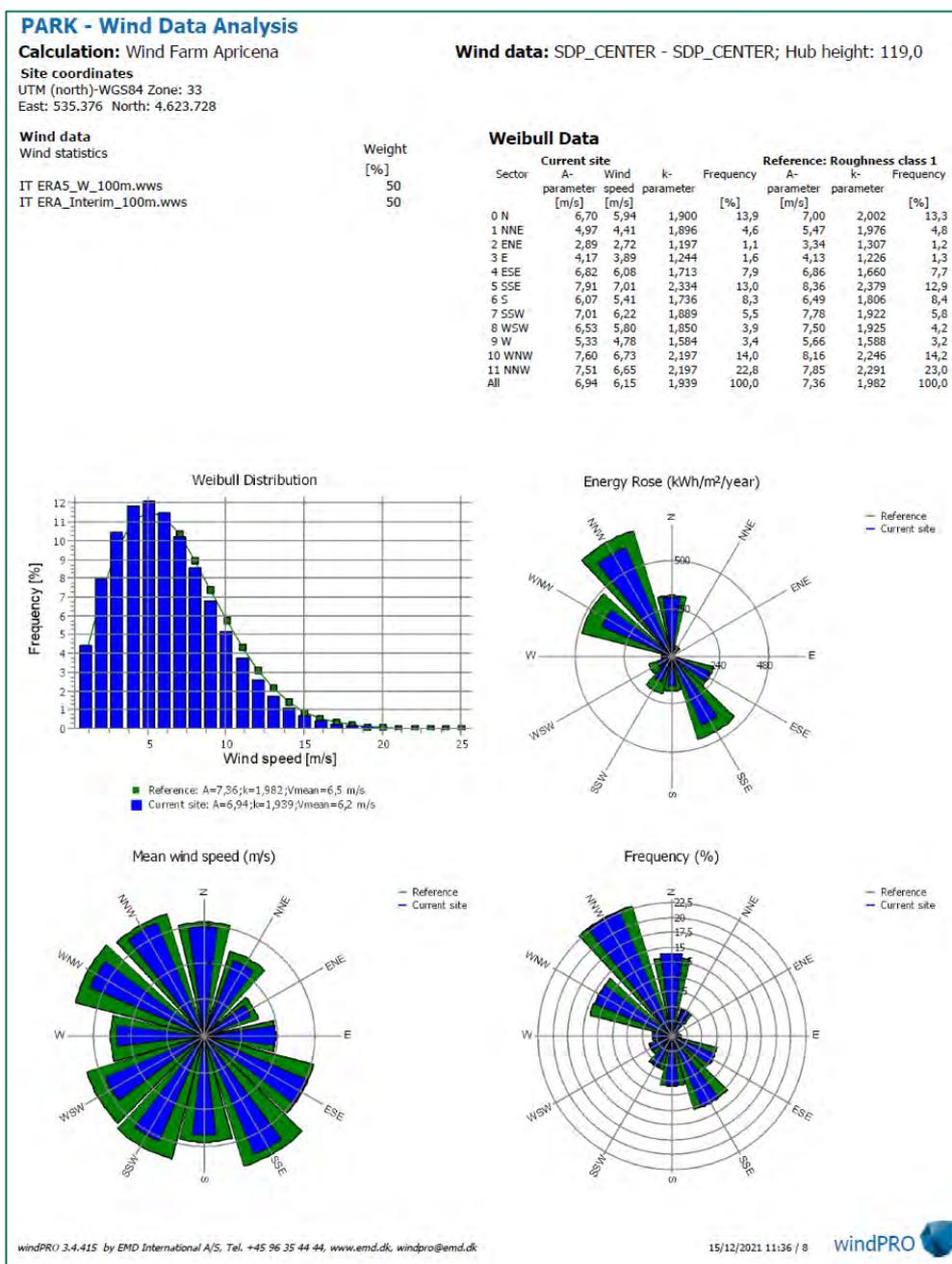


Figura 27: Caratteristiche di ventosità di sito nell’ipotesi di turbine con altezza al mozzo pari a 119 m s.l.t.

5.6 Scenario di simulazione

A seguire si riporta lo scenario di simulazione proposto su immagine satellitare estratta da Google Earth nella versione planimetrica (2D) e tridimensionale (3D), che individua l'area di indagine con evidenza delle turbine di progetto, dei recettori individuati (SHR), e degli ulteriori aerogeneratori insistenti sul territorio considerati nella simulazione, onde poterne valutare l'eventuale effetto cumulato.

I risultati proposti in successione identificano numericamente i valori dell'elaborazione proposti rispettivamente per la esclusiva condizione di inserimento degli aerogeneratori di progetto e per la condizione cumulata complessiva con gli aerogeneratori esistenti e di potenziale futura installazione.

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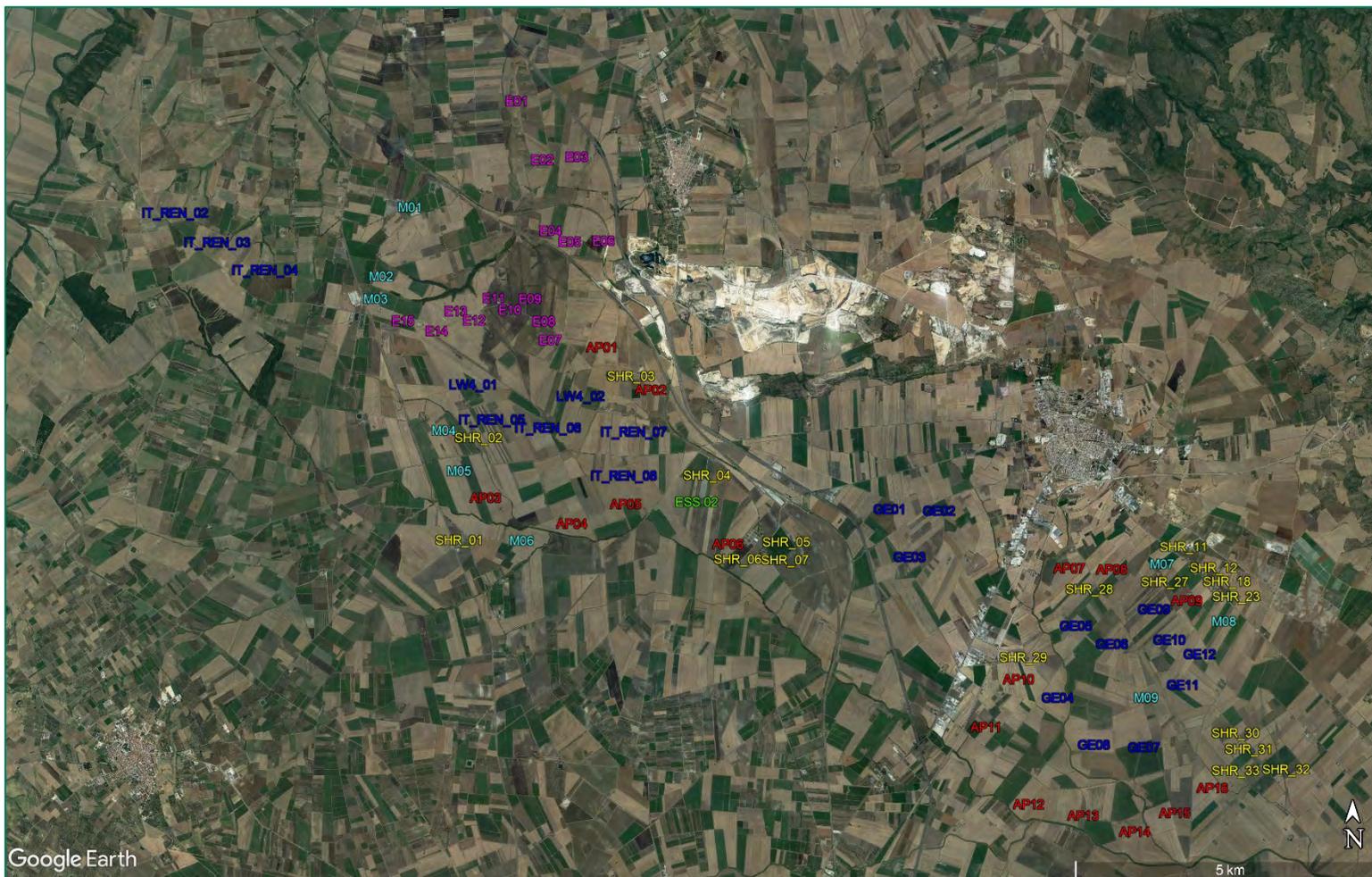


Figura 28: Scenario di simulazione proposto su immagine satellitare estratta da Google Earth versione planimetrica 2D)

6 POST-PROCESSING – RISULTATI DELLE ELABORAZIONI

Sulla base dei dati di input precedentemente specificati, sono presentati a seguire in forma tabellare i risultati delle elaborazioni riportati rispettivamente per l'ipotesi di apporto del solo impianto di progetto e ipotesi di impatto cumulativo in considerazione di tutti gli impianti esistenti (e di potenziale futura installazione) inseriti nel modello. La simulazione è stata condotta nei confronti dei recettori individuati per la condizione di "Real Case" ed il risultato è mostrato in termini ore/anno cui il fenomeno si manifesta nei confronti di ogni struttura analizzata.

Tabella 10: Risultati del calcolo

SHR	Scenario impanto di progetto	Scenario solo esistenti	Scenario cumulativo
	Manifestazione del fenomeno [ore/anno]		
SHR_01	1:10	0:00	1:07
SHR_02	0:00	19:40	19:58
SHR_03	22:12	2:41	70:12
SHR_04	2:09	9:32	11:41
SHR_05	15:36	0:00	37:41
SHR_06	2:40	0:00	48:25
SHR_07	5:30	0:00	51:12
SHR_08	2:26	0:00	2:18
SHR_09	2:07	0:00	2:01
SHR_10	2:12	0:00	2:05
SHR_11	3:11	0:00	3:01
SHR_12	3:09	0:07	2:56
SHR_13	2:45	0:58	3:32
SHR_14	2:06	6:19	31:36
SHR_15	19:26	5:42	24:29
SHR_16	32:54	7:43	39:34
SHR_17	24:48	6:57	30:38
SHR_18	30:40	7:40	37:05
SHR_19	30:36	7:35	36:55
SHR_20	38:49	5:21	38:38
SHR_21	46:42	7:21	46:59
SHR_22	26:38	4:04	26:41
SHR_23	38:48	4:35	40:26
SHR_24	26:02	3:51	28:32
SHR_25	24:49	5:03	28:30
SHR_26	37:11	5:21	40:26
SHR_27	67:35	5:45	70:06
SHR_28	2:18	9:55	12:19
SHR_29	22:48	8:21	30:40
SHR_30	0:00	1:28	1:30
SHR_31	4:34	0:00	4:25
SHR_32	7:38	0:00	7:18
SHR_33	8:31	0:00	8:07
SHR_34	7:29	0:00	7:08

I risultati delle analisi riportati in forma numerica in tabella precedente, sono frutto delle elaborazioni che utilizzano in input i dati storici di una stazione meteorologica rappresentativa di lungo termine che fornisce

in modo piuttosto attendibile quello che può essere il soleggiamento medio mensile dell'area di indagine. Con tali dati di input i risultati della simulazione portano a concludere che l'apporto fornito dalle turbine di progetto nei confronti dei recettori analizzati presso i quali si ingenera il fenomeno di Shadow/Flickering, risulta essere, nei casi più estremi, compreso tra 50 e 69 ore/anno. In soli 13 casi tale valore risulta essere superiore le 30 ore/anno, anche in considerazione del potenziale effetto cumulato con altri impianti già insistenti sul territorio.

Come anticipato però, lo scenario di simulazione di Real Case, pur nell'ottica della maggiore affidabilità, risulta in ogni caso altamente cautelativo (non si tiene in conto la reale copertura nuvolosa o la presenza di vegetazione e/o ostacoli naturali o di altro tipo) così come l'impostazione di calcolo associato ai recettori (nella modalità "Green House mode") considera le strutture al pari di calotte completamente trasparenti e prive di pareti.

Come reportistica di analisi, oltre al "Main Result" nel quale sono riportate tutte le impostazioni di calcolo, i riferimenti dei recettori, delle turbine sorgenti ed una sintesi dei risultati, sono presentati nei successivi Allegati i report "Calendar", proposti rispettivamente in forma tabellare ed in forma grafica ("Calendar Graphical"). Il primo individua per ogni recettore considerato, la durata giornaliera del fenomeno dettagliato per ogni giorno e per l'intero anno con evidenza dell'orario di inizio e di fine e con indicazione della sorgente che lo produce. Il secondo sintetizza invece graficamente per ogni recettore quanto schematizzato numericamente nel "Calendar", mostrando sempre per ogni recettore, l'apporto di ogni sorgente (diversificata per colore) nei diversi mesi o periodi dell'anno.

Viene in ultimo proposto il report "Map" con la rappresentazione grafica del fenomeno elaborata per tutte le sorgenti considerate e proposta su stralcio di opportuna base cartografica. La mappatura riporta tutte le zone soggette al fenomeno, diversificato nella sua durata da una prestabilita gradazione di colori.

L'immagine a seguire riporta una tipica rappresentazione del "Calendar Graphical" che, nei confronti di un particolare recettore, individua e definisce il fenomeno dell'ombreggiamento prodotto da diverse sorgenti turbine (distinte da differenti colori) in virtù delle fasce orarie nei diversi mesi dell'anno.

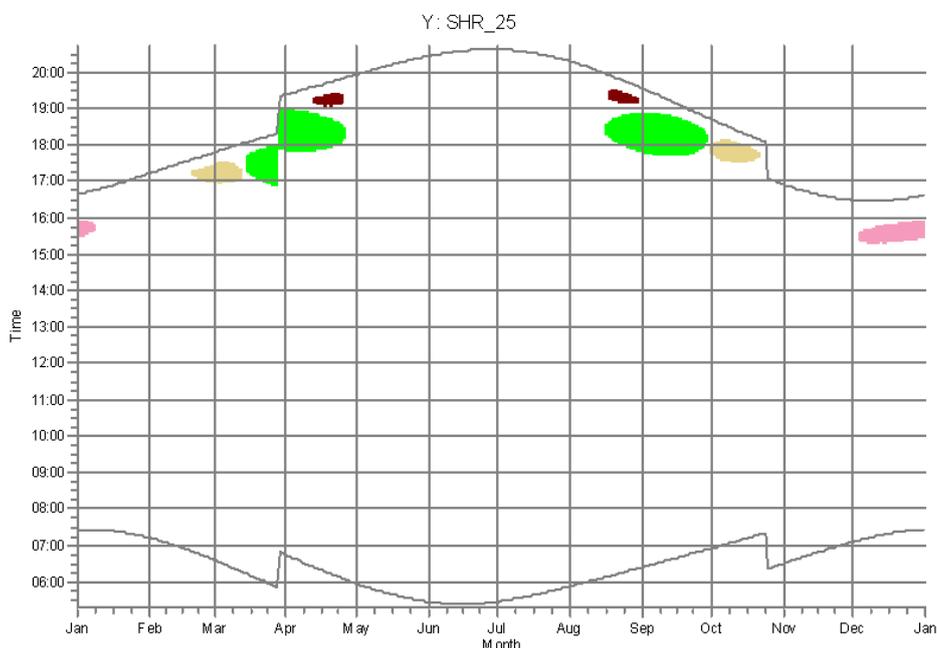


Figura 29: Estratto del “Calendar Graphical” con evidenza grafica dell’ombreggiamento prodotto da differenti sorgenti turbine (distinte per colore) per le differenti fasce orarie e mesi dell’anno

Sebbene l’ombreggiamento possa interessare anche parziali e brevi tratti stradali di differente natura (SS/SP/SC), è comunque importante sottolineare che nelle simulazioni non si è tenuto conto dell’eventuale esistenza di alberature e/o siepi fiancheggianti le carreggiate e che in ogni caso, nella peggiore delle ipotesi, il fenomeno si potrebbe manifestare per un numero di ore/anno certamente trascurabili e poco significative (inferiore a 30). Considerando inoltre che i veicoli lungo le arterie stradali sono sostanzialmente da ipotizzarsi in movimento, il fenomeno (e quindi il potenziale fastidio che ne potrebbe conseguire) sarebbe eventualmente di limitata quanto temporanea entità e percezione.

7 MITIGAZIONI

Per il sito in oggetto risulta che il fenomeno di ombreggiamento si manifesterebbe in alcune circostanze in modo non del tutto irrilevante seppur in considerazione dell'ottica altamente cautelativa con la quale si è giunta ai risultati delle analisi. Tuttavia, laddove dovessero sussistere delle motivate esigenze o reiterate problematiche di fastidio, sarebbe plausibile adottare alcune semplici quanto poco onerose misure di mitigazione consistenti in applicazioni (temporanee o permanenti) di apparati schermanti di tipo artificiale (pannelli, pensiline etc.) o naturale (piantumazione di siepi, alberature, etc.). In casi estremi, ed in relazione alla reale operatività degli impianti, laddove dovessero effettivamente manifestarsi condizioni di disagio, sarebbe possibile operare delle preimpostate modifiche operative alle turbine imputate della generazione del fenomeno o del fastidio, limitandone o riducendone l'operatività esclusivamente per quei periodi in cui il fenomeno può effettivamente verificarsi. Tali periodi sono ampiamente descritti e dettagliati al minuto nel report "*Calendar*" attraverso il quale si potrebbe pre-programmare l'operatività della turbina impostandone periodi di inizio e fine (o durata) della ridotta funzionalità attraverso la modifica di parametri firmware. Tale eventualità è oggi resa possibile grazie all'utilizzo di sensori che rilevano le effettive condizioni ambientali (velocità del vento e percentuale di copertura nuvolosa) che regolano la pre-programmazione firmware esclusivamente ai casi in cui il fenomeno potrebbe effettivamente verificarsi, riducendo quindi al contempo eventuali inutili limitazioni di produzione energetica quando le condizioni al contorno risultano non favorevoli alla generazione del fenomeno dello Shadow/Flickering.

8 CONCLUSIONI E RACCOMANDAZIONI

Dai risultati delle analisi emerge che gli aerogeneratori costituenti la proposta progettuale in esame generano effetti di shadow flickering i cui impatti risultano piuttosto modesti (o non particolarmente problematici) per la maggior parte delle strutture in analisi, mentre per alcune di esse, sebbene nelle ipotesi di elaborazione più sfavorevoli possibili, il fenomeno appare manifestarsi con risultati che superano i valori soglia presi.

Nella specifica circostanza, vi sono un discreto gruppo di recettori che risultano essere più sollecitati, ossia quelli per i quali il fenomeno di ombreggiamento si attesterebbe con una durata superiore le 30 ore/anno (valore soglia utilizzato da alcuni paesi europei). È però importante ribadire che tali valori sono frutto di un calcolo effettuato con modalità assolutamente cautelative che fornisce risultati certamente sovrastimati in relazione al fatto che non vengono considerate le ampiezze delle finestre delle abitazioni ma l'intero corpo della struttura o del fabbricato è considerato al pari di una calotta totalmente trasparente ed inoltre il modello di simulazione non tiene conto delle possibili attenuazioni legate alla presenza di alberi, ostacoli, siepi e quant'altro possa mitigare il fenomeno dell'evoluzione dell'ombra.

Sono inoltre stati elaborati e quantificati anche i potenziali effetti cumulativi incidenti sui recettori considerati nell'analisi relativamente l'apporto dovuto ad impianti in esercizio già esistenti sul territorio localizzati in aree sufficientemente vicine ai punti individuati per lo sviluppo progettuale proposto.

9 RIFERIMENTI BIBLIOGRAFICI

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- WindPRO, EMD International Co. Denmark, version 3.4.424
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- <http://www.epilepsy.org.uk/info/photo.html> Leeds, UK, November 2009.
- Wind Energy Handbook, Wiley Editions 2011, Burton Jenkins, Sharpe, Bossanyi
- Richard Lampeter: Shadow Flicker Regulations and Guidance: New England and Beyond

ALLEGATO 1: "MAIN RESULT" - IMPOSTAZIONI DI SIMULAZIONE E SINTESI DEI RISULTATI "REAL CASE" PER L'IMPIANTO DI PROGETTO

SHADOW - Main Result

Calculation: Wind Farm Apricena - Project

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

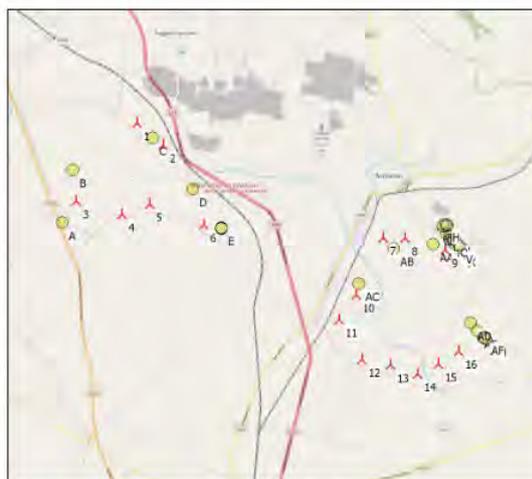
Sunshine probability S (Average daily sunshine hours) [AMENDOLA]
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4,12 4,66 5,30 6,72 8,25 9,35 10,16 9,45 7,64 5,82 4,65 3,82

Operational hours are calculated from WTGs in calculation and wind distribution:
SDP_CENTER

Operational time
N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

Line-of-sight calculation has been deactivated. This means that sheltering from obstacles, areas or hills are not taken into account.

All coordinates are in
UTM (north)-WGS84 Zone: 32



Scale 1:125.000
New WTG Shadow receptor

WTGs

Row	Easting	Northing	Z	Row data/Description	WTG type				Shadow data			
					Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Calculation distance	RPM
			[m]				[kW]	[m]	[m]	[m]	[RPM]	
1	529.208	4.627.453	124,6	AP01	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
2	529.995	4.626.779	111,3	AP02	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
3	527.347	4.625.052	64,3	AP03	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
4	528.738	4.624.648	60,0	AP04	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
5	529.602	4.624.962	55,9	AP05	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
6	531.250	4.624.334	55,3	AP06	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
7	536.745	4.623.972	50,0	AP07	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
8	537.427	4.623.958	50,0	AP08	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
9	538.636	4.623.589	50,0	AP09	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
10	535.936	4.622.202	40,0	AP10	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
11	535.413	4.621.439	40,0	AP11	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
12	536.107	4.620.215	37,8	AP12	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
13	536.984	4.620.039	34,2	AP13	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
14	537.818	4.619.786	30,0	AP14	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
15	538.459	4.620.085	30,0	AP15	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0
16	539.063	4.620.485	30,3	AP16	Yes	VESTAS	V162-6.2-6.200	6.200	162,0	119,0	2.041	0,0

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	SHR_01	526.923	4.624.380	79,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
B	SHR_02	527.225	4.626.008	79,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
C	SHR_03	529.675	4.626.998	130,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
D	SHR_04	530.906	4.625.428	71,5	1,0	1,0	1,0	90,0	"Green house mode"	2,0
E	SHR_05	531.801	4.624.245	60,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
F	SHR_06	531.790	4.624.222	60,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
G	SHR_07	531.780	4.624.209	60,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
H	SHR_08	538.640	4.624.389	90,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
I	SHR_09	538.704	4.624.357	90,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
J	SHR_10	538.689	4.624.331	90,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
K	SHR_11	538.581	4.624.323	82,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
L	SHR_12	538.680	4.624.113	71,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
M	SHR_13	538.778	4.624.018	67,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
N	SHR_14	538.782	4.623.927	61,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
O	SHR_15	538.842	4.623.955	65,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0

To be continued on next page...

SHADOW - Main Result
Calculation: Wind Farm Apricena - Project
...continued from previous page

No.	Name	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]
P	SHR_16	538.792	4.623.904	60,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Q	SHR_17	538.895	4.623.931	65,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
R	SHR_18	538.894	4.623.898	63,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
S	SHR_19	538.901	4.623.896	64,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
T	SHR_20	538.973	4.623.825	62,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
U	SHR_21	538.933	4.623.779	59,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
V	SHR_22	539.081	4.623.725	60,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
W	SHR_23	539.043	4.623.658	57,2	1,0	1,0	1,0	90,0	"Green house mode"	2,0
X	SHR_24	539.173	4.623.632	57,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Y	SHR_25	539.202	4.623.613	58,1	1,0	1,0	1,0	90,0	"Green house mode"	2,0
Z	SHR_26	539.127	4.623.584	55,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AA	SHR_27	538.279	4.623.763	50,0	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AB	SHR_28	537.066	4.623.643	47,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AC	SHR_29	536.007	4.622.552	40,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AD	SHR_30	539.429	4.621.365	34,8	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AE	SHR_31	539.642	4.621.108	33,6	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AF	SHR_32	539.861	4.620.913	32,3	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AG	SHR_33	539.819	4.620.893	31,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0
AH	SHR_34	539.900	4.620.862	31,9	1,0	1,0	1,0	90,0	"Green house mode"	2,0

Calculation Results

Shadow receptor

Shadow, expected values

No.	Name	Shadow hours per year [h/year]
A	SHR_01	1:10
B	SHR_02	0:00
C	SHR_03	70:12
D	SHR_04	2:09
E	SHR_05	39:36
F	SHR_06	50:40
G	SHR_07	53:30
H	SHR_08	2:26
I	SHR_09	2:07
J	SHR_10	2:12
K	SHR_11	3:11
L	SHR_12	3:09
M	SHR_13	2:45
N	SHR_14	26:06
O	SHR_15	19:26
P	SHR_16	32:54
Q	SHR_17	24:48
R	SHR_18	30:40
S	SHR_19	30:36
T	SHR_20	38:49
U	SHR_21	46:42
V	SHR_22	26:38
W	SHR_23	38:48
X	SHR_24	26:02
Y	SHR_25	24:49
Z	SHR_26	37:11
AA	SHR_27	67:35
AB	SHR_28	2:18
AC	SHR_29	22:48
AD	SHR_30	0:00
AE	SHR_31	4:34
AF	SHR_32	7:38
AG	SHR_33	8:31
AH	SHR_34	7:29

SHADOW - Main Result**Calculation:** Wind Farm Apricena - Project

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

No.	Name	Worst case [h/year]	Expected [h/year]
1	AP01	0:00	0:00
2	AP02	209:40	70:12
3	AP03	0:00	0:00
4	AP04	3:51	1:10
5	AP05	9:34	2:09
6	AP06	157:41	61:55
7	AP07	17:45	5:42
8	AP08	83:08	27:57
9	AP09	793:06	198:47
10	AP10	101:25	22:48
11	AP11	0:00	0:00
12	AP12	0:00	0:00
13	AP13	0:00	0:00
14	AP14	0:00	0:00
15	AP15	20:22	3:51
16	AP16	75:17	14:40

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.



RELAZIONE DI FLICKERING

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ALLEGATO 2: "CALENDAR": EVOLUZIONE DEL FENOMENO CON DETTAGLIO GIORNALIERO CALCOLATO PER OGNI RECETTORE – IMPIANTO DI PROGETTO

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: A - SHR_01

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December			
1	07:27	07:13	06:36	06:44	05:57	05:27	05:28	05:52	06:24	06:45 (4)	06:55	06:30	07:06		
	16:39	17:13	17:48	19:24	19:57	20:27	20:38	20:18	19:34	11	06:56 (4)	18:43	16:55	16:30	
2	07:27	07:12	06:34	06:42	05:56	05:27	05:28	05:53	06:25	06:46 (4)	06:56	06:31	07:07		
	16:39	17:15	17:50	19:25	19:58	20:28	20:38	20:17	19:33	10	06:56 (4)	18:41	16:54	16:29	
3	07:27	07:11	06:33	06:40	05:54	05:26	05:29	05:54	06:26	06:47 (4)	06:57	06:33	07:08		
	16:40	17:16	17:51	19:26	19:59	20:28	20:38	20:16	19:31	8	06:55 (4)	18:39	16:52	16:29	
4	07:27	07:09	06:31	06:39	05:53	05:26	05:29	05:55	06:27	06:48 (4)	06:58	06:34	07:09		
	16:41	17:17	17:52	19:27	20:00	20:29	20:37	20:15	19:29	6	06:54 (4)	18:38	16:51	16:29	
5	07:27	07:08	06:29	06:37	05:52	05:26	05:30	05:56	06:28	06:49 (4)	06:59	06:35	07:10		
	16:42	17:19	17:53	19:28	20:01	20:30	20:37	20:14	19:28	4	06:53 (4)	18:36	16:50	16:29	
6	07:27	07:07	06:28	06:35	06:54 (4)	05:51	05:25	05:30	05:57	06:29	06:50 (4)	07:00	06:36	07:11	
	16:43	17:20	17:54	19:29	2	06:56 (4)	20:02	20:30	20:37	19:26	2	06:52 (4)	18:34	16:49	16:29
7	07:27	07:06	06:26	06:34	06:52 (4)	05:49	05:25	05:31	05:58	06:30	07:01	06:38	07:12		
	16:44	17:21	17:56	19:30	4	06:56 (4)	20:03	20:31	20:37	19:24	18:32	16:48	16:28		
8	07:27	07:05	06:24	06:32	06:51 (4)	05:48	05:25	05:32	05:59	06:31	07:03	06:39	07:13		
	16:45	17:22	17:57	19:31	6	06:57 (4)	20:04	20:32	20:36	19:22	18:31	16:46	16:28		
9	07:26	07:04	06:23	06:30	06:49 (4)	05:47	05:25	05:32	06:00	06:32	07:04	06:40	07:14		
	16:46	17:24	17:58	19:32	8	06:57 (4)	20:05	20:32	20:36	19:21	18:29	16:45	16:28		
10	07:26	07:03	06:21	06:29	06:48 (4)	05:46	05:24	05:33	06:01	06:33	07:05	06:41	07:15		
	16:47	17:25	17:59	19:34	10	06:58 (4)	20:06	20:33	20:36	19:19	18:28	16:44	16:28		
11	07:26	07:01	06:20	06:27	06:46 (4)	05:45	05:24	05:34	06:02	06:34	07:06	06:43	07:16		
	16:48	17:26	18:00	19:35	11	06:57 (4)	20:07	20:33	20:35	19:17	18:26	16:43	16:28		
12	07:26	07:00	06:18	06:26	06:44 (4)	05:44	05:24	05:34	06:03	06:35	07:07	06:40	16:29		
	16:49	17:28	18:01	19:36	12	06:56 (4)	20:08	20:34	20:35	19:16	18:24	16:42	16:29		
13	07:25	06:59	06:16	06:24	06:43 (4)	05:42	05:24	05:35	06:04	06:36	07:08	06:45	07:17		
	16:50	17:29	18:02	19:37	13	06:56 (4)	20:09	20:34	20:34	19:14	18:23	16:41	16:29		
14	07:25	06:58	06:15	06:22	06:41 (4)	05:41	05:24	05:36	06:05	06:37	07:09	06:46	07:18		
	16:51	17:30	18:04	19:38	14	06:55 (4)	20:10	20:35	20:34	19:12	18:21	16:40	16:29		
15	07:25	06:56	06:13	06:21	06:40 (4)	05:40	05:24	05:37	06:06	06:38	07:10	06:47	07:19		
	16:53	17:31	18:05	19:39	14	06:54 (4)	20:11	20:35	20:33	19:09	18:19	16:40	16:29		
16	07:24	06:55	06:11	06:19	06:39 (4)	05:39	05:24	05:38	06:07	06:39	07:11	06:49	07:20		
	16:54	17:33	18:06	19:40	13	06:52 (4)	20:12	20:36	20:32	19:09	18:18	16:39	16:29		
17	07:24	06:53	06:09	06:18	06:41 (4)	05:38	05:24	05:38	06:08	06:40	07:13	06:50	07:20		
	16:55	17:34	18:07	19:41	8	06:49 (4)	20:13	20:36	20:32	19:07	18:16	16:38	16:30		
18	07:23	06:52	06:08	06:16	05:37	05:24	05:39	06:10	06:41	06:41	07:14	06:51	07:21		
	16:56	17:35	18:08	19:42	20:14	20:36	20:31	19:56	19:05	18:15	16:37	16:30			
19	07:23	06:51	06:06	06:14	05:37	05:24	05:40	06:11	06:42	06:42	07:15	06:52	07:22		
	16:57	17:36	18:09	19:43	20:15	20:37	20:30	19:55	19:03	18:13	16:36	16:30			
20	07:22	06:49	06:04	06:13	05:36	05:24	05:41	06:12	06:43	06:43	07:16	06:53	07:22		
	16:58	17:38	18:10	19:44	20:16	20:37	20:30	19:53	19:02	18:12	16:36	16:31			
21	07:22	06:48	06:03	06:11	05:35	05:24	05:42	06:13	06:45	06:45	07:17	06:55	07:23		
	17:00	17:39	18:11	19:46	20:17	20:37	20:29	19:52	19:00	18:10	16:35	16:31			
22	07:21	06:46	06:01	06:10	05:34	05:24	05:43	06:14	06:46	06:46	07:18	06:56	07:23		
	17:01	17:40	18:13	19:47	20:18	20:38	20:28	19:50	19:58	18:09	16:34	16:32			
23	07:20	06:45	05:59	06:08	06:54 (4)	05:33	05:25	05:44	06:15	06:47	07:20	06:57	07:24		
	17:02	17:41	18:14	19:48	20:19	20:38	20:27	19:49	19:56	18:07	16:34	16:32			
24	07:19	06:43	05:58	06:07	05:32	05:25	05:45	06:16	06:48	06:48	07:21	06:58	07:24		
	17:03	17:42	18:15	19:49	20:20	20:38	20:26	19:47	18:55	18:06	16:33	16:33			
25	07:19	06:42	05:56	06:05	05:32	05:25	05:45	06:17	06:49	06:49	06:22	06:59	07:25		
	17:05	17:44	18:16	19:50	20:21	20:38	20:25	19:46	18:53	17:04	16:32	16:33			
26	07:18	06:40	05:54	06:04	05:31	05:26	05:46	06:18	06:50	06:23	07:00	07:25			
	17:06	17:45	18:17	19:51	20:22	20:38	20:24	19:44	9	06:52 (4)	17:03	16:32	16:34		
27	07:17	06:39	05:52	06:03	05:30	05:26	05:47	06:19	06:51	06:41 (4)	06:51	06:32	07:25		
	17:07	17:46	18:18	19:52	20:23	20:38	20:24	19:42	13	06:54 (4)	18:50	17:02	16:35		
28	07:16	06:37	05:51	06:01	05:30	05:26	05:48	06:20	06:41 (4)	06:52	06:25	07:03	07:26		
	17:08	17:47	18:19	19:53	20:24	20:38	20:23	19:41	14	06:55 (4)	18:48	17:00	16:31		
29	07:15		06:49	06:00	05:29	05:27	05:49	06:21	06:42 (4)	06:53	06:27	07:04	07:26		
	17:10		19:20	19:54	20:24	20:38	20:22	19:39	14	06:56 (4)	18:46	16:59	16:30		
30	07:14		06:47	05:58	05:28	05:27	05:50	06:22	06:43 (4)	06:54	06:28	07:05	07:26		
	17:11		19:21	19:55	20:25	20:38	20:20	19:38	13	06:56 (4)	18:44	16:58	16:30		
31	07:14		06:46		05:28		05:51	06:23	06:44 (4)		06:29	07:06	07:26		
	17:12		19:23		20:26		20:19	19:36	12	06:56 (4)	16:56		16:37		
Potential sun hours	295	296	369	400	450	455	461	429	375	344	296	285			
Total, worst case				115				75		41					
Sun reduction				0,50				0,68		0,61					
Oper. time red.				0,92				0,92		0,92					
Wind dir. red.				0,58				0,58		0,58					
Total reduction				0,27				0,36		0,32					
Total, real				31				27		13					

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: B - SHR_02

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:22 16:39	07:13 17:13	06:36 17:48	06:44 19:24	05:57 19:57	05:27 20:27	05:28 20:38	05:52 20:18	06:24 19:34	06:55 18:43	06:30 16:55	07:06 16:30
2	07:27 16:39	07:12 17:15	06:34 17:50	06:42 19:25	05:56 19:58	05:27 20:28	05:28 20:38	05:53 20:17	06:25 19:33	06:56 18:41	06:32 16:54	07:07 16:29
3	07:27 16:40	07:11 17:16	06:33 17:51	06:40 19:26	05:54 19:59	05:26 20:28	05:29 20:38	05:54 20:16	06:26 19:31	06:57 18:39	06:33 16:52	07:08 16:29
4	07:27 16:41	07:10 17:17	06:31 17:52	06:39 19:27	05:53 20:00	05:26 20:29	05:29 20:37	05:55 20:15	06:27 19:29	06:58 18:38	06:34 16:51	07:09 16:29
5	07:27 16:42	07:08 17:19	06:29 17:53	06:37 19:28	05:52 20:01	05:26 20:30	05:30 20:37	05:56 20:14	06:28 19:28	06:59 18:36	06:35 16:50	07:10 16:29
6	07:27 16:43	07:07 17:20	06:28 17:54	06:35 19:29	05:51 20:02	05:25 20:30	05:30 20:37	05:57 20:13	06:29 19:26	07:00 18:34	06:36 16:49	07:11 16:29
7	07:27 16:44	07:06 17:21	06:26 17:56	06:34 19:30	05:49 20:03	05:25 20:31	05:31 20:37	05:58 20:11	06:30 19:24	07:01 18:32	06:38 16:48	07:12 16:28
8	07:27 16:45	07:05 17:22	06:24 17:57	06:32 19:31	05:48 20:04	05:25 20:32	05:32 20:36	05:59 20:10	06:31 19:22	07:03 18:31	06:39 16:47	07:13 16:28
9	07:26 16:46	07:04 17:24	06:23 17:58	06:30 19:32	05:47 20:05	05:24 20:32	05:32 20:36	06:00 20:09	06:32 19:21	07:04 18:29	06:40 16:45	07:14 16:28
10	07:26 16:47	07:03 17:25	06:21 17:59	06:29 19:34	05:46 20:06	05:24 20:33	05:33 20:36	06:01 20:07	06:33 19:19	07:05 18:27	06:41 16:44	07:15 16:28
11	07:26 16:48	07:01 17:26	06:20 18:00	06:27 19:35	05:45 20:07	05:24 20:33	05:34 20:35	06:02 20:06	06:34 19:17	07:06 18:26	06:43 16:43	07:16 16:28
12	07:26 16:49	07:00 17:28	06:18 18:01	06:26 19:36	05:44 20:08	05:24 20:34	05:34 20:35	06:03 20:05	06:35 19:16	07:07 18:24	06:44 16:42	07:17 16:29
13	07:25 16:50	06:59 17:29	06:16 18:02	06:24 19:37	05:42 20:09	05:24 20:35	05:35 20:34	06:04 20:03	06:36 19:14	07:08 18:23	06:45 16:41	07:17 16:29
14	07:25 16:51	06:58 17:30	06:15 18:04	06:22 19:38	05:41 20:10	05:24 20:35	05:36 20:34	06:05 20:02	06:37 19:12	07:09 18:21	06:46 16:40	07:18 16:29
15	07:25 16:53	06:56 17:31	06:13 18:05	06:21 19:39	05:40 20:11	05:24 20:35	05:37 20:33	06:06 20:01	06:38 19:10	07:10 18:19	06:47 16:40	07:19 16:29
16	07:24 16:54	06:55 17:33	06:11 18:06	06:19 19:40	05:39 20:12	05:24 20:36	05:38 20:32	06:07 19:59	06:39 19:09	07:11 18:18	06:49 16:39	07:20 16:29
17	07:24 16:55	06:53 17:34	06:09 18:07	06:18 19:41	05:38 20:13	05:24 20:36	05:38 20:32	06:08 19:58	06:40 19:07	07:13 18:16	06:50 16:38	07:20 16:30
18	07:23 16:56	06:52 17:35	06:08 18:08	06:16 19:42	05:37 20:14	05:24 20:37	05:39 20:31	06:09 19:56	06:41 19:05	07:14 18:15	06:51 16:37	07:21 16:30
19	07:23 16:57	06:51 17:36	06:06 18:09	06:14 19:43	05:36 20:15	05:24 20:37	05:40 20:30	06:11 19:55	06:42 19:03	07:15 18:13	06:52 16:36	07:22 16:30
20	07:22 16:58	06:49 17:38	06:04 18:10	06:13 19:44	05:36 20:16	05:24 20:37	05:41 20:30	06:12 19:53	06:43 19:02	07:16 18:12	06:53 16:35	07:22 16:31
21	07:22 17:00	06:48 17:39	06:03 18:11	06:11 19:46	05:35 20:17	05:24 20:37	05:42 20:29	06:13 19:52	06:44 19:00	07:17 18:10	06:55 16:35	07:23 16:31
22	07:21 17:01	06:46 17:40	06:01 18:13	06:10 19:47	05:34 20:18	05:24 20:38	05:43 20:28	06:14 19:50	06:46 18:58	07:18 18:09	06:56 16:34	07:23 16:32
23	07:20 17:02	06:45 17:41	05:59 18:14	06:08 19:48	05:33 20:19	05:25 20:38	05:44 20:27	06:15 19:49	06:47 18:56	07:20 18:07	06:57 16:33	07:24 16:32
24	07:19 17:03	06:43 17:42	05:57 18:15	06:07 19:49	05:32 20:20	05:25 20:38	05:44 20:26	06:16 19:47	06:48 18:55	07:21 18:06	06:58 16:33	07:24 16:33
25	07:19 17:05	06:42 17:44	05:56 18:16	06:05 19:50	05:32 20:21	05:25 20:38	05:45 20:25	06:17 19:46	06:49 18:53	07:22 17:04	06:59 16:32	07:25 16:33
26	07:18 17:06	06:40 17:45	05:54 18:17	06:04 19:51	05:31 20:22	05:26 20:38	05:46 20:25	06:18 19:44	06:50 18:51	07:23 17:03	07:00 16:32	07:25 16:34
27	07:17 17:07	06:39 17:46	05:52 18:18	06:03 19:52	05:30 20:23	05:26 20:38	05:47 20:24	06:19 19:42	06:51 18:50	07:24 17:02	07:02 16:31	07:25 16:34
28	07:16 17:08	06:37 17:47	05:51 18:19	06:01 19:53	05:30 20:24	05:26 20:38	05:48 20:23	06:20 19:41	06:52 18:48	07:25 17:00	07:03 16:31	07:26 16:35
29	07:15 17:10		06:49 19:20	06:00 19:54	05:29 20:24	05:27 20:38	05:49 20:22	06:21 19:39	06:53 18:46	07:26 16:59	07:04 16:30	07:26 16:36
30	07:15 17:11		06:47 19:21	05:58 19:55	05:28 20:25	05:27 20:38	05:50 20:21	06:22 19:38	06:54 18:44	07:27 16:57	07:05 16:30	07:26 16:37
31	07:14 17:12		06:46 19:23		05:28 20:26		05:51 20:19	06:23 19:36		06:29 16:56		07:26 16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	344	296	285
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

Daily in month Sun rise (hh:mm) Sun set (hh:mm) Minibus with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: C - SHR_03

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June			
1	07:27 16:38	07:49 (2) 08:52 (2)	07:12 17:13	07:43 (2) 09:17 (2)	06:36 17:48	07:50 (2) 09:04 (2)	06:44 19:24	05:57 19:56	05:27 20:27
2	07:27 16:39	07:49 (2) 08:53 (2)	07:11 17:15	07:43 (2) 09:17 (2)	06:34 17:50	07:51 (2) 09:02 (2)	06:42 19:25	05:56 19:58	05:27 20:28
3	07:27 16:40	07:49 (2) 08:54 (2)	07:10 17:16	07:43 (2) 09:18 (2)	06:32 17:51	07:52 (2) 09:01 (2)	06:40 19:26	05:54 19:59	05:26 20:28
4	07:27 16:41	07:49 (2) 08:55 (2)	07:09 17:17	07:43 (2) 09:18 (2)	06:31 17:52	07:53 (2) 08:59 (2)	06:39 19:27	05:53 20:00	05:26 20:29
5	07:27 16:42	07:49 (2) 08:56 (2)	07:08 17:18	07:42 (2) 09:18 (2)	06:29 17:53	07:54 (2) 08:56 (2)	06:37 19:28	05:52 20:01	05:25 20:30
6	07:27 16:43	07:49 (2) 08:57 (2)	07:07 17:20	07:42 (2) 09:18 (2)	06:28 17:54	07:56 (2) 08:55 (2)	06:35 19:29	05:50 20:02	05:25 20:30
7	07:27 16:44	07:49 (2) 08:58 (2)	07:06 17:21	07:42 (2) 09:18 (2)	06:26 17:55	07:57 (2) 08:52 (2)	06:34 19:30	05:49 20:03	05:25 20:31
8	07:27 16:45	07:49 (2) 08:59 (2)	07:05 17:22	07:42 (2) 09:19 (2)	06:24 17:57	07:59 (2) 08:49 (2)	06:32 19:31	05:48 20:04	05:25 20:32
9	07:26 16:46	07:49 (2) 09:00 (2)	07:04 17:24	07:43 (2) 09:19 (2)	06:23 17:58	08:02 (2) 08:47 (2)	06:30 19:32	05:47 20:05	05:24 20:32
10	07:26 16:47	07:48 (2) 09:00 (2)	07:03 17:25	07:42 (2) 09:18 (2)	06:21 17:59	08:04 (2) 08:43 (2)	06:29 19:33	05:46 20:06	05:24 20:33
11	07:26 16:48	07:48 (2) 09:02 (2)	07:01 17:26	07:42 (2) 09:18 (2)	06:19 18:00	08:06 (2) 08:39 (2)	06:27 19:35	05:44 20:07	05:24 20:33
12	07:26 16:49	07:48 (2) 09:03 (2)	07:00 17:27	07:43 (2) 09:18 (2)	06:18 18:01	08:11 (2) 08:34 (2)	06:25 19:36	05:43 20:08	05:24 20:34
13	07:25 16:50	07:47 (2) 09:03 (2)	06:59 17:29	07:42 (2) 09:17 (2)	06:16 18:02		06:24 19:37	05:42 20:09	05:24 20:34
14	07:25 16:51	07:47 (2) 09:05 (2)	06:57 17:30	07:43 (2) 09:17 (2)	06:14 18:03		06:22 19:38	05:41 20:10	05:24 20:35
15	07:25 16:52	07:46 (2) 09:05 (2)	06:56 17:31	07:43 (2) 09:17 (2)	06:13 18:05		06:21 19:39	05:40 20:11	05:24 20:35
16	07:24 16:54	07:46 (2) 09:06 (2)	06:55 17:32	07:43 (2) 09:16 (2)	06:11 18:06		06:19 19:40	05:39 20:12	05:24 20:36
17	07:24 16:55	07:45 (2) 09:07 (2)	06:53 17:34	07:44 (2) 09:16 (2)	06:09 18:07		06:17 19:41	05:38 20:13	05:24 20:36
18	07:23 16:56	07:45 (2) 09:08 (2)	06:52 17:35	07:44 (2) 09:16 (2)	06:08 18:08		06:16 19:42	05:37 20:14	05:24 20:36
19	07:23 16:57	07:45 (2) 09:09 (2)	06:51 17:36	07:44 (2) 09:15 (2)	06:06 18:09		06:14 19:43	05:36 20:15	05:24 20:37
20	07:22 16:58	07:44 (2) 09:09 (2)	06:49 17:37	07:45 (2) 09:15 (2)	06:04 18:10		06:13 19:44	05:35 20:16	05:24 20:37
21	07:21 16:59	07:45 (2) 09:11 (2)	06:48 17:39	07:45 (2) 09:13 (2)	06:02 18:11		06:11 19:45	05:35 20:17	05:24 20:37
22	07:21 17:01	07:44 (2) 09:11 (2)	06:46 17:40	07:46 (2) 09:13 (2)	06:01 18:12		06:10 19:47	05:34 20:18	05:24 20:37
23	07:20 17:02	07:44 (2) 09:12 (2)	06:45 17:41	07:46 (2) 09:11 (2)	05:59 18:14		06:08 19:48	05:33 20:19	05:25 20:38
24	07:19 17:03	07:43 (2) 09:12 (2)	06:43 17:42	07:47 (2) 09:11 (2)	05:57 18:15		06:07 19:49	05:32 20:20	05:25 20:38
25	07:19 17:04	07:43 (2) 09:13 (2)	06:42 17:44	07:47 (2) 09:09 (2)	05:56 18:16		06:05 19:50	05:31 20:21	05:25 20:38
26	07:18 17:06	07:44 (2) 09:14 (2)	06:40 17:45	07:48 (2) 09:09 (2)	05:54 18:17		06:04 19:51	05:31 20:22	05:25 20:38
27	07:17 17:07	07:43 (2) 09:15 (2)	06:39 17:46	07:48 (2) 09:07 (2)	05:52 18:18		06:02 19:52	05:30 20:23	05:26 20:38
28	07:16 17:08	07:43 (2) 09:15 (2)	06:37 17:47	07:49 (2) 09:05 (2)	05:51 18:19		06:01 19:53	05:29 20:24	05:26 20:38
29	07:15 17:09	07:43 (2) 09:16 (2)			06:49 19:20		06:00 19:54	05:29 20:24	05:27 20:38
30	07:14 17:11	07:43 (2) 09:16 (2)			06:47 19:21		05:58 19:55	05:28 20:25	05:27 20:38
31	07:13 17:12	07:43 (2) 09:17 (2)			06:45 19:22			05:28 20:26	
Potential sun hours	295	296	369	400	450	455			
Total, worst case	2465	2549	646						
Sun reduction	0,43	0,44	0,44						
Oper. time red.	0,92	0,92	0,92						
Wind dir. red.	0,80	0,80	0,80						
Total reduction	0,32	0,32	0,33						
Total, real	781	823	211						

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	65 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: C - SHR_03

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:27	05:52	06:24	06:55	08:52 (2)	07:06
	20:38	20:18	19:34	18:43	18	09:10 (2)
2	05:28	05:53	06:25	06:56	08:47 (2)	06:31
	20:38	20:17	19:32	18:41	28	09:15 (2)
3	05:28	05:54	06:26	06:57	08:43 (2)	06:33
	20:38	20:16	19:31	18:39	36	09:19 (2)
4	05:29	05:55	06:27	06:58	08:39 (2)	06:34
	20:37	20:15	19:29	18:37	43	09:22 (2)
5	05:30	05:56	06:28	06:59	08:38 (2)	06:35
	20:37	20:14	19:27	18:36	47	09:25 (2)
6	05:30	05:57	06:29	07:00	08:35 (2)	06:36
	20:37	20:12	19:26	18:34	52	09:27 (2)
7	05:31	05:58	06:30	07:01	08:33 (2)	06:38
	20:37	20:11	19:24	18:32	56	09:29 (2)
8	05:31	05:59	06:31	07:02	08:31 (2)	06:39
	20:36	20:10	19:22	18:31	60	09:31 (2)
9	05:32	06:00	06:32	07:04	08:29 (2)	06:40
	20:36	20:09	19:21	18:29	63	09:32 (2)
10	05:33	06:01	06:33	07:05	08:27 (2)	06:41
	20:35	20:07	19:19	18:27	67	09:34 (2)
11	05:34	06:02	06:34	07:06	08:25 (2)	06:42
	20:35	20:06	19:17	18:26	70	09:35 (2)
12	05:34	06:03	06:35	07:07	08:24 (2)	06:44
	20:35	20:05	19:15	18:24	72	09:36 (2)
13	05:35	06:04	06:36	07:08	08:23 (2)	06:45
	20:34	20:03	19:14	18:22	75	09:38 (2)
14	05:36	06:05	06:37	07:09	08:22 (2)	06:46
	20:34	20:02	19:12	18:21	77	09:39 (2)
15	05:37	06:06	06:38	07:10	08:20 (2)	06:47
	20:33	20:00	19:10	18:19	80	09:40 (2)
16	05:37	06:07	06:39	07:11	08:19 (2)	06:49
	20:32	19:59	19:09	18:18	82	09:41 (2)
17	05:38	06:08	06:40	07:12	08:18 (2)	06:50
	20:32	19:58	19:07	18:16	83	09:41 (2)
18	05:39	06:09	06:41	07:14	08:17 (2)	06:51
	20:31	19:56	19:05	18:15	85	09:42 (2)
19	05:40	06:10	06:42	07:15	08:17 (2)	06:52
	20:30	19:55	19:03	18:13	86	09:43 (2)
20	05:41	06:11	06:43	07:16	08:16 (2)	06:53
	20:30	19:53	19:02	18:12	88	09:44 (2)
21	05:42	06:12	06:44	07:17	08:15 (2)	06:55
	20:29	19:52	19:00	18:10	89	09:44 (2)
22	05:42	06:13	06:45	07:18	08:14 (2)	06:56
	20:28	19:50	18:58	18:09	90	09:44 (2)
23	05:43	06:15	06:46	07:19	08:15 (2)	06:57
	20:27	19:49	18:56	18:07	91	09:46 (2)
24	05:44	06:16	06:47	07:21	08:14 (2)	06:58
	20:26	19:47	18:55	18:06	92	09:46 (2)
25	05:45	06:17	06:49	06:22	07:13 (2)	06:59
	20:25	19:45	18:53	17:04	93	08:46 (2)
26	05:46	06:18	06:50	06:23	07:12 (2)	07:00
	20:24	19:44	18:51	17:03	94	08:46 (2)
27	05:47	06:19	06:51	06:24	07:13 (2)	07:02
	20:23	19:42	18:49	17:01	94	08:47 (2)
28	05:48	06:20	06:52	06:25	07:12 (2)	07:03
	20:22	19:41	18:48	17:00	95	08:47 (2)
29	05:49	06:21	06:53	06:27	07:12 (2)	07:04
	20:21	19:39	18:46	16:59	95	08:47 (2)
30	05:50	06:22	06:54	06:28	07:11 (2)	07:05
	20:20	19:37	18:44	16:57	96	08:47 (2)
31	05:51	06:23	06:55	06:29	07:12 (2)	07:06
	20:19	19:36	18:43	16:56	96	08:48 (2)
Potential sun hours	461	429	375	344	296	285
Total, worst case				2293	2673	1954
Sun reduction				0,52	0,47	0,41
Oper. time red.				0,92	0,92	0,92
Wind dir. red.				0,80	0,80	0,80
Total reduction				0,38	0,35	0,30
Total, real				880	923	594

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	66 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: D - SHR_04

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 16:38	07:12 17:13	06:36 17:48	06:44 19:23	05:57 19:56	05:27 20:27	05:27 20:38	05:52 20:18	06:24 19:34	06:55 18:42	06:30 16:55	16:30 (5) 16:30 (5)
2	07:27 16:39	07:11 17:15	06:34 17:49	06:42 19:25	05:56 19:57	05:27 20:27	05:28 20:38	05:53 20:17	06:25 19:32	06:56 18:41	06:31 16:53	07:07 16:29
3	07:27 16:40	07:10 17:16	06:32 17:51	06:40 19:26	05:54 19:59	05:26 20:28	05:28 20:37	05:54 20:16	06:26 19:31	06:57 18:39	06:33 16:52	07:08 16:29
4	07:27 16:41	07:09 17:17	06:31 17:52	06:39 19:27	05:53 20:00	05:26 20:29	05:29 20:37	05:55 20:15	06:27 19:29	06:58 18:37	06:34 16:51	07:09 16:29
5	07:27 16:42	07:08 17:18	06:29 17:53	06:37 19:28	05:52 20:01	05:25 20:30	05:30 20:37	05:56 20:14	06:28 19:27	06:59 18:36	06:35 16:50	07:10 16:29
6	07:27 16:43	07:07 17:20	06:28 17:54	06:35 19:29	05:50 20:02	05:25 20:30	05:30 20:37	05:57 20:12	06:29 19:26	07:00 18:34	06:36 16:49	07:11 16:28
7	07:27 16:44	07:06 17:21	06:26 17:55	06:34 19:30	05:49 20:03	05:25 20:31	05:31 20:36	05:58 20:11	06:30 19:24	06:59 18:32	06:37 16:47	07:12 16:28
8	07:26 16:45	07:05 17:22	06:24 17:57	06:32 19:31	05:48 20:04	05:25 20:32	05:31 20:36	05:59 20:10	06:31 19:22	07:02 18:31	06:39 16:46	07:13 16:28
9	07:26 16:46	07:04 17:24	06:23 17:58	06:30 19:32	05:47 20:05	05:24 20:32	05:32 20:36	06:00 20:09	06:32 19:21	07:03 18:29	06:40 16:45	07:14 16:28
10	07:26 16:47	07:02 17:25	17:00 (5) 06:21	06:29 17:59	05:46 19:33	05:24 20:06	05:33 20:35	06:01 20:07	06:33 19:19	07:05 18:27	06:41 16:44	07:15 16:28
11	07:26 16:48	07:01 17:26	16:58 (5) 17:03 (5)	06:19 18:00	06:27 19:34	05:44 20:07	05:34 20:35	06:02 20:06	06:34 19:17	07:06 18:26	06:42 16:43	07:15 16:28
12	07:26 16:49	07:00 17:27	16:57 (5) 17:05 (5)	06:18 18:01	06:25 19:36	05:43 20:08	05:34 20:34	06:03 20:05	06:35 19:15	07:07 18:24	06:44 16:42	07:16 16:28
13	07:25 16:50	06:59 17:29	16:55 (5) 17:05 (5)	06:16 18:02	06:24 19:37	05:42 20:09	05:35 20:34	06:04 20:03	06:36 19:14	07:08 18:22	06:45 16:41	07:17 16:28
14	07:25 16:51	06:57 17:30	16:55 (5) 17:09 (5)	06:14 18:03	06:22 19:38	05:41 20:10	05:36 20:33	06:05 20:02	06:37 19:12	07:09 18:21	17:37 (5) 17:41 (5)	06:46 16:40
15	07:24 16:52	06:56 17:31	16:54 (5) 17:09 (5)	06:13 18:05	06:21 19:39	05:40 20:11	05:37 20:33	06:06 20:00	06:38 19:10	07:10 18:19	17:32 (5) 17:45 (5)	06:47 16:39
16	07:24 16:54	06:55 17:32	16:53 (5) 17:09 (5)	06:11 18:06	06:19 19:40	05:39 20:12	05:37 20:32	06:07 19:59	06:39 19:08	07:11 18:18	17:29 (5) 17:47 (5)	06:48 16:38
17	07:24 16:55	06:53 17:34	16:53 (5) 17:11 (5)	06:09 18:07	06:17 19:41	05:38 20:13	05:38 20:32	06:08 19:58	06:40 19:07	07:12 18:16	17:27 (5) 17:46 (5)	06:50 16:38
18	07:23 16:56	06:52 17:35	16:53 (5) 17:12 (5)	06:08 18:08	06:16 19:42	05:37 20:14	05:39 20:31	06:09 19:56	06:41 19:05	07:14 18:15	17:26 (5) 17:49 (5)	06:51 16:37
19	07:23 16:57	06:51 17:36	16:53 (5) 17:14 (5)	06:06 18:09	06:14 19:43	05:36 20:15	05:40 20:30	06:10 19:55	06:42 19:03	07:15 18:13	17:26 (5) 17:50 (5)	06:52 16:36
20	07:22 16:58	06:49 17:37	16:54 (5) 17:16 (5)	06:04 18:10	06:13 19:44	05:35 20:16	05:41 20:29	06:11 19:53	06:43 19:02	07:16 18:12	17:25 (5) 17:48 (5)	06:53 16:35
21	07:21 16:59	06:48 17:39	16:53 (5) 17:16 (5)	06:02 18:11	06:11 19:45	05:35 20:17	05:42 20:29	06:12 19:52	06:44 19:00	07:17 18:10	17:24 (5) 17:46 (5)	06:54 16:35
22	07:21 17:01	06:46 17:40	16:54 (5) 17:18 (5)	06:01 18:12	06:10 19:47	05:34 20:18	05:42 20:28	06:13 19:50	06:45 18:58	07:18 18:09	17:23 (5) 17:45 (5)	06:56 16:34
23	07:20 17:02	06:45 17:41	16:54 (5) 17:18 (5)	05:59 18:14	06:08 19:48	05:33 20:19	05:43 20:27	06:14 19:48	06:46 18:56	07:19 18:07	17:24 (5) 17:44 (5)	06:57 16:33
24	07:19 17:03	06:43 17:42	16:56 (5) 17:18 (5)	05:57 18:15	06:07 19:49	05:32 20:20	05:44 20:26	06:16 19:47	06:47 18:55	07:21 18:06	17:23 (5) 17:42 (5)	06:58 16:33
25	07:19 17:04	06:42 17:43	16:57 (5) 17:16 (5)	05:56 18:16	06:05 19:50	05:31 20:21	05:45 20:25	06:17 19:45	06:48 18:53	06:22 17:04	16:23 (5) 16:40 (5)	06:59 16:32
26	07:18 17:06	06:40 17:45	16:58 (5) 17:14 (5)	05:54 18:17	06:04 19:51	05:31 20:22	05:46 20:24	06:18 19:44	06:50 18:51	06:23 17:03	16:23 (5) 16:39 (5)	07:00 16:34
27	07:17 17:07	06:39 17:46	17:01 (5) 17:11 (5)	05:52 18:18	06:02 19:52	05:30 20:23	05:47 20:23	06:19 19:42	06:51 18:49	06:24 17:01	16:24 (5) 16:38 (5)	07:01 16:34
28	07:16 17:08	06:37 17:47	05:50 18:19	06:01 19:53	05:29 20:23	05:26 20:38	05:48 20:22	06:20 19:41	06:52 18:48	06:25 17:00	16:25 (5) 16:36 (5)	07:03 16:35
29	07:15 17:09	06:35 17:49	06:49 19:20	06:00 19:54	05:29 20:24	05:27 20:38	05:49 20:21	06:21 19:39	06:53 18:46	06:26 16:59	16:25 (5) 16:35 (5)	07:04 16:30
30	07:14 17:11	06:33 17:51	06:47 19:21	05:58 19:55	05:28 20:25	05:27 20:38	05:50 20:20	06:22 19:37	06:54 18:44	06:28 16:57	16:26 (5) 16:33 (5)	07:05 16:30
31	07:13 17:12	06:31 17:50	06:45 19:22	05:56 20:26	05:28 20:26	05:27 20:19	05:51 20:19	06:23 19:36	06:29 16:56	06:29 16:32	16:28 (5) 16:32 (5)	07:06 16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	344	296	285
Total, worst case		285								288		1
Sun reduction		0,44								0,52		0,47
Oper. time red.		0,92								0,92		0,92
Wind dir. red.		0,51								0,51		0,51
Total reduction		0,21								0,24		0,22
Total, real		59								71		0

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	67 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: E - SHR_05

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June
1	07:26 16:38	07:12 17:13	06:35 17:48	06:44 19:23	05:57 19:56	18:12 (6) 20:27
2	07:26 16:39	07:11 17:15	06:34 17:49	06:42 19:25	05:55 19:57	18:12 (6) 20:27
3	07:27 16:40	07:10 17:16	06:32 17:51	06:40 19:26	05:54 19:58	18:13 (6) 20:28
4	07:27 16:41	07:09 17:17	06:31 17:52	06:39 19:27	05:53 20:00	18:13 (6) 20:29
5	07:27 16:42	07:08 17:18	06:29 17:53	06:37 19:28	05:52 20:01	18:12 (6) 20:30
6	07:27 16:43	07:07 17:20	06:28 17:54	06:35 19:29	05:50 20:02	18:13 (6) 20:30
7	07:26 16:44	07:06 17:21	06:26 17:55	06:34 19:30	05:49 20:03	18:13 (6) 20:31
8	07:26 16:45	07:05 17:22	06:24 17:57	06:32 19:31	05:48 20:04	18:14 (6) 20:31
9	07:26 16:46	07:04 17:23	06:23 17:58	06:30 19:32	05:47 20:05	18:14 (6) 20:32
10	07:26 16:47	07:02 17:25	06:21 17:59	06:29 19:33	05:46 20:06	18:15 (6) 20:33
11	07:26 16:48	07:01 17:26	06:19 18:00	06:27 19:34	05:44 20:07	18:15 (6) 20:33
12	07:25 16:49	07:00 17:27	06:18 18:01	06:25 19:35	05:43 20:08	18:16 (6) 20:34
13	07:25 16:50	06:59 17:29	06:16 18:02	06:24 19:37	05:42 20:09	18:16 (6) 20:34
14	07:25 16:51	06:57 17:30	06:14 18:03	06:22 19:38	05:41 20:10	18:17 (6) 20:35
15	07:24 16:52	06:56 17:31	06:13 18:05	06:21 19:39	05:40 20:11	18:18 (6) 20:35
16	07:24 16:54	06:55 17:32	06:11 18:06	06:19 19:40	05:39 20:12	18:18 (6) 20:36
17	07:24 16:55	06:53 17:34	06:09 18:07	06:17 19:41	05:38 20:13	18:19 (6) 20:36
18	07:23 16:56	06:52 17:35	06:08 18:08	06:16 19:42	05:37 20:14	18:19 (6) 20:36
19	07:22 16:57	06:50 17:36	06:06 18:09	06:14 19:43	05:36 20:15	18:20 (6) 20:37
20	07:22 16:58	06:49 17:37	06:04 18:10	06:13 19:44	05:35 20:16	18:21 (6) 20:37
21	07:21 16:59	06:48 17:39	06:02 18:11	06:11 19:45	05:35 20:17	18:21 (6) 20:37
22	07:21 17:01	06:46 17:40	06:01 18:12	06:10 19:46	05:34 20:18	18:23 (6) 20:37
23	07:20 17:02	06:45 17:41	05:59 18:13	06:08 19:48	05:33 20:19	18:24 (6) 20:37
24	07:19 17:03	06:43 17:42	05:57 18:15	06:07 19:49	05:32 20:20	18:24 (6) 20:38
25	07:18 17:04	06:42 17:43	05:56 18:16	06:05 19:50	05:31 20:21	18:26 (6) 20:38
26	07:18 17:06	06:40 17:45	05:54 18:17	06:04 19:51	05:31 20:22	18:27 (6) 20:38
27	07:17 17:07	06:39 17:46	05:52 18:18	06:02 19:52	05:30 20:22	18:28 (6) 20:38
28	07:16 17:08	06:37 17:47	05:50 18:19	06:01 19:53	05:29 20:23	18:29 (6) 20:38
29	07:15 17:09		06:49 19:20	06:00 19:54	05:29 20:24	18:30 (6) 20:38
30	07:14 17:11		06:47 19:21	05:58 19:55	05:28 20:25	18:32 (6) 20:38
31	07:13 17:12		06:45 19:22		05:28 20:26	18:33 (6) 19:01 (6)
Potential sun hours	295	296	369	400	450	455
Total, worst case				1344	1631	108
Sun reduction				0,50	0,57	0,62
Oper. time red.				0,92	0,92	0,92
Wind dir. red.				0,69	0,69	0,69
Total reduction				0,32	0,36	0,39
Total, real				426	582	42

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: E - SHR_05

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:27 20:38	05:52 20:18	18:25 (6) 06:24	18:27 (6) 06:55	06:30 07:06	
2	05:28 20:38	05:53 20:17	61 18:25 (6) 19:34	44 18:29 (6) 18:42	16:55 16:29	
3	05:28 20:37	05:54 20:16	61 18:24 (6) 19:32	39 18:31 (6) 18:41	06:31 06:32	07:07
4	05:29 20:37	05:55 20:15	62 18:24 (6) 19:31	35 18:33 (6) 18:39	06:57 06:58	07:08
5	05:30 20:37	05:56 20:13	63 18:23 (6) 19:29	30 18:36 (6) 18:36	06:34 06:35	07:09
6	05:30 20:37	18:53 (6) 05:57	64 18:23 (6) 19:27	23 18:42 (6) 18:59 (6)	06:36 07:00	07:10
7	05:31 20:36	18:55 (6) 20:12	64 18:22 (6) 19:26	11 18:53 (6) 18:34	16:49 16:49	16:28
8	05:31 20:36	18:49 (6) 05:58	66 18:22 (6) 19:24	11 18:32 16:47	07:01 06:37	07:12
9	05:31 20:36	19:00 (6) 20:11	66 18:22 (6) 19:22	11 18:32 16:47	07:02 06:39	07:13
10	05:32 20:36	18:47 (6) 05:59	66 18:22 (6) 19:22	11 18:31 16:46	07:03 06:40	07:14
11	05:32 20:36	19:02 (6) 20:10	66 18:22 (6) 19:21	11 18:31 16:46	07:03 06:40	07:14
12	05:32 20:36	18:45 (6) 06:00	66 18:21 (6) 19:21	11 18:29 16:45	07:05 06:41	07:15
13	05:33 20:35	19:04 (6) 20:08	66 18:21 (6) 19:19	11 18:27 16:44	07:05 06:41	07:15
14	05:33 20:35	18:44 (6) 06:01	67 18:21 (6) 19:19	11 18:27 16:44	07:06 06:42	07:15
15	05:34 20:35	18:42 (6) 06:02	67 18:21 (6) 19:17	11 18:26 16:43	07:07 06:43	07:16
16	05:34 20:34	19:07 (6) 20:06	67 18:21 (6) 19:17	11 18:26 16:43	07:07 06:43	07:16
17	05:34 20:34	18:42 (6) 06:03	67 18:21 (6) 19:15	11 18:24 16:42	07:08 06:45	07:17
18	05:35 20:34	19:09 (6) 20:04	68 18:20 (6) 19:14	11 18:22 16:41	07:08 06:45	07:17
19	05:35 20:34	18:41 (6) 06:04	68 18:20 (6) 19:14	11 18:22 16:41	07:09 06:46	07:18
20	05:36 20:33	19:10 (6) 20:03	67 18:20 (6) 19:12	11 18:21 16:40	07:09 06:46	07:18
21	05:36 20:33	18:40 (6) 06:05	67 18:20 (6) 19:12	11 18:21 16:40	07:10 06:47	07:19
22	05:37 20:33	19:12 (6) 20:02	67 18:20 (6) 19:10	11 18:19 16:39	07:10 06:47	07:19
23	05:37 20:33	18:38 (6) 06:06	67 18:20 (6) 19:09	11 18:19 16:39	07:11 06:48	07:19
24	05:37 20:32	19:12 (6) 20:00	67 18:20 (6) 19:08	11 18:18 16:38	07:11 06:48	07:19
25	05:37 20:32	18:37 (6) 06:07	67 18:20 (6) 19:08	11 18:18 16:38	07:12 06:50	07:20
26	05:38 20:31	19:14 (6) 19:59	66 18:20 (6) 19:07	11 18:16 16:38	07:12 06:50	07:20
27	05:38 20:31	18:37 (6) 06:08	66 18:20 (6) 19:07	11 18:16 16:38	07:13 06:51	07:21
28	05:39 20:31	18:36 (6) 06:09	66 18:20 (6) 19:05	11 18:15 16:37	07:13 06:51	07:21
29	05:39 20:31	19:16 (6) 19:56	66 18:20 (6) 19:05	11 18:15 16:37	07:15 06:52	07:21
30	05:40 20:30	18:35 (6) 06:10	65 18:20 (6) 19:03	11 18:15 16:37	07:15 06:52	07:21
31	05:40 20:30	19:17 (6) 19:55	65 18:20 (6) 19:03	11 18:13 16:36	07:15 06:52	07:21
1	05:41 20:29	18:34 (6) 06:11	65 18:20 (6) 19:01	11 18:13 16:36	07:16 06:53	07:22
2	05:41 20:29	19:17 (6) 19:53	65 18:20 (6) 19:01	11 18:11 16:35	07:16 06:54	07:22
3	05:42 20:29	18:33 (6) 06:12	64 18:20 (6) 19:00	11 18:11 16:35	07:17 06:54	07:22
4	05:42 20:29	19:18 (6) 19:52	64 18:20 (6) 19:00	11 18:10 16:35	07:17 06:54	07:22
5	05:42 20:28	18:32 (6) 06:13	64 18:20 (6) 18:58	11 18:10 16:35	07:18 06:56	07:23
6	05:42 20:28	19:19 (6) 19:50	64 18:20 (6) 18:58	11 18:08 16:34	07:18 06:56	07:23
7	05:43 20:27	18:32 (6) 06:14	63 18:20 (6) 18:56	11 18:08 16:34	07:19 06:57	07:23
8	05:43 20:27	19:20 (6) 19:48	63 18:20 (6) 18:56	11 18:07 16:33	07:19 06:57	07:23
9	05:44 20:26	18:31 (6) 06:15	61 18:21 (6) 18:54	11 18:07 16:33	07:20 06:58	07:24
10	05:44 20:26	19:21 (6) 19:47	61 18:21 (6) 18:54	11 18:06 16:33	07:20 06:58	07:24
11	05:45 20:25	18:30 (6) 06:17	60 18:21 (6) 18:53	11 18:06 16:33	06:22 06:59	07:24
12	05:45 20:25	19:22 (6) 19:45	60 18:21 (6) 18:53	11 17:04 16:32	06:22 06:59	07:24
13	05:46 20:24	18:30 (6) 06:18	58 18:22 (6) 18:51	11 17:04 16:32	06:23 07:00	07:25
14	05:46 20:24	19:23 (6) 19:44	58 18:22 (6) 18:51	11 17:03 16:32	06:23 07:00	07:25
15	05:47 20:23	18:29 (6) 06:19	57 18:22 (6) 18:49	11 17:03 16:32	06:24 07:01	07:25
16	05:47 20:23	18:29 (6) 06:19	57 18:22 (6) 18:49	11 17:03 16:32	06:24 07:01	07:25
17	05:48 20:22	19:24 (6) 19:42	57 18:22 (6) 18:49	11 17:01 16:31	06:25 07:02	07:25
18	05:48 20:22	18:29 (6) 06:20	54 18:23 (6) 18:48	11 17:01 16:31	06:25 07:02	07:25
19	05:49 20:21	19:24 (6) 19:41	54 18:23 (6) 18:48	11 17:00 16:31	06:26 07:04	07:26
20	05:49 20:21	18:28 (6) 06:21	52 18:24 (6) 18:46	11 16:59 16:30	06:26 07:04	07:26
21	05:50 20:20	19:25 (6) 19:39	52 18:24 (6) 18:46	11 16:59 16:30	06:28 07:05	07:26
22	05:50 20:20	18:26 (6) 06:22	49 18:25 (6) 18:44	11 16:57 16:30	06:28 07:05	07:26
23	05:51 20:19	19:25 (6) 19:37	49 18:25 (6) 18:44	11 16:57 16:30	06:29 07:06	07:26
24	05:51 20:19	18:26 (6) 06:23	47 18:26 (6) 19:13 (6)	11 16:57 16:30	06:29 07:06	07:26
25	05:51 20:19	19:25 (6) 19:36	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
26	05:51 20:19	18:26 (6) 06:23	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
27	05:51 20:19	19:25 (6) 19:36	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
28	05:51 20:19	18:26 (6) 06:23	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
29	05:51 20:19	19:25 (6) 19:36	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
30	05:51 20:19	18:26 (6) 06:23	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
31	05:51 20:19	19:25 (6) 19:36	47 18:26 (6) 19:13 (6)	11 16:56 16:29	06:29 07:06	07:26
Potential sun hours	461	429	375	344	296	285
Total, worst case	996	1934	182			
Sun reduction	0,68	0,68	0,61			
Oper. time red.	0,92	0,92	0,92			
Wind dir. red.	0,69	0,69	0,69			
Total reduction	0,43	0,43	0,38			
Total, real	427	829	70			

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	69 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: F - SHR_06

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:26	07:12	06:35	06:44	05:57	18:18 (6)
	16:38	17:13	17:48	19:23	19:56	67 19:25 (6)
2	07:26	07:11	06:34	06:42	05:55	18:18 (6)
	16:39	17:15	17:49	19:25	19:57	68 19:26 (6)
3	07:27	07:10	06:32	06:40	05:54	18:18 (6)
	16:40	17:16	17:51	19:26	19:58	68 19:26 (6)
4	07:27	07:09	06:31	06:39	05:53	18:18 (6)
	16:41	17:17	17:52	19:27	20:00	68 19:26 (6)
5	07:27	07:08	06:29	06:37	05:52	18:17 (6)
	16:42	17:18	17:53	19:28	20:01	68 19:25 (6)
6	07:27	07:07	06:28	06:35	05:50	18:17 (6)
	16:43	17:20	17:54	19:29	20:02	69 19:26 (6)
7	07:26	07:06	06:26	06:34	05:49	18:17 (6)
	16:44	17:21	17:55	19:30	20:03	69 19:26 (6)
8	07:26	07:05	06:24	06:32	05:48	18:17 (6)
	16:45	17:22	17:57	19:31	20:04	69 19:26 (6)
9	07:26	07:04	06:23	06:30	05:47	18:18 (6)
	16:46	17:23	17:58	19:32	20:05	68 19:26 (6)
10	07:26	07:02	06:21	06:29	05:46	18:18 (6)
	16:47	17:25	17:59	19:33	20:06	68 19:26 (6)
11	07:26	07:01	06:19	06:27	18:52 (6)	05:44
	16:48	17:26	18:00	19:34	9 19:01 (6)	20:07
12	07:25	07:00	06:18	06:25	18:45 (6)	05:43
	16:49	17:27	18:01	19:35	21 19:06 (6)	20:08
13	07:25	06:59	06:16	06:24	18:40 (6)	05:42
	16:50	17:29	18:02	19:37	29 19:09 (6)	20:09
14	07:25	06:57	06:14	06:22	18:38 (6)	05:41
	16:51	17:30	18:03	19:38	35 19:13 (6)	20:10
15	07:24	06:56	06:13	06:21	18:35 (6)	05:40
	16:52	17:31	18:05	19:39	39 19:14 (6)	20:11
16	07:24	06:55	06:11	06:19	18:33 (6)	05:39
	16:54	17:32	18:06	19:40	43 19:16 (6)	20:12
17	07:24	06:53	06:09	06:17	18:31 (6)	05:38
	16:55	17:34	18:07	19:41	46 19:17 (6)	20:13
18	07:23	06:52	06:08	06:16	18:30 (6)	05:37
	16:56	17:35	18:08	19:42	49 19:19 (6)	20:14
19	07:22	06:50	06:06	06:14	18:28 (6)	05:36
	16:57	17:36	18:09	19:43	52 19:20 (6)	20:15
20	07:22	06:49	06:04	06:13	18:27 (6)	05:35
	16:58	17:37	18:10	19:44	54 19:21 (6)	20:16
21	07:21	06:48	06:02	06:11	18:25 (6)	05:35
	16:59	17:39	18:11	19:45	56 19:21 (6)	20:17
22	07:21	06:46	06:01	06:10	18:24 (6)	05:34
	17:01	17:40	18:12	19:46	59 19:23 (6)	20:18
23	07:20	06:45	05:59	06:08	18:23 (6)	05:33
	17:02	17:41	18:13	19:48	60 19:23 (6)	20:19
24	07:19	06:43	05:57	06:07	18:22 (6)	05:32
	17:03	17:42	18:15	19:49	62 19:24 (6)	20:20
25	07:18	06:42	05:56	06:05	18:21 (6)	05:31
	17:04	17:43	18:16	19:50	63 19:24 (6)	20:21
26	07:18	06:40	05:54	06:04	18:21 (6)	05:31
	17:06	17:45	18:17	19:51	63 19:24 (6)	20:22
27	07:17	06:39	05:52	06:02	18:20 (6)	05:30
	17:07	17:46	18:18	19:52	65 19:25 (6)	20:22
28	07:16	06:37	05:50	06:01	18:19 (6)	05:29
	17:08	17:47	18:19	19:53	66 19:25 (6)	20:23
29	07:15		06:49	06:00	18:19 (6)	05:29
	17:09		19:20	19:54	66 19:25 (6)	20:24
30	07:14		06:47	05:58	18:19 (6)	05:28
	17:11		19:21	19:55	67 19:26 (6)	20:25
31	07:13		06:45			05:28
	17:12		19:22			20:26
Potential sun hours	295	296	369	400	450	455
Total, worst case				1004	1952	1227
Sun reduction				0,50	0,57	0,62
Oper. time red.				0,92	0,92	0,92
Wind dir. red.				0,70	0,70	0,70
Total reduction				0,32	0,36	0,39
Total, real				323	708	483

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	70 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: F - SHR_06

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:27	18:39 (6) 05:52	18:28 (6) 06:24	18:51 (6) 06:55	06:30	07:06
	20:38	41 19:20 (6) 20:18	67 19:35 (6) 19:34	8 18:59 (6) 18:42	16:55	16:29
2	05:28	18:39 (6) 05:53	18:28 (6) 06:25		06:56	06:31 07:07
	20:38	42 19:21 (6) 20:17	67 19:35 (6) 19:32		18:41	16:53 16:29
3	05:28	18:38 (6) 05:54	18:27 (6) 06:26		06:57	06:32 07:08
	20:37	43 19:21 (6) 20:16	68 19:35 (6) 19:31		18:39	16:52 16:29
4	05:29	18:39 (6) 05:55	18:27 (6) 06:27		06:58	06:34 07:09
	20:37	43 19:22 (6) 20:15	68 19:35 (6) 19:29		18:37	16:51 16:29
5	05:30	18:39 (6) 05:56	18:27 (6) 06:28		06:59	06:35 07:10
	20:37	44 19:23 (6) 20:13	68 19:35 (6) 19:27		18:36	16:50 16:29
6	05:30	18:38 (6) 05:57	18:27 (6) 06:29		07:00	06:36 07:11
	20:37	45 19:23 (6) 20:12	68 19:35 (6) 19:26		18:34	16:49 16:28
7	05:31	18:38 (6) 05:58	18:27 (6) 06:30		07:01	06:37 07:12
	20:36	46 19:24 (6) 20:11	68 19:35 (6) 19:24		18:32	16:47 16:28
8	05:31	18:37 (6) 05:59	18:27 (6) 06:31		07:02	06:39 07:13
	20:36	47 19:24 (6) 20:10	68 19:35 (6) 19:22		18:31	16:46 16:28
9	05:32	18:37 (6) 06:00	18:26 (6) 06:32		07:03	06:40 07:14
	20:36	48 19:25 (6) 20:08	69 19:35 (6) 19:21		18:29	16:45 16:28
10	05:33	18:37 (6) 06:01	18:26 (6) 06:33		07:05	06:41 07:15
	20:35	49 19:26 (6) 20:07	69 19:35 (6) 19:19		18:27	16:44 16:28
11	05:34	18:36 (6) 06:02	18:26 (6) 06:34		07:06	06:42 07:15
	20:35	50 19:26 (6) 20:06	68 19:34 (6) 19:17		18:26	16:43 16:28
12	05:34	18:36 (6) 06:03	18:26 (6) 06:35		07:07	06:43 07:16
	20:34	51 19:27 (6) 20:04	68 19:34 (6) 19:15		18:24	16:42 16:28
13	05:35	18:36 (6) 06:04	18:27 (6) 06:36		07:08	06:45 07:17
	20:34	52 19:28 (6) 20:03	66 19:33 (6) 19:14		18:22	16:41 16:28
14	05:36	18:35 (6) 06:05	18:27 (6) 06:37		07:09	06:46 07:18
	20:33	53 19:28 (6) 20:02	66 19:33 (6) 19:12		18:21	16:40 16:29
15	05:37	18:34 (6) 06:06	18:27 (6) 06:38		07:10	06:47 07:19
	20:33	54 19:28 (6) 20:00	65 19:32 (6) 19:10		18:19	16:39 16:29
16	05:37	18:34 (6) 06:07	18:27 (6) 06:39		07:11	06:48 07:19
	20:32	55 19:29 (6) 19:59	65 19:32 (6) 19:08		18:18	16:38 16:29
17	05:38	18:34 (6) 06:08	18:27 (6) 06:40		07:12	06:50 07:20
	20:31	56 19:30 (6) 19:57	64 19:31 (6) 19:07		18:16	16:38 16:29
18	05:39	18:34 (6) 06:09	18:28 (6) 06:41		07:13	06:51 07:21
	20:31	57 19:31 (6) 19:56	62 19:30 (6) 19:05		18:15	16:37 16:30
19	05:40	18:33 (6) 06:10	18:28 (6) 06:42		07:15	06:52 07:21
	20:30	58 19:31 (6) 19:55	61 19:29 (6) 19:03		18:13	16:36 16:30
20	05:41	18:32 (6) 06:11	18:29 (6) 06:43		07:16	06:53 07:22
	20:29	59 19:31 (6) 19:53	59 19:28 (6) 19:01		18:11	16:35 16:30
21	05:42	18:32 (6) 06:12	18:29 (6) 06:44		07:17	06:54 07:22
	20:29	60 19:32 (6) 19:52	58 19:27 (6) 19:00		18:10	16:35 16:31
22	05:42	18:32 (6) 06:13	18:30 (6) 06:45		07:18	06:56 07:23
	20:28	60 19:32 (6) 19:50	56 19:26 (6) 18:58		18:08	16:34 16:31
23	05:43	18:31 (6) 06:14	18:31 (6) 06:46		07:19	06:57 07:23
	20:27	62 19:33 (6) 19:48	54 19:25 (6) 18:56		18:07	16:33 16:32
24	05:44	18:31 (6) 06:15	18:32 (6) 06:47		07:20	06:58 07:24
	20:26	62 19:33 (6) 19:47	51 19:23 (6) 18:54		18:06	16:33 16:32
25	05:45	18:31 (6) 06:17	18:33 (6) 06:48		06:22	06:59 07:24
	20:25	63 19:34 (6) 19:45	49 19:22 (6) 18:53		17:04	16:32 16:33
26	05:46	18:30 (6) 06:18	18:34 (6) 06:49		06:23	07:00 07:25
	20:24	64 19:34 (6) 19:44	46 19:20 (6) 18:51		17:03	16:32 16:34
27	05:47	18:30 (6) 06:19	18:35 (6) 06:51		06:24	07:01 07:25
	20:23	65 19:35 (6) 19:42	43 19:18 (6) 18:49		17:01	16:31 16:34
28	05:48	18:30 (6) 06:20	18:37 (6) 06:52		06:25	07:02 07:25
	20:22	65 19:35 (6) 19:41	39 19:16 (6) 18:48		17:00	16:31 16:35
29	05:49	18:30 (6) 06:21	18:39 (6) 06:53		06:26	07:04 07:26
	20:21	65 19:35 (6) 19:39	34 19:13 (6) 18:46		16:59	16:30 16:36
30	05:50	18:28 (6) 06:22	18:41 (6) 06:54		06:28	07:05 07:26
	20:20	67 19:35 (6) 19:37	29 19:10 (6) 18:44		16:57	16:30 16:36
31	05:51	18:28 (6) 06:23	18:45 (6)		06:29	07:06 07:26
	20:19	67 19:35 (6) 19:36	21 19:06 (6)		16:56	16:37 16:37
Potential sun hours	461	429	375	344	296	285
Total, worst case	1693		1804			
Sun reduction	0,68		0,68			0,61
Oper. time red.	0,92		0,92			0,92
Wind dir. red.	0,70		0,70			0,70
Total reduction	0,44		0,44			0,39
Total, real	738		786			3

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	71 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: G - SHR_07

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 07:12 06:35 06:44	05:57	18:22 (6) 05:27	18:27 (6) 05:27	18:36 (6) 05:52	18:30 (6) 06:24	06:55	06:30 07:06				
2	07:26 07:13 07:48 19:23	05:55	66 19:28 (6) 05:27	60 19:27 (6) 05:28	53 19:29 (6) 05:18	70 19:40 (6) 19:34	18:42	18:55	16:29			
3	07:27 07:10 06:32 06:40	05:54	67 19:29 (6) 05:27	59 19:26 (6) 05:38	53 19:30 (6) 05:17	70 19:40 (6) 19:32	18:41	16:53	16:29			
4	07:27 07:09 06:31 06:39	05:53	68 19:29 (6) 05:26	58 19:28 (6) 05:28	54 19:30 (6) 05:16	70 19:40 (6) 19:31	18:39	16:52	16:29			
5	07:27 07:08 06:29 06:37	05:52	69 19:30 (6) 05:25	57 19:28 (6) 05:30	55 19:31 (6) 05:15	70 19:40 (6) 19:29	18:37	16:58	16:29			
6	07:27 07:07 06:28 06:35	05:50	69 19:29 (6) 05:25	57 19:26 (6) 05:37	55 19:32 (6) 05:13	69 19:39 (6) 19:27	18:36	16:50	16:29			
7	07:26 07:06 06:26 06:34	05:49	69 19:29 (6) 05:25	56 19:26 (6) 05:37	56 19:32 (6) 05:12	69 19:39 (6) 19:26	18:34	16:49	16:28			
8	07:26 07:05 06:24 06:32	05:48	70 19:30 (6) 05:24	57 19:28 (6) 05:36	57 19:33 (6) 05:11	69 19:39 (6) 19:24	18:32	16:47	16:28			
9	07:26 07:04 06:23 06:30	05:47	70 19:30 (6) 05:24	55 19:26 (6) 05:36	58 19:33 (6) 05:10	69 19:39 (6) 19:22	18:31	16:46	16:28			
10	07:26 07:02 06:21 06:29	05:46	70 19:30 (6) 05:24	54 19:26 (6) 05:36	58 19:33 (6) 05:08	68 19:38 (6) 19:21	18:29	16:45	16:28			
11	07:26 07:01 06:19 06:27	05:44	70 19:30 (6) 05:24	54 19:25 (6) 05:37	58 19:36 (6) 05:07	68 19:38 (6) 19:19	18:27	16:44	16:28			
12	07:25 07:00 06:18 06:25	05:43	70 19:30 (6) 05:24	53 19:25 (6) 05:38	59 19:34 (6) 05:06	66 19:37 (6) 19:17	18:26	16:43	16:28			
13	07:25 06:59 06:16 06:24	05:42	70 19:30 (6) 05:24	53 19:25 (6) 05:39	60 19:35 (6) 05:04	66 19:37 (6) 19:15	18:24	16:42	16:28			
14	07:25 06:57 06:14 06:22	05:41	69 19:30 (6) 05:24	52 19:25 (6) 05:39	60 19:35 (6) 05:03	65 19:36 (6) 19:14	18:22	16:41	16:28			
15	07:24 06:56 06:13 06:21	05:40	69 19:30 (6) 05:24	52 19:25 (6) 05:39	61 19:36 (6) 05:02	64 19:35 (6) 19:12	18:21	16:40	16:29			
16	07:24 06:55 06:11 06:19	05:39	69 19:30 (6) 05:24	51 19:25 (6) 05:39	62 19:36 (6) 05:01	63 19:35 (6) 19:10	18:19	16:39	16:29			
17	07:24 06:54 06:10 06:18	05:38	69 19:30 (6) 05:24	51 19:25 (6) 05:39	62 19:36 (6) 05:00	63 19:35 (6) 19:09	18:18	16:38	16:29			
18	07:23 06:53 06:09 06:17	05:37	69 19:30 (6) 05:24	51 19:25 (6) 05:39	63 19:37 (6) 05:00	63 19:36 (6) 19:08	18:17	16:37	16:30			
19	07:23 06:52 06:08 06:16	05:36	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:07	18:16	16:36	16:29			
20	07:22 06:51 06:07 06:15	05:35	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:06	18:15	16:35	16:30			
21	07:22 06:50 06:06 06:14	05:34	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:05	18:14	16:34	16:30			
22	07:21 06:49 06:05 06:13	05:33	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:04	18:13	16:33	16:30			
23	07:21 06:48 06:04 06:12	05:32	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:03	18:12	16:32	16:30			
24	07:21 06:47 06:03 06:11	05:31	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:02	18:11	16:31	16:30			
25	07:21 06:46 06:02 06:10	05:30	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:01	18:10	16:30	16:30			
26	07:21 06:45 06:01 06:09	05:29	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 19:00	18:09	16:29	16:30			
27	07:21 06:44 06:00 06:08	05:28	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 18:59	18:08	16:28	16:30			
28	07:21 06:43 05:59 06:07	05:27	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 18:58	18:07	16:27	16:30			
29	07:21 06:42 05:58 06:06	05:26	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 18:57	18:06	16:26	16:30			
30	07:21 06:41 05:57 06:05	05:25	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 18:56	18:05	16:25	16:30			
31	07:21 06:40 05:56 06:04	05:24	68 19:29 (6) 05:24	51 19:25 (6) 05:39	64 19:38 (6) 05:00	63 19:36 (6) 18:55	18:04	16:24	16:30			
Potential sun hours	295	296	369	400	450	455	461	429	375	344	296	285
Total, worst case												
Sun reduction	0,50			800	2076		1601	1929		1612		
Oper. time red.	0,92			0,50	0,57		0,62	0,68		0,68		
Wind dir. red.	0,70			0,70	0,70		0,70	0,70		0,70		
Total reduction	0,32			0,32	0,37		0,44	0,44		0,44		
Total, real	260			260	759		636	848		708		

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	72 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: H - SHR_08

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 16:38	07:12 17:13	06:35 17:48	17:21 (7) 06:43	05:56 17:26 (7)	05:27 19:23	05:27 20:26	05:52 20:37	06:23 20:18	06:54 19:34	06:30 18:42	16:29 (8) 07:05
2	07:26 16:39	07:11 17:14	06:34 17:49	17:22 (7) 06:42	05:55 17:28 (7)	05:26 19:24	05:26 20:27	05:53 20:37	06:24 20:17	06:56 19:32	06:31 18:40	16:31 (8) 07:06
3	07:26 16:40	07:10 17:15	06:32 17:50	17:21 (7) 06:40	05:54 17:29 (7)	05:26 19:25	05:26 20:28	05:54 20:37	06:25 20:16	06:57 19:30	06:32 18:39	16:32 07:09
4	07:26 16:41	07:09 17:17	06:30 17:51	17:22 (7) 06:38	05:53 17:30 (7)	05:25 19:26	05:25 20:29	05:55 20:37	06:26 20:14	06:58 19:29	06:33 18:37	16:33 07:10
5	07:26 16:42	07:08 17:18	06:29 17:53	17:23 (7) 06:37	05:51 17:31 (7)	05:25 19:27	05:25 20:30	05:56 20:37	06:28 20:13	06:59 19:27	06:35 18:35	16:35 07:11
6	07:26 16:43	07:07 17:19	06:27 17:54	17:24 (7) 06:35	05:50 17:32 (7)	05:25 19:29	05:25 20:30	05:57 20:36	06:29 20:12	06:59 19:25	06:36 18:34	16:36 07:12
7	07:26 16:43	07:06 17:21	06:26 17:55	17:26 (7) 06:33	05:49 17:34 (7)	05:24 19:30	05:24 20:31	05:58 20:36	06:30 20:11	07:01 19:24	06:37 18:32	16:37 07:13
8	07:26 16:44	07:04 17:22	06:24 17:56	17:27 (7) 06:32	05:48 17:31 (7)	05:24 19:31	05:24 20:31	05:59 20:36	06:31 20:09	07:02 19:22	06:38 18:30	16:38 07:14
9	07:26 16:46	07:03 17:23	06:22 17:57	17:28 (7) 06:31	05:46 17:32 (7)	05:24 19:32	05:24 20:32	06:00 20:35	06:32 20:08	07:03 19:20	06:39 18:29	16:39 07:15
10	07:26 16:47	07:02 17:24	16:59 (8) 17:01 (8)	06:21 17:58	05:45 17:33 (7)	05:24 19:33	05:24 20:32	06:01 20:35	06:33 20:07	07:04 19:18	06:41 18:27	16:41 07:16
11	07:26 16:48	07:01 17:26	16:58 (8) 17:03 (8)	06:19 18:00	05:44 17:34 (7)	05:24 19:34	05:24 20:33	06:02 20:06	06:34 19:17	07:05 18:25	06:42 17:55 (7)	16:42 07:17
12	07:26 16:49	07:00 17:27	16:56 (8) 17:04 (8)	06:17 18:01	05:43 17:35 (7)	05:23 19:35	05:23 20:33	06:03 20:04	06:35 19:15	07:06 18:24	06:43 17:58 (7)	16:43 07:18
13	07:26 16:50	06:58 17:28	16:56 (8) 17:05 (8)	06:16 18:02	05:42 17:36 (7)	05:23 19:36	05:23 20:34	06:04 20:03	06:36 19:13	07:08 18:22	06:44 17:55 (7)	16:44 07:19
14	07:26 16:51	06:57 17:30	16:56 (8) 17:07 (8)	06:14 18:03	05:41 17:37 (7)	05:23 19:37	05:23 20:33	06:05 20:01	06:37 19:12	07:09 18:20	06:46 17:57 (7)	16:46 07:20
15	07:26 16:52	06:56 17:31	16:55 (8) 17:08 (8)	06:12 18:04	05:40 17:38 (7)	05:23 19:38	05:23 20:32	06:06 20:00	06:38 19:10	07:10 18:19	06:47 17:46 (8)	16:47 07:21
16	07:26 16:53	06:54 17:32	16:55 (8) 17:10 (8)	06:11 18:05	05:39 17:39 (7)	05:23 19:39	05:23 20:33	06:07 19:08	06:39 18:17	07:11 18:25	06:48 17:53 (8)	16:48 07:22
17	07:26 16:54	06:53 17:33	16:54 (8) 17:10 (8)	06:09 18:06	05:38 17:41 (7)	05:23 19:41	05:23 20:31	06:08 19:57	06:40 19:06	07:12 18:16	06:49 17:51 (8)	16:49 07:23
18	07:26 16:56	06:52 17:35	16:54 (8) 17:12 (8)	06:07 18:08	05:37 17:42 (7)	05:23 19:42	05:23 20:30	06:09 19:56	06:41 19:05	07:13 18:14	06:50 17:52 (8)	16:50 07:24
19	07:26 16:57	06:51 17:36	16:55 (8) 17:14 (8)	06:05 18:09	05:36 17:43 (7)	05:23 19:43	05:23 20:30	06:10 19:54	06:42 19:03	07:14 18:13	06:52 17:49 (8)	16:52 07:25
20	07:26 16:58	06:49 17:37	16:55 (8) 17:15 (8)	06:04 18:10	05:35 17:44 (7)	05:24 19:44	05:24 20:29	06:11 19:53	06:43 19:01	07:15 18:11	06:53 17:47 (8)	16:53 07:26
21	07:26 16:59	06:47 17:38	16:56 (8) 17:16 (8)	06:02 18:11	05:34 17:45 (7)	05:24 19:45	05:24 20:28	06:12 19:51	06:44 18:59	07:17 18:10	06:54 17:26 (8)	16:54 07:27
22	07:26 17:00	06:46 17:39	16:56 (8) 17:17 (8)	06:00 18:12	05:33 17:46 (7)	05:24 19:46	05:24 20:27	06:13 19:50	06:45 18:58	07:18 18:08	06:55 17:25 (8)	16:55 07:28
23	07:26 17:01	06:44 17:41	16:57 (8) 17:19 (8)	05:59 18:13	05:32 17:47 (7)	05:24 19:47	05:24 20:27	06:14 19:48	06:46 18:56	07:19 18:07	06:56 17:24 (8)	16:56 07:29
24	07:26 17:03	06:43 17:42	16:58 (8) 17:20 (8)	05:57 18:14	05:31 17:48 (7)	05:24 19:48	05:24 20:26	06:15 19:47	06:47 18:54	07:20 18:05	06:58 17:41 (8)	16:58 07:30
25	07:26 17:04	06:41 17:43	16:58 (8) 17:19 (8)	05:55 18:15	05:30 17:49 (7)	05:25 19:49	05:25 20:25	06:16 19:45	06:48 18:52	07:21 17:04	06:59 16:25 (8)	16:59 07:31
26	07:26 17:05	06:40 17:44	16:59 (8) 17:16 (8)	05:54 18:16	05:29 17:50 (7)	05:25 19:50	05:25 20:24	06:17 19:43	06:50 18:51	07:22 17:02	07:00 16:39 (8)	16:60 07:32
27	07:26 17:07	06:38 17:46	17:05 (8) 17:24 (7)	05:52 18:18	05:28 17:51 (7)	05:25 19:52	05:25 20:23	06:18 19:42	06:50 18:49	07:23 17:01	07:01 16:24 (8)	16:61 07:33
28	07:26 17:08	06:37 17:47	17:22 (7) 17:25 (7)	05:50 18:19	05:27 17:52 (7)	05:26 19:53	05:26 20:22	06:19 19:40	06:51 18:47	07:24 17:00	07:02 16:35 (8)	16:62 07:34
29	07:26 17:09	06:36 17:49	17:23 (7) 19:20	05:48 18:20	05:26 17:53 (7)	05:26 19:54	05:26 20:21	06:20 19:39	06:52 18:46	07:25 16:58	07:03 16:35 (8)	16:63 07:35
30	07:26 17:10	06:35 17:50	17:24 (7) 19:21	05:47 18:21	05:25 17:54 (7)	05:26 19:55	05:26 20:20	06:21 19:37	06:53 18:44	07:26 16:57	07:04 16:33 (8)	16:64 07:36
31	07:26 17:12	06:34 17:51	17:25 (7) 19:22	05:46 18:22	05:24 17:55 (7)	05:26 19:56	05:26 20:19	06:22 19:35	06:54 18:56	07:27 16:56	07:05 16:31 (8)	16:65 07:37
Potential sun hours	295	296	369	51	400	450	455	461	429	375	344	285
Total, worst case		267									320	2
Sun reduction		0,44		0,44							0,52	0,47
Oper. time red.		0,92		0,92							0,92	0,92
Wind dir. red.		0,51		0,54							0,52	0,51
Total reduction		0,21		0,22							0,25	0,22
Total, real		55		11							79	0

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	73 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: I - SHR_09

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December				
1	07:26	07:12	06:35	17:06 (8)	06:43	05:56	05:27	05:27	05:52	06:23	06:54	06:30	07:05			
	16:38	17:13	17:48	17	17:23 (8)	19:23	19:56	20:26	20:37	20:18	19:34	18:42	16:54	16:29		
2	07:26	07:11	06:34		17:09 (8)	06:42	05:55	05:26	05:28	05:53	06:24	06:56	06:31	07:06		
	16:39	17:14	17:49	14	17:28 (7)	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16:53	16:29		
3	07:26	07:10	06:32		17:25 (7)	06:40	05:54	05:26	05:28	05:54	06:25	06:57	06:32	07:08		
	16:40	17:15	17:50	4	17:29 (7)	19:25	19:58	20:28	20:37	20:16	19:30	18:39	16:52	16:29		
4	07:26	07:09	06:30		17:25 (7)	06:38	05:53	05:25	05:29	05:55	06:26	06:58	18:08 (7)	06:33	07:09	
	16:41	17:17	17:51	5	17:30 (7)	19:26	19:59	20:29	20:37	20:14	19:29	18:37	6	18:14 (7)	16:51	16:28
5	07:26	07:08	06:29		17:25 (7)	06:37	05:51	05:25	05:29	05:56	06:28	06:59	18:04 (7)	06:35	07:10	
	16:42	17:18	17:53	6	17:31 (7)	19:27	20:00	20:29	20:37	20:13	19:27	18:35	8	18:12 (7)	16:49	16:28
6	07:26	07:07	06:27		17:25 (7)	06:35	05:50	05:25	05:30	05:57	06:29	07:00	18:02 (7)	06:36	07:11	
	16:43	17:19	17:54	7	17:32 (7)	19:29	20:01	20:30	20:36	20:12	19:25	18:34	8	18:10 (7)	16:48	16:28
7	07:26	07:06	06:26		17:26 (7)	06:33	05:49	05:24	05:30	05:58	06:30	07:01	18:01 (7)	06:37	07:11	
	16:43	17:21	17:55	8	17:34 (7)	19:30	20:02	20:31	20:36	20:11	19:24	18:32	8	18:09 (7)	16:47	16:28
8	07:26	07:04	06:24		17:27 (7)	06:32	05:48	05:24	05:31	05:59	06:31	07:02	18:00 (7)	06:38	07:12	
	16:44	17:22	17:56	8	17:35 (7)	19:31	20:04	20:31	20:36	20:09	19:22	18:30	7	18:07 (7)	16:46	16:28
9	07:26	07:03	06:22		17:28 (7)	06:30	05:46	05:24	05:32	06:00	06:32	07:03	18:00 (7)	06:39	07:13	
	16:46	17:23	17:57	8	17:36 (7)	19:32	20:05	20:32	20:35	20:08	19:20	18:29	6	18:06 (7)	16:45	16:28
10	07:26	07:02	06:21		17:28 (7)	06:28	05:45	05:24	05:32	06:01	06:33	07:04	18:00 (7)	06:41	07:14	
	16:47	17:24	17:58	19	17:33	20:06	20:32	20:35	20:35	20:07	19:18	18:27	4	18:04 (7)	16:44	16:28
11	07:25	07:01	06:19		17:27 (7)	06:27	05:44	05:24	05:33	06:02	06:34	07:05	17:45 (8)	06:42	07:15	
	16:48	17:26	18:00		17:34	20:07	20:33	20:35	20:35	20:06	19:17	18:25	9	18:02 (7)	16:43	16:28
12	07:25	07:00	06:17		17:27 (7)	06:25	05:43	05:23	05:34	06:03	06:35	07:06	17:41 (8)	06:43	07:16	
	16:49	17:27	18:01		17:31	20:08	20:33	20:34	20:34	20:04	19:15	18:24	15	18:01 (7)	16:42	16:28
13	07:25	06:58	06:16		17:26 (7)	06:23	05:42	05:23	05:35	06:04	06:36	07:08	17:38 (8)	06:44	07:17	
	16:50	17:28	18:02		17:30	20:09	20:34	20:34	20:34	20:03	19:13	18:22	19	17:57 (8)	16:41	16:28
14	07:24	06:57	06:14		17:25 (7)	06:22	05:41	05:23	05:35	06:05	06:37	07:09	17:36 (8)	06:46	07:17	
	16:51	17:30	18:03		17:33	20:10	20:34	20:33	20:33	20:01	19:12	18:20	21	17:57 (8)	16:40	16:28
15	07:24	06:56	06:12		17:24 (7)	06:20	05:40	05:23	05:36	06:06	06:38	07:10	17:35 (8)	06:47	07:18	
	16:52	17:31	18:04	3	17:08 (8)	19:38	20:11	20:35	20:32	20:00	19:10	18:19	20	17:55 (8)	16:39	16:29
16	07:24	06:54	06:11		17:24 (7)	06:19	05:39	05:23	05:37	06:07	06:39	07:11	17:34 (8)	06:48	07:19	
	16:53	17:32	18:05	6	17:10 (8)	19:40	20:12	20:35	20:32	19:59	19:08	18:17	19	17:54 (8)	16:38	16:29
17	07:23	06:53	06:09		17:13 (8)	06:17	05:38	05:23	05:38	06:08	06:40	07:12	17:34 (8)	06:49	07:20	
	16:54	17:33	18:06	7	17:10 (8)	19:41	20:13	20:36	20:31	19:57	19:06	18:16	19	17:53 (8)	16:37	16:29
18	07:23	06:52	06:07		17:12 (8)	06:15	05:37	05:23	05:39	06:09	06:41	07:13	17:33 (8)	06:50	07:20	
	16:56	17:35	18:08	9	17:12 (8)	19:42	20:14	20:36	20:30	19:56	19:05	18:14	18	17:51 (8)	16:36	16:29
19	07:22	06:50	06:05		17:11 (8)	06:14	05:36	05:23	05:40	06:10	06:42	07:14	17:32 (8)	06:52	07:21	
	16:57	17:36	18:09	12	17:14 (8)	19:43	20:15	20:36	20:30	19:54	19:03	18:13	17	17:49 (8)	16:36	16:30
20	07:22	06:49	06:04		17:10 (8)	06:12	05:35	05:24	05:40	06:11	06:43	07:15	17:32 (8)	06:53	07:22	
	16:58	17:37	18:10	13	17:15 (8)	19:44	20:16	20:36	20:29	19:53	19:01	18:11	15	17:47 (8)	16:35	16:30
21	07:21	06:47	06:02		17:09 (8)	06:11	05:34	05:24	05:41	06:12	06:44	07:17	17:32 (8)	06:54	07:22	
	16:59	17:38	18:11	14	17:16 (8)	19:45	20:17	20:37	20:28	19:51	18:59	18:10	14	17:46 (8)	16:34	16:31
22	07:20	06:46	06:00		17:08 (8)	06:09	05:33	05:24	05:42	06:13	06:45	07:18	17:32 (8)	06:55	07:23	
	17:00	17:39	18:12	16	17:19 (8)	19:46	20:18	20:37	20:27	19:50	18:58	18:08	13	17:45 (8)	16:34	16:31
23	07:20	06:44	05:59		17:07 (8)	06:08	05:33	05:24	05:43	06:14	06:46	07:19	17:32 (8)	06:56	07:23	
	17:02	17:41	18:13	17	17:19 (8)	19:47	20:19	20:37	20:27	19:48	18:56	18:07	11	17:43 (8)	16:33	16:32
24	07:19	06:43	05:57		17:01 (8)	06:06	05:32	05:24	05:44	06:15	06:47	07:20	17:32 (8)	06:58	07:24	
	17:03	17:42	18:14	19	17:20 (8)	19:48	20:19	20:37	20:26	19:47	18:54	18:05	9	17:41 (8)	16:32	16:32
25	07:18	06:41	05:55		17:02 (8)	06:05	05:31	05:25	05:45	06:16	06:48	06:21	16:34 (8)	06:59	07:24	
	17:04	17:43	18:15	20	17:22 (8)	19:49	20:20	20:37	20:25	19:45	18:52	17:04	7	16:41 (8)	16:32	16:33
26	07:17	06:40	05:54		17:04 (8)	06:03	05:30	05:25	05:46	06:17	06:49	06:23	16:34 (8)	07:00	07:24	
	17:05	17:44	18:16	19	17:24 (8)	19:50	20:21	20:37	20:24	19:43	18:51	17:02	5	16:39 (8)	16:31	16:33
27	07:17	06:38	05:52		17:02 (8)	06:02	05:30	05:25	05:47	06:18	06:50	06:24	16:35 (8)	07:01	07:25	
	17:07	17:46	18:18	20	17:24 (8)	19:52	20:22	20:38	20:23	19:42	18:49	17:01	2	16:37 (8)	16:31	16:34
28	07:16	06:37	05:50		17:05 (8)	06:01	05:29	05:26	05:48	06:19	06:51	06:25			07:02	07:25
	17:08	17:47	18:19	20	17:25 (8)	19:53	20:23	20:38	20:22	19:40	18:47	17:00			16:30	16:35
29	07:15		06:48		17:03 (8)	05:59	05:28	05:26	05:49	06:20	06:52	06:26			07:03	07:25
	17:09		18:20		17:11 (8)	19:54	20:24	20:38	20:21	19:39	18:46	16:58			16:30	16:35
30	07:14		06:47		17:01 (8)	05:58	05:28	05:27	05:50	06:21	06:53	06:27			07:04	07:26
	17:10		19:21		17:06 (8)	19:55	20:25	20:37	20:20	19:37	18:44	16:57			16:29	16:36
31	07:13		06:45		17:00 (8)	05:57	05:27	05:25	05:51	06:22	06:54	06:29			07:05	07:26
	17:12		19:22		17:05 (8)	19:56	20:25	20:37	20:19	19:35	18:42	16:56			16:29	16:37
Potential sun hours	295	296	369		400	450	455	461	429	375	344			280	296	285
Total, worst case		195		77										280		
Sun reduction		0,44		0,44										0,92		
Oper. time red.		0,92		0,92										0,92		
Wind dir. red.		0,52		0,54										0,52		
Total reduction		0,21		0,22										0,25		
Total, real		41		17										70		

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

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





RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	74 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: J - SHR_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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December				
1	07:26	07:12	06:35	17:05 (8)	06:43	05:56	05:27	05:27	05:52	06:23	06:54	06:30	07:05			
	16:38	17:13	17:48	21	17:26 (8)	19:23	19:56	20:26	20:37	20:18	19:34	18:42	16:54	16:29		
2	07:26	07:11	06:34		17:07 (8)	06:42	05:55	05:26	05:28	05:53	06:24	06:56	06:31	07:06		
	16:39	17:14	17:49	20	17:27 (8)	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16:53	16:29		
3	07:26	07:10	06:32		17:08 (8)	06:40	05:54	05:26	05:28	05:54	06:25	06:57	18:08 (7)	06:32	07:08	
	16:40	17:15	17:50	19	17:29 (7)	19:25	19:58	20:28	20:37	20:16	19:30	18:39	8	18:16 (7)	16:52	16:29
4	07:26	07:09	06:30		17:11 (8)	06:38	05:53	05:25	05:29	05:55	06:26	06:58	18:06 (7)	06:33	07:09	
	16:41	17:17	17:51	15	17:30 (7)	19:26	19:59	20:29	20:37	20:14	19:29	18:37	8	18:14 (7)	16:51	16:28
5	07:26	07:08	06:29		17:26 (7)	06:37	05:51	05:25	05:29	05:56	06:28	06:59	18:04 (7)	06:35	07:10	
	16:42	17:18	17:53	5	17:31 (7)	19:27	20:00	20:29	20:37	20:13	19:27	18:35	8	18:12 (7)	16:49	16:28
6	07:26	07:07	06:27		17:26 (7)	06:35	05:50	05:25	05:30	05:57	06:29	07:00	18:03 (7)	06:36	07:11	
	16:43	17:19	17:54	6	17:32 (7)	19:29	20:01	20:30	20:36	20:12	19:25	18:34	7	18:10 (7)	16:48	16:28
7	07:26	07:06	06:26		17:27 (7)	06:33	05:49	05:24	05:30	05:58	06:30	07:01	18:02 (7)	06:37	07:11	
	16:43	17:21	17:55	7	17:34 (7)	19:30	20:02	20:31	20:36	20:11	19:24	18:32	7	18:09 (7)	16:47	16:28
8	07:26	07:04	06:24		17:27 (7)	06:32	05:48	05:24	05:31	05:59	06:31	07:02	18:01 (7)	06:38	07:12	
	16:44	17:22	17:56	8	17:35 (7)	19:31	20:04	20:31	20:36	20:09	19:22	18:30	6	18:07 (7)	16:46	16:28
9	07:26	07:03	06:22		17:28 (7)	06:30	05:46	05:24	05:32	06:00	06:32	07:03	17:48 (8)	06:39	07:13	
	16:46	17:23	17:57	8	17:36 (7)	19:32	20:05	20:32	20:35	20:08	19:20	18:29	11	18:06 (7)	16:45	16:28
10	07:26	07:02	06:21		17:30 (7)	06:28	05:45	05:24	05:32	06:01	06:33	07:04	17:44 (8)	06:41	07:14	
	16:47	17:24	17:58	8	17:38 (7)	19:33	20:06	20:32	20:35	20:07	19:18	18:27	16	18:04 (7)	16:44	16:28
11	07:25	07:01	06:19		17:33 (7)	06:27	05:44	05:24	05:33	06:02	06:34	07:05	17:41 (8)	06:42	07:15	
	16:48	17:26	18:00	3	17:36 (7)	19:34	20:07	20:33	20:35	20:06	19:17	18:25	19	18:00 (8)	16:43	16:28
12	07:25	07:00	06:17		17:33 (7)	06:25	05:43	05:23	05:34	06:03	06:35	07:06	17:40 (8)	06:43	07:16	
	16:49	17:27	18:01		17:35 (7)	19:35	20:08	20:33	20:34	20:04	19:15	18:24	21	18:01 (8)	16:42	16:28
13	07:25	06:58	06:16		17:36 (7)	06:23	05:42	05:23	05:35	06:04	06:36	07:08	17:38 (8)	06:44	07:17	
	16:50	17:28	18:02		17:37 (7)	19:36	20:09	20:34	20:34	20:03	19:13	18:22	21	17:59 (8)	16:41	16:28
14	07:24	06:57	06:14		17:38 (7)	06:22	05:41	05:23	05:35	06:05	06:37	07:09	17:37 (8)	06:46	07:17	
	16:51	17:30	18:03		17:39 (7)	19:37	20:10	20:34	20:33	20:01	19:12	18:20	20	17:57 (8)	16:40	16:28
15	07:24	06:56	06:12		17:40 (7)	06:20	05:40	05:23	05:36	06:06	06:38	07:10	17:36 (8)	06:47	07:18	
	16:52	17:31	18:04		17:41 (7)	19:38	20:11	20:35	20:32	20:00	19:10	18:19	19	17:55 (8)	16:39	16:29
16	07:24	06:54	06:11		17:42 (7)	06:19	05:39	05:23	05:37	06:07	06:39	07:11	17:36 (8)	06:48	07:19	
	16:53	17:32	1	17:10 (8)	18:05	19:40	20:12	20:35	20:32	19:59	19:08	18:17	18	17:54 (8)	16:38	16:29
17	07:23	06:53	06:09		17:11 (8)	06:09	06:17	05:38	05:23	05:38	06:08	06:40	17:35 (8)	06:49	07:20	
	16:54	17:33	3	17:10 (8)	18:06	19:41	20:13	20:36	20:31	19:57	19:06	18:16	18	17:53 (8)	16:37	16:29
18	07:23	06:52	06:07		17:12 (8)	06:07	06:15	05:37	05:23	05:39	06:09	06:41	17:35 (8)	06:50	07:20	
	16:56	17:35	6	17:12 (8)	18:08	19:42	20:14	20:36	20:30	19:56	19:05	18:14	16	17:51 (8)	16:36	16:29
19	07:22	06:50	06:05		17:13 (8)	06:05	06:14	05:36	05:23	05:40	06:10	06:42	17:34 (8)	06:52	07:21	
	16:57	17:36	8	17:14 (8)	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	15	17:49 (8)	16:36	16:30
20	07:22	06:49	06:04		17:14 (8)	06:04	06:12	05:35	05:24	05:40	06:11	06:43	17:34 (8)	06:53	07:22	
	16:58	17:37	11	17:15 (8)	18:10	19:44	20:16	20:36	20:29	19:53	19:01	18:11	13	17:47 (8)	16:35	16:30
21	07:21	06:47	06:02		17:16 (8)	06:02	06:11	05:34	05:24	05:41	06:12	06:44	17:35 (8)	06:54	07:22	
	16:59	17:38	12	17:16 (8)	18:11	19:45	20:17	20:37	20:28	19:51	18:59	18:10	11	17:46 (8)	16:34	16:31
22	07:20	06:46	06:00		17:17 (8)	06:00	06:09	05:33	05:24	05:42	06:13	06:45	17:35 (8)	06:55	07:23	
	17:00	17:39	14	17:17 (8)	18:12	19:46	20:18	20:37	20:27	19:50	18:58	18:08	10	17:45 (8)	16:34	16:31
23	07:20	06:44	05:59		17:18 (8)	05:59	06:08	05:33	05:24	05:43	06:14	06:46	17:35 (8)	06:56	07:23	
	17:02	17:41	15	17:19 (8)	18:13	19:47	20:19	20:37	20:27	19:48	18:56	18:07	8	17:43 (8)	16:33	16:32
24	07:19	06:43	05:57		17:20 (8)	05:57	06:06	05:32	05:24	05:44	06:15	06:47	17:36 (8)	06:58	07:24	
	17:03	17:42	17	17:20 (8)	18:14	19:48	20:19	20:37	20:26	19:47	18:54	18:05	5	17:41 (8)	16:32	16:32
25	07:18	06:41	05:55		17:21 (8)	05:55	06:05	05:31	05:25	05:45	06:16	06:48	16:38 (8)	06:59	07:24	
	17:04	17:43	18	17:22 (8)	18:15	19:49	20:20	20:37	20:25	19:45	18:52	17:04	3	16:41 (8)	16:32	16:33
26	07:17	06:40	05:54		17:23 (8)	05:54	06:03	05:30	05:25	05:46	06:17	06:49	16:32 (8)	07:00	07:24	
	17:05	17:44	19	17:22 (8)	18:16	19:50	20:21	20:37	20:24	19:43	18:51	17:02		16:31	16:33	
27	07:17	06:38	05:52		17:24 (8)	05:52	06:02	05:30	05:25	05:47	06:18	06:50	16:30 (8)	07:01	07:25	
	17:07	17:46	20	17:24 (8)	18:18	19:52	20:22	20:38	20:23	19:42	18:49	17:01		16:31	16:34	
28	07:16	06:37	05:50		17:25 (8)	05:50	06:01	05:29	05:26	05:48	06:19	06:51	16:25 (8)	07:02	07:25	
	17:08	17:47	20	17:25 (8)	18:19	19:53	20:23	20:38	20:22	19:40	18:47	17:00		16:30	16:35	
29	07:15		06:48		17:26 (8)	05:48	05:59	05:28	05:26	05:49	06:20	06:52	16:24 (8)	07:03	07:25	
	17:09		19:20		17:27 (8)	05:47	19:54	20:24	20:38	20:21	19:39	18:46	16:58	16:30	16:35	
30	07:14		06:47		17:28 (8)	05:46	05:58	05:28	05:27	05:50	06:21	06:53	16:57	07:04	07:26	
	17:10		19:21		17:29 (8)	05:45	19:55	20:25	20:37	20:20	19:37	18:44	16:57	16:29	16:36	
31	07:13		06:45		17:30 (8)	05:44	19:56	20:26	20:38	20:21	19:38	18:45	16:58	16:30	16:36	
	17:12		19:22		17:31 (8)	05:43	19:57	20:27	20:39	20:22	19:39	18:46	16:59	16:31	16:37	
Potential sun hours	295	296	369		400	450	455	461	429	375	344	288		296	285	
Total, worst case				120								288				
Sun reduction		0,44		0,44								0,52				
Oper. time red.		0,92		0,92								0,92				
Wind dir. red.		0,52		0,53								0,52				
Total reduction		0,21		0,22								0,25				
Total, real		34		26								72				

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

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





RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	75 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: K - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December				
1	07:26	07:12	06:35	17:00 (8)	06:43	05:56	05:27	05:27	05:52	06:23	06:54	06:30	07:05			
	16:38	17:13	17:48	24	17:24 (8)	19:23	19:56	20:26	20:37	20:18	19:34	18:42	16:54	16:29		
2	07:26	07:11	06:34	17:01 (8)	06:42	05:55	05:26	05:28	05:53	06:24	06:56	06:31	07:06			
	16:39	17:14	17:49	24	17:28 (7)	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16:53	16:29		
3	07:26	07:10	06:32	17:03 (8)	06:40	05:54	05:26	05:28	05:54	06:25	06:57	18:05 (7)	06:32	07:08		
	16:40	17:15	17:50	21	17:29 (7)	19:25	19:58	20:28	20:37	20:16	19:30	18:39	11	18:16 (7)	16:52	16:29
4	07:26	07:09	06:30	17:06 (8)	06:38	05:53	05:25	05:29	05:55	06:26	06:58	18:03 (7)	06:33	07:09		
	16:41	17:17	17:51	17	17:30 (7)	19:26	19:59	20:29	20:37	20:14	19:29	18:37	11	18:14 (7)	16:51	16:28
5	07:26	07:08	06:29	17:24 (7)	06:37	05:51	05:25	05:29	05:56	06:28	06:59	18:01 (7)	06:35	07:10		
	16:42	17:18	17:53	7	17:31 (7)	19:27	20:00	20:29	20:37	20:13	19:27	18:35	11	18:12 (7)	16:49	16:28
6	07:26	07:07	06:27	17:23 (7)	06:35	05:50	05:25	05:30	05:57	06:29	07:00	18:00 (7)	06:36	07:11		
	16:43	17:19	17:54	9	17:32 (7)	19:29	20:01	20:30	20:36	20:12	19:25	18:34	10	18:10 (7)	16:48	16:28
7	07:26	07:06	06:26	17:24 (7)	06:33	05:49	05:24	05:30	05:58	06:30	07:01	17:59 (7)	06:37	07:11		
	16:43	17:21	17:55	10	17:34 (7)	19:30	20:02	20:31	20:36	20:11	19:24	18:32	10	18:09 (7)	16:47	16:28
8	07:26	07:04	06:24	17:24 (7)	06:32	05:48	05:24	05:31	05:59	06:31	07:02	17:59 (7)	06:38	07:12		
	16:44	17:22	17:56	11	17:35 (7)	19:31	20:04	20:31	20:36	20:09	19:22	18:30	8	18:07 (7)	16:46	16:28
9	07:26	07:03	06:22	17:25 (7)	06:30	05:46	05:24	05:32	06:00	06:32	07:03	17:43 (8)	06:39	07:13		
	16:46	17:23	17:57	11	17:36 (7)	19:32	20:05	20:32	20:35	20:08	19:20	18:29	14	18:06 (7)	16:45	16:28
10	07:26	07:02	06:21	17:27 (7)	06:28	05:45	05:24	05:32	06:01	06:33	07:04	17:39 (8)	06:41	07:14		
	16:47	17:24	17:58	11	17:38 (7)	19:33	20:06	20:32	20:35	20:07	19:18	18:27	20	18:04 (7)	16:44	16:28
11	07:25	07:01	06:19	17:29 (7)	06:27	05:44	05:24	05:33	06:02	06:34	07:05	17:36 (8)	06:42	07:15		
	16:48	17:26	18:00	7	17:36 (7)	19:34	20:07	20:33	20:35	20:06	19:17	18:25	23	18:02 (7)	16:43	16:28
12	07:25	07:00	06:17	17:30 (7)	06:25	05:43	05:23	05:34	06:03	06:35	07:06	17:34 (8)	06:43	07:16		
	16:49	17:27	18:01	19:35	20:08	20:33	20:34	20:34	20:04	19:15	18:24	25	18:01 (7)	16:42	16:28	
13	07:25	06:58	06:16	17:31 (7)	06:23	05:42	05:23	05:35	06:04	06:36	07:08	17:32 (8)	06:44	07:17		
	16:50	17:28	18:02	19:36	20:09	20:34	20:34	20:34	20:03	19:13	18:22	26	17:58 (8)	16:41	16:28	
14	07:24	06:57	06:14	17:32 (7)	06:22	05:41	05:23	05:35	06:05	06:37	07:09	17:31 (8)	06:46	07:17		
	16:51	17:30	3	17:07 (8)	18:03	19:37	20:10	20:34	20:33	20:01	19:12	18:20	26	17:57 (8)	16:40	16:28
15	07:24	06:56	06:12	17:08 (8)	18:04	19:38	20:11	20:35	20:32	20:00	19:10	18:19	25	17:55 (8)	16:39	16:29
	16:52	17:31	6	17:08 (8)	18:04	19:38	20:11	20:35	20:32	20:00	19:10	18:19	25	17:55 (8)	16:39	16:29
16	07:24	06:54	06:11	17:09 (8)	18:05	19:39	20:12	20:35	20:32	20:01	19:11	18:20	24	17:54 (8)	16:38	16:29
	16:53	17:32	9	17:10 (8)	18:05	19:40	20:12	20:35	20:32	20:01	19:11	18:20	24	17:54 (8)	16:38	16:29
17	07:23	06:53	06:09	16:59 (8)	18:06	19:41	20:13	20:36	20:31	19:57	19:06	18:16	24	17:53 (8)	16:37	16:29
	16:54	17:33	11	17:10 (8)	18:06	19:41	20:13	20:36	20:31	19:57	19:06	18:16	24	17:53 (8)	16:37	16:29
18	07:23	06:52	06:07	16:59 (8)	18:07	19:42	20:14	20:36	20:30	19:56	19:05	18:14	23	17:51 (8)	16:36	16:29
	16:56	17:35	13	17:12 (8)	18:08	19:42	20:14	20:36	20:30	19:56	19:05	18:14	23	17:51 (8)	16:36	16:29
19	07:22	06:50	06:05	16:59 (8)	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	21	17:49 (8)	16:36	16:30
	16:57	17:36	15	17:14 (8)	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	21	17:49 (8)	16:36	16:30
20	07:22	06:49	06:04	16:58 (8)	18:10	19:44	20:16	20:37	20:29	19:53	19:01	18:11	19	17:47 (8)	16:35	16:30
	16:58	17:37	17	17:15 (8)	18:10	19:44	20:16	20:37	20:29	19:53	19:01	18:11	19	17:47 (8)	16:35	16:30
21	07:21	06:47	06:02	16:58 (8)	18:11	19:45	20:17	20:37	20:28	19:51	18:59	18:10	18	17:46 (8)	16:34	16:31
	16:59	17:38	18	17:16 (8)	18:11	19:45	20:17	20:37	20:28	19:51	18:59	18:10	18	17:46 (8)	16:34	16:31
22	07:20	06:46	06:00	16:57 (8)	18:12	19:46	20:18	20:37	20:27	19:50	18:58	18:08	17	17:45 (8)	16:34	16:31
	17:00	17:39	20	17:17 (8)	18:12	19:46	20:18	20:37	20:27	19:50	18:58	18:08	17	17:45 (8)	16:34	16:31
23	07:20	06:44	05:59	16:57 (8)	18:13	19:47	20:19	20:37	20:27	19:48	18:56	18:07	15	17:43 (8)	16:33	16:32
	17:02	17:41	22	17:19 (8)	18:13	19:47	20:19	20:37	20:27	19:48	18:56	18:07	15	17:43 (8)	16:33	16:32
24	07:19	06:43	05:57	16:58 (8)	18:14	19:48	20:19	20:37	20:26	19:47	18:54	18:05	12	17:41 (8)	16:32	16:32
	17:03	17:42	23	17:20 (8)	18:14	19:48	20:19	20:37	20:25	19:47	18:54	18:05	12	17:41 (8)	16:32	16:32
25	07:18	06:41	05:55	16:59 (8)	18:15	19:49	20:20	20:37	20:25	19:45	18:52	17:04	11	16:41 (8)	16:32	16:33
	17:04	17:43	24	17:22 (8)	18:15	19:49	20:20	20:37	20:25	19:45	18:52	17:04	11	16:41 (8)	16:32	16:33
26	07:17	06:40	05:54	16:59 (8)	18:16	19:50	20:21	20:37	20:24	19:43	18:51	17:02	8	16:39 (8)	16:31	16:33
	17:05	17:44	24	17:22 (8)	18:16	19:50	20:21	20:37	20:24	19:43	18:51	17:02	8	16:39 (8)	16:31	16:33
27	07:17	06:38	05:52	16:59 (8)	18:17	19:51	20:22	20:38	20:23	19:42	18:49	17:01	5	16:37 (8)	16:31	16:34
	17:07	17:46	25	17:24 (8)	18:18	19:52	20:22	20:38	20:23	19:42	18:49	17:01	5	16:37 (8)	16:31	16:34
28	07:16	06:37	05:50	16:59 (8)	18:19	19:53	20:23	20:38	20:22	19:40	18:47	17:00	2	16:35 (8)	16:30	16:35
	17:08	17:47	26	17:25 (8)	18:19	19:53	20:23	20:38	20:22	19:40	18:47	17:00	2	16:35 (8)	16:30	16:35
29	07:15		06:48	16:59 (8)	18:20	19:54	20:24	20:38	20:21	19:39	18:46	16:58		16:30	16:35	16:35
	17:09		19:20	18:20	19:54	20:24	20:38	20:21	19:39	18:46	16:58			16:30	16:35	16:35
30	07:14		06:47	16:59 (8)	18:21	19:55	20:25	20:37	20:20	19:37	18:44	16:57		16:30	16:36	16:36
	17:10		19:21	18:21	19:55	20:25	20:37	20:20	19:37	18:44	16:57			16:30	16:36	16:36
31	07:13		06:45	16:59 (8)	18:22	19:56	20:26	20:37	20:19	19:35	16:56			16:30	16:37	16:37
	17:12		19:22	18:22	19:56	20:26	20:37	20:20	19:35	16:56				16:30	16:37	16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	344	419	296	285			
Total, worst case		256	152								419					
Sun reduction		0,44	0,44								0,52					
Oper. time red.		0,92	0,92								0,92					
Wind dir. red.		0,52	0,54								0,52					
Total reduction		0,21	0,22								0,25					
Total, real		53	33								105					

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

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





RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	76 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: L - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December			
1	07:26	07:12	06:35	06:43	05:56	05:27	05:27	05:52	06:23	06:54	18:02 (8)	06:30	07:05		
	16:38	17:13	17:48	19:23	19:56	20:26	20:37	20:18	19:34	18:42	17	18:19 (8)	16:54	16:29	
2	07:26	07:11	06:34	06:42	05:55	05:26	05:28	05:53	06:24	06:56	18:02 (8)	06:31	07:06		
	16:39	17:14	17:49	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16	18:18 (8)	16:53	16:29	
3	07:26	07:10	06:32	06:40	05:54	05:26	05:28	05:54	06:25	06:57	18:03 (8)	06:32	07:08		
	16:40	17:15	17:50	19:25	19:58	20:28	20:37	20:16	19:30	18:39	13	18:16 (8)	16:52	16:29	
4	07:26	07:09	06:30	06:38	05:53	05:25	05:29	05:55	06:26	06:58	18:03 (8)	06:33	07:09		
	16:41	17:17	17:51	19:26	19:59	20:29	20:37	20:14	19:29	18:37	11	18:14 (8)	16:51	16:28	
5	07:26	07:08	06:29	06:37	05:51	05:25	05:29	05:56	06:28	06:59	18:04 (8)	06:35	07:10		
	16:42	17:18	17:53	19:27	20:00	20:29	20:37	20:13	19:27	18:35	8	18:12 (8)	16:49	16:28	
6	07:26	07:07	06:27	06:35	05:50	05:25	05:30	05:57	06:29	07:00	18:06 (8)	06:36	07:11		
	16:43	17:19	17:54	19:29	20:01	20:30	20:36	20:12	19:25	18:34	4	18:10 (8)	16:48	16:28	
7	07:26	07:06	06:26	17:31 (8)	06:33	05:49	05:24	05:30	05:58	06:30	07:01	18:08 (8)	06:37	07:11	
	16:43	17:21	17:55	17:34 (8)	19:30	20:02	20:31	20:36	20:11	19:24	18:32	1	18:09 (8)	16:47	16:28
8	07:26	07:04	06:24	17:29 (8)	06:32	05:48	05:24	05:31	05:59	06:31	07:02	18:08 (8)	06:38	07:12	
	16:44	17:22	17:56	17:35 (8)	19:31	20:03	20:31	20:36	20:09	19:22	18:30	18:09 (8)	16:46	16:28	
9	07:26	07:03	06:22	17:26 (8)	06:30	05:46	05:24	05:32	06:00	06:32	07:03	18:09 (8)	16:45	16:28	
	16:46	17:23	17:57	17:36 (8)	19:32	20:05	20:32	20:35	20:08	19:20	18:29	18:09 (8)	16:45	16:28	
10	07:26	07:02	06:21	17:26 (8)	06:28	05:45	05:24	05:32	06:01	06:33	07:04	18:10 (8)	16:44	16:28	
	16:47	17:24	17:58	17:38 (8)	19:33	20:06	20:32	20:35	20:07	19:18	18:27	18:10 (8)	16:44	16:28	
11	07:25	07:01	06:19	17:24 (8)	06:27	05:44	05:24	05:33	06:02	06:34	07:05	18:11 (8)	16:43	16:28	
	16:48	17:26	18:00	17:38 (8)	19:34	20:07	20:33	20:35	20:06	19:17	18:25	18:11 (8)	16:43	16:28	
12	07:25	07:00	06:17	17:23 (8)	06:25	05:43	05:23	05:34	06:03	06:35	07:06	18:12 (8)	16:42	16:28	
	16:49	17:27	18:01	17:39 (8)	19:35	20:08	20:33	20:34	20:04	19:15	18:24	18:12 (8)	16:42	16:28	
13	07:25	06:58	06:16	17:23 (8)	06:23	05:42	05:23	05:35	06:04	06:36	07:08	18:13 (8)	16:41	16:28	
	16:50	17:28	18:02	17:41 (8)	19:36	20:09	20:34	20:34	20:03	19:13	18:22	18:13 (8)	16:41	16:28	
14	07:24	06:57	06:14	17:22 (8)	06:22	05:41	05:23	05:35	06:05	06:37	07:09	18:14 (8)	16:40	16:28	
	16:51	17:30	18:03	17:42 (8)	19:37	20:10	20:34	20:33	20:01	19:12	18:20	18:14 (8)	16:40	16:28	
15	07:24	06:56	06:12	17:21 (8)	06:20	05:40	05:23	05:36	06:06	06:38	07:10	18:15 (8)	16:39	16:28	
	16:52	17:31	18:04	17:43 (7)	19:38	20:11	20:35	20:32	20:00	19:10	18:19	18:15 (8)	16:39	16:29	
16	07:24	06:54	06:11	17:21 (8)	06:19	05:39	05:23	05:37	06:07	06:39	07:11	18:16 (8)	16:38	16:29	
	16:53	17:32	18:05	17:44 (7)	19:40	20:12	20:35	20:32	19:59	19:08	18:17	18:16 (8)	16:38	16:29	
17	07:23	06:53	06:09	17:22 (8)	06:17	05:38	05:23	05:38	06:08	06:40	07:12	18:17 (8)	16:37	16:29	
	16:54	17:33	18:06	17:46 (7)	19:41	20:13	20:36	20:31	19:57	19:06	18:16	18:17 (8)	16:37	16:29	
18	07:23	06:52	06:07	17:21 (8)	06:15	05:37	05:23	05:39	06:09	06:41	07:13	18:18 (8)	16:36	16:29	
	16:56	17:35	18:08	17:46 (7)	19:42	20:14	20:36	20:30	19:56	19:05	18:14	18:18 (8)	16:36	16:29	
19	07:22	06:50	06:05	17:22 (8)	06:14	05:36	05:23	05:40	06:10	06:42	7	18:17 (8)	07:14	06:52	07:21
	16:57	17:36	18:09	17:47 (7)	19:43	20:15	20:36	20:30	19:54	19:03	18:24 (8)	18:13	16:36	16:30	
20	07:22	06:49	06:04	17:23 (8)	06:12	05:35	05:24	05:40	06:11	06:43	18:13 (8)	07:15	16:36	16:30	
	16:58	17:37	18:10	17:49 (7)	19:44	20:16	20:36	20:29	19:53	19:01	24	18:37 (7)	18:11	16:35	16:30
21	07:21	06:47	06:02	17:23 (8)	06:11	05:34	05:24	05:41	06:12	06:44	18:10 (8)	07:17	16:35	16:30	
	16:59	17:38	18:11	17:50 (7)	19:45	20:17	20:37	20:28	19:51	18:59	26	18:36 (7)	18:10	16:34	16:31
22	07:20	06:46	06:00	17:24 (8)	06:09	05:33	05:24	05:42	06:13	06:45	18:08 (8)	07:18	16:34	16:31	
	17:00	17:39	18:12	17:51 (7)	19:46	20:18	20:37	20:27	19:50	18:58	27	18:35 (7)	18:08	16:34	16:31
23	07:20	06:44	05:59	17:26 (8)	06:08	05:33	05:24	05:43	06:14	06:46	18:07 (8)	07:19	16:33	16:31	
	17:02	17:41	18:13	17:51 (7)	19:47	20:19	20:37	20:27	19:48	18:56	26	18:33 (7)	18:07	16:33	16:32
24	07:19	06:43	05:57	17:30 (8)	06:06	05:32	05:24	05:44	06:15	06:47	18:05 (8)	07:20	16:32	16:32	
	17:03	17:42	18:14	17:48 (7)	19:48	20:19	20:37	20:26	19:47	18:54	26	18:31 (7)	18:05	16:32	16:32
25	07:18	06:41	05:55	17:04	06:41	06:05	05:31	05:25	05:45	06:16	06:48	18:04 (8)	06:21	16:32	16:32
	17:04	17:43	18:15	19:49	20:20	20:37	20:25	19:45	18:52	25	18:29 (7)	17:04	16:32	16:33	
26	07:17	06:40	05:54	17:03	06:40	06:03	05:30	05:25	05:46	06:17	06:49	18:03 (8)	06:22	16:32	16:33
	17:05	17:44	18:16	19:50	20:21	20:37	20:24	19:43	18:51	25	18:28 (7)	17:02	16:32	16:33	
27	07:17	06:38	05:52	17:07	06:38	06:02	05:30	05:25	05:47	06:18	06:50	18:04 (8)	06:24	16:31	16:33
	17:07	17:46	18:18	19:52	20:22	20:38	20:23	19:42	18:49	23	18:27 (7)	17:01	16:31	16:34	
28	07:16	06:37	05:50	17:08	06:37	06:01	05:29	05:26	05:48	06:19	06:51	18:03 (8)	06:25	16:31	16:34
	17:08	17:47	18:19	19:53	20:23	20:38	20:22	19:40	18:47	22	18:25 (7)	17:00	16:30	16:35	
29	07:15		06:48	17:09	06:36	06:05	05:28	05:26	05:49	06:20	06:52	18:03 (8)	06:26	16:30	16:35
	17:09		19:20	19:54	20:24	20:38	20:21	19:39	18:46	20	18:23 (7)	16:58	16:30	16:35	
30	07:14		06:47	17:10	06:35	06:04	05:28	05:27	05:50	06:21	06:53	18:02 (8)	06:27	16:30	16:35
	17:10		19:21	19:55	20:25	20:37	20:20	19:37	18:44	19	18:21 (8)	16:57	16:30	16:36	
31	07:13		06:45	17:12	06:34	06:03	05:27	05:26	05:51	06:22		06:28	16:30	16:36	16:36
	17:12		19:22		20:25		20:19	19:35				16:56	16:37	16:37	16:37
Potential sun hours	295	296	369		400	450	455	461	429	375		344	296	285	
Total, worst case				335						270		70			
Sun reduction				0,44						0,61		0,52			
Oper. time red.				0,92						0,92		0,92			
Wind dir. red.				0,59						0,59		0,59			
Total reduction				0,24						0,33		0,28			
Total, real				81						89		20			

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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windPRO 3.4.415 by EMD International A/S, Tel. +45 96 35 44 44, www.emd.dk, windpro@emd.dk

20/12/2021 16:52 / 15





RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	77 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: M - SHR_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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 16:38	07:12 17:13	06:35 17:48	06:43 19:23	18:41 (8) 05:56	05:27 20:26	05:27 20:37	05:52 20:18	06:23 19:34	06:54 18:42	06:30 16:54	07:05 16:29
2	07:26 16:39	07:11 17:14	06:34 17:49	06:42 19:24	18:47 (8) 05:55	05:26 20:27	05:28 20:37	05:53 20:17	06:24 19:32	06:55 18:40	06:31 16:53	07:06 16:29
3	07:26 16:40	07:10 17:15	06:32 17:50	06:40 19:25	05:54 19:58	05:26 20:28	05:28 20:37	05:54 20:16	06:25 19:30	06:57 18:39	06:32 16:52	07:07 16:29
4	07:26 16:41	07:09 17:17	06:30 17:51	06:38 19:26	05:53 19:59	05:25 20:28	05:29 20:37	05:55 20:14	06:26 19:29	06:58 18:37	06:33 16:51	07:09 16:28
5	07:26 16:42	07:08 17:18	06:29 17:53	06:37 19:27	05:51 20:00	05:25 20:29	05:29 20:37	05:56 20:13	06:28 19:27	06:59 18:35	06:35 16:49	07:10 16:28
6	07:26 16:43	07:07 17:19	06:27 17:54	06:35 19:29	05:50 20:01	05:25 20:30	05:30 20:36	05:57 20:12	06:29 19:25	07:00 18:34	06:36 16:48	07:11 16:28
7	07:26 16:43	07:06 17:21	06:26 17:55	06:33 19:30	05:49 20:02	05:24 20:31	05:30 20:36	05:58 20:11	06:30 19:24	07:01 18:32	06:37 16:47	07:11 16:28
8	07:26 16:44	07:04 17:22	06:24 17:56	06:32 19:31	05:48 20:03	05:24 20:31	05:31 20:36	05:59 20:09	06:31 19:22	07:02 18:30	06:38 16:46	07:12 16:28
9	07:26 16:46	07:03 17:23	06:22 17:57	06:30 19:32	05:46 20:05	05:24 20:32	05:32 20:35	06:00 20:08	06:32 19:20	07:03 18:29	06:39 16:45	07:13 16:28
10	07:26 16:47	07:02 17:24	06:21 17:58	06:28 19:33	05:45 20:06	05:24 20:32	05:32 20:35	06:01 20:07	06:33 19:18	07:04 18:27	06:41 16:44	07:14 16:28
11	07:25 16:48	07:01 17:26	06:19 18:00	06:27 19:34	05:44 20:07	05:24 20:33	05:33 20:35	06:02 20:06	06:34 19:17	18:34 (8) 07:05	06:42 16:43	07:15 16:28
12	07:25 16:49	07:00 17:27	06:17 18:01	06:25 19:35	05:43 20:08	05:23 20:33	05:34 20:34	06:03 20:04	06:35 19:15	18:42 (8) 07:06	06:43 16:42	07:16 16:28
13	07:25 16:50	06:58 17:28	06:16 18:02	06:23 19:36	05:42 20:09	05:23 20:34	05:35 20:34	06:04 20:03	06:36 19:13	18:26 (8) 07:08	06:44 16:41	07:17 16:28
14	07:24 16:51	06:57 17:30	06:14 18:03	06:22 19:37	05:41 20:10	05:23 20:34	05:35 20:33	06:05 20:01	06:37 19:12	18:45 (8) 07:09	06:46 16:40	07:18 16:28
15	07:24 16:52	06:56 17:31	06:12 18:04	06:20 19:38	05:40 20:11	05:23 20:35	05:36 20:32	06:06 20:00	06:38 19:10	18:23 (8) 07:10	06:47 16:39	07:18 16:29
16	07:24 16:53	06:54 17:32	06:11 18:05	06:19 19:40	05:39 20:12	05:23 20:35	05:37 20:32	06:07 19:59	06:39 19:08	18:21 (8) 07:11	06:48 16:38	07:19 16:29
17	07:23 16:54	06:53 17:33	06:09 18:06	06:17 19:41	05:38 20:13	05:23 20:36	05:38 20:31	06:08 19:57	06:40 19:06	18:45 (7) 07:12	06:49 16:37	07:20 16:29
18	07:23 16:56	06:52 17:35	06:07 18:08	06:15 19:42	05:37 20:14	05:23 20:36	05:39 20:30	06:09 19:56	06:41 19:05	18:44 (7) 07:13	06:50 16:36	07:20 16:29
19	07:22 16:57	06:50 17:36	06:05 18:09	06:14 19:43	05:36 20:15	05:23 20:36	05:40 20:30	06:10 19:54	06:42 19:03	18:19 (8) 07:14	06:52 16:36	07:21 16:30
20	07:22 16:58	06:49 17:37	06:04 18:10	06:12 19:44	05:35 20:16	05:24 20:36	05:40 20:29	06:11 19:53	06:43 19:01	18:18 (8) 07:15	06:53 16:35	07:22 16:30
21	07:21 16:59	06:47 17:38	06:02 18:11	06:11 19:45	05:34 20:17	05:24 20:37	05:41 20:28	06:12 19:51	06:44 18:59	18:18 (8) 07:16	06:54 16:34	07:22 16:31
22	07:20 17:00	06:46 17:39	06:00 18:12	06:09 19:46	05:33 20:18	05:24 20:37	05:42 20:27	06:13 19:50	06:45 18:58	18:18 (8) 07:17	06:55 16:34	07:23 16:31
23	07:20 17:02	06:44 17:41	05:59 18:13	06:08 19:47	05:33 20:19	05:24 20:37	05:43 20:27	06:14 19:48	06:46 18:56	18:18 (8) 07:18	06:56 16:33	07:23 16:32
24	07:19 17:03	06:43 17:42	05:57 18:14	06:06 19:48	05:32 20:19	05:24 20:37	05:44 20:26	06:15 19:47	06:47 18:54	18:18 (8) 07:19	06:58 16:32	07:24 16:32
25	07:18 17:04	06:41 17:43	05:55 18:15	06:05 19:49	05:31 20:20	05:25 20:37	05:45 20:25	06:16 19:45	06:48 18:52	18:19 (8) 07:20	06:59 16:32	07:24 16:33
26	07:17 17:05	06:40 17:44	05:54 18:16	06:03 19:50	05:30 20:21	05:25 20:37	05:46 20:24	06:17 19:43	06:49 18:51	18:20 (8) 07:21	07:00 16:31	07:24 16:33
27	07:17 17:07	06:38 17:46	05:52 18:18	06:02 19:52	05:30 20:22	05:25 20:38	05:47 20:23	06:18 19:42	06:50 18:49	18:21 (8) 07:22	07:01 16:31	07:25 16:34
28	07:16 17:08	06:37 17:47	05:50 18:19	06:01 19:53	05:29 20:23	05:26 20:38	05:48 20:22	06:19 19:40	06:51 18:47	18:26 (8) 07:23	07:02 16:30	07:25 16:35
29	07:15 17:09	06:48 18:20	06:48 19:20	05:59 19:54	05:28 20:24	05:26 20:38	05:49 20:21	06:20 19:39	06:52 18:46	06:26 16:58	07:03 16:30	07:25 16:35
30	07:14 17:10	06:47 19:21	06:47 18:35	05:58 19:55	05:28 20:25	05:27 20:37	05:50 20:20	06:21 19:37	06:53 18:44	06:27 16:57	07:04 16:30	07:26 16:36
31	07:13 17:12	06:45 19:22	06:45 18:37	06:03 19:55	05:27 20:25	05:21 20:37	05:51 20:19	06:22 19:35	06:54 18:44	06:28 16:56	07:05 16:30	07:26 16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	344	296	285
Total, worst case			266	6					277			
Sun reduction			0,44	0,50					0,61			
Oper. time red.			0,92	0,92					0,92			
Wind dir. red.			0,62	0,62					0,62			
Total reduction			0,25	0,29					0,35			
Total, real			67	2					96			

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

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



SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: N - SHR_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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June
1	07:26 16:38	12:57 (9) 14:34 (9)	07:12 17:13	13:50 (9) 14:11 (9)	06:35 17:48	06:43 19:23
2	07:26 16:39	12:58 (9) 14:34 (9)	07:11 17:14	06:34 17:49	06:42 19:24	18:39 (8) 19:57
3	07:26 16:40	12:58 (9) 14:34 (9)	07:10 17:15	06:32 17:50	06:40 19:25	18:40 (8) 19:58
4	07:26 16:41	12:59 (9) 14:35 (9)	07:09 17:17	06:30 17:51	06:38 19:26	18:40 (8) 19:59
5	07:26 16:42	13:00 (9) 14:35 (9)	07:08 17:18	06:29 17:53	06:37 19:27	18:40 (8) 19:03 (8)
6	07:26 16:43	13:01 (9) 14:35 (9)	07:07 17:19	06:27 17:54	06:35 19:29	18:42 (8) 19:02 (8)
7	07:26 16:43	13:01 (9) 14:34 (9)	07:06 17:21	06:26 17:55	06:33 19:30	18:42 (8) 19:00 (8)
8	07:26 16:44	13:02 (9) 14:35 (9)	07:04 17:22	06:24 17:56	06:32 19:31	18:44 (8) 18:57 (8)
9	07:26 16:46	13:03 (9) 14:35 (9)	07:03 17:23	06:22 17:57	06:30 19:32	18:48 (8) 18:54 (8)
10	07:26 16:47	13:05 (9) 14:35 (9)	07:02 17:24	06:21 17:58	06:28 19:33	05:45 20:06
11	07:25 16:48	13:05 (9) 14:35 (9)	07:01 17:26	06:19 18:00	06:27 19:34	05:44 20:07
12	07:25 16:49	13:06 (9) 14:35 (9)	07:00 17:27	06:17 18:01	06:25 19:35	05:43 20:08
13	07:25 16:50	13:08 (9) 14:35 (9)	06:58 17:28	06:16 18:02	06:23 19:36	05:42 20:09
14	07:24 16:51	13:08 (9) 14:35 (9)	06:57 17:30	06:14 18:03	06:22 19:37	05:41 20:10
15	07:24 16:52	13:10 (9) 14:35 (9)	06:56 17:31	06:12 18:04	06:20 19:38	05:40 20:11
16	07:24 16:53	13:11 (9) 14:34 (9)	06:54 17:32	06:11 18:05	06:19 19:40	05:39 20:12
17	07:23 16:54	13:13 (9) 14:34 (9)	06:53 17:33	06:09 18:06	06:17 19:41	05:38 20:13
18	07:23 16:56	13:14 (9) 14:33 (9)	06:52 17:35	06:07 18:08	06:15 19:42	05:37 20:14
19	07:22 16:57	13:15 (9) 14:33 (9)	06:50 17:36	06:05 18:09	06:14 19:43	05:36 20:15
20	07:22 16:58	13:17 (9) 14:33 (9)	06:49 17:37	06:04 18:10	06:12 19:44	05:35 20:16
21	07:21 16:59	13:18 (9) 14:32 (9)	06:47 17:38	06:02 18:11	06:11 19:45	05:34 20:17
22	07:20 17:00	13:20 (9) 14:31 (9)	06:46 17:39	06:00 18:12	06:09 19:46	05:33 20:18
23	07:20 17:02	13:22 (9) 14:31 (9)	06:44 17:41	05:59 18:13	06:08 17:50 (8) 17:52 (8)	05:33 20:19
24	07:19 17:03	13:24 (9) 14:29 (9)	06:43 17:42	05:57 18:14	06:06 17:48 (8) 17:53 (8)	05:32 20:19
25	07:18 17:04	13:26 (9) 14:28 (9)	06:41 17:43	05:55 18:15	06:05 17:45 (8) 17:54 (7)	05:31 20:20
26	07:17 17:05	13:28 (9) 14:27 (9)	06:40 17:44	05:54 18:16	06:03 17:43 (8) 17:55 (7)	05:30 20:21
27	07:17 17:07	13:30 (9) 14:25 (9)	06:38 17:46	05:52 18:18	06:02 17:42 (8) 17:56 (7)	05:30 20:22
28	07:16 17:08	13:33 (9) 14:23 (9)	06:37 17:47	05:50 18:19	06:01 17:42 (8) 17:58 (7)	05:29 20:23
29	07:15 17:09	13:36 (9) 14:21 (9)	06:36 17:48	05:48 18:20	05:59 18:40 (8) 18:58 (7)	05:28 20:24
30	07:14 17:10	13:40 (9) 14:19 (9)	06:35 17:49	05:47 18:21	05:58 18:40 (8) 18:59 (7)	05:28 20:25
31	07:13 17:12	13:44 (9) 14:15 (9)	06:34 17:50	05:45 18:22	05:57 18:40 (8) 19:01 (7)	05:27 20:25
Potential sun hours	295	296	369	400	450	455
Total, worst case	2397	21	116	175		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,92	0,92	0,92		
Wind dir. red.	0,51	0,51	0,64	0,64		
Total reduction	0,20	0,21	0,26	0,30		
Total, real	485	4	30	52		

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

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

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: N - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:27 20:37	05:52 20:18	06:23 19:34	06:54 18:42	06:30 16:54	07:05 16:29
2	05:28 20:37	05:53 20:17	06:24 19:32	06:55 18:40	06:31 16:53	90 16:29
3	05:28 20:37	05:54 20:16	06:25 19:30	18:45 (8) 18:51 (8)	06:57 18:39	06:32 16:52
4	05:29 20:37	05:55 20:14	06:26 19:29	18:41 (8) 18:54 (8)	06:58 18:37	06:33 16:51
5	05:29 20:37	05:56 20:13	06:28 19:27	18:38 (8) 18:56 (8)	06:59 18:35	06:35 16:49
6	05:30 20:36	05:57 20:12	06:29 19:25	18:37 (8) 18:57 (8)	07:00 18:34	06:36 16:48
7	05:30 20:36	05:58 20:11	06:30 19:24	18:35 (8) 18:58 (8)	07:01 18:32	06:37 16:47
8	05:31 20:36	05:59 20:09	06:31 19:22	18:34 (8) 18:59 (8)	07:02 18:30	06:38 16:46
9	05:32 20:35	06:00 20:08	06:32 19:20	18:33 (8) 18:57 (8)	07:03 18:29	06:39 16:45
10	05:32 20:35	06:01 20:07	06:33 19:18	18:32 (8) 18:56 (7)	07:04 18:27	06:41 16:44
11	05:33 20:35	06:02 20:06	06:34 19:17	18:31 (8) 18:54 (7)	07:05 18:25	06:42 16:43
12	05:34 20:34	06:03 20:04	06:35 19:15	18:31 (8) 18:52 (7)	07:06 18:24	06:43 16:42
13	05:35 20:34	06:04 20:03	06:36 19:13	18:31 (8) 18:51 (7)	07:08 18:22	06:44 16:41
14	05:35 20:33	06:05 20:01	06:37 19:12	18:31 (8) 18:49 (7)	07:09 18:20	06:46 16:40
15	05:36 20:32	06:06 20:00	06:38 19:10	18:31 (8) 18:47 (7)	07:10 18:19	06:47 16:39
16	05:37 20:32	06:07 19:59	06:39 19:08	18:31 (8) 18:45 (7)	07:11 18:17	06:48 16:38
17	05:38 20:31	06:08 19:57	06:40 19:06	18:31 (8) 18:44 (7)	07:12 18:16	06:49 16:37
18	05:39 20:30	06:09 19:56	06:41 19:05	18:32 (8) 18:42 (7)	07:13 18:14	06:50 16:36
19	05:40 20:30	06:10 19:54	06:42 19:03	18:34 (8) 18:40 (8)	07:14 18:13	06:52 16:36
20	05:40 20:29	06:11 19:53	06:43 19:01	18:36 (8) 18:38 (8)	07:15 18:11	06:53 16:35
21	05:41 20:28	06:12 19:51	06:44 18:59	07:17 18:10	06:54 16:34	71 12:54 (9)
22	05:42 20:27	06:13 19:50	06:45 18:58	07:18 18:08	06:55 16:34	74 12:53 (9)
23	05:43 20:27	06:14 19:48	06:46 18:56	07:19 18:07	06:56 16:33	76 14:09 (9)
24	05:44 20:26	06:15 19:47	06:47 18:54	07:20 18:05	06:58 16:32	78 14:10 (9)
25	05:45 20:25	06:16 19:45	06:48 18:52	06:21 17:04	06:59 16:32	79 14:10 (9)
26	05:46 20:24	06:17 19:43	06:49 18:51	06:22 17:02	07:00 16:31	81 12:50 (9)
27	05:47 20:23	06:18 19:42	06:50 18:49	06:24 17:01	07:01 16:31	83 14:13 (9)
28	05:48 20:22	06:19 19:40	06:51 18:47	06:25 17:00	07:02 16:30	85 12:49 (9)
29	05:49 20:21	06:20 19:39	06:52 18:46	06:26 16:58	07:03 16:30	87 14:14 (9)
30	05:50 20:20	06:21 19:37	06:53 18:44	06:27 16:57	07:04 16:30	87 12:47 (9)
31	05:51 20:19	06:22 19:35	06:54 18:44	06:28 16:56	07:05 16:30	89 14:16 (9)
Potential sun hours	461	429	375	344	296	285
Total, worst case			296		1389	3002
Sun reduction			0,61		0,47	0,41
Oper. time red.			0,92		0,92	0,92
Wind dir. red.			0,64		0,51	0,51
Total reduction			0,36		0,22	0,19
Total, real			106		306	583

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	80 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: O - SHR_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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June				
1	07:26	13:33 (9)	07:12	06:35	06:43	18:39 (8)	05:56	05:27		
	16:38	82	14:55 (9)	17:13	17:48	19:23	23	19:02 (8)	19:56	20:26
2	07:26	13:34 (9)	07:11	06:34	06:42	18:39 (8)	05:55	05:26		
	16:39	82	14:56 (9)	17:14	17:49	19:24	22	19:01 (8)	19:57	20:27
3	07:26	13:34 (9)	07:10	06:32	06:40	18:41 (8)	05:54	05:26		
	16:40	82	14:56 (9)	17:15	17:50	19:25	19	19:00 (8)	19:58	20:28
4	07:26	13:35 (9)	07:09	06:30	06:38	18:42 (8)	05:53	05:25		
	16:41	81	14:56 (9)	17:17	17:51	19:26	16	18:58 (8)	19:59	20:28
5	07:26	13:36 (9)	07:08	06:29	06:37	18:44 (8)	05:51	05:25		
	16:42	80	14:56 (9)	17:18	17:53	19:27	11	18:55 (8)	20:00	20:29
6	07:26	13:37 (9)	07:07	06:27	06:35	19:00 (8)	05:50	05:25		
	16:43	79	14:56 (9)	17:19	17:54	19:29		20:01	20:30	
7	07:26	13:37 (9)	07:06	06:26	06:33	19:01 (8)	05:49	05:24		
	16:43	79	14:56 (9)	17:21	17:55	19:30		20:02	20:31	
8	07:26	13:38 (9)	07:04	06:24	06:32	19:02 (8)	05:48	05:24		
	16:44	78	14:56 (9)	17:22	17:56	19:31		20:03	20:31	
9	07:26	13:40 (9)	07:03	06:22	06:30	19:03 (8)	05:46	05:24		
	16:46	76	14:56 (9)	17:23	17:57	19:32		20:05	20:32	
10	07:26	13:41 (9)	07:02	06:21	06:28	19:04 (8)	05:45	05:24		
	16:47	75	14:56 (9)	17:24	17:58	19:33		20:06	20:32	
11	07:25	13:41 (9)	07:01	06:19	06:27	19:05 (8)	05:44	05:24		
	16:48	75	14:56 (9)	17:26	18:00	19:34		20:07	20:33	
12	07:25	13:43 (9)	07:00	06:17	06:25	19:06 (8)	05:43	05:23		
	16:49	73	14:56 (9)	17:27	18:01	19:35		20:08	20:33	
13	07:25	13:44 (9)	06:58	06:16	06:23	19:07 (8)	05:42	05:23		
	16:50	72	14:56 (9)	17:28	18:02	19:36		20:09	20:34	
14	07:24	13:45 (9)	06:57	06:14	06:22	19:08 (8)	05:41	05:23		
	16:51	70	14:55 (9)	17:30	18:03	19:37		20:10	20:34	
15	07:24	13:47 (9)	06:56	06:12	06:20	19:09 (8)	05:40	05:23		
	16:52	68	14:55 (9)	17:31	18:04	19:38		20:11	20:35	
16	07:24	13:48 (9)	06:54	06:11	06:19	19:10 (8)	05:39	05:23		
	16:53	66	14:54 (9)	17:32	18:05	19:40		20:12	20:35	
17	07:23	13:50 (9)	06:53	06:09	06:17	19:11 (8)	05:38	05:23		
	16:54	64	14:54 (9)	17:33	18:06	19:41		20:13	20:36	
18	07:23	13:51 (9)	06:52	06:07	06:15	19:12 (8)	05:37	05:23		
	16:56	62	14:53 (9)	17:35	18:08	19:42		20:14	20:36	
19	07:22	13:52 (9)	06:50	06:05	06:14	19:13 (8)	05:36	05:23		
	16:57	60	14:52 (9)	17:36	18:09	19:43		20:15	20:36	
20	07:22	13:54 (9)	06:49	06:04	06:12	19:14 (8)	05:35	05:24		
	16:58	58	14:52 (9)	17:37	18:10	19:44		20:16	20:36	
21	07:21	13:56 (9)	06:47	06:02	17:48 (8)	06:11	05:34	05:24		
	16:59	55	14:51 (9)	17:38	18:11	2	17:50 (8)	19:45	20:17	20:37
22	07:20	13:58 (9)	06:46	06:00	17:45 (8)	06:09	05:33	05:24		
	17:00	52	14:50 (9)	17:39	18:12	6	17:51 (8)	19:46	20:18	20:37
23	07:20	14:01 (9)	06:44	05:59	17:43 (8)	06:08	05:33	05:24		
	17:02	48	14:49 (9)	17:41	18:13	9	17:52 (8)	19:47	20:19	20:37
24	07:19	14:03 (9)	06:43	05:57	17:42 (8)	06:06	05:32	05:24		
	17:03	45	14:48 (9)	17:42	18:14	11	17:53 (8)	19:48	20:19	20:37
25	07:18	14:05 (9)	06:41	05:55	17:41 (8)	06:05	05:31	05:25		
	17:04	41	14:46 (9)	17:43	18:15	13	17:54 (8)	19:49	20:20	20:37
26	07:17	14:08 (9)	06:40	05:54	17:40 (8)	06:03	05:30	05:25		
	17:05	35	14:43 (9)	17:44	18:16	15	17:55 (8)	19:50	20:21	20:37
27	07:17	14:12 (9)	06:38	05:52	17:39 (8)	06:02	05:30	05:25		
	17:07	29	14:41 (9)	17:46	18:18	17	17:56 (8)	19:52	20:22	20:38
28	07:16	14:16 (9)	06:37	05:50	17:39 (8)	06:01	05:29	05:26		
	17:08	21	14:37 (9)	17:47	18:19	19	17:58 (8)	19:53	20:23	20:38
29	07:15			06:48	18:39 (8)	05:59	05:28	05:26		
	17:09			19:20	19	18:58 (8)	19:54	20:24	20:38	
30	07:14			06:47	18:38 (8)	05:58	05:28	05:27		
	17:10			19:21	21	18:59 (8)	19:55	20:25	20:37	
31	07:13			06:45	18:39 (8)		05:27			
	17:12			19:22	22	19:01 (8)	20:25			
Potential sun hours	295	296	369	400			450	455		
Total, worst case	1788			154		91				
Sun reduction	0,43			0,44		0,50				
Oper. time red.	0,92			0,92		0,92				
Wind dir. red.	0,49			0,64		0,64				
Total reduction	0,19			0,26		0,29				
Total, real	345			40		27				

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

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

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: O - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December			
1	05:27	05:52	06:23	06:54	06:30	07:05	13:23 (9)		
	20:37	20:18	19:34	18:42	16:54	16:29	75 14:38 (9)		
2	05:28	05:53	06:24	06:55	06:31	07:06	13:23 (9)		
	20:37	20:17	19:32	18:40	16:53	16:29	75 14:38 (9)		
3	05:28	05:54	06:25	06:57	06:32	07:07	13:24 (9)		
	20:37	20:15	19:30	18:39	16:52	16:29	76 14:40 (9)		
4	05:29	05:55	06:26	06:58	06:33	07:09	13:23 (9)		
	20:37	20:14	19:29	18:37	16:51	16:28	78 14:41 (9)		
5	05:29	05:56	06:28	06:59	06:35	07:10	13:23 (9)		
	20:37	20:13	19:27	18:35	16:49	16:28	79 14:42 (9)		
6	05:30	05:57	06:29	07:00	06:36	07:10	13:23 (9)		
	20:36	20:12	19:25	18:34	16:48	16:28	79 14:42 (9)		
7	05:30	05:58	06:30	18:39 (8)	07:01	06:37	07:11	13:23 (9)	
	20:36	20:11	19:24	18:50 (8)	18:32	16:47	16:28	80 14:43 (9)	
8	05:31	05:59	06:31	18:36 (8)	07:02	06:38	07:12	13:22 (9)	
	20:36	20:09	19:22	18:52 (8)	18:30	16:46	16:28	81 14:43 (9)	
9	05:32	06:00	06:32	18:34 (8)	07:03	06:39	07:13	13:22 (9)	
	20:35	20:08	19:20	18:53 (8)	18:29	16:45	16:28	82 14:44 (9)	
10	05:32	06:01	06:33	18:33 (8)	07:04	06:41	07:14	13:23 (9)	
	20:35	20:07	19:18	18:54 (8)	18:27	16:44	16:28	82 14:45 (9)	
11	05:33	06:02	06:34	18:31 (8)	07:05	06:42	07:15	13:23 (9)	
	20:35	20:05	19:17	18:54 (8)	18:25	16:43	16:28	82 14:45 (9)	
12	05:34	06:03	06:35	18:30 (8)	07:06	06:43	07:16	13:23 (9)	
	20:34	20:04	19:15	18:52 (8)	18:24	16:42	16:28	83 14:46 (9)	
13	05:35	06:04	06:36	18:30 (8)	07:08	06:44	13:58 (9)	07:17	13:24 (9)
	20:34	20:03	19:13	18:51 (8)	18:22	16:41	2 14:00 (9)	16:28	83 14:47 (9)
14	05:35	06:05	06:37	18:29 (8)	07:09	06:46	13:49 (9)	07:17	13:24 (9)
	20:33	20:01	19:12	18:49 (8)	18:20	16:40	21 14:10 (9)	16:28	84 14:48 (9)
15	05:36	06:06	06:38	18:28 (8)	07:10	06:47	13:44 (9)	07:18	13:24 (9)
	20:32	20:00	19:10	18:47 (8)	18:19	16:39	30 14:14 (9)	16:29	84 14:48 (9)
16	05:37	06:07	06:39	18:28 (8)	07:11	06:48	13:41 (9)	07:19	13:24 (9)
	20:32	19:59	19:08	18:45 (8)	18:17	16:38	35 14:16 (9)	16:29	85 14:49 (9)
17	05:38	06:08	06:40	18:28 (8)	07:12	06:49	13:38 (9)	07:20	13:25 (9)
	20:31	19:57	19:06	18:44 (8)	18:16	16:37	41 14:19 (9)	16:29	85 14:50 (9)
18	05:39	06:09	06:41	18:28 (8)	07:13	06:50	13:37 (9)	07:20	13:25 (9)
	20:30	19:56	19:05	18:42 (8)	18:14	16:36	45 14:22 (9)	16:29	84 14:49 (9)
19	05:40	06:10	06:42	18:28 (8)	07:14	06:52	13:35 (9)	07:21	13:26 (9)
	20:30	19:54	19:03	18:40 (8)	18:13	16:36	48 14:23 (9)	16:30	84 14:50 (9)
20	05:40	06:11	06:43	18:29 (8)	07:15	06:53	13:33 (9)	07:22	13:25 (9)
	20:29	19:53	19:01	18:38 (8)	18:11	16:35	52 14:25 (9)	16:30	85 14:50 (9)
21	05:41	06:12	06:44	18:30 (8)	07:17	06:54	13:32 (9)	07:22	13:26 (9)
	20:28	19:51	18:59	18:36 (8)	18:10	16:34	55 14:27 (9)	16:31	85 14:51 (9)
22	05:42	06:13	06:45	18:32 (8)	07:18	06:55	13:30 (9)	07:23	13:26 (9)
	20:27	19:50	18:58	18:35 (8)	18:08	16:34	58 14:28 (9)	16:31	85 14:51 (9)
23	05:43	06:14	06:46	07:19	06:56	07:23	13:29 (9)	07:23	13:27 (9)
	20:27	19:48	18:56	18:07	16:33	60 14:29 (9)	16:32	85 14:52 (9)	
24	05:44	06:15	06:47	07:20	06:58	07:24	13:28 (9)	07:24	13:28 (9)
	20:26	19:47	18:54	18:05	16:32	62 14:30 (9)	16:32	84 14:52 (9)	
25	05:45	06:16	06:48	06:21	06:59	07:24	13:27 (9)	07:24	13:29 (9)
	20:25	19:45	18:52	17:04	16:32	64 14:31 (9)	16:33	84 14:53 (9)	
26	05:46	06:17	06:49	06:22	07:00	07:24	13:27 (9)	07:24	13:29 (9)
	20:24	19:43	18:51	17:02	16:31	66 14:33 (9)	16:33	85 14:54 (9)	
27	05:47	06:18	06:50	06:24	07:01	07:25	13:26 (9)	07:25	13:29 (9)
	20:23	19:42	18:49	17:01	16:31	68 14:34 (9)	16:34	85 14:54 (9)	
28	05:48	06:19	06:51	06:25	07:02	07:25	13:25 (9)	07:25	13:30 (9)
	20:22	19:40	18:47	17:00	16:30	70 14:35 (9)	16:35	84 14:54 (9)	
29	05:49	06:20	06:52	06:26	07:03	07:25	13:24 (9)	07:25	13:31 (9)
	20:21	19:39	18:46	16:58	16:30	72 14:36 (9)	16:35	84 14:55 (9)	
30	05:50	06:21	06:53	06:27	07:04	07:26	13:24 (9)	07:26	13:32 (9)
	20:20	19:37	18:44	16:57	16:30	73 14:37 (9)	16:36	83 14:55 (9)	
31	05:51	06:22	06:54	06:28	07:05	07:26	13:23 (9)	07:26	13:32 (9)
	20:19	19:35	18:43	16:56	16:29	74 14:38 (9)	16:37	83 14:55 (9)	
Potential sun hours	461	429	375	344	296	285			2553
Total, worst case									0,41
Sun reduction									0,92
Oper. time red.									0,49
Wind dir. red.									0,19
Total reduction									473
Total, real									

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

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

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: P - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:26 16:38	13:02 (9) 14:50 (9)	07:12 17:13	13:36 (9) 14:43 (9)	06:35 17:48	18:42 (8) 19:56
2	07:26 16:39	13:02 (9) 14:50 (9)	07:11 17:14	13:38 (9) 14:42 (9)	06:34 17:49	18:41 (8) 19:57
3	07:26 16:40	13:03 (9) 14:50 (9)	07:10 17:15	13:41 (9) 14:40 (9)	06:32 17:50	18:42 (8) 19:58
4	07:26 16:41	13:04 (9) 14:50 (9)	07:09 17:17	13:44 (9) 14:38 (9)	06:30 17:51	18:41 (8) 19:59
5	07:26 16:42	13:04 (9) 14:51 (9)	07:08 17:18	13:47 (9) 14:36 (9)	06:29 17:53	18:41 (8) 20:00
6	07:26 16:43	13:05 (9) 14:51 (9)	07:07 17:19	13:51 (9) 14:34 (9)	06:27 17:54	18:42 (8) 20:01
7	07:26 16:43	13:05 (9) 14:51 (9)	07:06 17:21	13:55 (9) 14:31 (9)	06:26 17:55	18:42 (8) 20:02
8	07:26 16:44	13:06 (9) 14:51 (9)	07:04 17:22	13:59 (9) 14:26 (9)	06:24 17:56	18:43 (8) 19:03 (8)
9	07:26 16:46	13:07 (9) 14:51 (9)	07:03 17:23	14:08 (9) 14:18 (9)	06:22 17:57	18:45 (8) 19:02 (8)
10	07:26 16:47	13:08 (9) 14:52 (9)	07:02 17:24	14:11 (9) 14:52 (9)	06:21 17:58	18:47 (8) 20:06
11	07:25 16:48	13:08 (9) 14:51 (9)	07:01 17:26	14:15 (9) 18:00	06:19 18:00	18:51 (8) 20:07
12	07:25 16:49	13:09 (9) 14:52 (9)	07:00 17:27	14:19 (9) 18:01	06:17 18:01	18:53 (8) 20:08
13	07:25 16:50	13:11 (9) 14:52 (9)	06:58 17:28	14:23 (9) 18:02	06:16 18:02	19:09 20:09
14	07:24 16:51	13:11 (9) 14:52 (9)	06:57 17:30	14:27 (9) 18:03	06:14 18:03	19:13 20:10
15	07:24 16:52	13:12 (9) 14:52 (9)	06:56 17:31	14:31 (9) 18:04	06:12 18:04	19:17 20:11
16	07:24 16:53	13:13 (9) 14:52 (9)	06:54 17:32	14:35 (9) 18:05	06:11 18:05	19:21 20:12
17	07:23 16:54	13:14 (9) 14:52 (9)	06:53 17:33	14:39 (9) 18:06	06:10 18:06	19:25 20:13
18	07:23 16:56	13:15 (9) 14:52 (9)	06:52 17:35	14:43 (9) 18:08	06:15 18:08	19:29 20:14
19	07:22 16:57	13:16 (9) 14:51 (9)	06:50 17:36	14:47 (9) 18:09	06:14 18:09	19:33 20:15
20	07:22 16:58	13:17 (9) 14:51 (9)	06:49 17:37	14:51 (9) 18:10	06:12 18:10	19:37 20:16
21	07:21 16:59	13:18 (9) 14:51 (9)	06:47 17:38	14:55 (9) 18:11	06:11 18:11	19:41 20:17
22	07:20 17:00	13:19 (9) 14:50 (9)	06:46 17:39	14:59 (9) 18:12	06:09 18:12	19:45 20:18
23	07:20 17:02	13:21 (9) 14:51 (9)	06:44 17:41	15:03 (9) 18:13	06:08 18:13	19:49 20:19
24	07:19 17:03	13:22 (9) 14:50 (9)	06:43 17:42	15:07 (9) 18:14	06:06 18:14	19:53 20:19
25	07:18 17:04	13:23 (9) 14:49 (9)	06:41 17:43	15:11 (9) 18:15	06:05 18:15	19:57 20:20
26	07:17 17:05	13:25 (9) 14:49 (9)	06:40 17:44	15:15 (9) 18:16	06:03 18:16	20:01 20:21
27	07:17 17:07	13:26 (9) 14:48 (9)	06:38 17:46	15:19 (9) 18:18	06:02 18:18	20:05 20:22
28	07:16 17:08	13:28 (9) 14:47 (9)	06:37 17:47	15:23 (9) 18:19	06:01 18:19	20:09 20:23
29	07:15 17:09	13:30 (9) 14:46 (9)	06:36 17:48	15:27 (9) 18:20	06:00 18:20	20:13 20:24
30	07:14 17:10	13:31 (9) 14:45 (9)	06:35 17:49	15:31 (9) 18:21	06:00 18:21	20:17 20:25
31	07:13 17:12	13:33 (9) 14:44 (9)	06:34 17:50	15:35 (9) 19:01 (8)	06:00 19:01 (8)	20:21 20:25
Potential sun hours	295	296	369	400	450	455
Total, worst case	2966	409	77	211		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,50	0,92	0,65		
Wind dir. red.	0,50	0,20	0,65	0,30		
Total reduction	0,20	0,20	0,26	0,30		
Total, real	588	83	20	63		

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: P - SHR_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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	July	August	September	October	November	December						
1	05:27	05:52	06:23	18:50 (8)	06:54	06:30	07:05	12:50 (9)				
	20:37	20:18	19:34	3	18:53 (8)	18:42	16:54	16:29	103	14:33 (9)		
2	05:28	05:53	06:24	18:45 (8)	06:55	06:31	13:36 (9)	07:06		12:50 (9)		
	20:37	20:17	19:32	12	18:57 (8)	18:40	16:53	13:50 (9)	16:29	104	14:34 (9)	
3	05:28	05:54	06:25	18:42 (8)	06:57	06:32	13:28 (9)	07:07			12:51 (9)	
	20:37	20:16	19:30	17	18:59 (8)	18:39	16:52	29	13:57 (9)	16:29	105	14:36 (9)
4	05:29	05:55	06:26	18:40 (8)	06:58	06:33	13:23 (9)	07:09				12:51 (9)
	20:37	20:14	19:29	20	19:00 (8)	18:37	16:51	37	14:00 (9)	16:28	105	14:36 (9)
5	05:29	05:56	06:28	18:39 (8)	06:59	06:35	13:20 (9)	07:10				12:51 (9)
	20:37	20:13	19:27	22	19:01 (8)	18:35	16:49	44	14:04 (9)	16:28	106	14:37 (9)
6	05:30	05:57	06:29	18:37 (8)	07:00	06:36	13:16 (9)	07:10				12:51 (9)
	20:36	20:12	19:25	25	19:02 (8)	18:34	16:48	51	14:07 (9)	16:28	106	14:37 (9)
7	05:30	05:58	06:30	18:36 (8)	07:01	06:37	13:13 (9)	07:11				12:52 (9)
	20:36	20:11	19:24	25	19:01 (8)	18:32	16:47	55	14:08 (9)	16:28	106	14:38 (9)
8	05:31	05:59	06:31	18:35 (8)	07:02	06:38	13:11 (9)	07:12				12:51 (9)
	20:36	20:09	19:22	24	18:59 (8)	18:30	16:46	60	14:11 (9)	16:28	107	14:38 (9)
9	05:32	06:00	06:32	18:35 (8)	07:03	06:39	13:09 (9)	07:13				12:51 (9)
	20:35	20:08	19:20	22	18:57 (8)	18:29	16:45	64	14:13 (9)	16:28	107	14:38 (9)
10	05:32	06:01	06:33	18:34 (8)	07:04	06:41	13:06 (9)	07:14				12:51 (9)
	20:35	20:07	19:18	22	18:56 (8)	18:27	16:44	68	14:14 (9)	16:28	108	14:39 (9)
11	05:33	06:02	06:34	18:34 (8)	07:05	06:42	13:05 (9)	07:15				12:52 (9)
	20:35	20:05	19:17	20	18:54 (8)	18:25	16:43	71	14:16 (9)	16:28	108	14:40 (9)
12	05:34	06:03	06:35	18:34 (8)	07:06	06:43	13:03 (9)	07:16				12:52 (9)
	20:34	20:04	19:15	18	18:52 (8)	18:24	16:42	74	14:17 (9)	16:28	108	14:40 (9)
13	05:35	06:04	06:36	18:34 (8)	07:08	06:44	13:01 (9)	07:17				12:53 (9)
	20:34	20:03	19:13	17	18:51 (8)	18:22	16:41	77	14:18 (9)	16:28	108	14:41 (9)
14	05:35	06:05	06:37	18:34 (8)	07:09	06:46	13:01 (9)	07:17				12:53 (9)
	20:33	20:01	19:12	15	18:49 (8)	18:20	16:40	79	14:20 (9)	16:28	109	14:42 (9)
15	05:36	06:06	06:38	18:35 (8)	07:10	06:47	12:59 (9)	07:18				12:53 (9)
	20:32	20:00	19:10	12	18:47 (8)	18:19	16:39	82	14:21 (9)	16:29	109	14:42 (9)
16	05:37	06:07	06:39	18:36 (8)	07:11	06:48	12:58 (9)	07:19				12:54 (9)
	20:32	19:59	19:08	9	18:45 (8)	18:17	16:38	84	14:22 (9)	16:29	108	14:42 (9)
17	05:38	06:08	06:40	18:37 (8)	07:12	06:49	12:56 (9)	07:20				12:54 (9)
	20:31	19:57	19:06	7	18:44 (8)	18:16	16:37	86	14:22 (9)	16:29	109	14:43 (9)
18	05:39	06:09	06:41	18:39 (8)	07:13	06:50	12:56 (9)	07:20				12:54 (9)
	20:30	19:56	19:05	3	18:42 (8)	18:14	16:36	88	14:24 (9)	16:29	109	14:43 (9)
19	05:40	06:10	06:42		07:14	06:52	12:55 (9)	07:21				12:55 (9)
	20:30	19:54	19:03		18:13	16:36	90	14:25 (9)	16:30	109	14:44 (9)	
20	05:40	06:11	06:43		07:15	06:53	12:54 (9)	07:22				12:55 (9)
	20:29	19:53	19:01		18:11	16:35	91	14:25 (9)	16:30	109	14:44 (9)	
21	05:41	06:12	06:44		07:17	06:54	12:54 (9)	07:22				12:56 (9)
	20:28	19:51	18:59		18:10	16:34	93	14:27 (9)	16:31	109	14:45 (9)	
22	05:42	06:13	06:45		07:18	06:55	12:53 (9)	07:23				12:56 (9)
	20:27	19:50	18:58		18:08	16:34	94	14:27 (9)	16:31	109	14:45 (9)	
23	05:43	06:14	06:46		07:19	06:56	12:53 (9)	07:23				12:57 (9)
	20:27	19:48	18:56		18:07	16:33	95	14:28 (9)	16:32	109	14:46 (9)	
24	05:44	06:15	06:47		07:20	06:58	12:52 (9)	07:24				12:57 (9)
	20:26	19:47	18:54		18:05	16:32	97	14:29 (9)	16:32	109	14:46 (9)	
25	05:45	06:16	06:48		06:21	06:59	12:51 (9)	07:24				12:58 (9)
	20:25	19:45	18:52		17:04	16:32	98	14:29 (9)	16:33	109	14:47 (9)	
26	05:46	06:17	06:49		06:22	07:00	12:52 (9)	07:24				12:58 (9)
	20:24	19:43	18:51		17:02	16:31	99	14:31 (9)	16:33	109	14:47 (9)	
27	05:47	06:18	06:50		06:24	07:01	12:51 (9)	07:25				12:59 (9)
	20:23	19:42	18:49		17:01	16:31	100	14:31 (9)	16:34	108	14:47 (9)	
28	05:48	06:19	06:51		06:25	07:02	12:51 (9)	07:25				12:59 (9)
	20:22	19:40	18:47		17:00	16:30	101	14:32 (9)	16:35	109	14:48 (9)	
29	05:49	06:20	06:52		06:26	07:03	12:51 (9)	07:25				13:00 (9)
	20:21	19:39	18:46		16:58	16:30	101	14:32 (9)	16:35	109	14:49 (9)	
30	05:50	06:21	06:53		06:27	07:04	12:50 (9)	07:26				13:01 (9)
	20:20	19:37	18:44		16:57	16:30	103	14:33 (9)	16:36	108	14:49 (9)	
31	05:51	06:22			06:28			07:26				13:01 (9)
	20:19	19:35			16:56			16:37	108	14:49 (9)		
Potential sun hours	461	429	375	344	296			285				
Total, worst case			293		2225			3339				
Sun reduction			0,61		0,47			0,41				
Oper. time red.			0,92		0,92			0,50				
Wind dir. red.			0,65		0,50			0,19				
Total reduction			0,36		0,22			0,19				
Total, real			106		480			635				

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: Q - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:26 16:38	13:59 (9) 15:29 (9)	07:12 17:13	14:28 (9) 15:24 (9)	06:35 17:48	06:43 19:23
2	07:26 16:39	13:59 (9) 15:30 (9)	07:11 17:14	14:30 (9) 15:23 (9)	06:34 17:49	06:42 19:24
3	07:26 16:40	14:00 (9) 15:30 (9)	07:10 17:15	14:32 (9) 15:22 (9)	06:32 17:50	06:40 19:25
4	07:26 16:41	14:00 (9) 15:30 (9)	07:09 17:17	14:35 (9) 15:20 (9)	06:30 17:51	06:38 19:26
5	07:26 16:42	14:01 (9) 15:31 (9)	07:08 17:18	14:38 (9) 15:18 (9)	06:29 17:53	06:37 19:27
6	07:26 16:43	14:02 (9) 15:31 (9)	07:07 17:19	14:41 (9) 15:16 (9)	06:27 17:54	06:35 19:29
7	07:26 16:43	14:02 (9) 15:31 (9)	07:06 17:21	14:45 (9) 15:13 (9)	06:26 17:55	06:33 19:30
8	07:26 16:44	14:02 (9) 15:31 (9)	07:04 17:22	14:50 (9) 15:07 (9)	06:24 17:56	06:32 19:31
9	07:26 16:46	14:03 (9) 15:32 (9)	07:03 17:23	14:50 (9) 17:57	06:22 17:57	06:30 19:32
10	07:26 16:47	14:04 (9) 15:32 (9)	07:02 17:24	14:50 (9) 17:58	06:21 17:58	06:28 19:33
11	07:25 16:48	14:04 (9) 15:32 (9)	07:01 17:26	14:50 (9) 18:00	06:19 18:00	06:27 19:34
12	07:25 16:49	14:05 (9) 15:32 (9)	07:00 17:27	14:50 (9) 18:01	06:17 18:01	06:25 19:35
13	07:25 16:50	14:06 (9) 15:33 (9)	06:58 17:28	14:50 (9) 18:02	06:16 18:02	06:23 19:36
14	07:24 16:51	14:07 (9) 15:33 (9)	06:57 17:30	14:50 (9) 18:03	06:14 18:03	06:22 19:37
15	07:24 16:52	14:08 (9) 15:33 (9)	06:56 17:31	14:50 (9) 18:04	06:12 18:04	06:20 19:38
16	07:24 16:53	14:08 (9) 15:32 (9)	06:54 17:32	14:50 (9) 18:05	06:11 18:05	06:19 19:40
17	07:23 16:54	14:10 (9) 15:33 (9)	06:53 17:33	14:50 (9) 18:06	06:09 18:06	06:17 19:41
18	07:23 16:56	14:10 (9) 15:32 (9)	06:52 17:35	14:50 (9) 18:08	06:07 18:08	06:15 19:42
19	07:22 16:57	14:11 (9) 15:32 (9)	06:50 17:36	14:50 (9) 18:09	06:05 18:09	06:14 19:43
20	07:22 16:58	14:12 (9) 15:32 (9)	06:49 17:37	14:50 (9) 18:10	06:04 18:10	06:12 19:44
21	07:21 16:59	14:13 (9) 15:32 (9)	06:47 17:38	14:50 (9) 18:11	06:02 18:11	06:11 19:45
22	07:20 17:00	14:14 (9) 15:31 (9)	06:46 17:39	14:50 (9) 18:12	06:00 18:12	06:09 19:46
23	07:20 17:02	14:16 (9) 15:32 (9)	06:44 17:41	14:50 (9) 18:13	05:59 18:13	06:08 17:49 (8)
24	07:19 17:03	14:16 (9) 15:31 (9)	06:43 17:42	14:50 (9) 18:14	05:57 18:14	06:06 17:52 (8)
25	07:18 17:04	14:18 (9) 15:30 (9)	06:41 17:43	14:50 (9) 18:15	05:55 18:15	06:05 17:48 (8)
26	07:17 17:05	14:19 (9) 15:30 (9)	06:40 17:44	14:50 (9) 18:16	05:54 18:16	06:03 17:53 (8)
27	07:17 17:07	14:20 (9) 15:29 (9)	06:38 17:46	14:50 (9) 18:18	05:52 18:18	06:02 17:44 (8)
28	07:16 17:08	14:21 (9) 15:28 (9)	06:37 17:47	14:50 (9) 18:19	05:50 18:19	06:01 17:56 (8)
29	07:15 17:09	14:23 (9) 15:27 (9)	06:35 17:48	14:50 (9) 18:20	05:48 18:20	05:59 17:58 (8)
30	07:14 17:10	14:24 (9) 15:26 (9)	06:34 17:49	14:50 (9) 18:21	05:47 18:21	05:58 18:42 (8)
31	07:13 17:12	14:26 (9) 15:25 (9)	06:32 17:50	14:50 (9) 18:22	05:45 18:22	05:57 19:01 (8)
Potential sun hours	295	296	324	369	400	455
Total, worst case	2508	324	108	114		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,92	0,92	0,92		
Wind dir. red.	0,45	0,45	0,64	0,64		
Total reduction	0,18	0,18	0,26	0,30		
Total, real	447	59	28	34		

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

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

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: Q - SHR_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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December	
1	05:27	05:52	06:23	06:54	06:30	07:05	13:46 (9)
	20:37	20:18	19:34	18:42	16:54	16:29	88 15:14 (9)
2	05:28	05:53	06:24	06:55	06:31	07:06	13:46 (9)
	20:37	20:17	19:32	18:40	16:53	16:29	88 15:14 (9)
3	05:28	05:54	06:25	06:57	06:32	14:18 (9) 07:07	13:47 (9)
	20:37	20:15	19:30	18:39	16:52	20 14:38 (9) 16:29	89 15:16 (9)
4	05:29	05:55	06:26	06:58	06:33	14:13 (9) 07:09	13:47 (9)
	20:37	20:14	19:29	18:37	16:51	29 14:42 (9) 16:28	89 15:16 (9)
5	05:29	05:56	06:28	18:47 (8) 06:59	06:35	14:10 (9) 07:10	13:48 (9)
	20:37	20:13	19:27	2 18:49 (8) 18:35	16:49	36 14:46 (9) 16:28	89 15:17 (9)
6	05:30	05:57	06:29	18:42 (8) 07:00	06:36	14:07 (9) 07:10	13:48 (9)
	20:36	20:12	19:25	12 18:54 (8) 18:34	16:48	41 14:48 (9) 16:28	89 15:17 (9)
7	05:30	05:58	06:30	18:39 (8) 07:01	06:37	14:04 (9) 07:11	13:48 (9)
	20:36	20:11	19:24	17 18:56 (8) 18:32	16:47	46 14:50 (9) 16:28	90 15:18 (9)
8	05:31	05:59	06:31	18:37 (8) 07:02	06:38	14:03 (9) 07:12	13:47 (9)
	20:36	20:09	19:22	20 18:57 (8) 18:30	16:46	50 14:53 (9) 16:28	90 15:17 (9)
9	05:32	06:00	06:32	18:36 (8) 07:03	06:39	14:01 (9) 07:13	13:48 (9)
	20:35	20:08	19:20	21 18:57 (8) 18:29	16:45	53 14:54 (9) 16:28	90 15:18 (9)
10	05:32	06:01	06:33	18:35 (8) 07:04	06:41	13:59 (9) 07:14	13:48 (9)
	20:35	20:07	19:18	21 18:56 (8) 18:27	16:44	56 14:55 (9) 16:28	91 15:19 (9)
11	05:33	06:02	06:34	18:34 (8) 07:05	06:42	13:58 (9) 07:15	13:49 (9)
	20:35	20:05	19:17	20 18:54 (8) 18:25	16:43	59 14:57 (9) 16:28	90 15:19 (9)
12	05:34	06:03	06:35	18:33 (8) 07:06	06:43	13:56 (9) 07:16	13:49 (9)
	20:34	20:04	19:15	19 18:52 (8) 18:24	16:42	62 14:58 (9) 16:28	91 15:20 (9)
13	05:35	06:04	06:36	18:33 (8) 07:08	06:44	13:55 (9) 07:17	13:50 (9)
	20:34	20:03	19:13	18 18:51 (8) 18:22	16:41	64 14:59 (9) 16:28	91 15:21 (9)
14	05:35	06:05	06:37	18:32 (8) 07:09	06:46	13:54 (9) 07:17	13:50 (9)
	20:33	20:01	19:12	17 18:49 (8) 18:20	16:40	67 15:01 (9) 16:28	91 15:21 (9)
15	05:36	06:06	06:38	18:32 (8) 07:10	06:47	13:53 (9) 07:18	13:50 (9)
	20:32	20:00	19:10	15 18:47 (8) 18:19	16:39	69 15:02 (9) 16:29	91 15:21 (9)
16	05:37	06:07	06:39	18:32 (8) 07:11	06:48	13:52 (9) 07:19	13:51 (9)
	20:32	19:59	19:08	13 18:45 (8) 18:17	16:38	71 15:03 (9) 16:29	91 15:22 (9)
17	05:38	06:08	06:40	18:32 (8) 07:12	06:49	13:50 (9) 07:20	13:51 (9)
	20:31	19:57	19:06	12 18:44 (8) 18:16	16:37	73 15:03 (9) 16:29	92 15:23 (9)
18	05:39	06:09	06:41	18:33 (8) 07:13	06:50	13:50 (9) 07:20	13:51 (9)
	20:30	19:56	19:05	9 18:42 (8) 18:14	16:36	75 15:05 (9) 16:29	92 15:23 (9)
19	05:40	06:10	06:42	18:34 (8) 07:14	06:52	13:50 (9) 07:21	13:52 (9)
	20:30	19:54	19:03	6 18:40 (8) 18:13	16:36	76 15:06 (9) 16:30	92 15:24 (9)
20	05:40	06:11	06:43	18:35 (8) 07:15	06:53	13:49 (9) 07:22	13:52 (9)
	20:29	19:53	19:01	3 18:38 (8) 18:11	16:35	77 15:06 (9) 16:30	92 15:24 (9)
21	05:41	06:12	06:44	07:17 06:54	13:49 (9) 07:22	13:53 (9)	
	20:28	19:51	18:59	18:10 16:34	79 15:08 (9) 16:31	92 15:25 (9)	
22	05:42	06:13	06:45	07:18 06:55	13:48 (9) 07:23	13:53 (9)	
	20:27	19:50	18:58	18:08 16:34	80 15:08 (9) 16:31	92 15:25 (9)	
23	05:43	06:14	06:46	07:19 06:56	13:48 (9) 07:23	13:54 (9)	
	20:27	19:48	18:56	18:07 16:33	81 15:09 (9) 16:32	92 15:26 (9)	
24	05:44	06:15	06:47	07:20 06:58	13:47 (9) 07:24	13:54 (9)	
	20:26	19:47	18:54	18:05 16:32	82 15:09 (9) 16:32	92 15:26 (9)	
25	05:45	06:16	06:48	06:21 06:59	13:47 (9) 07:24	13:54 (9)	
	20:25	19:45	18:52	17:04 16:32	83 15:10 (9) 16:33	92 15:26 (9)	
26	05:46	06:17	06:49	06:22 07:00	13:47 (9) 07:24	13:55 (9)	
	20:24	19:43	18:51	17:02 16:31	84 15:11 (9) 16:33	92 15:27 (9)	
27	05:47	06:18	06:50	06:24 07:01	13:47 (9) 07:25	13:55 (9)	
	20:23	19:42	18:49	17:01 16:31	85 15:12 (9) 16:34	92 15:27 (9)	
28	05:48	06:19	06:51	06:25 07:02	13:47 (9) 07:25	13:56 (9)	
	20:22	19:40	18:47	17:00 16:30	85 15:12 (9) 16:35	91 15:27 (9)	
29	05:49	06:20	06:52	06:26 07:03	13:47 (9) 07:25	13:57 (9)	
	20:21	19:39	18:46	16:58 16:30	86 15:13 (9) 16:35	91 15:28 (9)	
30	05:50	06:21	06:53	06:27 07:04	13:46 (9) 07:26	13:57 (9)	
	20:20	19:37	18:44	16:57 16:29	87 15:13 (9) 16:36	92 15:29 (9)	
31	05:51	06:22		06:28		07:26	13:58 (9)
	20:19	19:35		16:56		16:37	91 15:29 (9)
Potential sun hours	461	429	375	344	296	285	
Total, worst case			225		1856		2815
Sun reduction			0,61		0,47		0,41
Oper. time red.			0,92		0,92		0,92
Wind dir. red.			0,64		0,45		0,45
Total reduction			0,36		0,19		0,17
Total, real			80		360		481

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: R - SHR_18

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:26	14:02 (9)	07:12	14:23 (9)	06:35	06:43
	16:38	98 15:40 (9)	17:13	80 15:43 (9)	17:48	19:23 18
2	07:26	14:03 (9)	07:11	14:24 (9)	06:34	06:42
	16:39	98 15:41 (9)	17:14	78 15:42 (9)	17:49	19:24 18
3	07:26	14:03 (9)	07:10	14:25 (9)	06:32	06:40
	16:40	98 15:41 (9)	17:15	77 15:42 (9)	17:50	19:25 20
4	07:26	14:04 (9)	07:09	14:27 (9)	06:30	06:38
	16:41	98 15:42 (9)	17:17	74 15:41 (9)	17:51	19:26 21
5	07:26	14:05 (9)	07:08	14:28 (9)	06:29	06:37
	16:42	97 15:42 (9)	17:18	72 15:40 (9)	17:53	19:27 22
6	07:26	14:05 (9)	07:07	14:30 (9)	06:27	06:35
	16:43	98 15:43 (9)	17:19	70 15:40 (9)	17:54	19:29 22
7	07:26	14:05 (9)	07:06	14:32 (9)	06:26	06:33
	16:43	97 15:42 (9)	17:21	67 15:39 (9)	17:55	19:30 19
8	07:26	14:06 (9)	07:04	14:33 (9)	06:24	06:32
	16:44	97 15:43 (9)	17:22	64 15:37 (9)	17:56	19:31 15
9	07:26	14:06 (9)	07:03	14:35 (9)	06:22	06:30
	16:46	97 15:43 (9)	17:23	61 15:36 (9)	17:57	19:32 10
10	07:26	14:07 (9)	07:02	14:37 (9)	06:21	06:28
	16:47	97 15:44 (9)	17:24	58 15:35 (9)	17:58	19:33
11	07:25	14:07 (9)	07:01	14:40 (9)	06:19	06:27
	16:48	97 15:44 (9)	17:26	53 15:33 (9)	18:00	19:34
12	07:25	14:08 (9)	07:00	14:41 (9)	06:17	06:25
	16:49	96 15:44 (9)	17:27	50 15:31 (9)	18:01	19:35
13	07:25	14:09 (9)	06:58	14:44 (9)	06:16	06:23
	16:50	96 15:45 (9)	17:28	45 15:29 (9)	18:02	19:36
14	07:24	14:09 (9)	06:57	14:48 (9)	06:14	06:22
	16:51	96 15:45 (9)	17:30	39 15:27 (9)	18:03	19:37
15	07:24	14:10 (9)	06:56	14:51 (9)	06:12	06:20
	16:52	95 15:45 (9)	17:31	32 15:23 (9)	18:04	19:38
16	07:24	14:10 (9)	06:54	14:56 (9)	06:11	06:19
	16:53	95 15:45 (9)	17:32	23 15:19 (9)	18:05	19:40
17	07:23	14:11 (9)	06:53	15:05 (9)	06:09	06:17
	16:54	95 15:46 (9)	17:33	4 15:09 (9)	18:06	19:41
18	07:23	14:11 (9)	06:52		06:07	06:15
	16:56	95 15:46 (9)	17:35		18:08	19:42
19	07:22	14:12 (9)	06:50		06:05	06:14
	16:57	93 15:45 (9)	17:36		18:09	19:43
20	07:22	14:13 (9)	06:49		06:04	06:12
	16:58	93 15:46 (9)	17:37		18:10	19:44
21	07:21	14:13 (9)	06:47		06:02	06:11
	16:59	93 15:46 (9)	17:38		18:11	19:45
22	07:20	14:14 (9)	06:46		06:00	06:09
	17:00	91 15:45 (9)	17:39		18:12	19:46
23	07:20	14:15 (9)	06:44		05:59	06:08
	17:02	91 15:46 (9)	17:41		18:13	19:47
24	07:19	14:16 (9)	06:43		05:57	06:06
	17:03	90 15:46 (9)	17:42		18:14	19:48
25	07:18	14:16 (9)	06:41		05:55	06:05
	17:04	90 15:46 (9)	17:43		18:15	19:49
26	07:17	14:17 (9)	06:40		05:54	06:03
	17:05	88 15:45 (9)	17:44		18:16	19:50
27	07:17	14:18 (9)	06:38		05:52	06:02
	17:07	87 15:45 (9)	17:46		18:18	19:52
28	07:16	14:19 (9)	06:37		05:50	06:01
	17:08	86 15:45 (9)	17:47		18:19	19:53
29	07:15	14:20 (9)			06:48	18:46 (8)
	17:09	84 15:44 (9)			19:20	12 18:58 (8)
30	07:14	14:21 (9)			06:47	18:45 (8)
	17:10	83 15:44 (9)			19:21	14 18:59 (8)
31	07:13	14:22 (9)			06:45	18:45 (8)
	17:12	81 15:43 (9)			19:22	16 19:01 (8)
Potential sun hours	295	296	369	400	450	455
Total, worst case	2890	947	63	165		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,92	0,92	0,92		
Wind dir. red.	0,44	0,44	0,65	0,65		
Total reduction	0,17	0,18	0,26	0,30		
Total, real	497	166	17	49		

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

Day in month	Sun rise (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	87 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: R - SHR_18

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December			
1	05:27 20:37	05:52 20:18	06:23 19:34	06:54 18:42	06:30 16:54	14:06 (9) 15:05 (9)	17:05 16:29	13:49 (9) 15:26 (9)	
2	05:28 20:37	05:53 20:17	06:24 19:32	06:55 18:40	06:31 16:53	14:04 (9) 15:06 (9)	17:06 16:29	13:49 (9) 15:26 (9)	
3	05:28 20:37	05:54 20:15	06:25 19:30	18:47 (8) 18:57 (8)	06:57 18:39	14:02 (9) 15:07 (9)	17:07 16:29	13:50 (9) 15:27 (9)	
4	05:29 20:37	05:55 20:14	06:26 19:29	18:44 (8) 18:59 (8)	06:58 18:37	14:00 (9) 15:08 (9)	17:09 16:28	13:51 (9) 15:28 (9)	
5	05:29 20:37	05:56 20:13	06:28 19:27	18:42 (8) 19:01 (8)	06:59 18:35	14:00 (9) 15:10 (9)	17:10 16:28	13:51 (9) 15:28 (9)	
6	05:30 20:36	05:57 20:12	06:29 19:25	18:41 (8) 19:02 (8)	07:00 18:34	13:58 (9) 15:10 (9)	17:10 16:28	13:51 (9) 15:29 (9)	
7	05:30 20:36	05:58 20:11	06:30 19:24	18:39 (8) 19:01 (8)	07:01 18:32	13:56 (9) 15:11 (9)	17:11 16:28	13:52 (9) 15:29 (9)	
8	05:31 20:36	05:59 20:09	06:31 19:22	18:38 (8) 18:59 (8)	07:02 18:30	13:56 (9) 15:13 (9)	17:12 16:28	13:51 (9) 15:29 (9)	
9	05:32 20:35	06:00 20:08	06:32 19:20	18:38 (8) 18:57 (8)	07:03 18:29	13:55 (9) 15:13 (9)	17:13 16:28	13:51 (9) 15:29 (9)	
10	05:32 20:35	06:01 20:07	06:33 19:18	18:37 (8) 18:56 (8)	07:04 18:27	13:54 (9) 15:14 (9)	17:14 16:28	13:52 (9) 15:30 (9)	
11	05:33 20:35	06:02 20:05	06:34 19:17	18:37 (8) 18:54 (8)	07:05 18:25	13:53 (9) 15:15 (9)	17:15 16:28	13:53 (9) 15:30 (9)	
12	05:34 20:34	06:03 20:04	06:35 19:15	18:36 (8) 18:52 (8)	07:06 18:24	13:52 (9) 15:16 (9)	17:16 16:28	13:53 (9) 15:31 (9)	
13	05:35 20:34	06:04 20:03	06:36 19:13	18:36 (8) 18:51 (8)	07:08 18:22	13:51 (9) 15:16 (9)	17:17 16:28	13:54 (9) 15:31 (9)	
14	05:35 20:33	06:05 20:01	06:37 19:12	18:36 (8) 18:49 (8)	07:09 18:20	13:52 (9) 15:18 (9)	17:17 16:28	13:54 (9) 15:32 (9)	
15	05:36 20:32	06:06 20:00	06:38 19:10	18:37 (8) 18:47 (8)	07:10 18:19	13:51 (9) 15:18 (9)	17:18 16:29	13:54 (9) 15:32 (9)	
16	05:37 20:32	06:07 19:59	06:39 19:08	18:38 (8) 18:45 (8)	07:11 18:17	13:50 (9) 15:18 (9)	17:19 16:29	13:55 (9) 15:33 (9)	
17	05:38 20:31	06:08 19:57	06:40 19:06	18:39 (8) 18:44 (8)	07:12 18:16	13:49 (9) 15:19 (9)	17:20 16:29	13:56 (9) 15:33 (9)	
18	05:39 20:30	06:09 19:56	06:41 19:05	18:40 (8) 18:42 (8)	07:13 18:14	13:50 (9) 15:20 (9)	17:20 16:29	13:56 (9) 15:33 (9)	
19	05:40 20:30	06:10 19:54	06:42 19:03	07:14 18:13	18:13	13:49 (9) 15:20 (9)	17:21 16:30	13:56 (9) 15:34 (9)	
20	05:40 20:29	06:11 19:53	06:43 19:01	07:15 18:11	18:11	13:49 (9) 15:20 (9)	17:22 16:30	13:56 (9) 15:34 (9)	
21	05:41 20:28	06:12 19:51	06:44 18:59	07:17 18:10	18:10	13:49 (9) 15:22 (9)	17:22 16:31	13:57 (9) 15:35 (9)	
22	05:42 20:27	06:13 19:50	06:45 18:58	07:18 18:08	18:08	13:49 (9) 15:22 (9)	17:23 16:31	13:57 (9) 15:35 (9)	
23	05:43 20:27	06:14 19:48	06:46 18:56	07:19 18:07	18:07	13:49 (9) 15:22 (9)	17:23 16:32	13:58 (9) 15:36 (9)	
24	05:44 20:26	06:15 19:47	06:47 18:54	07:20 18:05	18:05	13:48 (9) 15:23 (9)	17:24 16:32	13:58 (9) 15:36 (9)	
25	05:45 20:25	06:16 19:45	06:48 18:52	06:21 17:04	14:32 (9) 14:44 (9)	06:59 16:32	13:48 (9) 15:23 (9)	17:24 16:33	13:58 (9) 15:36 (9)
26	05:46 20:24	06:17 19:43	06:49 18:51	06:22 17:02	14:24 (9) 14:50 (9)	07:00 16:31	13:49 (9) 15:24 (9)	17:24 16:33	14:00 (9) 15:37 (9)
27	05:47 20:23	06:18 19:42	06:50 18:49	06:24 17:01	14:20 (9) 14:53 (9)	07:01 16:31	13:49 (9) 15:24 (9)	17:25 16:34	14:00 (9) 15:38 (9)
28	05:48 20:22	06:19 19:40	06:51 18:47	06:25 17:00	14:16 (9) 14:56 (9)	07:02 16:30	13:49 (9) 15:25 (9)	17:25 16:35	14:00 (9) 15:38 (9)
29	05:49 20:21	06:20 19:39	06:52 18:46	06:26 16:58	14:13 (9) 14:59 (9)	07:03 16:30	13:49 (9) 15:25 (9)	17:25 16:35	14:01 (9) 15:39 (9)
30	05:50 20:20	06:21 19:37	06:53 18:44	06:27 16:57	14:11 (9) 15:01 (9)	07:04 16:29	13:49 (9) 15:25 (9)	17:26 16:36	14:02 (9) 15:39 (9)
31	05:51 20:19	06:22 19:35	06:54 18:43	06:28 16:56	14:08 (9) 15:02 (9)	07:05 16:28	13:48 (9) 15:26 (9)	17:26 16:37	14:02 (9) 15:40 (9)
Potential sun hours	461	429	375	344	296	2527	285	3026	
Total, worst case			231	261	2527			3026	
Sun reduction			0,61	0,52	0,47			0,41	
Oper. time red.			0,92	0,92	0,92			0,92	
Wind dir. red.			0,65	0,44	0,44			0,44	
Total reduction			0,36	0,21	0,19			0,17	
Total, real			84	54	474			500	

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	88 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: S - SHR_19

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1	07:26 16:38	14:07 (9) 15:43 (9)	07:12 17:13	14:26 (9) 15:47 (9)	06:35 17:48	06:43 19:23
2	07:26 16:39	14:07 (9) 15:44 (9)	07:11 17:14	14:27 (9) 15:46 (9)	06:34 17:49	06:42 19:24
3	07:26 16:40	14:07 (9) 15:44 (9)	07:10 17:15	14:28 (9) 15:46 (9)	06:32 17:50	06:40 19:25
4	07:26 16:41	14:08 (9) 15:45 (9)	07:09 17:17	14:29 (9) 15:45 (9)	06:30 17:51	06:38 19:26
5	07:26 16:42	14:09 (9) 15:45 (9)	07:08 17:18	14:31 (9) 15:45 (9)	06:29 17:53	06:37 19:27
6	07:26 16:43	14:09 (9) 15:46 (9)	07:07 17:19	14:32 (9) 15:44 (9)	06:27 17:54	06:35 19:29
7	07:26 16:43	14:09 (9) 15:45 (9)	07:06 17:21	14:34 (9) 15:43 (9)	06:26 17:55	06:33 19:30
8	07:26 16:44	14:09 (9) 15:46 (9)	07:04 17:22	14:35 (9) 15:41 (9)	06:24 17:56	06:32 19:31
9	07:26 16:46	14:10 (9) 15:47 (9)	07:03 17:23	14:37 (9) 15:40 (9)	06:22 17:57	06:30 19:32
10	07:26 16:47	14:11 (9) 15:47 (9)	07:02 17:24	14:39 (9) 15:39 (9)	06:21 17:58	06:28 19:33
11	07:25 16:48	14:11 (9) 15:47 (9)	07:01 17:26	14:41 (9) 15:38 (9)	06:19 18:00	06:27 19:34
12	07:25 16:49	14:12 (9) 15:48 (9)	07:00 17:27	14:43 (9) 15:36 (9)	06:17 18:01	06:25 19:35
13	07:25 16:50	14:13 (9) 15:48 (9)	06:58 17:28	14:45 (9) 15:34 (9)	06:16 18:02	06:23 19:36
14	07:24 16:51	14:13 (9) 15:48 (9)	06:57 17:30	14:48 (9) 15:32 (9)	06:14 18:03	06:22 19:37
15	07:24 16:52	14:14 (9) 15:49 (9)	06:56 17:31	14:51 (9) 15:29 (9)	06:12 18:04	06:20 19:38
16	07:24 16:53	14:14 (9) 15:48 (9)	06:54 17:32	14:55 (9) 15:26 (9)	06:11 18:05	06:19 19:40
17	07:23 16:54	14:15 (9) 15:49 (9)	06:53 17:33	14:59 (9) 15:21 (9)	06:09 18:06	06:17 19:41
18	07:23 16:56	14:15 (9) 15:49 (9)	06:52 17:35	06:07 18:08	06:15 19:42	06:15 20:14
19	07:22 16:57	14:15 (9) 15:49 (9)	06:50 17:36	06:05 18:09	06:14 19:43	06:14 20:15
20	07:22 16:58	14:16 (9) 15:50 (9)	06:49 17:37	06:04 18:10	06:12 19:44	06:12 20:16
21	07:21 16:59	14:17 (9) 15:49 (9)	06:47 17:38	06:02 18:11	06:11 19:45	06:11 20:17
22	07:20 17:00	14:17 (9) 15:49 (9)	06:46 17:39	06:00 18:12	06:09 19:46	06:09 20:18
23	07:20 17:02	14:19 (9) 15:50 (9)	06:44 17:41	05:59 18:13	06:08 19:47	06:08 20:19
24	07:19 17:03	14:19 (9) 15:50 (9)	06:43 17:42	05:57 18:14	06:06 19:48	06:06 20:19
25	07:18 17:04	14:20 (9) 15:49 (9)	06:41 17:43	05:55 18:15	06:05 19:49	06:05 20:20
26	07:17 17:05	14:20 (9) 15:49 (9)	06:40 17:44	05:54 18:16	06:03 19:50	06:03 20:21
27	07:17 17:07	14:21 (9) 15:49 (9)	06:38 17:46	05:52 18:18	06:02 19:52	06:02 20:22
28	07:16 17:08	14:22 (9) 15:48 (9)	06:37 17:47	05:50 18:19	06:01 19:53	06:01 20:23
29	07:15 17:09	14:23 (9) 15:48 (9)	06:36 17:48	05:48 18:20	06:00 19:54	06:00 20:24
30	07:14 17:10	14:24 (9) 15:48 (9)	06:35 17:49	05:47 18:21	05:58 19:55	05:58 20:25
31	07:13 17:12	14:25 (9) 15:47 (9)	06:34 17:50	05:45 18:22	05:57 19:56	05:57 20:26
Potential sun hours	295	296	369	400	450	455
Total, worst case	2882	1012	62	164		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,92	0,92	0,92		
Wind dir. red.	0,43	0,43	0,65	0,65		
Total reduction	0,17	0,17	0,26	0,30		
Total, real	490	175	16	49		

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: S - SHR_19

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December
1	05:27	05:52	06:23	06:54	06:30	14:08 (9) 07:05 13:53 (9)
	20:37	20:18	19:34	18:42	16:54	61 15:09 (9) 16:29 96 15:29 (9)
2	05:28	05:53	06:24	06:55	06:31	14:06 (9) 07:06 13:53 (9)
	20:37	20:17	19:32	18:40	16:53	64 15:10 (9) 16:29 96 15:29 (9)
3	05:28	05:54	06:25	18:47 (8) 06:57	06:32	14:04 (9) 07:07 13:54 (9)
	20:37	20:15	19:30	18:58 (8) 18:39	16:52	67 15:11 (9) 16:29 97 15:31 (9)
4	05:29	05:55	06:26	18:44 (8) 06:58	06:33	14:03 (9) 07:09 13:54 (9)
	20:37	20:14	19:29	19:00 (8) 18:37	16:51	69 15:12 (9) 16:28 97 15:31 (9)
5	05:29	05:56	06:28	18:42 (8) 06:59	06:35	14:02 (9) 07:10 13:55 (9)
	20:37	20:13	19:27	19:01 (8) 18:35	16:49	72 15:14 (9) 16:28 96 15:31 (9)
6	05:30	05:57	06:29	18:41 (8) 07:00	06:36	14:00 (9) 07:10 13:55 (9)
	20:36	20:12	19:25	19:02 (8) 18:34	16:48	75 15:15 (9) 16:28 97 15:32 (9)
7	05:30	05:58	06:30	18:40 (8) 07:01	06:37	13:59 (9) 07:11 13:56 (9)
	20:36	20:11	19:24	19:01 (8) 18:32	16:47	76 15:15 (9) 16:28 96 15:32 (9)
8	05:31	05:59	06:31	18:39 (8) 07:02	06:38	13:59 (9) 07:12 13:55 (9)
	20:36	20:09	19:22	18:59 (8) 18:30	16:46	78 15:17 (9) 16:28 97 15:32 (9)
9	05:32	06:00	06:32	18:38 (8) 07:03	06:39	13:58 (9) 07:13 13:55 (9)
	20:35	20:08	19:20	18:57 (8) 18:29	16:45	79 15:17 (9) 16:28 97 15:32 (9)
10	05:32	06:01	06:33	18:37 (8) 07:04	06:41	13:56 (9) 07:14 13:56 (9)
	20:35	20:07	19:18	18:56 (8) 18:27	16:44	82 15:18 (9) 16:28 97 15:33 (9)
11	05:33	06:02	06:34	18:37 (8) 07:05	06:42	13:56 (9) 07:15 13:57 (9)
	20:35	20:05	19:17	18:54 (8) 18:25	16:43	83 15:19 (9) 16:28 96 15:33 (9)
12	05:34	06:03	06:35	18:37 (8) 07:06	06:43	13:55 (9) 07:16 13:57 (9)
	20:34	20:04	19:15	18:52 (8) 18:24	16:42	85 15:20 (9) 16:28 97 15:34 (9)
13	05:35	06:04	06:36	18:37 (8) 07:08	06:44	13:54 (9) 07:17 13:58 (9)
	20:34	20:03	19:13	18:51 (8) 18:22	16:41	86 15:20 (9) 16:28 97 15:35 (9)
14	05:35	06:05	06:37	18:37 (8) 07:09	06:46	13:55 (9) 07:17 13:59 (9)
	20:33	20:01	19:12	18:49 (8) 18:20	16:40	86 15:21 (9) 16:28 96 15:35 (9)
15	05:36	06:06	06:38	18:37 (8) 07:10	06:47	13:54 (9) 07:18 13:58 (9)
	20:32	20:00	19:10	18:47 (8) 18:19	16:39	88 15:22 (9) 16:29 97 15:35 (9)
16	05:37	06:07	06:39	18:38 (8) 07:11	06:48	13:53 (9) 07:19 13:59 (9)
	20:32	19:59	19:08	18:45 (8) 18:17	16:38	89 15:22 (9) 16:29 97 15:36 (9)
17	05:38	06:08	06:40	18:39 (8) 07:12	06:49	13:53 (9) 07:20 14:00 (9)
	20:31	19:57	19:06	18:44 (8) 18:16	16:37	89 15:22 (9) 16:29 97 15:37 (9)
18	05:39	06:09	06:41	18:41 (8) 07:13	06:50	13:53 (9) 07:20 14:00 (9)
	20:30	19:56	19:05	18:42 (8) 18:14	16:36	91 15:24 (9) 16:29 96 15:36 (9)
19	05:40	06:10	06:42	07:14	06:52	13:53 (9) 07:21 14:01 (9)
	20:30	19:54	19:03	18:13	16:36	91 15:24 (9) 16:30 96 15:37 (9)
20	05:40	06:11	06:43	07:15	06:53	13:52 (9) 07:22 14:00 (9)
	20:29	19:53	19:01	18:11	16:35	92 15:24 (9) 16:30 97 15:37 (9)
21	05:41	06:12	06:44	07:17	06:54	13:53 (9) 07:22 14:01 (9)
	20:28	19:51	18:59	18:10	16:34	92 15:25 (9) 16:31 97 15:38 (9)
22	05:42	06:13	06:45	07:18	06:55	13:52 (9) 07:23 14:01 (9)
	20:27	19:50	18:58	18:08	16:34	94 15:26 (9) 16:31 97 15:38 (9)
23	05:43	06:14	06:46	07:19	06:56	13:52 (9) 07:23 14:02 (9)
	20:27	19:48	18:56	18:07	16:33	94 15:26 (9) 16:32 97 15:39 (9)
24	05:44	06:15	06:47	07:20	06:58	13:52 (9) 07:24 14:02 (9)
	20:26	19:47	18:54	18:05	11 15:46 (9) 16:32	94 15:26 (9) 16:32 97 15:39 (9)
25	05:45	06:16	06:48	06:21	14:29 (9) 06:59	13:52 (9) 07:24 14:03 (9)
	20:25	19:45	18:52	17:04	24 14:53 (9) 16:32	94 15:26 (9) 16:33 96 15:39 (9)
26	05:46	06:17	06:49	06:22	14:24 (9) 07:00	13:53 (9) 07:24 14:04 (9)
	20:24	19:43	18:51	17:02	33 14:57 (9) 16:31	95 15:28 (9) 16:33 96 15:40 (9)
27	05:47	06:18	06:50	06:24	14:20 (9) 07:01	13:53 (9) 07:25 14:04 (9)
	20:23	19:42	18:49	17:01	40 15:00 (9) 16:31	95 15:28 (9) 16:34 97 15:41 (9)
28	05:48	06:19	06:51	06:25	14:17 (9) 07:02	13:53 (9) 07:25 14:04 (9)
	20:22	19:40	18:47	17:00	45 15:02 (9) 16:30	95 15:28 (9) 16:35 97 15:41 (9)
29	05:49	06:20	06:52	06:26	14:15 (9) 07:03	13:53 (9) 07:25 14:05 (9)
	20:21	19:39	18:46	16:58	49 15:04 (9) 16:30	95 15:28 (9) 16:35 97 15:42 (9)
30	05:50	06:21	06:53	06:27	14:12 (9) 07:04	13:53 (9) 07:26 14:06 (9)
	20:20	19:37	18:44	16:57	54 15:06 (9) 16:29	96 15:29 (9) 16:36 96 15:42 (9)
31	05:51	06:22	06:54	06:28	14:10 (9)	07:26 14:06 (9)
	20:19	19:35	18:43	16:56	57 15:07 (9)	07:26 16:37 97 15:43 (9)
Potential sun hours	461	429	375	344	296	285
Total, worst case			227	313	2547	2996
Sun reduction			0,61	0,52	0,47	0,41
Oper. time red.			0,92	0,92	0,92	0,92
Wind dir. red.			0,65	0,43	0,43	0,43
Total reduction			0,36	0,21	0,19	0,16
Total, real			82	64	471	488

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: T - SHR_20

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June
1 07:26	15:13 (9) 07:12	15:07 (9) 06:35	15:20 (9) 06:43	18:55 (8) 05:56	05:27	
16:38	57 16:10 (9) 17:13	89 16:36 (9) 17:48	67 16:27 (9) 19:23	7 19:02 (8) 19:56	20:26	
2 07:26	15:13 (9) 07:11	15:07 (9) 06:34	15:22 (9) 06:42	18:53 (8) 05:55	05:26	
16:39	58 16:11 (9) 17:14	89 16:36 (9) 17:49	65 16:27 (9) 19:24	9 19:02 (8) 19:57	20:27	
3 07:26	15:13 (9) 07:10	15:07 (9) 06:32	15:23 (9) 06:40	18:53 (8) 05:54	05:26	
16:40	59 16:12 (9) 17:15	90 16:37 (9) 17:50	62 16:25 (9) 19:25	11 19:04 (8) 19:58	20:28	
4 07:26	15:13 (9) 07:09	15:07 (9) 06:30	15:24 (9) 06:38	18:52 (8) 05:53	05:25	
16:41	60 16:13 (9) 17:17	90 16:37 (9) 17:51	59 16:23 (9) 19:26	13 19:05 (8) 19:59	20:28	
5 07:26	15:13 (9) 07:08	15:08 (9) 06:29	15:27 (9) 06:37	18:51 (8) 05:51	05:25	
16:42	61 16:14 (9) 17:18	90 16:38 (9) 17:53	54 16:21 (9) 19:27	15 19:06 (8) 20:00	20:29	
6 07:26	15:13 (9) 07:07	15:08 (9) 06:27	15:29 (9) 06:35	18:51 (8) 05:50	05:25	
16:43	62 16:15 (9) 17:19	90 16:38 (9) 17:54	50 16:19 (9) 19:29	16 19:07 (8) 20:01	20:30	
7 07:26	15:12 (9) 07:06	15:08 (9) 06:26	15:31 (9) 06:33	18:51 (8) 05:49	05:24	
16:43	63 16:15 (9) 17:21	91 16:39 (9) 17:55	46 16:17 (9) 19:30	17 19:08 (8) 20:02	20:31	
8 07:26	15:12 (9) 07:04	15:07 (9) 06:24	15:34 (9) 06:32	18:50 (8) 05:48	05:24	
16:44	64 16:16 (9) 17:22	91 16:38 (9) 17:56	40 16:14 (9) 19:31	19 19:09 (8) 20:03	20:31	
9 07:26	15:12 (9) 07:03	15:08 (9) 06:22	15:37 (9) 06:30	18:51 (8) 05:46	05:24	
16:46	66 16:18 (9) 17:23	90 16:38 (9) 17:57	34 16:11 (9) 19:32	19 19:10 (8) 20:05	20:32	
10 07:26	15:12 (9) 07:02	15:08 (9) 06:21	15:41 (9) 06:28	18:51 (8) 05:45	05:24	
16:47	67 16:19 (9) 17:24	91 16:39 (9) 17:58	26 16:07 (9) 19:33	20 19:11 (8) 20:06	20:32	
11 07:25	15:11 (9) 07:01	15:09 (9) 06:19	15:47 (9) 06:27	18:51 (8) 05:44	05:24	
16:48	68 16:19 (9) 17:26	90 16:39 (9) 18:00	14 16:01 (9) 19:34	20 19:11 (8) 20:07	20:33	
12 07:25	15:12 (9) 07:00	15:08 (9) 06:17	06:25	18:53 (8) 05:43	05:23	
16:49	69 16:21 (9) 17:27	90 16:38 (9) 18:01	19:35	17 19:10 (8) 20:08	20:33	
13 07:25	15:12 (9) 06:58	15:09 (9) 06:16	06:23	18:54 (8) 05:42	05:23	
16:50	70 16:22 (9) 17:28	89 16:38 (9) 18:02	19:36	13 19:07 (8) 20:09	20:34	
14 07:24	15:11 (9) 06:57	15:09 (9) 06:14	06:22	18:58 (8) 05:41	05:23	
16:51	71 16:22 (9) 17:30	90 16:39 (9) 18:03	19:37	6 19:04 (8) 20:10	20:34	
15 07:24	15:11 (9) 06:56	15:09 (9) 06:12	06:20	05:40	05:23	
16:52	73 16:24 (9) 17:31	89 16:38 (9) 18:04	19:38	20:11	20:35	
16 07:24	15:11 (9) 06:54	15:10 (9) 06:11	06:19	05:39	05:23	
16:53	73 16:24 (9) 17:32	88 16:38 (9) 18:05	19:40	20:12	20:35	
17 07:23	15:11 (9) 06:53	15:10 (9) 06:09	06:17	05:38	05:23	
16:54	75 16:26 (9) 17:33	87 16:37 (9) 18:06	19:41	20:13	20:36	
18 07:23	15:10 (9) 06:52	15:11 (9) 06:07	06:15	05:37	05:23	
16:56	76 16:26 (9) 17:35	86 16:37 (9) 18:08	19:42	20:14	20:36	
19 07:22	15:10 (9) 06:50	15:12 (9) 06:05	06:14	05:36	05:23	
16:57	77 16:27 (9) 17:36	85 16:37 (9) 18:09	19:43	20:15	20:36	
20 07:22	15:10 (9) 06:49	15:12 (9) 06:04	06:12	05:35	05:24	
16:58	78 16:28 (9) 17:37	84 16:36 (9) 18:10	19:44	20:16	20:36	
21 07:21	15:09 (9) 06:47	15:13 (9) 06:02	06:11	05:34	05:24	
16:59	80 16:29 (9) 17:38	83 16:36 (9) 18:11	19:45	20:17	20:37	
22 07:20	15:09 (9) 06:46	15:13 (9) 06:00	06:09	05:33	05:24	
17:00	80 16:29 (9) 17:39	81 16:34 (9) 18:12	19:46	20:18	20:37	
23 07:20	15:09 (9) 06:44	15:14 (9) 05:59	06:08	05:33	05:24	
17:02	82 16:31 (9) 17:41	80 16:34 (9) 18:13	19:47	20:19	20:37	
24 07:19	15:09 (9) 06:43	15:15 (9) 05:57	06:06	05:32	05:24	
17:03	83 16:32 (9) 17:42	78 16:33 (9) 18:14	19:48	20:19	20:37	
25 07:18	15:09 (9) 06:41	15:16 (9) 05:55	06:05	05:31	05:25	
17:04	83 16:32 (9) 17:43	77 16:33 (9) 18:15	19:49	20:20	20:37	
26 07:17	15:08 (9) 06:40	15:17 (9) 05:54	06:03	05:30	05:25	
17:05	85 16:33 (9) 17:44	74 16:31 (9) 18:16	19:50	20:21	20:37	
27 07:17	15:08 (9) 06:38	15:17 (9) 05:52	06:02	05:30	05:25	
17:07	85 16:33 (9) 17:46	73 16:30 (9) 18:18	19:52	20:22	20:37	
28 07:16	15:08 (9) 06:37	15:19 (9) 05:50	06:01	05:29	05:26	
17:08	86 16:34 (9) 17:47	70 16:29 (9) 18:19	19:53	20:23	20:38	
29 07:15	15:08 (9) 06:36	06:48	05:59	05:28	05:26	
17:09	86 16:34 (9) 17:48	19:20	19:54	20:24	20:37	
30 07:14	15:07 (9) 06:35	06:47	05:58	05:28	05:27	
17:10	88 16:35 (9) 17:49	19:21	19:55	20:25	20:37	
31 07:13	15:07 (9) 06:34	06:45	18:57 (8)	05:27		
17:12	88 16:35 (9) 17:50	19:22	4 19:01 (8)	20:25		
Potential sun hours	295	296	369	400	450	455
Total, worst case	2273	2395	521	202		
Sun reduction	0,43	0,44	0,44	0,50		
Oper. time red.	0,92	0,92	0,92	0,92		
Wind dir. red.	0,46	0,46	0,46	0,67		
Total reduction	0,18	0,18	0,19	0,31		
Total, real	411	441	97	62		

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: T - SHR_20

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December	
1	05:27	05:52	06:23	18:50 (8) 06:54	06:30	14:38 (9) 07:05	14:53 (9)
	20:37	20:18	19:34	20 19:10 (8) 18:42	16:54	90 16:08 (9) 16:29	68 16:01 (9)
2	05:28	05:53	06:24	18:49 (8) 06:55	06:31	14:38 (9) 07:06	14:54 (9)
	20:37	20:17	19:32	20 19:09 (8) 18:40	16:53	90 16:08 (9) 16:29	67 16:01 (9)
3	05:28	05:54	06:25	18:48 (8) 06:57	16:21 (9) 06:32	14:37 (9) 07:07	14:56 (9)
	20:37	20:15	19:30	19 19:07 (8) 18:39	22 16:43 (9) 16:52	91 16:08 (9) 16:29	66 16:02 (9)
4	05:29	05:55	06:26	18:47 (8) 06:58	16:16 (9) 06:33	14:37 (9) 07:09	14:57 (9)
	20:37	20:14	19:29	19 19:06 (8) 18:37	31 16:47 (9) 16:51	90 16:07 (9) 16:28	64 16:01 (9)
5	05:29	05:56	06:28	18:47 (8) 06:59	16:12 (9) 06:35	14:38 (9) 07:10	14:58 (9)
	20:37	20:13	19:27	17 19:04 (8) 18:35	38 16:50 (9) 16:49	90 16:08 (9) 16:28	63 16:01 (9)
6	05:30	05:57	06:29	18:46 (8) 07:00	16:08 (9) 06:36	14:37 (9) 07:10	14:59 (9)
	20:36	20:12	19:25	16 19:02 (8) 18:34	44 16:52 (9) 16:48	91 16:08 (9) 16:28	62 16:01 (9)
7	05:30	05:58	06:30	18:46 (8) 07:01	16:05 (9) 06:37	14:37 (9) 07:11	15:00 (9)
	20:36	20:11	19:24	15 19:01 (8) 18:32	49 16:54 (9) 16:47	90 16:07 (9) 16:28	61 16:01 (9)
8	05:31	05:59	06:31	18:46 (8) 07:02	16:03 (9) 06:38	14:38 (9) 07:12	15:00 (9)
	20:36	20:09	19:22	13 18:59 (8) 18:30	52 16:55 (9) 16:46	90 16:08 (9) 16:28	60 16:00 (9)
9	05:32	06:00	06:32	18:46 (8) 07:03	16:01 (9) 06:39	14:38 (9) 07:13	15:01 (9)
	20:35	20:08	19:20	11 18:57 (8) 18:29	56 16:57 (9) 16:45	89 16:07 (9) 16:28	59 16:00 (9)
10	05:32	06:01	06:33	18:46 (8) 07:04	15:59 (9) 06:41	14:38 (9) 07:14	15:02 (9)
	20:35	20:07	19:18	10 18:56 (8) 18:27	60 16:59 (9) 16:44	89 16:07 (9) 16:28	58 16:00 (9)
11	05:33	06:02	06:34	18:47 (8) 07:05	15:57 (9) 06:42	14:39 (9) 07:15	15:03 (9)
	20:34	20:05	19:17	7 18:54 (8) 18:25	63 17:00 (9) 16:43	88 16:07 (9) 16:28	57 16:00 (9)
12	05:34	06:03	06:35	18:48 (8) 07:06	15:55 (9) 06:43	14:39 (9) 07:16	15:04 (9)
	20:34	20:04	19:15	4 18:52 (8) 18:24	65 17:00 (9) 16:42	88 16:07 (9) 16:28	56 16:00 (9)
13	05:35	06:04	06:36	18:50 (8) 07:07	15:53 (9) 06:44	14:40 (9) 07:17	15:05 (9)
	20:34	20:03	19:13	1 18:51 (8) 18:22	68 17:01 (9) 16:41	86 16:06 (9) 16:28	55 16:00 (9)
14	05:35	06:05	06:37	07:09	15:51 (9) 06:46	14:41 (9) 07:17	15:05 (9)
	20:33	20:01	19:12	18:20	71 17:02 (9) 16:40	86 16:07 (9) 16:28	55 16:00 (9)
15	05:36	06:06	06:38	07:10	15:49 (9) 06:47	14:41 (9) 07:18	15:06 (9)
	20:32	20:00	19:10	18:19	73 17:02 (9) 16:39	85 16:06 (9) 16:29	54 16:00 (9)
16	05:37	06:07	06:39	07:11	15:49 (9) 06:48	14:41 (9) 07:19	15:07 (9)
	20:32	19:59	19:08	18:17	75 17:04 (9) 16:38	85 16:06 (9) 16:29	54 16:01 (9)
17	05:38	06:08	06:40	07:12	15:47 (9) 06:49	14:42 (9) 07:20	15:09 (9)
	20:31	19:57	19:06	18:16	77 17:04 (9) 16:37	83 16:05 (9) 16:29	52 16:01 (9)
18	05:39	06:09	06:41	07:13	15:46 (9) 06:50	14:43 (9) 07:20	15:09 (9)
	20:30	19:56	19:05	18:14	79 17:05 (9) 16:36	83 16:06 (9) 16:29	52 16:01 (9)
19	05:40	06:10	06:42	07:14	15:45 (9) 06:52	14:43 (9) 07:21	15:10 (9)
	20:30	19:54	19:03	18:13	80 17:05 (9) 16:36	82 16:05 (9) 16:30	52 16:02 (9)
20	05:40	06:11	06:43	07:15	15:43 (9) 06:53	14:44 (9) 07:22	15:10 (9)
	20:29	19:53	19:01	18:11	82 17:05 (9) 16:35	80 16:04 (9) 16:30	51 16:01 (9)
21	05:41	06:12	06:44	07:17	15:43 (9) 06:54	14:45 (9) 07:22	15:11 (9)
	20:28	19:51	18:59	18:10	83 17:06 (9) 16:34	80 16:05 (9) 16:31	51 16:02 (9)
22	05:42	06:13	06:45	07:18	15:42 (9) 06:55	14:46 (9) 07:23	15:11 (9)
	20:27	19:50	18:58	18:08	85 17:07 (9) 16:34	78 16:04 (9) 16:31	51 16:02 (9)
23	05:43	06:14	06:46	07:19	15:41 (9) 06:56	14:47 (9) 07:23	15:12 (9)
	20:27	19:48	18:56	18:07	86 17:07 (9) 16:33	77 16:04 (9) 16:32	51 16:03 (9)
24	05:44	06:15	06:47	07:20	15:40 (9) 06:58	14:47 (9) 07:24	15:12 (9)
	20:26	19:47	18:54	18:05	87 17:07 (9) 16:32	76 16:03 (9) 16:32	52 16:04 (9)
25	05:45	06:16	06:48	06:21	14:40 (9) 06:59	14:48 (9) 07:24	15:12 (9)
	20:25	19:45	18:52	17:04	88 16:08 (9) 16:32	75 16:03 (9) 16:33	52 16:04 (9)
26	05:46	06:17	06:49	06:22	14:40 (9) 07:00	14:50 (9) 07:24	15:13 (9)
	20:24	19:43	18:51	17:02	87 16:07 (9) 16:31	73 16:03 (9) 16:33	52 16:05 (9)
27	05:47	06:18	06:50	06:24	14:39 (9) 07:01	14:50 (9) 07:25	15:12 (9)
	20:23	19:42	18:49	17:01	88 16:07 (9) 16:31	73 16:03 (9) 16:34	54 16:06 (9)
28	05:48	06:19	06:51	06:25	14:38 (9) 07:02	14:51 (9) 07:25	15:12 (9)
	20:22	19:40	18:47	17:00	89 16:07 (9) 16:30	71 16:02 (9) 16:35	54 16:06 (9)
29	05:49	06:20	18:59 (8) 06:52	06:26	14:38 (9) 07:03	14:52 (9) 07:25	15:13 (9)
	20:21	19:39	6 19:05 (8) 18:45	16:58	90 16:08 (9) 16:30	70 16:02 (9) 16:35	55 16:08 (9)
30	05:50	06:21	18:54 (8) 06:53	06:27	14:38 (9) 07:04	14:53 (9) 07:26	15:13 (9)
	20:20	19:37	13 19:07 (8) 18:44	16:57	90 16:08 (9) 16:29	69 16:02 (9) 16:36	55 16:08 (9)
31	05:51	06:22	18:52 (8) 06:54	06:28	14:37 (9) 07:05	14:54 (9) 07:26	15:13 (9)
	20:19	19:35	17 19:09 (8) 18:41	16:56	91 16:08 (9) 16:29	68 16:02 (9) 16:37	56 16:09 (9)
Potential sun hours	461	429	375	345	296	285	
Total, worst case		36	172	2049	2488	1749	
Sun reduction		0,68	0,61	0,52	0,47	0,41	
Oper. time red.		0,92	0,92	0,92	0,92	0,92	
Wind dir. red.		0,67	0,67	0,46	0,46	0,46	
Total reduction		0,41	0,37	0,22	0,20	0,17	
Total, real		15	64	448	489	303	

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: U - SHR_21

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June			
1	07:26 16:38	15:27 (9) 15:57 (9)	07:12 17:13	15:06 (9) 16:38 (9)	06:35 17:48	15:05 (9) 16:42 (9)	06:43 19:23	05:56 19:56	05:27 20:26
2	07:26 16:39	15:27 (9) 15:59 (9)	07:11 17:14	15:06 (9) 16:38 (9)	06:34 17:49	15:06 (9) 16:42 (9)	06:42 19:24	05:55 19:57	05:26 20:27
3	07:26 16:40	15:26 (9) 16:00 (9)	07:10 17:15	15:06 (9) 16:39 (9)	06:32 17:50	15:07 (9) 16:41 (9)	06:40 19:25	19:03 (8) 05:54	05:26 20:28
4	07:26 16:41	15:25 (9) 16:02 (9)	07:09 17:17	15:05 (9) 16:40 (9)	06:30 17:51	15:07 (9) 16:40 (9)	06:38 19:26	19:00 (8) 05:53	05:25 20:28
5	07:26 16:42	15:24 (9) 16:04 (9)	07:08 17:18	15:05 (9) 16:41 (9)	06:29 17:53	15:08 (9) 16:39 (9)	06:37 19:27	18:58 (8) 05:51	05:25 20:29
6	07:26 16:43	15:24 (9) 16:05 (9)	07:07 17:19	15:05 (9) 16:42 (9)	06:27 17:54	15:09 (9) 16:38 (9)	06:35 19:29	18:57 (8) 05:50	05:25 20:30
7	07:26 16:43	15:22 (9) 16:06 (9)	07:06 17:21	15:05 (9) 16:42 (9)	06:26 17:55	15:10 (9) 16:38 (9)	06:33 19:30	18:56 (8) 05:49	05:24 20:31
8	07:26 16:44	15:22 (9) 16:08 (9)	07:04 17:22	15:04 (9) 16:42 (9)	06:24 17:56	15:11 (9) 16:37 (9)	06:32 19:31	18:54 (8) 05:48	05:24 20:31
9	07:26 16:44	15:21 (9) 16:10 (9)	07:03 17:23	15:04 (9) 16:43 (9)	06:22 17:57	15:12 (9) 16:35 (9)	06:30 19:32	18:54 (8) 05:46	05:24 20:32
10	07:26 16:47	15:21 (9) 16:12 (9)	07:02 17:24	15:04 (9) 16:44 (9)	06:21 17:58	15:13 (9) 16:35 (9)	06:28 19:33	18:54 (8) 05:45	05:24 20:32
11	07:25 16:48	15:19 (9) 16:12 (9)	07:01 17:26	15:04 (9) 16:44 (9)	06:19 18:00	15:14 (9) 16:33 (9)	06:27 19:34	18:53 (8) 05:44	05:24 20:33
12	07:25 16:49	15:19 (9) 16:14 (9)	07:00 17:27	15:03 (9) 16:44 (9)	06:17 18:01	15:15 (9) 16:31 (9)	06:25 19:35	18:54 (8) 05:43	05:23 20:33
13	07:25 16:50	15:19 (9) 16:16 (9)	06:58 17:28	15:03 (9) 16:45 (9)	06:16 18:02	15:16 (9) 16:30 (9)	06:23 19:36	18:53 (8) 05:42	05:23 20:34
14	07:24 16:51	15:17 (9) 16:17 (9)	06:57 17:30	15:03 (9) 16:45 (9)	06:14 18:03	15:18 (9) 16:29 (9)	06:22 19:37	18:54 (8) 05:41	05:23 20:34
15	07:24 16:52	15:17 (9) 16:19 (9)	06:56 17:31	15:02 (9) 16:45 (9)	06:12 18:04	15:20 (9) 16:27 (9)	06:20 19:38	18:55 (8) 05:40	05:23 20:35
16	07:24 16:53	15:16 (9) 16:20 (9)	06:54 17:32	15:03 (9) 16:45 (9)	06:11 18:05	15:21 (9) 16:25 (9)	06:19 19:40	18:55 (8) 05:39	05:23 20:35
17	07:23 16:54	15:16 (9) 16:22 (9)	06:53 17:33	15:02 (9) 16:45 (9)	06:09 18:06	15:24 (9) 16:23 (9)	06:17 19:41	18:57 (8) 05:38	05:23 20:36
18	07:23 16:56	15:15 (9) 16:23 (9)	06:52 17:35	15:03 (9) 16:45 (9)	06:07 18:08	15:25 (9) 16:21 (9)	06:15 19:42	18:59 (8) 05:37	05:23 20:36
19	07:22 16:57	15:14 (9) 16:24 (9)	06:50 17:36	15:03 (9) 16:46 (9)	06:05 18:09	15:27 (9) 16:18 (9)	06:14 19:43	05:36 20:15	05:23 20:36
20	07:22 16:58	15:14 (9) 16:26 (9)	06:49 17:37	15:03 (9) 16:45 (9)	06:04 18:10	15:31 (9) 16:16 (9)	06:12 19:44	05:35 20:16	05:24 20:36
21	07:21 16:59	15:13 (9) 16:27 (9)	06:47 17:38	15:03 (9) 16:45 (9)	06:02 18:11	15:33 (9) 16:13 (9)	06:11 19:45	05:34 20:17	05:24 20:37
22	07:20 17:00	15:12 (9) 16:28 (9)	06:46 17:39	15:03 (9) 16:45 (9)	06:00 18:12	15:36 (9) 16:09 (9)	06:09 19:46	05:33 20:18	05:24 20:37
23	07:20 17:02	15:12 (9) 16:29 (9)	06:44 17:41	15:04 (9) 16:45 (9)	05:59 18:13	15:41 (9) 16:04 (9)	06:08 19:47	05:33 20:19	05:24 20:37
24	07:19 17:03	15:11 (9) 16:30 (9)	06:43 17:42	15:03 (9) 16:44 (9)	05:57 18:14	15:52 (9) 15:54 (9)	06:06 19:48	05:32 20:19	05:24 20:37
25	07:18 17:04	15:10 (9) 16:31 (9)	06:41 17:43	15:04 (9) 16:44 (9)	05:55 18:15	15:04 (9) 16:03	06:05 19:49	05:31 20:20	05:25 20:37
26	07:17 17:05	15:10 (9) 16:32 (9)	06:40 17:44	15:04 (9) 16:44 (9)	05:54 18:16	15:04 (9) 16:02	06:03 19:50	05:30 20:21	05:25 20:37
27	07:17 17:07	15:09 (9) 16:33 (9)	06:38 17:46	15:04 (9) 16:43 (9)	05:52 18:18	15:04 (9) 16:01	06:02 19:52	05:30 20:22	05:25 20:37
28	07:16 17:08	15:08 (9) 16:34 (9)	06:37 17:47	15:05 (9) 16:43 (9)	05:50 18:19	15:05 (9) 16:00	06:01 19:53	05:29 20:23	05:26 20:38
29	07:15 17:09	15:08 (9) 16:35 (9)	06:36 17:48	15:06 (9) 16:43 (9)	05:49 18:20	15:06 (9) 16:00	06:00 19:54	05:28 20:24	05:26 20:37
30	07:14 17:10	15:07 (9) 16:36 (9)	06:35 17:49	15:07 (9) 16:43 (9)	05:48 18:21	15:07 (9) 16:00	06:00 19:55	05:28 20:25	05:27 20:37
31	07:13 17:12	15:07 (9) 16:37 (9)	06:34 17:50	15:08 (9) 16:43 (9)	05:47 18:22	15:08 (9) 16:00	06:00 19:56	05:27 20:25	05:27 20:37
Potential sun hours	295	296	369	400	450	455			
Total, worst case	1936	2782	1639	227					
Sun reduction	0,43	0,44	0,44	0,50					
Oper. time red.	0,92	0,92	0,92	0,92					
Wind dir. red.	0,47	0,47	0,47	0,67					
Total reduction	0,18	0,19	0,19	0,31					
Total, real	358	524	312	71					

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	93 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: U - SHR_21

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

Idle start speed: Cut in wind speed from power curve

	July	August	September	October	November	December										
1	05:27	05:52	06:23	18:52 (8)	06:54	15:55 (9)	06:30	14:33 (9)	07:05	15:01 (9)						
	20:37	20:18	19:34	19	19:11 (8)	18:42	75	17:10 (9)	16:54	100	16:13 (9)	16:29	54	15:55 (9)		
2	05:28	05:53	06:24	18:52 (8)	06:55	15:53 (9)	06:31	14:33 (9)	07:06	15:03 (9)						
	20:37	20:17	19:32	17	19:09 (8)	18:40	78	17:11 (9)	16:53	100	16:13 (9)	16:29	51	15:54 (9)		
3	05:28	05:54	06:25	18:51 (8)	06:57	15:52 (9)	06:32	14:33 (9)	07:07	15:05 (9)						
	20:37	20:15	19:30	16	19:07 (8)	18:39	80	17:12 (9)	16:52	99	16:12 (9)	16:29	49	15:54 (9)		
4	05:29	05:55	06:26	18:51 (8)	06:58	15:50 (9)	06:33	14:34 (9)	07:09	15:07 (9)						
	20:37	20:14	19:29	15	19:06 (8)	18:37	82	17:12 (9)	16:51	97	16:11 (9)	16:28	46	15:53 (9)		
5	05:29	05:56	06:28	18:52 (8)	06:59	15:48 (9)	06:35	14:35 (9)	07:10	15:08 (9)						
	20:37	20:13	19:27	12	19:04 (8)	18:35	85	17:13 (9)	16:49	96	16:11 (9)	16:28	44	15:52 (9)		
6	05:30	05:57	06:29	18:52 (8)	07:00	15:46 (9)	06:36	14:35 (9)	07:10	15:10 (9)						
	20:36	20:12	19:25	10	19:02 (8)	18:34	87	17:13 (9)	16:48	96	16:11 (9)	16:28	42	15:52 (9)		
7	05:30	05:58	06:30	18:53 (8)	07:01	15:45 (9)	06:37	14:35 (9)	07:11	15:11 (9)						
	20:36	20:11	19:24	8	19:01 (8)	18:32	89	17:14 (9)	16:47	95	16:10 (9)	16:28	40	15:51 (9)		
8	05:31	05:59	06:31	18:54 (8)	07:02	15:44 (9)	06:38	14:36 (9)	07:12	15:12 (9)						
	20:36	20:09	19:22	5	18:59 (8)	18:30	90	17:14 (9)	16:46	94	16:10 (9)	16:28	37	15:49 (9)		
9	05:32	06:00	06:32	18:55 (8)	07:03	15:43 (9)	06:39	14:37 (9)	07:13	15:14 (9)						
	20:35	20:08	19:20	2	18:57 (8)	18:29	92	17:15 (9)	16:45	92	16:09 (9)	16:28	35	15:49 (9)		
10	05:32	06:01	06:33	07:04	15:42 (9)	06:41	14:37 (9)	07:14	15:16 (9)							
	20:35	20:07	19:18	18:27	93	17:15 (9)	16:44	91	16:08 (9)	16:28	32	15:48 (9)				
11	05:33	06:02	06:34	07:05	15:41 (9)	06:42	14:39 (9)	07:15	15:17 (9)							
	20:34	20:05	19:17	18:25	94	17:15 (9)	16:43	90	16:09 (9)	16:28	30	15:47 (9)				
12	05:34	06:03	06:35	07:06	15:39 (9)	06:43	14:39 (9)	07:16	15:19 (9)							
	20:34	20:04	19:15	18:24	96	17:15 (9)	16:42	89	16:08 (9)	16:28	28	15:47 (9)				
13	05:35	06:04	06:36	07:07	15:38 (9)	06:44	14:40 (9)	07:17	15:21 (9)							
	20:34	20:03	19:13	18:22	97	17:15 (9)	16:41	87	16:07 (9)	16:28	25	15:46 (9)				
14	05:35	06:05	06:37	07:09	15:37 (9)	06:46	14:41 (9)	07:17	15:22 (9)							
	20:33	20:01	19:12	18:20	98	17:15 (9)	16:40	86	16:07 (9)	16:28	23	15:45 (9)				
15	05:36	06:06	06:38	07:10	15:36 (9)	06:47	14:42 (9)	07:18	15:24 (9)							
	20:32	20:00	19:10	18:19	99	17:15 (9)	16:39	84	16:06 (9)	16:29	20	15:44 (9)				
16	05:37	06:07	06:39	07:11	15:36 (9)	06:48	14:43 (9)	07:19	15:25 (9)							
	20:32	19:59	19:08	18:17	100	17:16 (9)	16:38	82	16:05 (9)	16:29	19	15:44 (9)				
17	05:38	06:08	06:40	07:12	15:36 (9)	06:49	14:43 (9)	07:20	15:27 (9)							
	20:31	19:57	19:06	18:16	100	17:16 (9)	16:37	81	16:04 (9)	16:29	17	15:44 (9)				
18	05:39	06:09	06:41	07:13	15:35 (9)	06:50	14:45 (9)	07:20	15:28 (9)							
	20:30	19:56	19:05	18:14	101	17:16 (9)	16:36	79	16:04 (9)	16:29	15	15:43 (9)				
19	05:40	06:10	06:42	07:14	15:34 (9)	06:52	14:46 (9)	07:21	15:30 (9)							
	20:30	19:54	19:03	18:13	101	17:15 (9)	16:36	77	16:03 (9)	16:30	13	15:43 (9)				
20	05:40	06:11	06:43	16:29 (9)	07:15	15:33 (9)	06:53	14:47 (9)	07:22	15:30 (9)						
	20:29	19:53	19:01	20	16:49 (9)	18:11	102	17:15 (9)	16:35	76	16:03 (9)	16:30	12	15:42 (9)		
21	05:41	06:12	06:44	16:23 (9)	07:17	15:34 (9)	06:54	14:49 (9)	07:22	15:32 (9)						
	20:28	19:51	18:59	30	16:53 (9)	18:10	102	17:16 (9)	16:34	74	16:03 (9)	16:31	11	15:43 (9)		
22	05:42	06:13	06:45	16:19 (9)	07:18	15:33 (9)	06:55	14:50 (9)	07:23	15:32 (9)						
	20:27	19:50	18:58	38	16:57 (9)	18:08	103	17:16 (9)	16:34	72	16:02 (9)	16:31	11	15:43 (9)		
23	05:43	06:14	06:46	16:15 (9)	07:19	15:33 (9)	06:56	14:51 (9)	07:23	15:32 (9)						
	20:27	19:48	18:56	44	16:59 (9)	18:07	102	17:15 (9)	16:33	70	16:01 (9)	16:32	12	15:44 (9)		
24	05:44	06:15	06:47	16:12 (9)	07:20	15:32 (9)	06:58	14:52 (9)	07:24	15:32 (9)						
	20:26	19:47	18:54	49	17:01 (9)	18:05	103	17:15 (9)	16:32	68	16:00 (9)	16:32	12	15:44 (9)		
25	05:45	06:16	19:02 (8)	06:48	16:09 (9)	06:21	14:33 (9)	06:59	14:53 (9)	07:24	15:31 (9)					
	20:25	19:45	11	19:13 (8)	18:52	54	17:03 (9)	17:04	102	16:15 (9)	16:32	66	15:59 (9)	16:33	14	15:45 (9)
26	05:46	06:17	19:00 (8)	06:49	16:06 (9)	06:22	14:32 (9)	07:00	14:55 (9)	07:24	15:32 (9)					
	20:24	19:43	15	19:15 (8)	18:51	58	17:04 (9)	17:02	103	16:15 (9)	16:31	64	15:59 (9)	16:33	15	15:47 (9)
27	05:47	06:18	18:58 (8)	06:50	16:03 (9)	06:24	14:32 (9)	07:01	14:56 (9)	07:25	15:31 (9)					
	20:23	19:42	18	19:16 (8)	18:49	63	17:06 (9)	17:01	102	16:14 (9)	16:31	62	15:58 (9)	16:34	18	15:49 (9)
28	05:48	06:19	18:56 (8)	06:51	16:02 (9)	06:25	14:32 (9)	07:02	14:57 (9)	07:25	15:30 (9)					
	20:22	19:40	21	19:17 (8)	18:47	66	17:08 (9)	17:00	102	16:14 (9)	16:30	60	15:57 (9)	16:35	20	15:50 (9)
29	05:49	06:20	18:55 (8)	06:52	16:00 (9)	06:26	14:33 (9)	07:03	14:59 (9)	07:25	15:30 (9)					
	20:21	19:39	22	19:17 (8)	18:46	69	17:09 (9)	16:58	101	16:14 (9)	16:30	57	15:56 (9)	16:35	22	15:52 (9)
30	05:50	06:21	18:53 (8)	06:53	15:57 (9)	06:27	14:32 (9)	07:04	15:00 (9)	07:26	15:29 (9)					
	20:20	19:37	21	19:14 (8)	18:44	73	17:10 (9)	16:57	102	16:14 (9)	16:30	55	15:55 (9)	16:36	25	15:54 (9)
31	05:51	06:22	18:53 (8)	06:54	15:56 (9)	06:28	14:32 (9)	07:05	15:01 (9)	07:26	15:28 (9)					
	20:19	19:35	19	19:12 (8)	16:56	101	16:13 (9)	16:37	27	15:55 (9)						
Potential sun hours	461	429	375	344	296	2439	285									
Total, worst case		127	668	2962	2439	819										
Sun reduction		0,68	0,61	0,52	0,47	0,41										
Oper. time red.		0,92	0,92	0,92	0,92	0,92										
Wind dir. red.		0,67	0,50	0,47	0,47	0,47										
Total reduction		0,42	0,28	0,22	0,20	0,18										
Total, real		53	186	663	491	145										

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

Day in month	Sun rise (hh:mm)	Sun set (hh:mm)	Minutes with flicker	First time (hh:mm) with flicker	Last time (hh:mm) with flicker	(WTG causing flicker first time)	(WTG causing flicker last time)
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CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	94 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: V - SHR_22

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	
1	07:26 16:38	07:12 17:13	06:35 17:48	16:12 (9) 17:23 (9)	06:43 19:23	17:20 (9) 19:56	05:27 20:26
2	07:26 16:39	07:11 17:14	06:34 17:49	16:11 (9) 17:24 (9)	06:42 19:24	17:22 (9) 19:57	05:26 20:27
3	07:26 16:40	07:10 17:15	06:32 17:50	16:10 (9) 17:24 (9)	06:40 19:25	17:25 (9) 19:58	05:26 20:28
4	07:26 16:41	07:09 17:17	06:30 17:51	16:09 (9) 17:24 (9)	06:38 19:26	17:28 (9) 19:59	05:25 20:28
5	07:26 16:42	07:08 17:18	06:29 17:53	16:09 (9) 17:25 (9)	06:37 19:27	17:33 (9) 20:00	05:25 20:29
6	07:26 16:43	07:07 17:19	06:27 17:54	16:08 (9) 17:25 (9)	06:35 19:29	19:05 (8) 20:01	05:25 20:30
7	07:26 16:43	07:06 17:21	06:26 17:55	16:08 (9) 17:25 (9)	06:33 19:30	19:03 (8) 20:02	05:24 20:30
8	07:26 16:44	07:04 17:22	06:24 17:56	16:08 (9) 17:25 (9)	06:32 19:31	19:01 (8) 20:03	05:24 20:31
9	07:26 16:45	07:03 17:23	06:22 17:57	16:07 (9) 17:25 (9)	06:30 19:32	19:01 (8) 20:05	05:24 20:32
10	07:26 16:47	07:02 17:24	06:21 17:58	16:07 (9) 17:25 (9)	06:28 19:33	19:00 (8) 20:06	05:24 20:32
11	07:25 16:48	07:01 17:26	06:19 18:00	16:07 (9) 17:25 (9)	06:27 19:34	18:59 (8) 20:07	05:24 20:33
12	07:25 16:49	07:00 17:27	06:17 18:01	16:06 (9) 17:24 (9)	06:25 19:35	18:59 (8) 20:08	05:23 20:33
13	07:25 16:50	06:58 17:28	06:16 18:02	16:06 (9) 17:24 (9)	06:23 19:36	18:58 (8) 20:09	05:23 20:34
14	07:24 16:51	06:57 17:29	16:42 (9) 18:03	06:14 17:24 (9)	06:22 19:37	18:59 (8) 20:10	05:23 20:34
15	07:24 16:52	06:56 17:31	16:36 (9) 18:04	06:12 17:23 (9)	06:20 19:38	18:59 (8) 20:11	05:23 20:35
16	07:24 16:53	06:54 17:32	16:33 (9) 18:05	06:11 17:22 (9)	06:19 19:40	18:59 (8) 20:12	05:23 20:35
17	07:23 16:54	06:53 17:33	16:29 (9) 18:06	06:09 17:22 (9)	06:17 19:41	19:00 (8) 20:13	05:23 20:36
18	07:23 16:56	06:51 17:35	16:27 (9) 18:08	06:07 17:21 (9)	06:15 19:42	19:01 (8) 20:14	05:23 20:36
19	07:22 16:57	06:50 17:36	16:26 (9) 18:09	06:05 17:20 (9)	06:14 19:43	19:03 (8) 20:15	05:23 20:36
20	07:22 16:58	06:49 17:37	16:23 (9) 18:10	06:04 17:20 (9)	06:12 19:44	05:35 20:16	05:24 20:36
21	07:21 16:59	06:47 17:38	16:22 (9) 18:11	06:02 17:19 (9)	06:11 19:45	05:34 20:17	05:24 20:37
22	07:20 17:00	06:46 17:39	16:20 (9) 18:12	06:00 17:18 (9)	06:09 19:46	05:33 20:18	05:24 20:37
23	07:20 17:02	06:44 17:41	16:19 (9) 18:13	05:59 17:17 (9)	06:08 19:47	05:33 20:19	05:24 20:37
24	07:19 17:03	06:43 17:42	16:17 (9) 18:14	05:57 17:16 (9)	06:06 19:48	05:32 20:19	05:24 20:37
25	07:18 17:04	06:41 17:43	16:16 (9) 18:15	05:55 17:15 (9)	06:05 19:49	05:31 20:20	05:25 20:37
26	07:17 17:05	06:40 17:44	16:15 (9) 18:16	05:54 17:13 (9)	06:03 19:50	05:30 20:21	05:25 20:37
27	07:17 17:07	06:38 17:46	16:13 (9) 18:18	05:52 17:11 (9)	06:02 19:52	05:30 20:22	05:25 20:37
28	07:16 17:08	06:37 17:47	16:13 (9) 18:19	05:50 17:10 (9)	06:01 19:53	05:29 20:23	05:26 20:38
29	07:15 17:09		06:48 19:20	05:59 17:15 (9)	05:59 19:54	05:28 20:24	05:26 20:38
30	07:14 17:10		06:47 19:21	05:58 17:16 (9)	05:58 19:55	05:28 20:25	05:27 20:38
31	07:13 17:12		06:45 19:22	05:57 17:19 (9)	05:57 18:05 (9)	05:27 20:25	05:27 20:38
Potential sun hours	295	296	369	400	450	455	
Total, worst case		749	2175	322			
Sun reduction		0,44	0,44	0,50			
Oper. time red.		0,92	0,92	0,92			
Wind dir. red.		0,52	0,52	0,60			
Total reduction		0,21	0,21	0,28			
Total, real		156	456	90			

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: V - SHR_22

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	July	August	September	October	November	December			
1	05:27	05:52	06:23	18:58 (9)	06:54	16:46 (9)	06:30	07:05	
	20:37	20:18	19:34	13 19:11 (8)	18:42	78 18:04 (9)	16:54	16:29	
2	05:28	05:53	06:24	18:58 (8)	06:55	16:46 (9)	06:31	07:06	
	20:37	20:17	19:32	11 19:09 (8)	18:40	77 18:03 (9)	16:53	16:29	
3	05:28	05:54	06:25	18:58 (8)	06:57	16:45 (9)	06:32	07:07	
	20:37	20:15	19:30	9 19:07 (8)	18:39	78 18:03 (9)	16:52	16:29	
4	05:29	05:55	06:26	18:58 (8)	06:58	16:45 (9)	06:33	07:08	
	20:37	20:14	19:29	8 19:06 (8)	18:37	77 18:02 (9)	16:51	16:28	
5	05:29	05:56	06:28	18:59 (8)	06:59	16:44 (9)	06:35	07:09	
	20:37	20:13	19:27	5 19:04 (8)	18:35	78 18:02 (9)	16:49	16:28	
6	05:30	05:57	06:29	19:00 (8)	07:00	16:44 (9)	06:36	07:10	
	20:36	20:12	19:25	2 19:02 (8)	18:34	77 18:01 (9)	16:48	16:28	
7	05:30	05:58	06:30	17:29 (9)	07:01	16:44 (9)	06:37	07:11	
	20:36	20:11	19:24	13 17:42 (9)	18:32	76 18:00 (9)	16:47	16:28	
8	05:31	05:59	06:31	17:23 (9)	07:02	16:44 (9)	06:38	07:12	
	20:36	20:09	19:22	24 17:47 (9)	18:30	76 18:00 (9)	16:46	16:28	
9	05:32	06:00	06:32	17:19 (9)	07:03	16:45 (9)	06:39	07:13	
	20:35	20:08	19:20	31 17:50 (9)	18:29	75 18:00 (9)	16:45	16:28	
10	05:32	06:01	06:33	17:16 (9)	07:04	16:45 (9)	06:41	07:14	
	20:35	20:07	19:18	36 17:52 (9)	18:27	74 17:59 (9)	16:44	16:28	
11	05:33	06:02	06:34	17:13 (9)	07:05	16:45 (9)	06:42	07:15	
	20:34	20:05	19:17	41 17:54 (9)	18:25	73 17:58 (9)	16:43	16:28	
12	05:34	06:03	06:35	17:10 (9)	07:06	16:45 (9)	06:43	07:16	
	20:34	20:04	19:15	46 17:56 (9)	18:24	72 17:57 (9)	16:42	16:28	
13	05:35	06:04	06:36	17:08 (9)	07:07	16:45 (9)	06:44	07:17	
	20:34	20:03	19:13	49 17:57 (9)	18:22	71 17:56 (9)	16:41	16:28	
14	05:35	06:05	06:37	17:06 (9)	07:09	16:46 (9)	06:46	07:17	
	20:33	20:01	19:12	52 17:58 (9)	18:20	69 17:55 (9)	16:40	16:28	
15	05:36	06:06	06:38	17:04 (9)	07:10	16:46 (9)	06:47	07:18	
	20:32	20:00	19:10	55 17:59 (9)	18:19	67 17:53 (9)	16:39	16:29	
16	05:37	06:07	06:39	17:02 (9)	07:11	16:48 (9)	06:48	07:19	
	20:32	19:59	19:08	58 18:00 (9)	18:17	65 17:53 (9)	16:38	16:29	
17	05:38	06:08	06:40	17:00 (9)	07:12	16:48 (9)	06:49	07:20	
	20:31	19:57	19:06	61 18:01 (9)	18:16	64 17:52 (9)	16:37	16:29	
18	05:39	06:09	06:41	16:59 (9)	07:13	16:49 (9)	06:50	07:20	
	20:30	19:56	19:05	63 18:02 (9)	18:14	61 17:50 (9)	16:36	16:29	
19	05:40	06:10	06:42	16:57 (9)	07:14	16:50 (9)	06:52	07:21	
	20:30	19:54	19:03	65 18:02 (9)	18:13	58 17:48 (9)	16:36	16:30	
20	05:40	06:11	06:43	16:56 (9)	07:15	16:51 (9)	06:53	07:22	
	20:29	19:53	19:01	67 18:03 (9)	18:11	56 17:47 (9)	16:35	16:30	
21	05:41	06:12	06:44	16:54 (9)	07:17	16:53 (9)	06:54	07:22	
	20:28	19:51	18:59	69 18:03 (9)	18:10	53 17:46 (9)	16:34	16:31	
22	05:42	06:13	06:45	16:53 (9)	07:18	16:54 (9)	06:55	07:23	
	20:27	19:50	18:58	70 18:03 (9)	18:08	50 17:44 (9)	16:34	16:31	
23	05:43	06:14	06:46	16:52 (9)	07:19	16:56 (9)	06:56	07:23	
	20:27	19:48	18:56	72 18:04 (9)	18:07	45 17:41 (9)	16:33	16:32	
24	05:44	06:15	19:07 (8)	06:47	16:51 (9)	07:20	16:57 (9)	06:58	07:24
	20:26	19:47	11 19:18 (8)	18:54	73 18:04 (9)	18:05	42 17:39 (9)	16:32	16:32
25	05:45	06:16	19:05 (8)	06:48	16:50 (9)	06:21	16:01 (9)	06:59	07:24
	20:25	19:45	14 19:19 (8)	18:52	74 18:04 (9)	17:04	36 16:37 (9)	16:32	16:33
26	05:46	06:17	19:03 (8)	06:49	16:49 (9)	06:22	16:03 (9)	07:00	07:24
	20:24	19:43	17 19:20 (8)	18:51	75 18:04 (9)	17:02	31 16:34 (9)	16:31	16:33
27	05:47	06:18	19:02 (8)	06:50	16:48 (9)	06:24	16:07 (9)	07:01	07:25
	20:23	19:42	18 19:20 (8)	18:49	76 18:04 (9)	17:01	23 16:30 (9)	16:31	16:34
28	05:48	06:19	19:01 (8)	06:51	16:48 (9)	06:25	16:13 (9)	07:02	07:25
	20:22	19:40	17 19:18 (8)	18:47	77 18:05 (9)	17:00	10 16:23 (9)	16:30	16:35
29	05:49	06:20	19:00 (8)	06:52	16:47 (9)	06:26		07:03	07:25
	20:21	19:39	17 19:17 (8)	18:45	77 18:04 (9)	16:58		16:30	16:35
30	05:50	06:21	18:58 (8)	06:53	16:47 (9)	06:27		07:04	07:26
	20:20	19:37	16 19:14 (8)	18:44	77 18:04 (9)	16:57		16:29	16:36
31	05:51	06:22	18:58 (8)			06:28			07:26
	20:19	19:35	14 19:12 (8)			16:56			16:37
Potential sun hours	461	429	375		345		296		285
Total, worst case		124	1449		1712				
Sun reduction		0,68	0,61		0,52				
Oper. time red.		0,92	0,92		0,92				
Wind dir. red.		0,68	0,52		0,52				
Total reduction		0,42	0,29		0,25				
Total, real		53	422		423				

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	96 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: W - SHR_23

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

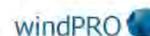
Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 07:12 06:35			16:53 (9) 06:43	17:12 (9) 05:56	05:27 05:27 05:52			06:23	17:14 (9) 06:54	17:02 (9) 06:30	07:05
2	07:26 07:11 06:34			16:47 (9) 06:42	17:11 (9) 05:55	05:26 05:28 05:53			06:24	17:13 (9) 06:55	17:03 (9) 06:31	07:06
3	07:26 07:10 06:32			16:43 (9) 06:40	17:12 (9) 05:54	05:26 05:28 05:54			06:25	17:11 (9) 06:57	17:04 (9) 06:32	07:07
4	07:26 07:09 06:30			16:39 (9) 06:38	17:12 (9) 05:53	05:25 05:29 05:55			06:26	17:10 (9) 06:58	17:05 (9) 06:33	07:08
5	07:26 07:08 06:29			16:35 (9) 06:34	17:13 (9) 05:54	05:24 05:30 05:58			06:27	17:07 (9) 07:01	17:09 (9) 06:37	07:11
6	07:26 07:07 06:27			16:31 (9) 06:30	17:13 (9) 05:50	05:24 05:32 06:01			06:28	17:09 (9) 06:59	17:06 (9) 06:35	07:09
7	07:26 07:06 06:26			16:27 (9) 06:28	17:15 (9) 05:49	05:24 05:30 05:58			06:29	17:08 (9) 07:00	17:07 (9) 06:36	07:10
8	07:26 07:04 06:24			16:23 (9) 06:24	17:14 (9) 05:46	05:24 05:32 06:00			06:30	17:05 (9) 07:03	17:13 (9) 06:39	07:13
9	07:26 07:03 06:22			16:19 (9) 06:20	17:14 (9) 05:46	05:24 05:32 06:00			06:31	17:06 (9) 07:02	17:10 (9) 06:38	07:12
10	07:26 07:02 06:21			16:15 (9) 06:19	17:15 (9) 05:45	05:24 05:35 06:02			06:32	17:05 (9) 07:01	17:11 (9) 06:37	07:11
11	07:26 07:01 06:19			16:11 (9) 06:17	17:15 (9) 05:44	05:24 05:35 06:02			06:33	17:04 (9) 07:05	17:16 (9) 06:41	07:14
12	07:26 07:00 06:17			16:07 (9) 06:23	17:16 (9) 05:43	05:23 05:34 06:03			06:34	17:03 (9) 07:06	17:23 (9) 06:43	07:16
13	07:26 06:58 06:15			16:03 (9) 06:19	17:17 (9) 05:42	05:23 05:35 06:04			06:35	17:02 (9) 07:07	17:30 (9) 06:44	07:17
14	07:26 06:57 06:14			16:00 (9) 06:16	17:18 (9) 05:41	05:23 05:35 06:05			06:36	17:01 (9) 07:08	17:31 (9) 06:45	07:18
15	07:26 06:56 06:13			15:56 (9) 06:12	17:19 (9) 05:40	05:23 05:36 06:06			06:37	17:00 (9) 07:09	17:32 (9) 06:46	07:19
16	07:26 06:55 06:12			15:52 (9) 06:11	17:20 (9) 05:39	05:23 05:37 06:07			06:38	17:01 (9) 07:10	17:33 (9) 06:47	07:20
17	07:26 06:54 06:11			15:48 (9) 06:10	17:21 (9) 05:38	05:23 05:38 06:08			06:39	17:02 (9) 07:11	17:34 (9) 06:48	07:21
18	07:26 06:53 06:10			15:44 (9) 06:09	17:22 (9) 05:37	05:23 05:39 06:09			06:40	17:03 (9) 07:12	17:35 (9) 06:49	07:22
19	07:26 06:52 06:09			15:40 (9) 06:08	17:23 (9) 05:36	05:23 05:40 06:10			06:41	17:04 (9) 07:13	17:36 (9) 06:50	07:23
20	07:26 06:51 06:08			15:36 (9) 06:07	17:24 (9) 05:35	05:23 05:41 06:11			06:42	17:05 (9) 07:14	17:37 (9) 06:51	07:24
21	07:26 06:50 06:07			15:32 (9) 06:06	17:25 (9) 05:34	05:24 05:42 06:12			06:43	17:06 (9) 07:15	17:38 (9) 06:52	07:25
22	07:26 06:49 06:06			15:28 (9) 06:05	17:26 (9) 05:33	05:24 05:42 06:13			06:44	17:07 (9) 07:16	17:39 (9) 06:53	07:26
23	07:26 06:48 06:05			15:24 (9) 06:04	17:27 (9) 05:32	05:24 05:43 06:14			06:45	17:08 (9) 07:17	17:40 (9) 06:54	07:27
24	07:26 06:47 06:04			15:20 (9) 06:03	17:28 (9) 05:31	05:24 05:44 06:15			06:46	17:09 (9) 07:18	17:41 (9) 06:55	07:28
25	07:26 06:46 06:03			15:16 (9) 06:02	17:29 (9) 05:30	05:24 05:45 06:16			06:47	17:10 (9) 07:19	17:42 (9) 06:56	07:29
26	07:26 06:45 06:02			15:12 (9) 06:01	17:30 (9) 05:29	05:24 05:46 06:17			06:48	17:11 (9) 07:20	17:43 (9) 06:57	07:30
27	07:26 06:44 06:01			15:08 (9) 06:00	17:31 (9) 05:28	05:24 05:47 06:18			06:49	17:12 (9) 07:21	17:44 (9) 06:58	07:31
28	07:26 06:43 06:00			15:04 (9) 05:59	17:32 (9) 05:27	05:24 05:48 06:19			06:50	17:13 (9) 07:22	17:45 (9) 06:59	07:32
29	07:26 06:42 05:59			15:00 (9) 05:58	17:33 (9) 05:26	05:24 05:49 06:20			06:51	17:14 (9) 07:23	17:46 (9) 07:00	07:33
30	07:26 06:41 05:58			14:56 (9) 05:57	17:34 (9) 05:25	05:24 05:50 06:21			06:52	17:15 (9) 07:24	17:47 (9) 07:01	07:34
31	07:26 06:40 05:57			14:52 (9) 05:56	17:35 (9) 05:24	05:24 05:51 06:22			06:53	17:16 (9) 07:25	17:48 (9) 07:02	07:35
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	285
Total, worst case			2181	1870				1004	2467	648		
Sun reduction			0,44	0,50				0,68	0,61	0,52		
Oper. time red.			0,92	0,92				0,92	0,92	0,92		
Wind dir. red.			0,57	0,58				0,59	0,57	0,57		
Total reduction			0,23	0,27				0,37	0,32	0,27		
Total, real			502	500				370	780	176		

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	97 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: X - SHR_24

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December						
1	07:26	07:12	06:35	06:43	17:43 (9)	05:56	05:27	05:27	05:52	06:23	17:43 (9)	06:54	17:47 (9)	06:30	07:05			
16:38	17:13	17:48		19:23	68	18:51 (9)	18:56	20:26	20:37	20:16	19:34	61	19:11 (8)	18:42	30	18:17 (9)	16:54	16:29
2	07:26	07:11	06:34	06:42	17:43 (9)	05:55	05:26	05:28	05:53	06:24	17:42 (9)	06:55	17:50 (9)	06:31	07:06			
16:39	17:14	17:49		19:24	67	18:50 (9)	19:57	20:27	20:37	20:17	19:32	61	18:43 (9)	18:40	23	18:13 (9)	16:53	16:29
3	07:26	07:10	06:32	06:40	17:43 (9)	05:54	05:26	05:28	05:54	06:25	17:41 (9)	06:57	17:56 (9)	06:32	07:07			
16:40	17:15	17:50		19:25	67	18:50 (9)	19:58	20:28	20:37	20:15	19:30	62	18:43 (9)	18:39	10	18:06 (9)	16:52	16:29
4	07:26	07:08	06:30	06:38	17:43 (9)	05:53	05:25	05:29	05:55	06:26	17:40 (9)	06:58	17:56 (9)	06:33	07:08			
16:41	17:17	17:51		19:26	66	18:49 (9)	19:59	20:28	20:37	20:14	19:29	64	18:44 (9)	18:37			16:51	16:28
5	07:26	07:08	06:29	06:37	17:43 (9)	05:51	05:25	05:29	05:56	06:27	17:39 (9)	06:59	17:56 (9)	06:35	07:09			
16:42	17:18	17:53		19:27	66	18:49 (9)	20:00	20:29	20:37	20:13	19:27	65	18:44 (9)	18:35			16:49	16:28
6	07:26	07:07	06:27	06:35	17:43 (9)	05:50	05:25	05:30	05:57	06:29	17:38 (9)	07:00	17:56 (9)	06:36	07:10			
16:43	17:19	17:54		19:29	66	18:49 (9)	20:01	20:30	20:36	20:12	19:25	66	18:44 (9)	18:34			16:48	16:28
7	07:26	07:06	06:26	06:33	17:43 (9)	05:49	05:24	05:30	05:58	06:30	17:38 (9)	07:02	17:56 (9)	06:37	07:11			
16:43	17:21	17:55		19:30	65	18:48 (9)	20:02	20:30	20:36	20:11	19:24	66	18:44 (9)	18:32			16:47	16:28
8	07:26	07:04	06:24	06:32	17:43 (9)	05:48	05:24	05:31	05:59	06:31	17:37 (9)	07:02	17:56 (9)	06:38	07:12			
16:44	17:22	17:56		19:31	64	18:47 (9)	20:03	20:31	20:36	20:09	19:22	67	18:44 (9)	18:30			16:46	16:28
9	07:26	07:03	06:22	06:30	17:44 (9)	05:46	05:24	05:32	06:00	06:32	17:36 (9)	07:03	17:56 (9)	06:39	07:13			
16:45	17:23	17:57		19:32	62	18:46 (9)	20:05	20:32	20:38	20:08	19:20	67	18:43 (9)	18:29			16:45	16:28
10	07:26	07:02	06:21	06:28	17:44 (9)	05:45	05:24	05:32	06:01	06:33	17:36 (9)	07:04	17:56 (9)	06:41	07:14			
16:47	17:24	17:58		19:33	61	18:45 (9)	20:06	20:32	20:35	20:07	19:18	67	18:43 (9)	18:27			16:44	16:28
11	07:25	07:01	06:19	17:14 (9)	06:27	17:44 (9)	05:44	05:24	05:33	06:02	06:34	17:35 (9)	07:05	16:42	07:15			
16:48	17:26	18:00	18	17:32 (9)	19:34	61	19:12 (8)	20:07	20:33	20:34	19:17	68	18:43 (9)	18:25			16:43	16:28
12	07:25	07:00	06:17	17:09 (9)	06:25	17:46 (9)	05:43	05:23	05:34	06:03	06:35	17:35 (9)	07:06	16:43	07:16			
16:49	17:27	18:01	27	17:36 (9)	19:35	60	19:13 (8)	20:08	20:33	20:34	19:15	67	18:42 (9)	18:24			16:42	16:28
13	07:25	06:58	06:16	17:05 (9)	06:23	17:46 (9)	05:42	05:23	05:35	06:04	06:36	17:34 (9)	07:07	16:44	07:17			
16:50	17:28	18:02	33	17:38 (9)	19:36	62	19:14 (8)	20:09	20:34	20:33	19:13	68	18:42 (9)	18:22			16:41	16:28
14	07:24	06:57	06:14	17:03 (9)	06:22	17:47 (9)	05:41	05:23	05:35	06:05	06:37	17:34 (9)	07:09	16:46	07:17			
16:51	17:29	18:03	38	17:41 (9)	19:37	63	19:16 (8)	20:10	20:34	20:33	19:12	67	18:41 (9)	18:20			16:40	16:28
15	07:24	06:56	06:12	17:00 (9)	06:20	17:48 (9)	05:40	05:23	05:36	06:06	06:38	17:34 (9)	07:10	16:47	07:18			
16:52	17:31	18:04	43	17:43 (9)	19:38	61	19:16 (8)	20:11	20:35	20:32	19:10	67	18:41 (9)	18:19			16:39	16:29
16	07:24	06:54	06:11	16:58 (9)	06:19	17:48 (9)	05:39	05:23	05:37	06:07	06:39	17:34 (9)	07:11	16:48	07:19			
16:53	17:32	18:05	46	17:44 (9)	19:40	61	19:17 (8)	20:12	20:35	20:32	19:08	66	18:40 (9)	18:17			16:38	16:29
17	07:23	06:53	06:09	16:57 (9)	06:17	17:50 (9)	05:38	05:23	05:38	06:09	06:40	17:34 (9)	07:12	16:38	07:20			
16:54	17:33	18:06	49	17:46 (9)	19:41	59	19:18 (8)	20:13	20:36	20:31	19:06	65	18:39 (9)	18:16			16:37	16:29
18	07:23	06:51	06:07	16:55 (9)	06:15	17:51 (9)	05:37	05:23	05:39	06:09	06:41	17:34 (9)	07:13	16:36	07:20			
16:56	17:35	18:08	51	17:46 (9)	19:42	57	19:19 (8)	20:14	20:36	20:30	19:05	65	18:39 (9)	18:14			16:36	16:29
19	07:22	06:50	06:05	16:53 (9)	06:14	17:53 (9)	05:36	05:23	05:40	06:10	06:42	17:34 (9)	07:14	16:36	07:21			
16:57	17:36	18:09	54	17:47 (9)	19:43	56	19:21 (8)	20:15	20:36	20:30	19:04	64	18:38 (9)	18:13			16:36	16:30
20	07:22	06:49	06:04	16:52 (9)	06:12	17:54 (9)	05:35	05:24	05:40	06:11	06:43	17:34 (9)	07:15	16:35	07:22			
16:58	17:37	18:10	57	17:49 (9)	19:44	52	19:21 (8)	20:16	20:36	20:29	19:03	63	18:37 (9)	18:11			16:35	16:30
21	07:21	06:47	06:02	16:51 (9)	06:11	17:57 (9)	05:34	05:24	05:41	06:12	06:44	17:34 (9)	07:17	16:34	07:22			
16:59	17:38	18:11	59	17:50 (9)	19:45	48	19:23 (8)	20:17	20:37	20:28	19:01	61	18:35 (9)	18:10			16:34	16:31
22	07:20	06:46	06:00	16:49 (9)	06:09	17:59 (9)	05:33	05:24	05:42	06:13	06:45	17:35 (9)	07:18	16:34	07:23			
17:00	17:39	18:12	61	17:50 (9)	19:46	42	19:22 (8)	20:18	20:37	20:27	19:00	49	19:27 (8)	18:58			16:34	16:31
23	07:20	06:44	06:05	16:48 (9)	06:08	18:03 (9)	05:33	05:24	05:43	06:14	06:46	17:35 (9)	07:19	16:36	07:23			
17:02	17:41	18:13	62	17:50 (9)	19:47	32	19:21 (8)	20:19	20:37	20:27	19:48	52	19:26 (8)	18:56			16:33	16:32
24	07:19	06:43	06:05	16:48 (9)	06:06	18:06 (9)	05:32	05:24	05:44	06:15	06:47	17:37 (9)	07:20	16:32	07:24			
17:03	17:42	18:14	63	17:51 (9)	19:48	16	19:18 (8)	20:19	20:37	20:26	19:47	55	19:24 (8)	18:54			16:32	16:32
25	07:18	06:41	06:05	16:47 (9)	06:05	05:31	05:25	05:45	06:16	06:48	06:48	17:35 (9)	07:21	16:31	07:24			
17:04	17:43	18:15	64	17:51 (9)	19:49	20	20:20	20:37	20:25	19:45	57	19:23 (8)	18:52	17:04			16:32	16:33
26	07:17	06:40	06:03	16:46 (9)	06:03	05:30	05:25	05:46	06:17	06:49	06:49	17:35 (9)	07:22	16:30	07:24			
17:05	17:44	18:16	65	17:51 (9)	19:50	17	17:57 (9)	20:24	20:37	20:24	19:43	59	19:21 (8)	18:51			16:31	16:33
27	07:17	06:38	06:02	16:45 (9)	06:02	05:30	05:25	05:47	06:18	06:50	06:50	17:35 (9)	07:23	16:30	07:25			
17:07	17:46	18:18	66	17:51 (9)	19:52	20	20:22	20:37	20:23	19:42	61	19:20 (8)	18:49	17:01			16:31	16:34
28	07:16	06:37	06:00	16:45 (9)	06:01	05:29	05:26	05:48	06:19	06:51	06:51	17:35 (9)	07:24	16:30	07:25			
17:08	17:47	18:19	67	17:52 (9)	19:53	20	20:23	20:37	20:22	19:40	61	19:18 (8)	18:47	17:00			16:30	16:35
29	07:15	06:48	06:04	17:44 (9)	06:05	05:28	05:26	05:49	06:20	06:52	06:52	17:35 (9)	07:25	16:30	07:25			
17:09	17:49	18:20	67	18:51 (9)	19:54	20	20:24	20:37	20:21	19:39	63	19:17 (8)	18:45	16:30	07:26			
30	07:14	06:47	06:06	17:43 (9)	06:05	05:28	05:27	05:50	06:21	06:53	06:53	17:36 (9)	07:26	16:30	07:26			
17:10	17:49	18:21	68	18:51 (9)	19:55	20	20:25	20:37	20:20	19:37	62	19:14 (8)	18:44	16:29	07:26			



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	98 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: Y - SHR_25

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 07:12 06:35			06:43	17:52 (9) 05:56	05:27	05:27	05:52	06:23	17:50 (9) 06:54	06:30	07:05
	16:38 17:13 17:48			19:23	64 18:56 (9) 19:56	20:26	20:37	20:18	19:34	60 18:50 (9) 18:42	16:54	16:29
2	07:26 07:11 06:34			06:42	64 17:51 (9) 19:55	05:26	05:28	05:53	06:24	60 17:49 (9) 06:55	06:31	07:06
	16:39 17:14 17:49			19:24	65 18:56 (9) 19:57	20:27	20:37	20:17	19:32	61 18:50 (9) 18:40	16:53	16:29
3	07:26 07:10 06:32			06:40	64 17:52 (9) 19:54	05:26	05:28	05:54	06:25	61 17:48 (9) 06:57	06:32	07:07
	16:40 17:15 17:50			19:25	64 18:56 (9) 19:58	20:28	20:37	20:15	19:30	63 18:51 (9) 18:39	16:52	16:29
4	07:26 07:09 06:30			06:38	64 17:51 (9) 19:53	05:25	05:29	05:55	06:26	63 17:47 (9) 06:58	06:33	07:08
	16:41 17:17 17:51			19:26	65 18:56 (9) 19:59	20:28	20:37	20:14	19:29	63 18:50 (9) 18:37	16:51	16:28
5	07:26 07:08 06:29			06:37	64 17:50 (9) 19:51	05:25	05:29	05:56	06:27	63 17:47 (9) 06:59	06:35	07:09
	16:42 17:18 17:53			19:27	65 18:55 (9) 20:00	20:29	20:37	20:13	19:27	63 18:50 (9) 18:35	16:49	16:28
6	07:26 07:07 06:27			06:35	64 17:51 (9) 19:50	05:25	05:30	05:57	06:29	63 17:46 (9) 07:00	06:36	07:10
	16:42 17:19 17:54			19:29	64 18:55 (9) 20:01	20:30	20:36	20:12	19:25	64 18:50 (9) 18:34	16:48	16:28
7	07:26 07:06 06:26			06:33	64 17:51 (9) 19:49	05:24	05:30	05:58	06:30	64 17:46 (9) 07:01	06:37	07:11
	16:43 17:21 17:55			19:30	63 18:54 (9) 20:02	20:30	20:36	20:11	19:24	64 18:50 (9) 18:32	16:47	16:28
8	07:26 07:04 06:24			06:32	64 17:50 (9) 19:48	05:24	05:31	05:59	06:31	64 17:45 (9) 07:02	06:38	07:12
	16:44 17:22 17:56			19:31	63 18:53 (9) 20:03	20:31	20:36	20:09	19:22	65 18:50 (9) 18:30	16:46	16:28
9	07:26 07:03 06:22			06:30	64 17:51 (9) 19:46	05:24	05:32	06:00	06:32	64 17:45 (9) 07:03	06:39	07:13
	16:45 17:23 17:57			19:32	62 18:53 (9) 20:05	20:32	20:35	20:08	19:20	64 18:49 (9) 18:29	16:45	16:28
10	07:26 07:02 06:21			06:28	64 17:51 (9) 19:45	05:24	05:32	06:01	06:33	64 17:44 (9) 07:04	06:41	07:14
	16:47 17:24 17:58			19:33	61 18:52 (9) 20:06	20:32	20:35	20:07	19:18	65 18:49 (9) 18:27	16:44	16:28
11	07:25 07:01 06:19			06:27	64 17:51 (9) 19:44	05:24	05:33	06:02	06:34	64 17:44 (9) 07:05	06:42	07:15
	16:48 17:26 18:00			19:34	60 18:51 (9) 20:07	20:33	20:34	20:05	19:17	64 18:48 (9) 18:25	16:43	16:28
12	07:25 06:59 06:17			06:25	64 17:52 (9) 19:43	05:23	05:34	06:03	06:35	64 17:44 (9) 07:06	06:45	07:16
	16:49 17:27 18:01			19:35	59 18:51 (9) 20:08	20:33	20:34	20:04	19:15	64 18:48 (9) 18:24	16:42	16:28
13	07:25 06:58 06:16			06:23	64 17:52 (9) 19:42	05:23	05:35	06:04	06:36	64 17:44 (9) 07:07	06:44	07:17
	16:50 17:28 18:02			19:36	62 18:14 (8) 20:09	20:34	20:33	20:03	19:13	63 18:47 (9) 18:22	16:41	16:28
14	07:24 06:57 06:14			06:22	64 17:53 (9) 19:41	05:23	05:35	06:05	06:37	64 17:44 (9) 07:09	06:46	07:17
	16:51 17:29 18:03			19:37	62 19:16 (8) 20:10	20:34	20:33	20:01	19:12	62 18:46 (9) 18:20	16:40	16:28
15	07:24 06:56 06:12		17:20 (9)	06:20	64 17:53 (9) 19:40	05:23	05:36	06:06	06:38	64 17:44 (9) 07:10	06:47	07:18
	16:52 17:31 18:04	17	17:37 (9)	19:38	63 19:16 (8) 20:11	20:35	20:32	20:00	19:10	61 18:45 (9) 18:19	16:39	16:29
16	07:24 06:54 06:11		17:15 (9)	06:19	64 17:53 (9) 19:39	05:23	05:37	06:07	06:39	64 17:44 (9) 07:11	06:48	07:19
	16:53 17:32 18:05	26	17:41 (9)	19:40	63 19:17 (8) 20:12	20:35	20:32	19:59	19:08	60 18:44 (9) 18:17	16:38	16:29
17	07:23 06:53 06:09		17:13 (8)	06:17	64 17:53 (9) 19:38	05:23	05:38	06:08	06:35	64 17:44 (9) 07:12	06:49	07:20
	16:54 17:33 18:06	32	17:45 (9)	19:41	62 19:18 (8) 20:13	20:36	20:31	19:57	16	18:34 (9)	19:06	16:37
18	07:23 06:51 06:07		17:10 (9)	06:15	64 17:55 (9) 19:37	05:23	05:39	06:09	06:36	64 17:45 (9) 07:13	06:50	07:20
	16:56 17:35 18:08	36	17:46 (9)	19:42	62 19:19 (8) 20:14	20:36	20:30	19:56	31	19:26 (8)	19:05	16:36
19	07:22 06:50 06:05		17:07 (9)	06:14	64 17:57 (9) 19:36	05:23	05:40	06:10	06:37	64 18:11 (9) 18:42	16:35	16:29
	16:57 17:36 18:09	40	17:47 (9)	19:43	60 19:21 (8) 20:15	20:36	20:30	19:54	41	19:28 (8)	19:03	16:36
20	07:22 06:49 06:04		17:05 (9)	06:12	64 17:58 (9) 19:35	05:24	05:40	06:11	06:38	64 17:46 (9) 07:15	06:53	07:22
	16:58 17:37 18:10	44	17:49 (9)	19:44	58 19:21 (8) 20:16	20:36	20:29	19:53	50	19:30 (8)	19:01	16:35
21	07:21 06:47 06:02		17:03 (9)	06:11	64 17:59 (9) 19:34	05:24	05:41	06:12	06:39	64 18:06 (9) 18:44	16:34	16:29
	16:59 17:38 18:11	47	17:50 (9)	19:45	57 19:23 (8) 20:17	20:37	20:28	19:51	53	19:29 (8)	18:59	16:34
22	07:20 06:46 06:00		17:01 (9)	06:09	64 18:00 (9) 19:33	05:24	05:42	06:13	06:40	64 18:04 (9) 18:45	16:33	16:29
	17:00 17:39 18:12	50	17:51 (9)	19:46	53 19:23 (8) 20:18	20:37	20:27	19:50	56	19:27 (8)	18:58	16:34
23	07:20 06:44 06:05		17:00 (9)	06:08	64 18:03 (9) 19:33	05:24	05:43	06:14	06:41	64 18:02 (9) 18:46	16:33	16:29
	17:02 17:41 18:13	52	17:52 (9)	19:47	49 19:24 (8) 20:19	20:37	20:27	19:48	59	19:26 (8)	18:56	16:33
24	07:19 06:43 06:05		16:59 (9)	06:06	64 18:04 (9) 19:32	05:24	05:44	06:15	06:42	64 18:00 (9) 18:47	16:32	16:29
	17:03 17:42 18:14	54	17:53 (9)	19:48	41 19:21 (8) 20:19	20:37	20:26	19:47	61	19:24 (8)	18:54	16:32
25	07:18 06:41 06:05		16:58 (9)	06:05	64 18:08 (9) 19:31	05:25	05:45	06:16	06:43	64 17:59 (9) 18:48	16:31	16:29
	17:04 17:43 18:15	56	17:54 (9)	19:49	29 19:19 (8) 20:20	20:37	20:25	19:45	62	19:23 (8)	18:52	16:32
26	07:17 06:40 06:03		16:56 (9)	06:03	64 18:12 (9) 19:30	05:25	05:46	06:17	06:44	64 17:58 (9) 18:49	16:31	16:29
	17:05 17:44 18:16	59	17:55 (9)	19:50	14 18:26 (9) 19:30	05:25	05:47	06:18	62	19:21 (8)	18:51	16:31
27	07:17 06:38 06:02		16:55 (9)	06:02	64 18:00 (9) 19:30	05:25	05:47	06:18	06:45	64 17:56 (9) 18:48	16:30	16:29
	17:07 17:46 18:18	60	17:55 (9)	19:52	20:22	20:37	20:23	19:42	63	19:20 (8)	18:49	16:31
28	07:16 06:37 06:05		16:55 (9)	06:01	64 18:00 (9) 19:30	05:25	05:48	06:19	06:46	64 17:55 (9) 18:51	16:30	16:29
	17:08 17:47 18:19	61	17:56 (9)	19:53	20:23	20:37	20:22	19:40	63	19:18 (8)	18:47	16:30
29	07:15 06:48 06:05		17:54 (9)	06:05	64 18:00 (9) 19:30	05:25	05:49	06:20	06:47	64 17:54 (9) 18:52	16:29	16:29
	17:09 17:48 18:20	62	18:56 (9)	19:54	20:24	20:37	20:21	19:39	62	19:17 (8)	18:45	16:30
30	07:14 06:47 06:05		17:53 (9)	06:05	64 18:00 (9) 19:30	05:25	05:50	06:21	06:48	64 17:52 (9) 18:53	16:29	16:30
	17:10 17:49 18:21	63	18:56 (9)	19:55	20:25	20:37	20:20	19:37	62	19:14 (8)	18:44	16:30
31	07:13 06:45 06:05		17:53 (9)	06:05	64 18:00 (9) 19:30	05:25	05:51	06:22	06:49	64 17:51 (9) 18:54	16:28	16:30
	17:12 17:51 18:23	63	18:56 (9)	19:56	20:25	20:37	20:19	19:35	59	18:50 (9)	18:56	16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	285
Total, worst case			822	1490				800	1540			
Sun reduction			0,44	0,50				0,68	0,61			
Oper. time red.			0,92	0,92				0,92	0,92			
Wind dir. red.			0,62	0,63				0,63	0,62			
Total reduction			0,25	0,29				0,40	0,35			
Total, real			207									

SHADOW - Calendar

Calculation: Wind Farm Apricena - ProjectShadow receptor: Z - SHR_26

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	
1	07:26	07:12	06:35	06:43	17:53 (9)	05:27	
	16:38	17:13	17:48	19:23	65 18:58 (9)	19:56 55 18:48 (9)	20:26
2	07:26	07:11	06:34	06:42	17:52 (9)	05:26	
	16:39	17:14	17:49	19:24	67 18:59 (9)	19:57 53 18:47 (9)	20:27
3	07:26	07:10	06:32	06:40	17:52 (9)	05:26	
	16:40	17:15	17:50	19:25	68 19:00 (9)	19:58 51 18:45 (9)	20:28
4	07:26	07:09	06:30	06:38	17:50 (9)	05:25	
	16:41	17:17	17:51	19:26	70 19:00 (9)	19:59 48 18:44 (9)	20:28
5	07:26	07:08	06:29	06:37	17:49 (9)	05:25	
	16:42	17:18	17:53	19:27	71 19:00 (9)	20:00 46 18:43 (9)	20:29
6	07:26	07:07	06:27	06:35	17:49 (9)	05:25	
	16:43	17:19	17:54	19:29	72 19:01 (9)	20:01 42 18:41 (9)	20:30
7	07:26	07:06	06:26	06:33	17:48 (9)	05:24	
	16:43	17:21	17:55	19:30	72 19:00 (9)	20:02 40 18:40 (9)	20:30
8	07:26	07:04	06:24	06:32	17:47 (9)	05:24	
	16:44	17:22	17:56	19:31	73 19:00 (9)	20:03 36 18:38 (9)	20:31
9	07:26	07:03	06:22	06:30	17:47 (9)	05:24	
	16:46	17:23	17:57	19:32	74 19:01 (9)	20:05 32 18:35 (9)	20:32
10	07:26	07:02	06:21	06:28	17:47 (9)	05:24	
	16:47	17:24	17:58	19:33	73 19:00 (9)	20:06 27 18:33 (9)	20:32
11	07:25	07:01	06:19	06:27	17:46 (9)	05:24	
	16:48	17:26	18:00	19:34	74 19:00 (9)	20:07 21 18:30 (9)	20:33
12	07:25	07:00	06:17	06:25	17:46 (9)	05:23	
	16:49	17:27	18:01	19:35	74 19:00 (9)	20:08 14 18:27 (9)	20:33
13	07:25	06:58	06:16	06:23	17:46 (9)	05:23	
	16:50	17:28	18:02	19:36	74 19:00 (9)	20:09 20:34	
14	07:24	06:57	06:14	06:22	17:46 (9)	05:23	
	16:51	17:29	18:03	19:37	74 19:00 (9)	20:10 20:34	
15	07:24	06:56	06:12	06:20	17:45 (9)	05:23	
	16:52	17:31	18:04	19:38	75 19:16 (8)	20:11 20:35	
16	07:24	06:54	06:11	06:19	17:45 (9)	05:23	
	16:53	17:32	18:05	19:40	79 19:17 (8)	20:12 20:35	
17	07:23	06:53	06:09	06:17	17:46 (9)	05:23	
	16:54	17:33	18:06	19:41	80 19:18 (8)	20:13 20:36	
18	07:23	06:51	06:07	06:15	17:45 (9)	05:23	
	16:56	17:35	18:08	19:42	82 19:19 (8)	20:14 20:36	
19	07:22	06:50	06:05	06:14	17:46 (9)	05:23	
	16:57	17:36	18:09	19:43	83 19:21 (8)	20:15 20:36	
20	07:22	06:49	06:04	06:12	17:46 (9)	05:24	
	16:58	17:37	18:10	19:44	83 19:21 (8)	20:16 20:36	
21	07:21	06:47	06:02	17:19 (9)	06:11	17:46 (9)	05:24
	16:59	17:38	18:11	21 17:40 (9)	19:45	85 19:23 (8)	20:17 20:37
22	07:20	06:46	06:00	17:14 (9)	06:09	17:46 (9)	05:33
	17:00	17:39	18:12	30 17:44 (9)	19:46	84 19:23 (8)	20:18 20:37
23	07:20	06:44	05:59	17:10 (9)	06:08	17:47 (9)	05:33
	17:02	17:41	18:13	37 17:47 (9)	19:47	84 19:25 (8)	20:19 20:37
24	07:19	06:43	05:57	17:08 (9)	06:06	17:47 (9)	05:32
	17:03	17:42	18:14	41 17:49 (9)	19:48	84 19:25 (8)	20:19 20:37
25	07:18	06:41	05:55	17:05 (9)	06:05	17:48 (9)	05:31
	17:04	17:43	18:15	46 17:51 (9)	19:49	84 19:27 (8)	20:20 20:37
26	07:17	06:40	05:53	17:03 (9)	06:03	17:49 (9)	05:30
	17:05	17:44	18:16	49 17:52 (9)	19:50	82 19:28 (8)	20:21 20:37
27	07:17	06:38	05:52	17:00 (9)	06:02	17:49 (9)	05:30
	17:07	17:46	18:18	53 17:53 (9)	19:52	79 19:26 (8)	20:22 20:37
28	07:16	06:37	05:50	16:59 (9)	06:01	17:50 (9)	05:29
	17:08	17:47	18:19	56 17:55 (9)	19:53	73 19:24 (8)	20:23 20:37
29	07:15	06:48	05:59	17:57 (9)	05:28	17:51 (9)	05:28
	17:09	19:20	59 18:56 (9)	19:54	66 19:22 (8)	20:24 20:37	
30	07:14	06:47	05:58	17:56 (9)	05:28	17:51 (9)	05:28
	17:10	19:21	61 18:57 (9)	19:55	58 18:49 (9)	20:25 20:37	
31	07:13	06:45	05:57	17:55 (9)	05:27	20:25	20:37
	17:12	19:22	63 18:58 (9)	20:25	450	455	
Potential sun hours	295	296	369	400	450	455	
Total, worst case			516	2262	465		
Sun reduction			0,44	0,50	0,57		
Oper. time red.			0,92	0,92	0,92		
Wind dir. red.			0,64	0,64	0,64		
Total reduction			0,26	0,30	0,33		
Total, real			134	673	155		

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

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

Calculation: Wind Farm Apricena - ProjectShadow receptor: Z - SHR_26

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	July	August	September	October	November	December				
1	05:27	05:52	18:22 (9)	06:23	17:45 (9)	06:54	06:30	07:05		
	20:37	20:18	17	18:39 (9)	19:34	74	18:59 (9)	18:42	16:54	16:29
2	05:28	05:53	18:18 (9)	06:24	17:45 (9)	06:55	06:31	07:06		
	20:37	20:17	24	18:42 (9)	19:32	73	18:58 (9)	18:40	16:53	16:29
3	05:28	05:54	18:16 (9)	06:25	17:44 (9)	06:57	06:32	07:07		
	20:37	20:15	29	18:45 (9)	19:30	74	18:58 (9)	18:39	16:52	16:29
4	05:29	05:55	18:13 (9)	06:26	17:44 (9)	06:58	06:33	07:08		
	20:37	20:14	34	18:47 (9)	19:29	73	18:57 (9)	18:37	16:51	16:28
5	05:29	05:56	18:11 (9)	06:28	17:44 (9)	06:59	06:35	07:09		
	20:37	20:13	38	18:49 (9)	19:27	73	18:57 (9)	18:35	16:49	16:28
6	05:30	05:57	18:10 (9)	06:29	17:44 (9)	07:00	06:36	07:10		
	20:36	20:12	40	18:50 (9)	19:25	72	18:56 (9)	18:34	16:48	16:28
7	05:30	05:58	18:08 (9)	06:30	17:44 (9)	07:01	06:37	07:11		
	20:36	20:11	44	18:52 (9)	19:24	71	18:55 (9)	18:32	16:47	16:28
8	05:31	05:59	18:06 (9)	06:31	17:44 (9)	07:02	06:38	07:12		
	20:36	20:09	47	18:53 (9)	19:22	70	18:54 (9)	18:30	16:46	16:28
9	05:32	06:00	18:05 (9)	06:32	17:45 (9)	07:03	06:39	07:13		
	20:35	20:08	49	18:54 (9)	19:20	68	18:53 (9)	18:29	16:45	16:28
10	05:32	06:01	18:03 (9)	06:33	17:45 (9)	07:04	06:41	07:14		
	20:35	20:07	52	18:55 (9)	19:18	67	18:52 (9)	18:27	16:44	16:28
11	05:33	06:02	18:02 (9)	06:34	17:45 (9)	07:05	06:42	07:15		
	20:34	20:05	54	18:56 (9)	19:17	66	18:51 (9)	18:25	16:43	16:28
12	05:34	06:03	18:01 (9)	06:35	17:46 (9)	07:06	06:43	07:16		
	20:34	20:04	56	18:57 (9)	19:15	63	18:49 (9)	18:24	16:42	16:28
13	05:35	06:04	18:00 (9)	06:36	17:47 (9)	07:07	06:44	07:17		
	20:33	20:03	58	18:58 (9)	19:13	61	18:48 (9)	18:22	16:41	16:28
14	05:35	06:05	17:59 (9)	06:37	17:47 (9)	07:09	06:46	07:17		
	20:33	20:01	68	19:31 (8)	19:12	59	18:46 (9)	18:20	16:40	16:28
15	05:36	06:06	17:57 (9)	06:38	17:48 (9)	07:10	06:47	07:18		
	20:32	20:00	76	19:33 (8)	19:10	57	18:45 (9)	18:19	16:39	16:29
16	05:37	06:07	17:56 (9)	06:39	17:49 (9)	07:11	06:48	07:19		
	20:32	19:59	80	19:34 (8)	19:08	54	18:43 (9)	18:17	16:38	16:29
17	05:38	06:08	17:55 (9)	06:40	17:51 (9)	07:12	06:49	07:20		
	20:31	19:57	82	19:34 (8)	19:06	50	18:41 (9)	18:16	16:37	16:29
18	05:39	06:09	17:54 (9)	06:41	17:52 (9)	07:13	06:50	07:20		
	20:30	19:56	83	19:33 (8)	19:05	47	18:39 (9)	18:14	16:36	16:29
19	05:40	06:10	17:54 (9)	06:42	17:54 (9)	07:14	06:52	07:21		
	20:30	19:54	84	19:32 (8)	19:03	42	18:36 (9)	18:13	16:36	16:30
20	05:40	06:11	17:53 (9)	06:43	17:56 (9)	07:15	06:53	07:22		
	20:29	19:53	84	19:30 (8)	19:01	38	18:34 (9)	18:11	16:35	16:30
21	05:41	06:12	17:52 (9)	06:44	17:58 (9)	07:17	06:54	07:22		
	20:28	19:51	84	19:29 (8)	18:59	32	18:30 (9)	18:10	16:34	16:31
22	05:42	06:13	17:51 (9)	06:45	18:02 (9)	07:18	06:55	07:23		
	20:27	19:50	84	19:27 (8)	18:58	24	18:26 (9)	18:08	16:34	16:31
23	05:43	06:14	17:50 (9)	06:46	18:08 (9)	07:19	06:56	07:23		
	20:27	19:48	85	19:26 (8)	18:56	11	18:19 (9)	18:07	16:33	16:32
24	05:44	06:15	17:50 (9)	06:47	18:05	07:20	06:58	07:24		
	20:26	19:47	82	19:24 (8)	18:54	18:05	16:32	16:32		
25	05:45	06:16	17:49 (9)	06:48	18:06	07:21	06:59	07:24		
	20:25	19:45	82	19:23 (8)	18:52	17:04	16:32	16:33		
26	05:46	06:17	17:48 (9)	06:49	18:07	07:22	07:00	07:24		
	20:24	19:43	81	19:21 (8)	18:51	17:02	16:31	16:33		
27	05:47	06:18	17:48 (9)	06:50	18:08	07:23	07:01	07:25		
	20:23	19:42	78	19:20 (8)	18:49	17:01	16:31	16:34		
28	05:48	06:19	17:47 (9)	06:51	18:09	07:24	07:02	07:25		
	20:22	19:40	75	19:18 (8)	18:47	17:00	16:30	16:35		
29	05:49	06:20	17:47 (9)	06:52	18:10	07:25	07:03	07:25		
	20:21	19:39	74	19:01 (9)	18:45	16:58	16:30	16:35		
30	05:50	06:21	17:45 (9)	06:53	18:11	07:26	07:04	07:26		
	20:20	19:37	75	19:00 (9)	18:44	16:57	16:29	16:36		
31	05:51	18:28 (9)	06:22	17:45 (9)	18:12	07:27	07:05	07:26		
	20:19	5	18:33 (9)	19:35	74	18:59 (9)	16:56	16:37		
Potential sun hours	461		429		375		345		296	285
Total, worst case	5		1973		1319					
Sun reduction	0,68		0,68		0,61					
Oper. time red.	0,92		0,92		0,92					
Wind dir. red.	0,64		0,65		0,64					
Total reduction	0,40		0,40		0,36					
Total, real	2		795		472					

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: AA - SHR_27

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June
1	07:26 16:38	07:12 17:13	07:47 (9) 06:35 08:34 (9) 17:48	07:24 (9) 06:43 08:54 (9) 19:23	05:57 19:56	18:45 (8) 05:27 19:29 (8) 20:26
2	07:26 16:39	07:11 17:14	07:45 (9) 06:34 08:36 (9) 17:49	07:25 (9) 06:42 08:54 (9) 19:24	05:55 19:57	18:45 (8) 05:26 19:29 (8) 20:27
3	07:26 16:40	07:10 17:15	07:44 (9) 06:32 08:38 (9) 17:50	07:24 (9) 06:40 08:54 (9) 19:25	05:54 19:58	18:45 (8) 05:26 19:28 (8) 20:28
4	07:26 16:41	07:09 17:17	07:42 (9) 06:30 08:40 (9) 17:52	07:25 (9) 06:38 08:54 (9) 19:26	05:53 19:59	18:45 (8) 05:26 19:28 (8) 20:29
5	07:26 16:42	07:08 17:18	07:41 (9) 06:29 08:41 (9) 17:53	07:24 (9) 06:37 08:53 (9) 19:27	19:05 (7) 05:51 19:06 (7) 20:00	18:45 (8) 05:25 19:28 (8) 20:29
6	07:26 16:43	07:07 17:19	07:40 (9) 06:27 08:43 (9) 17:54	07:24 (9) 06:35 08:52 (9) 19:29	19:02 (7) 05:50 19:07 (7) 20:01	18:46 (8) 05:25 19:27 (8) 20:30
7	07:26 16:44	07:06 17:21	07:39 (9) 06:26 08:45 (9) 17:55	07:25 (9) 06:33 08:52 (9) 19:30	19:00 (7) 05:49 19:08 (7) 20:02	18:46 (8) 05:24 19:27 (8) 20:31
8	07:26 16:45	07:04 17:22	07:37 (9) 06:24 08:45 (9) 17:56	07:24 (9) 06:32 08:51 (9) 19:31	18:58 (7) 05:48 19:09 (7) 20:04	18:47 (8) 05:24 19:27 (8) 20:31
9	07:26 16:46	07:03 17:23	07:36 (9) 06:22 08:47 (9) 17:57	07:24 (9) 06:30 08:49 (9) 19:32	18:58 (7) 05:46 19:10 (7) 20:05	18:47 (8) 05:24 19:28 (8) 20:32
10	07:26 16:47	07:02 17:24	07:35 (9) 06:21 08:48 (9) 17:59	07:25 (9) 06:28 08:49 (9) 19:33	18:56 (7) 05:45 19:11 (7) 20:06	18:47 (8) 05:24 19:28 (8) 20:32
11	07:25 16:48	07:01 17:26	07:35 (9) 06:19 08:49 (9) 18:00	07:25 (9) 06:27 08:48 (9) 19:34	18:55 (7) 05:44 19:12 (7) 20:07	18:48 (8) 05:24 19:29 (8) 20:33
12	07:25 16:49	07:00 17:27	07:33 (9) 06:17 08:49 (9) 18:01	07:25 (9) 06:25 08:46 (9) 19:35	18:55 (7) 05:43 19:13 (7) 20:08	18:49 (8) 05:23 19:29 (8) 20:33
13	07:25 16:50	06:58 17:28	07:33 (9) 06:16 08:51 (9) 18:02	07:26 (9) 06:23 08:46 (9) 19:36	18:55 (7) 05:42 19:14 (7) 20:09	18:50 (8) 05:23 19:22 (8) 20:34
14	07:24 16:51	06:57 17:30	07:32 (9) 06:14 08:52 (9) 18:03	07:26 (9) 06:22 08:44 (9) 19:37	18:55 (7) 05:41 19:16 (7) 20:10	18:51 (8) 05:23 19:22 (8) 20:34
15	07:24 16:52	06:56 17:31	07:31 (9) 06:12 08:52 (9) 18:04	07:26 (9) 06:20 08:42 (9) 19:38	18:55 (7) 05:40 19:16 (7) 20:11	18:52 (8) 05:23 19:20 (8) 20:35
16	07:24 16:53	06:54 17:32	07:30 (9) 06:11 08:53 (9) 18:05	07:27 (9) 06:19 08:41 (9) 19:40	18:55 (7) 05:39 19:17 (7) 20:12	18:53 (8) 05:23 19:19 (8) 20:35
17	07:23 16:54	06:53 17:33	07:29 (9) 06:09 08:53 (9) 18:06	07:28 (9) 06:17 08:40 (9) 19:41	18:56 (7) 05:38 19:18 (8) 20:13	18:54 (8) 05:23 19:18 (8) 20:36
18	07:23 16:56	06:52 17:35	07:29 (9) 06:07 08:54 (9) 18:08	07:28 (9) 06:15 08:38 (9) 19:42	18:55 (8) 05:37 19:19 (8) 20:14	18:56 (8) 05:23 19:17 (8) 20:36
19	07:22 16:57	06:50 17:36	07:29 (9) 06:05 08:55 (9) 18:09	07:29 (9) 06:14 08:36 (9) 19:43	18:54 (8) 05:36 19:21 (8) 20:15	18:58 (8) 05:23 19:15 (8) 20:36
20	07:22 16:58	06:49 17:37	07:28 (9) 06:04 08:54 (9) 18:10	07:31 (9) 06:12 08:35 (9) 19:44	18:52 (8) 05:35 19:21 (8) 20:16	19:00 (8) 05:24 19:13 (8) 20:36
21	07:21 16:59	06:47 17:38	07:28 (9) 06:02 08:55 (9) 18:11	07:31 (9) 06:11 08:32 (9) 19:45	18:51 (8) 05:34 19:23 (8) 20:17	19:05 (8) 05:24 19:08 (8) 20:37
22	07:20 17:00	06:46 17:39	07:27 (9) 06:00 08:55 (9) 18:12	07:32 (9) 06:09 08:30 (9) 19:46	18:49 (8) 05:33 19:23 (8) 20:18	05:33 19:17 (8) 20:37
23	07:20 17:02	06:44 17:41	07:27 (9) 05:59 08:56 (9) 18:13	07:33 (9) 06:08 08:27 (9) 19:47	18:49 (8) 05:33 19:25 (8) 20:19	05:33 19:15 (8) 20:37
24	07:19 17:03	06:43 17:42	07:26 (9) 05:57 08:55 (9) 18:14	07:36 (9) 06:06 08:26 (9) 19:48	18:48 (8) 05:32 19:26 (8) 20:19	05:32 19:15 (8) 20:37
25	07:18 17:04	06:41 17:43	07:26 (9) 05:55 08:56 (9) 18:15	07:37 (9) 06:05 08:23 (9) 19:49	18:47 (8) 05:31 19:27 (8) 20:20	05:25 19:15 (8) 20:37
26	07:17 17:05	06:40 17:44	07:25 (9) 05:54 08:55 (9) 18:16	07:39 (9) 06:03 08:19 (9) 19:51	18:47 (8) 05:30 19:28 (8) 20:21	05:25 19:15 (8) 20:37
27	07:17 17:07	08:01 (9) 06:38 08:18 (9) 17:46	07:26 (9) 05:52 08:56 (9) 18:18	07:42 (9) 06:02 08:16 (9) 19:52	18:46 (8) 05:30 19:28 (8) 20:22	05:25 19:15 (8) 20:38
28	07:16 17:08	07:56 (9) 06:37 08:22 (9) 17:47	07:25 (9) 05:50 08:55 (9) 18:19	07:45 (9) 06:01 08:12 (9) 19:53	18:46 (8) 05:29 19:29 (8) 20:23	05:26 19:15 (8) 20:38
29	07:15 17:09	07:53 (9) 06:36 08:26 (9) 17:48	07:24 (9) 05:48 08:54 (9) 18:20	07:46 (9) 06:00 08:11 (9) 19:54	18:46 (8) 05:28 19:29 (8) 20:24	05:26 19:15 (8) 20:38
30	07:14 17:10	07:51 (9) 06:35 08:29 (9) 17:49	07:23 (9) 05:47 08:53 (9) 18:21	07:47 (9) 05:59 08:10 (9) 19:55	18:45 (8) 05:27 19:29 (8) 20:25	05:27 19:15 (8) 20:38
31	07:13 17:12	07:49 (9) 06:34 08:31 (9) 17:50	07:22 (9) 05:46 08:52 (9) 18:22	07:48 (9) 05:58 08:09 (9) 19:56	18:45 (8) 05:26 19:30 (8) 20:26	05:27 19:15 (8) 20:38
Potential sun hours	295	296	369	400	450	455
Total, worst case	156	2137	2009	665	680	57
Sun reduction	0,43	0,44	0,44	0,50	0,57	0,57
Oper. time red.	0,92	0,92	0,92	0,92	0,92	0,92
Wind dir. red.	0,77	0,77	0,77	0,70	0,70	0,70
Total reduction	0,31	0,31	0,32	0,32	0,37	0,37
Total, real	48	668	634	214	249	

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: AA - SHR_27

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

[July	[August	[September	[October	[November	[December	
1 05:27	05:52	18:59 (8) 06:23	18:54 (7) 06:54	08:05 (9) 06:30	07:05 (9) 07:05	
20:37	20:18	35 19:34 (8) 19:34	17 19:11 (7) 18:42	80 09:25 (9) 16:54	72 08:17 (9) 16:29	
2 05:28	05:53	18:58 (8) 06:24	18:54 (7) 06:56	08:04 (9) 06:31	07:06 (9) 07:06	
20:37	20:17	37 19:35 (8) 19:32	15 19:09 (7) 18:40	82 09:26 (9) 16:53	70 08:16 (9) 16:29	
3 05:28	05:54	18:58 (8) 06:25	18:55 (7) 06:57	08:03 (9) 06:32	07:07 (9) 07:08	
20:37	20:16	38 19:36 (8) 19:30	12 19:07 (7) 18:39	83 09:26 (9) 16:52	68 08:15 (9) 16:29	
4 05:29	05:55	18:57 (8) 06:27	18:55 (7) 06:58	08:02 (9) 06:33	07:08 (9) 07:09	
20:37	20:14	39 19:36 (8) 19:29	11 19:06 (7) 18:37	85 09:27 (9) 16:51	65 08:13 (9) 16:28	
5 05:29	05:56	18:56 (8) 06:28	18:56 (7) 06:59	08:01 (9) 06:35	07:10 (9) 07:10	
20:37	20:13	41 19:37 (8) 19:27	8 19:04 (7) 18:35	86 09:27 (9) 16:49	63 08:13 (9) 16:28	
6 05:30	05:57	18:56 (8) 06:29	18:57 (7) 07:00	08:00 (9) 06:36	07:11 (9) 07:11	
20:36	20:12	41 19:37 (8) 19:25	5 19:02 (7) 18:34	87 09:27 (9) 16:48	60 08:11 (9) 16:28	
7 05:31	05:58	18:55 (8) 06:30	19:00 (7) 07:01	08:00 (9) 06:37	07:12 (9) 07:11	
20:36	20:11	42 19:37 (8) 19:24	1 19:01 (7) 18:32	87 09:27 (9) 16:47	57 08:09 (9) 16:28	
8 05:31	05:59	18:55 (8) 06:31	07:02	07:59 (9) 06:38	07:15 (9) 07:12	
20:36	20:09	42 19:37 (8) 19:22	18:30	88 09:27 (9) 16:46	53 08:08 (9) 16:28	
9 05:32	06:00	18:55 (8) 06:32	07:03	07:59 (9) 06:39	07:16 (9) 07:13	
20:35	20:08	43 19:38 (8) 19:20	18:29	89 09:28 (9) 16:45	51 08:07 (9) 16:28	
10 05:33	06:01	18:54 (8) 06:33	07:04	07:59 (9) 06:41	07:18 (9) 07:14	
20:35	20:07	44 19:38 (8) 19:18	18:27	89 09:28 (9) 16:44	46 08:04 (9) 16:28	
11 05:33	06:02	18:54 (8) 06:34	07:05	07:58 (9) 06:42	07:21 (9) 07:15	
20:35	20:06	44 19:38 (8) 19:17	18:25	90 09:28 (9) 16:43	42 08:03 (9) 16:28	
12 05:34	06:03	18:54 (8) 06:35	07:06	07:58 (9) 06:43	07:23 (9) 07:16	
20:34	20:04	43 19:37 (8) 19:15	18:24	90 09:28 (9) 16:42	38 08:01 (9) 16:28	
13 05:35	06:04	18:54 (8) 06:36	07:08	07:58 (9) 06:44	07:25 (9) 07:17	
20:34	20:03	43 19:37 (8) 19:13	18:22	90 09:28 (9) 16:41	33 07:58 (9) 16:28	
14 05:35	06:05	18:54 (8) 06:37	08:41 (9) 07:09	07:57 (9) 06:46	07:29 (9) 07:17	
20:33	20:01	43 19:37 (8) 19:12	13 08:54 (9) 18:21	90 09:27 (9) 16:40	26 07:55 (9) 16:28	
15 05:36	06:06	18:54 (8) 06:38	08:35 (9) 07:10	07:57 (9) 06:47	07:34 (9) 07:18	
20:32	20:00	43 19:37 (8) 19:10	25 09:00 (9) 18:19	90 09:27 (9) 16:39	17 07:51 (9) 16:29	
16 05:37	06:07	18:54 (8) 06:39	08:31 (9) 07:11	07:58 (9) 06:48	07:19	
20:32	19:59	42 19:36 (8) 19:08	33 09:04 (9) 18:17	90 09:28 (9) 16:38	16:29	
17 05:38	06:08	18:54 (8) 06:40	08:28 (9) 07:12	07:58 (9) 06:49	07:20	
20:31	19:57	40 19:34 (8) 19:06	39 09:07 (9) 18:16	89 09:27 (9) 16:37	16:29	
18 05:39	06:09	18:54 (8) 06:41	08:25 (9) 07:13	07:57 (9) 06:50	07:20	
20:30	19:56	39 19:33 (8) 19:05	44 09:09 (9) 18:14	90 09:27 (9) 16:37	16:29	
19 05:40	06:10	18:54 (8) 06:42	08:22 (9) 07:14	07:57 (9) 06:52	07:21	
20:30	19:54	38 19:32 (8) 19:03	49 09:11 (9) 18:13	89 09:26 (9) 16:36	16:30	
20 05:40	06:11	18:55 (8) 06:43	08:20 (9) 07:15	07:57 (9) 06:53	07:22	
20:29	19:53	35 19:30 (8) 19:01	53 09:13 (9) 18:11	88 09:25 (9) 16:35	16:30	
21 05:41	06:12	18:55 (8) 06:44	08:18 (9) 07:17	07:58 (9) 06:54	07:22	
20:28	19:51	34 19:29 (8) 18:59	57 09:15 (9) 18:10	88 09:26 (9) 16:34	16:31	
22 05:42	06:13	18:56 (8) 06:45	08:16 (9) 07:18	07:58 (9) 06:55	07:23	
20:27	19:50	31 19:27 (8) 18:58	60 09:16 (9) 18:08	87 09:25 (9) 16:34	16:31	
23 05:43	19:13 (8) 06:14	18:57 (8) 06:46	08:14 (9) 07:19	07:59 (9) 06:56	07:23	
20:27	8 19:21 (8) 19:48	29 19:26 (8) 18:56	64 09:18 (9) 18:07	85 09:24 (9) 16:33	16:32	
24 05:44	19:10 (8) 06:15	18:58 (8) 06:47	08:13 (9) 07:20	07:59 (9) 06:58	07:24	
20:26	15 19:25 (8) 19:47	26 19:24 (8) 18:54	66 09:19 (9) 18:05	84 09:23 (9) 16:32	16:32	
25 05:45	19:08 (8) 06:16	18:59 (8) 06:48	08:11 (9) 06:21	07:00 (9) 06:59	07:24	
20:25	19 19:27 (8) 19:45	24 19:23 (8) 18:52	69 09:20 (9) 17:04	83 08:23 (9) 16:32	16:33	
26 05:46	19:05 (8) 06:17	18:58 (7) 06:49	08:10 (9) 06:23	07:00 (9) 07:00	07:24	
20:24	23 19:28 (8) 19:43	23 19:21 (8) 18:51	71 09:21 (9) 17:02	82 08:22 (9) 16:31	16:33	
27 05:47	19:04 (8) 06:18	18:57 (7) 06:50	08:09 (9) 06:24	07:01 (9) 07:01	07:25	
20:23	25 19:29 (8) 19:42	23 19:20 (7) 18:49	74 09:23 (9) 17:01	80 08:21 (9) 16:31	16:34	
28 05:48	19:03 (8) 06:19	18:57 (7) 06:51	08:08 (9) 06:25	07:01 (9) 07:02	07:25	
20:22	27 19:30 (8) 19:40	21 19:18 (7) 18:47	76 09:24 (9) 17:00	79 08:20 (9) 16:30	16:35	
29 05:49	19:02 (8) 06:20	18:56 (7) 06:52	08:07 (9) 06:26	07:02 (9) 07:03	07:25	
20:21	29 19:31 (8) 19:39	21 19:17 (7) 18:46	77 09:24 (9) 16:58	78 08:20 (9) 16:30	16:35	
30 05:50	19:01 (8) 06:21	18:56 (7) 06:53	08:06 (9) 06:27	07:03 (9) 07:04	07:26	
20:20	32 19:33 (8) 19:37	19 19:15 (7) 18:44	79 09:25 (9) 16:57	76 08:19 (9) 16:30	16:36	
31 05:51	19:00 (8) 06:22	18:55 (7)	06:29	07:04 (9)	07:26	
20:19	33 19:33 (8) 19:35	18 19:13 (7)	16:56	74 08:18 (9)	16:37	
Potential sun hours	461	429	375	345	296	285
Total, worst case	211	1081	1018	2648	761	
Sun reduction	0,68	0,68	0,61	0,52	0,47	
Oper. time red.	0,92	0,92	0,92	0,92	0,92	
Wind dir. red.	0,70	0,70	0,77	0,77	0,77	
Total reduction	0,44	0,44	0,43	0,37	0,33	
Total, real	93	474	437	984	254	

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	103 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AB - SHR_28

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 16:38	07:12 17:13	06:35 17:48	06:43 19:23	05:57 19:56	05:27 20:26	05:27 20:37	05:52 20:18	06:23 19:34	06:55 18:42	06:30 16:54	07:05 16:29
2	07:26 16:39	07:11 17:14	06:34 17:49	06:42 19:24	05:55 19:57	05:26 20:27	05:28 20:37	05:53 20:17	06:25 19:32	06:56 18:40	06:31 16:53	07:07 16:29
3	07:26 16:40	07:10 17:16	06:32 17:50	06:40 19:25	05:54 19:58	05:26 20:28	05:28 20:37	05:54 20:16	06:26 19:30	06:57 18:39	06:32 16:52	07:08 16:29
4	07:26 16:41	07:09 17:17	06:30 17:52	06:38 19:26	05:53 19:59	05:26 20:29	05:29 20:37	05:55 20:14	06:27 19:29	06:58 18:37	06:33 16:51	07:09 16:28
5	07:26 16:42	07:08 17:18	06:29 17:53	06:37 19:28	05:51 20:00	05:25 20:29	05:29 20:37	05:56 20:13	06:28 19:27	06:59 18:35	06:35 16:50	07:10 16:28
6	07:26 16:43	07:07 17:19	06:27 17:54	06:35 19:29	05:50 20:01	05:25 20:30	05:30 20:36	05:57 20:12	06:29 19:25	07:00 18:34	06:36 16:48	07:11 16:28
7	07:26 16:44	07:06 17:21	06:26 17:55	06:33 19:30	05:49 20:02	05:25 20:31	05:31 20:36	05:58 20:11	06:30 19:24	07:01 18:32	06:37 16:47	07:12 16:28
8	07:26 16:45	07:04 17:22	06:24 17:56	06:32 19:31	05:48 20:04	05:24 20:31	05:31 20:36	05:59 20:09	06:31 19:22	07:02 18:30	06:38 16:46	07:12 16:28
9	07:26 16:46	07:03 17:23	06:22 17:57	06:30 19:32	05:46 20:05	05:24 20:32	05:32 20:35	06:00 20:08	06:32 19:20	07:03 18:29	06:40 16:45	07:13 16:28
10	07:26 16:47	07:02 17:25	06:21 17:59	06:28 19:33	05:45 20:06	05:24 20:32	05:33 20:35	06:01 20:07	06:33 19:19	07:04 18:27	06:41 16:44	07:14 16:28
11	07:25 16:48	07:01 17:26	06:19 18:00	06:27 19:34	05:44 20:07	05:24 20:33	05:33 20:35	06:02 20:06	06:34 19:17	07:05 18:25	06:42 16:43	07:15 16:28
12	07:25 16:49	07:00 17:27	06:17 18:01	06:25 19:35	05:43 20:08	05:24 20:33	05:34 20:34	06:03 20:04	06:35 19:15	07:06 18:24	06:43 16:42	07:16 16:28
13	07:25 16:50	06:58 17:28	06:16 18:02	06:23 19:36	05:42 20:09	05:23 20:34	05:35 20:34	06:04 20:03	06:36 19:13	07:07 (9) 18:22	06:44 16:41	07:17 16:28
14	07:25 16:51	06:57 17:30	06:14 18:03	06:22 19:37	05:41 20:10	05:23 20:34	05:36 20:33	06:05 20:01	06:37 19:12	07:08 (9) 18:21	06:45 16:40	07:18 16:28
15	07:24 16:52	06:56 17:31	06:12 18:04	06:20 19:39	05:40 20:11	05:23 20:35	05:36 20:32	06:06 20:00	06:38 19:10	07:09 (9) 18:19	06:46 16:39	07:18 16:29
16	07:24 16:53	06:54 17:32	06:11 18:05	06:19 19:40	05:39 20:12	05:23 20:35	05:37 20:32	06:07 19:59	06:39 19:08	07:10 (9) 18:17	06:47 16:38	07:19 16:29
17	07:23 16:54	06:53 17:33	06:09 18:07	06:17 19:41	05:38 20:13	05:23 20:36	05:38 20:31	06:08 19:57	06:40 19:06	07:11 (9) 18:16	06:48 16:37	07:20 16:29
18	07:23 16:56	06:52 17:35	06:07 18:08	06:16 19:42	05:37 20:14	05:23 20:36	05:39 20:31	06:09 19:56	06:41 19:05	07:12 (9) 18:14	06:49 16:37	07:20 16:29
19	07:22 16:57	06:50 17:36	06:06 18:09	06:14 19:43	05:36 20:15	05:24 20:36	05:40 20:30	06:10 19:54	06:42 19:03	07:13 (9) 18:13	06:50 16:36	07:21 16:30
20	07:22 16:58	06:49 17:37	06:04 18:10	06:12 19:44	05:35 20:16	05:24 20:37	05:40 20:29	06:11 19:53	06:43 19:01	07:14 (9) 18:11	06:51 16:35	07:22 16:30
21	07:21 16:59	06:47 17:38	06:02 18:11	06:11 19:45	05:34 20:17	05:24 20:37	05:41 20:28	06:12 19:51	06:44 18:59	07:15 (9) 18:10	06:52 16:34	07:22 16:31
22	07:20 17:00	06:46 17:40	06:00 18:12	06:09 19:46	05:33 20:18	05:24 20:37	05:42 20:27	06:13 19:50	06:45 18:58	07:16 (9) 18:08	06:53 16:34	07:23 16:31
23	07:20 17:02	06:44 17:41	05:59 18:13	06:08 19:47	05:33 20:19	05:24 20:37	05:43 20:27	06:14 19:48	06:46 18:56	07:17 (9) 18:07	06:54 16:33	07:23 16:32
24	07:19 17:03	06:43 17:42	05:57 18:14	06:07 19:48	05:32 20:20	05:25 20:37	05:44 20:26	06:15 19:47	06:47 18:54	07:18 (9) 18:05	06:55 16:32	07:24 16:32
25	07:18 17:04	06:41 17:43	05:55 18:15	06:05 19:49	05:31 20:20	05:25 20:37	05:45 20:25	06:16 19:45	06:48 18:53	07:19 (9) 18:04	06:56 16:32	07:24 16:33
26	07:17 17:05	06:40 17:44	05:54 18:17	06:12 19:51	05:30 20:21	05:25 20:38	05:46 20:24	06:17 19:43	06:49 18:51	07:20 (9) 18:03	06:57 16:31	07:24 16:33
27	07:17 17:07	06:38 17:46	05:52 18:18	06:13 19:52	05:30 20:22	05:25 20:38	05:47 20:23	06:18 19:42	06:50 18:49	07:21 (9) 18:02	06:58 16:31	07:25 16:34
28	07:16 17:08	06:37 17:47	05:50 18:19	06:13 19:53	05:29 20:23	05:26 20:38	05:48 20:22	06:19 19:40	06:51 18:47	07:22 (9) 18:01	06:59 16:30	07:25 16:35
29	07:15 17:09	06:48 18:19	06:48 19:20	07:14 (9) 19:54	05:59 20:24	05:26 20:38	05:49 20:21	06:20 19:39	06:52 18:46	07:23 (9) 18:00	07:00 16:30	07:25 16:36
30	07:14 17:10	06:47 19:21	06:47 19:21	07:15 (9) 19:55	05:58 20:25	05:27 20:38	05:50 20:20	06:21 19:37	06:53 18:44	07:24 (9) 18:00	07:01 16:30	07:26 16:36
31	07:13 17:12	06:45 19:22	06:45 19:22	07:20 (9) 19:55	05:57 20:26	05:27 20:38	05:51 20:19	06:22 19:35	06:54 18:44	07:25 (9) 18:00	07:02 16:30	07:26 16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	285
Total, worst case			220						222			
Sun reduction			0,44						0,61			
Oper. time red.			0,92						0,92			
Wind dir. red.			0,65						0,65			
Total reduction			0,26						0,36			
Total, real			58						80			

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

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

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	104 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AC - SHR_29

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December						
1	07:26	12:05 (10)	07:12	06:35	06:43	05:57	05:27	05:27	05:52	06:24	06:55	06:30	07:05	11:56 (10)				
	16:38	95	13:40 (10)	17:13	17:48	19:23	19:56	20:26	20:37	20:18	19:34	18:42	16:55	16:29	86	13:22 (10)		
2	07:26	12:06 (10)	07:11	06:34	06:42	05:55	05:27	05:28	05:53	06:25	06:56	06:31	07:07	11:57 (10)				
	16:39	95	13:41 (10)	17:14	17:49	19:24	19:57	20:27	20:37	20:17	19:32	18:41	16:53	16:29	87	13:24 (10)		
3	07:26	12:07 (10)	07:10	06:32	06:40	05:54	05:26	05:28	05:54	06:26	06:57	06:32	07:08	11:56 (10)				
	16:40	94	13:41 (10)	17:16	17:50	19:25	19:58	20:28	20:37	20:16	19:30	18:39	16:52	16:29	89	13:25 (10)		
4	07:26	12:08 (10)	07:09	06:31	06:38	05:53	05:26	05:29	05:55	06:27	06:58	06:33	07:09	11:56 (10)				
	16:41	93	13:41 (10)	17:17	17:52	19:26	19:59	20:29	20:37	20:14	19:29	18:37	16:51	16:29	90	13:26 (10)		
5	07:26	12:08 (10)	07:08	06:29	06:37	05:51	05:25	05:29	05:56	06:28	06:59	06:35	07:10	11:56 (10)				
	16:42	93	13:41 (10)	17:18	17:53	19:28	20:00	20:29	20:37	20:13	19:27	18:35	16:50	16:28	91	13:27 (10)		
6	07:26	12:10 (10)	07:07	06:27	06:35	05:50	05:25	05:30	05:57	06:29	07:00	06:36	07:11	11:56 (10)				
	16:43	91	13:41 (10)	17:19	17:54	19:29	20:01	20:30	20:36	20:12	19:25	18:34	16:48	16:28	91	13:27 (10)		
7	07:26	12:11 (10)	07:06	06:26	06:33	05:49	05:25	05:31	05:58	06:30	07:01	06:37	07:12	11:56 (10)				
	16:44	91	13:42 (10)	17:21	17:55	19:30	20:03	20:31	20:36	20:11	19:24	18:32	16:47	16:28	92	13:28 (10)		
8	07:26	12:11 (10)	07:05	06:24	06:32	05:48	05:24	05:31	05:59	06:31	07:02	06:38	07:12	11:56 (10)				
	16:45	90	13:41 (10)	17:22	17:56	19:31	20:04	20:31	20:36	20:10	19:22	18:30	16:46	16:28	93	13:29 (10)		
9	07:26	12:12 (10)	07:03	06:22	06:30	05:47	05:24	05:32	06:00	06:32	07:03	06:40	07:13	11:55 (10)				
	16:46	89	13:41 (10)	17:23	17:57	19:32	20:05	20:32	20:35	20:08	19:20	18:29	16:45	16:28	94	13:29 (10)		
10	07:26	12:13 (10)	07:02	06:21	06:28	05:45	05:24	05:33	06:01	06:33	07:04	06:41	07:14	11:55 (10)				
	16:47	88	13:41 (10)	17:25	17:59	19:33	20:06	20:32	20:35	20:07	19:19	18:27	16:44	16:28	95	13:30 (10)		
11	07:26	12:14 (10)	07:01	06:19	06:27	05:44	05:24	05:33	06:02	06:34	07:05	06:42	07:15	11:55 (10)				
	16:48	86	13:40 (10)	17:26	18:00	19:34	20:07	20:33	20:35	20:06	19:17	18:25	16:43	16:28	96	13:31 (10)		
12	07:25	12:15 (10)	07:00	06:17	06:25	05:43	05:24	05:34	06:03	06:35	07:07	06:43	07:16	11:56 (10)				
	16:49	85	13:40 (10)	17:27	18:01	19:35	20:08	20:33	20:34	20:04	19:15	18:24	16:42	16:28	95	13:31 (10)		
13	07:25	12:17 (10)	06:58	06:16	06:24	05:42	05:24	05:35	06:04	06:36	07:08	06:44	07:17	11:56 (10)				
	16:50	83	13:40 (10)	17:28	18:02	19:36	20:09	20:34	20:34	20:03	19:13	18:22	16:41	16:28	96	13:32 (10)		
14	07:25	12:18 (10)	06:57	06:14	06:22	05:41	05:23	05:36	06:05	06:37	07:09	06:46	07:18	11:56 (10)				
	16:51	82	13:40 (10)	17:30	18:03	19:37	20:10	20:34	20:33	20:02	19:12	18:21	16:40	19	12:48 (10)	16:28	97	13:33 (10)
15	07:24	12:20 (10)	06:56	06:12	06:20	05:40	05:23	05:36	06:06	06:38	07:10	06:47	07:18	11:56 (10)				
	16:52	80	13:40 (10)	17:31	18:04	19:39	20:11	20:35	20:32	20:00	19:10	18:19	16:39	31	12:54 (10)	16:29	97	13:33 (10)
16	07:24	12:21 (10)	06:54	06:11	06:19	05:39	05:23	05:37	06:07	06:39	07:11	06:48	07:19	11:57 (10)				
	16:53	78	13:39 (10)	17:32	18:05	19:40	20:12	20:35	20:32	19:59	19:08	18:17	16:38	40	12:58 (10)	16:29	97	13:34 (10)
17	07:23	12:23 (10)	06:53	06:09	06:17	05:38	05:23	05:38	06:08	06:40	07:12	06:49	07:20	11:57 (10)				
	16:55	75	13:38 (10)	17:33	18:07	19:41	20:13	20:36	20:31	19:57	19:06	18:16	16:37	47	13:02 (10)	16:29	98	13:35 (10)
18	07:23	12:24 (10)	06:52	06:07	06:16	05:37	05:24	05:39	06:09	06:41	07:13	06:51	07:21	11:57 (10)				
	16:56	73	13:37 (10)	17:35	18:08	19:42	20:14	20:36	20:31	19:58	19:05	18:14	16:37	52	13:04 (10)	16:30	98	13:35 (10)
19	07:22	12:26 (10)	06:50	06:06	06:14	05:36	05:24	05:40	06:10	06:42	07:14	06:52	07:21	11:58 (10)				
	16:57	70	13:36 (10)	17:36	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	16:36	57	13:06 (10)	16:30	98	13:36 (10)
20	07:22	12:28 (10)	06:49	06:04	06:13	05:35	05:24	05:41	06:11	06:43	07:16	06:53	07:22	11:58 (10)				
	16:58	68	13:36 (10)	17:37	18:10	19:44	20:16	20:37	20:29	19:53	19:01	18:11	16:35	61	13:08 (10)	16:30	98	13:36 (10)
21	07:21	12:30 (10)	06:47	06:02	06:11	05:34	05:24	05:41	06:12	06:44	07:17	06:54	07:22	11:58 (10)				
	16:59	64	13:34 (10)	17:38	18:11	19:45	20:17	20:37	20:28	19:51	19:00	18:10	16:34	64	13:10 (10)	16:31	99	13:37 (10)
22	07:20	12:32 (10)	06:46	06:00	06:09	05:34	05:24	05:42	06:13	06:45	07:18	06:55	07:23	11:58 (10)				
	17:01	61	13:33 (10)	17:40	18:12	19:46	20:18	20:37	20:28	19:50	18:58	18:08	16:34	68	13:12 (10)	16:31	99	13:37 (10)
23	07:20	12:35 (10)	06:44	05:59	06:08	05:33	05:24	05:43	06:14	06:46	07:19	06:57	07:23	12:00 (10)				
	17:02	57	13:32 (10)	17:41	18:13	19:47	20:19	20:37	20:27	19:48	18:56	18:07	16:33	70	13:13 (10)	16:32	98	13:38 (10)
24	07:19	12:38 (10)	06:43	05:57	06:07	05:32	05:25	05:44	06:15	06:47	07:20	06:58	07:24	12:00 (10)				
	17:03	52	13:30 (10)	17:42	18:14	19:48	20:20	20:37	20:26	19:47	18:54	18:05	16:33	73	13:14 (10)	16:32	98	13:38 (10)
25	07:18	12:41 (10)	06:41	05:55	06:05	05:31	05:25	05:45	06:16	06:48	07:21	06:59	07:24	12:01 (10)				
	17:04	47	13:28 (10)	17:43	18:15	19:50	20:20	20:37	20:25	19:45	18:53	17:04	16:32	75	13:16 (10)	16:33	98	13:39 (10)
26	07:17	12:45 (10)	06:40	05:54	06:04	05:31	05:25	05:46	06:17	06:49	07:23	07:00	07:24	12:01 (10)				
	17:05	40	13:25 (10)	17:44	18:17	19:51	20:21	20:38	20:24	19:44	18:51	17:03	16:31	78	13:18 (10)	16:34	98	13:39 (10)
27	07:17	12:50 (10)	06:38	05:52	06:02	05:30	05:26	05:47	06:18	06:50	07:24	07:01	07:25	12:01 (10)				
	17:07	31	13:21 (10)	17:46	18:18	19:52	20:22	20:38	20:23	19:42	18:49	17:01	16:31	80	13:19 (10)	16:34	98	13:39 (10)
28	07:16	12:57 (10)	06:37	05:50	06:01	05:29	05:26	05:48	06:19	06:51	07:25	07:02	07:25	12:02 (10)				
	17:08	18	13:15 (10)	17:47	18:19	19:53	20:23	20:38	20:22	19:40	18:47	17:00	16:30	82	13:20 (10)	16:35	97	13:39 (10)
29	07:15	12:59 (10)	06:36	05:49	05:59	05:29	05:26	05:49	06:20	06:52	07:26	07:03	07:25	12:03 (10)				
	17:09		19:20	19:54	20:24	20:38	20:21	19:39	18:46	16:58	16:30	83	13:20 (10)	16:36	97	13:40 (10)		
30	07:14	12:59 (10)	06:35	05:48	05:58	05:28	05:27	05:50	06:21	06:53	07:27	07:04	07:26	12:04 (10)				
	17:11		19:21	19:55	20:25	20:38	20:20	19:37	18:44	16:57	16:30	84	13:21 (10)	16:36	96	13:40 (10)		
31	07:13	12:59 (10)	06:34	05:47	05:57	05:27	05:26	05:49	06:20	06:52	07:26	07:03	07:26	12:04 (10)				
	17:12		19:22	19:56	20:26	20:38	20:19	19:35	18:42	16:56	16:30	84	13:21 (10)	16:37	96	13:40 (10)		
Potential sun hours	295		296	369	400	450	455	461	429	375	345	296	286					
Total, worst case	2069											1064		2952				
Sun reduction	0,43											0,47		0,41				
Oper. time red.	0,92											0,92		0,92				
Wind dir. red.	0,57											0,57		0,57				
Total reduction	0,23											0,25		0,22				
Total, real	467											262		639				

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

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

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AD - SHR_30

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26 16:38	07:12 17:13	06:35 17:48	06:43 19:23	05:57 19:56	05:27 20:26	05:27 20:37	05:52 20:18	06:23 19:34	06:54 18:42	06:30 16:54	07:05 16:29
2	07:26 16:39	07:11 17:14	06:34 17:49	06:42 19:24	05:55 19:57	05:26 20:27	05:28 20:37	05:53 20:17	06:24 19:32	06:55 18:40	06:31 16:53	07:06 16:29
3	07:26 16:40	07:10 17:15	06:32 17:50	06:40 19:25	05:54 19:58	05:26 20:28	05:28 20:37	05:54 20:15	06:25 19:30	06:57 18:39	06:32 16:52	07:07 16:29
4	07:26 16:41	07:09 17:17	06:30 17:51	06:38 19:26	05:53 19:59	05:26 20:28	05:29 20:37	05:55 20:14	06:26 19:29	06:58 18:37	06:33 16:51	07:08 16:28
5	07:26 16:42	07:08 17:18	06:29 17:53	06:37 19:27	05:51 20:00	05:25 20:29	05:29 20:37	05:56 20:13	06:28 19:27	06:59 18:35	06:35 16:49	07:09 16:28
6	07:26 16:43	07:07 17:19	06:27 17:54	06:35 19:29	05:50 20:01	05:25 20:30	05:30 20:36	05:57 20:12	06:29 19:25	07:00 18:34	06:36 16:48	07:10 16:28
7	07:26 16:44	07:06 17:21	06:26 17:55	06:33 19:30	05:49 20:02	05:25 20:30	05:31 20:36	05:58 20:11	06:30 19:24	07:01 18:32	06:37 16:47	07:11 16:28
8	07:26 16:45	07:04 17:22	06:24 17:56	06:32 19:31	05:48 20:03	05:24 20:31	05:31 20:36	05:59 20:09	06:31 19:22	07:02 18:30	06:38 16:46	07:12 16:28
9	07:26 16:46	07:03 17:23	06:22 17:57	06:30 19:32	05:46 20:04	05:24 20:32	05:32 20:35	06:00 20:08	06:32 19:20	07:03 18:29	06:39 16:45	07:13 16:28
10	07:26 16:47	07:02 17:24	06:21 17:58	06:28 19:33	05:45 20:06	05:24 20:32	05:33 20:35	06:01 20:07	06:33 19:18	07:04 18:27	06:41 16:44	07:14 16:28
11	07:25 16:48	07:01 17:26	06:19 18:00	06:27 19:34	05:44 20:07	05:24 20:33	05:33 20:34	06:02 20:05	06:34 19:17	07:05 18:25	06:42 16:43	07:15 16:28
12	07:25 16:49	06:59 17:27	06:17 18:01	06:25 19:35	05:43 20:08	05:23 20:33	05:34 20:34	06:03 20:04	06:35 19:15	07:06 18:24	06:43 16:42	07:16 16:28
13	07:25 16:50	06:58 17:28	06:16 18:02	06:23 19:36	05:42 20:09	05:23 20:34	05:35 20:33	06:04 20:03	06:36 19:13	07:07 18:22	06:44 16:41	07:17 16:28
14	07:24 16:51	06:57 17:30	06:14 18:03	06:22 19:37	05:41 20:10	05:23 20:34	05:35 20:33	06:05 20:01	06:37 19:12	07:09 18:20	06:46 16:40	07:17 16:28
15	07:24 16:52	06:56 17:31	06:12 18:04	06:20 19:38	05:40 20:11	05:23 20:35	05:36 20:32	06:06 20:00	06:38 19:10	07:10 18:19	06:47 16:39	07:18 16:29
16	07:24 16:53	06:54 17:32	06:11 18:05	06:19 19:39	05:39 20:12	05:23 20:35	05:37 20:32	06:07 19:58	06:39 19:08	07:11 18:17	06:48 16:38	07:19 16:29
17	07:23 16:54	06:53 17:33	06:09 18:06	06:17 19:41	05:38 20:13	05:23 20:35	05:38 20:31	06:08 19:57	06:40 19:06	07:12 18:16	06:49 16:37	07:20 16:29
18	07:23 16:56	06:51 17:35	06:07 18:08	06:15 19:42	05:37 20:14	05:23 20:36	05:39 20:30	06:09 19:56	06:41 19:05	07:13 18:14	06:50 16:37	07:20 16:29
19	07:22 16:57	06:50 17:36	06:05 18:09	06:14 19:43	05:36 20:15	05:23 20:36	05:40 20:30	06:10 19:54	06:42 19:03	07:14 18:13	06:52 16:36	07:21 16:30
20	07:21 16:58	06:49 17:37	06:04 18:10	06:12 19:44	05:35 20:16	05:24 20:36	05:40 20:29	06:11 19:53	06:43 19:01	07:15 18:11	06:53 16:35	07:21 16:30
21	07:21 16:59	06:47 17:38	06:02 18:11	06:11 19:45	05:34 20:17	05:24 20:37	05:41 20:28	06:12 19:51	06:44 18:59	07:17 18:10	06:54 16:34	07:22 16:31
22	07:20 17:00	06:46 17:39	06:00 18:12	06:09 19:46	05:33 20:18	05:24 20:37	05:42 20:27	06:13 19:50	06:45 18:58	07:18 18:08	06:55 16:34	07:23 16:31
23	07:20 17:02	06:44 17:41	05:59 18:13	06:08 19:47	05:33 20:18	05:24 20:37	05:43 20:26	06:14 19:48	06:46 18:56	07:19 18:07	06:56 16:33	07:23 16:32
24	07:19 17:03	06:43 17:42	05:57 18:14	06:06 19:48	05:32 20:19	05:24 20:37	05:44 20:26	06:15 19:46	06:47 18:54	07:20 18:05	06:57 16:32	07:23 16:32
25	07:18 17:04	06:41 17:43	05:55 18:15	06:05 19:49	05:31 20:20	05:25 20:37	05:45 20:25	06:16 19:45	06:48 18:52	07:21 17:04	06:59 16:32	07:24 16:33
26	07:17 17:05	06:40 17:44	05:53 18:16	06:03 19:50	05:30 20:21	05:25 20:37	05:46 20:24	06:17 19:43	06:49 18:51	07:22 17:02	07:00 16:31	07:24 16:33
27	07:16 17:07	06:38 17:46	05:52 18:18	06:02 19:52	05:30 20:22	05:25 20:37	05:47 20:23	06:18 19:42	06:50 18:49	07:24 17:01	07:01 16:31	07:25 16:34
28	07:16 17:08	06:37 17:47	05:50 18:19	06:01 19:53	05:29 20:23	05:26 20:37	05:48 20:22	06:19 19:40	06:51 18:47	07:25 17:00	07:02 16:30	07:25 16:35
29	07:15 17:09	06:36 17:48	05:49 18:20	06:00 19:54	05:28 20:24	05:26 20:37	05:49 20:21	06:20 19:39	06:52 18:45	07:26 16:58	07:03 16:30	07:25 16:35
30	07:14 17:10	06:35 17:49	05:48 18:21	05:59 19:55	05:28 20:25	05:27 20:37	05:50 20:20	06:21 19:37	06:53 18:44	07:27 16:57	07:04 16:30	07:25 16:36
31	07:13 17:12	06:34 17:50	05:47 18:22	05:58 19:56	05:27 20:26	05:27 20:37	05:51 20:19	06:22 19:35	06:54 18:43	07:28 16:56	07:05 16:30	07:26 16:37
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	286
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	106 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AE - SHR_31

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December	
1 07:26	15:02 (16)	07:12	06:35	06:43	05:56	05:27	05:27	05:52	06:23	06:54	06:30	07:05	14:56 (16)
2 16:38	43 15:55 (15)	17:13	17:48	19:23	19:56	20:26	20:37	20:18	19:34	18:42	16:54	16:29	18 15:14 (16)
3 16:39	39 15:03 (16)	07:11	06:34	06:42	05:55	05:26	05:28	05:53	06:24	06:55	06:31	07:06	14:55 (16)
4 16:40	32 15:54 (15)	17:14	17:49	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16:53	16:29	21 15:16 (16)
5 07:26	15:04 (16)	07:10	06:32	06:40	05:54	05:26	05:28	05:54	06:25	06:57	06:32	07:07	14:54 (16)
6 16:40	32 15:36 (16)	17:15	17:50	19:25	19:58	20:28	20:37	20:15	19:30	18:39	16:52	16:29	23 15:17 (16)
7 07:26	15:05 (16)	07:09	06:30	06:38	05:53	05:26	05:29	05:55	06:26	06:58	06:33	07:08	14:53 (16)
8 16:41	31 15:36 (16)	17:17	17:51	19:26	19:59	20:28	20:37	20:14	19:29	18:37	16:51	16:28	26 15:19 (16)
9 07:26	15:06 (16)	07:08	06:29	06:37	05:51	05:25	05:29	05:56	06:28	06:59	06:34	07:09	14:53 (16)
10 16:42	30 15:36 (16)	17:18	17:53	19:27	20:00	20:29	20:37	20:13	19:27	18:35	16:49	16:28	27 15:20 (16)
11 07:26	15:07 (16)	07:07	06:27	06:35	05:50	05:25	05:30	05:57	06:29	07:00	06:36	07:10	14:52 (16)
12 16:43	29 15:36 (16)	17:19	17:54	19:29	20:01	20:30	20:36	20:12	19:25	18:34	16:48	16:28	29 15:21 (16)
13 07:26	15:08 (16)	07:05	06:25	06:33	05:49	05:25	05:31	05:58	06:30	07:01	06:37	07:11	14:52 (16)
14 16:44	27 15:35 (16)	17:21	17:55	19:30	20:02	20:30	20:36	20:11	19:24	18:32	16:47	16:28	30 15:22 (16)
15 07:26	15:09 (16)	07:04	06:24	06:32	05:48	05:24	05:31	05:59	06:31	07:02	06:38	07:12	14:52 (16)
16 16:45	26 15:35 (16)	17:22	17:56	19:31	20:03	20:31	20:36	20:09	19:22	18:30	16:46	16:28	31 15:23 (16)
17 07:26	15:11 (16)	07:03	06:22	06:30	05:46	05:24	05:32	06:00	06:32	07:03	06:39	07:13	14:52 (16)
18 16:46	23 15:34 (16)	17:23	17:57	19:32	20:04	20:32	20:35	20:08	19:20	18:29	16:45	16:28	32 15:24 (16)
19 07:26	15:13 (16)	07:02	06:21	06:28	05:45	05:24	05:33	06:01	06:33	07:04	06:41	07:14	14:52 (16)
20 16:47	21 15:34 (16)	17:24	17:58	19:33	20:06	20:32	20:35	20:07	19:18	18:27	16:44	16:28	39 15:43 (15)
21 07:25	15:14 (16)	07:01	06:19	06:27	05:44	05:24	05:33	06:02	06:34	07:05	06:42	07:15	14:52 (16)
22 16:48	18 15:32 (16)	17:26	18:00	19:34	20:07	20:33	20:34	20:05	19:17	18:25	16:43	16:28	43 15:45 (15)
23 07:25	15:17 (16)	06:59	06:17	06:25	05:43	05:23	05:34	06:03	06:35	07:06	06:43	07:16	14:52 (16)
24 16:49	14 15:31 (16)	17:27	18:01	19:35	20:08	20:33	20:34	20:04	19:15	18:24	16:42	16:28	45 15:46 (15)
25 07:25	15:19 (16)	06:58	06:16	06:23	05:42	05:23	05:35	06:04	06:36	07:07	06:44	07:17	14:53 (16)
26 16:50	9 15:28 (16)	17:28	18:02	19:36	20:09	20:34	20:35	20:03	19:13	18:22	16:41	16:28	46 15:47 (15)
27 07:24	15:20 (16)	06:57	06:14	06:22	05:41	05:23	05:35	06:05	06:37	07:09	06:45	07:17	14:52 (16)
28 16:51	17:30	18:03	19:37	20:10	20:34	20:33	20:01	19:12	18:20	16:40	16:28	49 15:48 (15)	
29 07:24	15:24 (16)	06:56	06:12	06:20	05:40	05:23	05:36	06:06	06:38	07:10	06:47	07:18	14:53 (16)
30 16:52	17:31	18:04	19:38	20:11	20:35	20:32	20:00	19:10	18:19	16:39	16:29	50 15:49 (15)	
31 07:24	15:24 (16)	06:54	06:11	06:19	05:39	05:23	05:37	06:07	06:39	07:11	06:48	07:19	14:53 (16)
32 16:53	17:32	18:05	19:39	20:12	20:35	20:32	19:58	19:08	18:17	16:38	16:29	51 15:50 (15)	
33 07:23	15:27 (16)	06:53	06:09	06:17	05:38	05:23	05:38	06:08	06:40	07:12	06:49	07:20	14:53 (16)
34 16:54	17:33	18:06	19:41	20:13	20:35	20:31	19:57	19:06	18:16	16:37	16:29	52 15:50 (15)	
35 07:23	15:28 (16)	06:51	06:07	06:15	05:37	05:23	05:39	06:09	06:41	07:13	06:50	07:20	14:54 (16)
36 16:56	17:35	18:08	19:42	20:14	20:36	20:30	19:56	19:05	18:14	16:37	16:29	52 15:51 (15)	
37 07:22	15:29 (16)	06:50	06:05	06:14	05:36	05:23	05:40	06:10	06:42	07:14	06:52	07:21	14:54 (16)
38 16:57	17:36	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	16:36	16:30	54 15:52 (15)	
39 07:21	15:30 (16)	06:49	06:04	06:12	05:35	05:24	05:40	06:11	06:43	07:15	06:53	07:21	14:54 (16)
40 16:58	17:37	18:10	19:44	20:16	20:36	20:30	19:53	19:01	18:11	16:35	16:30	54 15:52 (15)	
41 07:21	15:31 (16)	06:47	06:02	06:11	05:34	05:24	05:41	06:12	06:44	07:17	06:54	07:22	14:55 (16)
42 16:59	17:38	18:11	19:45	20:17	20:37	20:28	19:51	18:59	18:10	16:34	16:31	54 15:53 (15)	
43 07:20	15:32 (16)	06:46	06:00	06:09	05:33	05:24	05:42	06:13	06:45	07:18	06:55	07:23	14:55 (16)
44 17:00	17:39	18:12	19:46	20:18	20:37	20:27	19:50	18:58	18:08	16:34	16:31	54 15:53 (15)	
45 07:20	15:33 (16)	06:44	06:09	06:08	05:33	05:24	05:43	06:14	06:46	07:19	06:56	07:23	14:56 (16)
46 17:02	17:41	18:13	19:47	20:18	20:37	20:26	19:48	18:56	18:07	16:33	16:32	54 15:54 (15)	
47 07:19	15:34 (16)	06:43	06:07	06:06	05:32	05:24	05:44	06:15	06:47	07:20	06:57	07:23	14:56 (16)
48 17:03	17:42	18:14	19:48	20:19	20:37	20:26	19:46	18:54	18:05	16:32	16:32	54 15:54 (15)	
49 07:18	15:35 (16)	06:41	06:05	06:05	05:31	05:25	05:45	06:16	06:48	07:21	06:59	07:24	14:56 (16)
50 17:04	17:43	18:15	19:49	20:20	20:37	20:25	19:45	18:52	17:04	16:32	16:33	53 15:54 (15)	
51 07:17	15:36 (16)	06:40	06:03	06:03	05:30	05:25	05:46	06:17	06:49	07:22	07:00	07:24	14:58 (16)
52 17:05	17:44	18:16	19:50	20:21	20:37	20:24	19:43	18:51	17:02	16:31	16:31	52 15:55 (15)	
53 07:16	15:37 (16)	06:38	06:02	06:02	05:30	05:25	05:47	06:18	06:50	07:24	07:01	07:25	14:58 (16)
54 17:07	17:46	18:18	19:51	20:22	20:37	20:23	19:42	18:49	17:01	16:31	16:34	52 15:55 (15)	
55 07:16	15:38 (16)	06:37	06:01	06:01	05:29	05:26	05:48	06:19	06:51	07:25	07:02	07:25	14:58 (16)
56 17:08	17:47	18:19	19:53	20:23	20:37	20:22	19:40	18:47	17:00	16:30	16:30	51 15:55 (15)	
57 07:15	15:39 (16)	06:48	06:09	06:08	05:35	05:26	05:49	06:20	06:52	07:26	07:03	07:25	14:59 (16)
58 17:09	17:48	18:20	19:54	20:24	20:37	20:21	19:39	18:45	16:58	16:30	9 15:00 (16)	07:25	49 15:55 (15)
59 07:14	15:40 (16)	06:47	06:08	06:08	05:35	05:27	05:50	06:21	06:53	07:27	07:04	07:25	15:00 (16)
60 17:10	17:49	19:21	19:55	20:25	20:37	20:20	19:37	18:44	16:57	16:30	14 15:12 (16)	07:26	48 15:55 (15)
61 07:13	15:41 (16)	06:45	06:05	06:05	05:32	05:27	05:51	06:22	06:54	07:28	07:05	07:26	15:01 (16)
62 17:12	17:48	19:22	19:56	20:25	20:37	20:19	19:35	18:42	16:56	16:30	16:37	46 15:55 (15)	
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	286	
Total, worst case	342										23	1339	
Sun reduction	0,43										0,47	0,41	
Oper. time red.	0,92										0,92	0,92	
Wind dir. red.	0,42										0,42	0,42	
Total reduction	0,17										0,18	0,16	
Total, real	57										4	214	

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	107 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AF - SHR_32

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
1.079	389	87	129	649	1.026	640	444	322	284	1.158	1.812	8.020

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

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



RELAZIONE DI FLICKERING

CODICE	EO.APR01.PD.SF.SIA.01
REVISIONE n.	00
DATA REVISIONE	12/2021
PAGINA	108 di 120

SHADOW - Calendar

Calculation: Wind Farm Apricena - Project Shadow receptor: AG - SHR 33

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
1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December	
1 07:26		07:12	16:09 (16)	06:35	06:43	05:56	05:27	05:27	05:52	06:23	06:54	15:38 (16)	07:05
16:38		17:13	16:49 (16)	17:48	19:23	19:56	20:26	20:27	20:18	19:34	18:42	16:54	16:23 (16)
2 07:26		07:11	16:09 (16)	06:34	06:42	05:55	05:26	05:28	05:53	06:24	06:55	15:39 (16)	07:06
16:39		17:14	16:50 (16)	17:49	19:24	19:57	20:27	20:37	20:17	19:32	18:40	16:53	16:23 (16)
3 07:26		07:10	16:09 (16)	06:32	06:40	05:54	05:26	05:28	05:54	06:25	06:57	15:39 (16)	07:07
16:40		17:15	16:51 (16)	17:50	19:25	19:58	20:28	20:37	20:15	19:30	18:39	16:52	16:23 (16)
4 07:26		07:09	16:09 (16)	06:30	06:38	05:53	05:28	05:29	05:55	06:26	06:58	15:38 (16)	07:08
16:41		17:17	16:53 (16)	17:51	19:26	19:59	20:28	20:37	20:14	19:29	18:37	16:51	16:23 (16)
5 07:26		07:08	16:09 (16)	06:29	06:37	05:51	05:25	05:29	05:56	06:27	06:59	15:39 (16)	07:09
16:42		17:18	16:53 (16)	17:53	19:27	20:00	20:29	20:36	20:13	19:27	18:35	16:49	16:23 (16)
6 07:26		07:07	16:09 (16)	06:27	06:35	05:50	05:25	05:30	05:57	06:29	07:00	16:49	16:23 (16)
16:43		17:19	16:54 (16)	17:54	19:28	20:01	20:30	20:36	20:12	19:25	18:34	16:48	16:23 (16)
7 07:26		07:05	16:08 (16)	06:25	06:33	05:49	05:25	05:31	05:58	06:30	07:01	16:47	16:23 (16)
16:44		17:21	16:53 (16)	17:55	19:30	20:02	20:30	20:36	20:11	19:24	18:32	16:43	16:23 (16)
8 07:26		07:04	16:09 (16)	06:24	06:32	05:48	05:24	05:31	05:59	06:31	07:02	16:48	16:23 (16)
16:45		17:22	16:53 (16)	17:56	19:31	20:03	20:31	20:36	20:09	19:22	18:30	16:46	16:23 (16)
9 07:26		07:03	16:09 (16)	06:22	06:30	05:46	05:24	05:32	06:00	06:32	07:03	16:49	16:23 (16)
16:46		17:23	16:54 (16)	17:57	19:32	20:04	20:32	20:35	20:06	19:20	18:29	16:45	16:23 (16)
10 07:26		07:02	16:10 (16)	06:21	06:28	05:45	05:24	05:33	06:01	06:33	07:04	16:41	16:23 (16)
16:47		17:24	16:54 (16)	17:58	19:33	20:05	20:32	20:35	20:07	19:18	18:27	16:44	16:23 (16)
11 07:26		07:01	16:09 (16)	06:19	06:27	05:44	05:24	05:33	06:02	06:34	07:05	16:42	16:23 (16)
16:48		17:26	16:53 (16)	18:00	19:34	20:07	20:33	20:34	20:05	19:17	18:25	16:43	16:23 (16)
12 07:26		16:21 (15)	16:59 (16)	06:17	06:25	05:43	05:23	05:34	06:03	06:35	07:06	16:43	16:23 (16)
16:49	2	17:27	16:53 (16)	18:01	19:35	20:08	20:33	20:34	20:04	19:15	18:24	16:42	16:23 (16)
13 07:26		16:20 (15)	16:58 (16)	06:16	06:23	05:42	05:23	05:35	06:04	06:36	07:07	16:44	16:23 (16)
16:50	4	16:24 (15)	17:28	18:02	19:36	20:09	20:34	20:33	20:03	19:13	18:22	16:41	16:23 (16)
14 07:26		16:20 (15)	16:57	06:14	06:22	05:41	05:23	05:35	06:05	06:37	07:09	16:45	16:23 (16)
16:51	5	16:25 (15)	17:30	18:03	19:37	20:10	20:34	20:33	20:01	19:11	18:20	16:40	16:23 (16)
15 07:26		16:20 (15)	16:56	06:12	06:20	05:40	05:23	05:36	06:06	06:38	07:10	16:47	16:23 (16)
16:52	7	16:27 (15)	17:31	18:04	19:38	20:11	20:35	20:32	20:00	19:10	18:19	16:39	16:23 (16)
16 07:26		16:19 (15)	16:54	06:11	06:19	05:39	05:23	05:37	06:07	06:39	07:11	16:48	16:23 (16)
16:53	9	16:28 (15)	17:32	18:05	19:39	20:12	20:35	20:32	19:58	19:08	18:17	16:38	16:23 (16)
17 07:26		16:18 (15)	16:53	06:09	06:17	05:38	05:23	05:38	06:08	06:40	07:12	16:49	16:23 (16)
16:54	10	16:28 (15)	17:33	18:06	19:41	20:13	20:35	20:31	19:57	19:06	18:16	16:37	16:23 (16)
18 07:26		16:19 (15)	16:51	06:07	06:15	05:37	05:23	05:39	06:09	06:41	07:13	16:50	16:23 (16)
16:56	11	16:30 (15)	17:35	18:08	19:42	20:14	20:36	20:30	19:56	19:05	18:14	16:37	16:23 (16)
19 07:26		16:18 (15)	16:50	06:05	06:14	05:36	05:23	05:40	06:10	06:42	07:14	16:55 (16)	16:23 (16)
16:57	13	16:31 (15)	17:36	18:09	19:43	20:15	20:36	20:30	19:54	19:03	18:13	15	17:10 (16)
20 07:26		16:19 (15)	16:49	06:04	06:12	05:35	05:24	05:40	06:11	06:43	07:15	16:51 (16)	16:23 (16)
16:58	14	16:33 (15)	17:37	18:10	19:44	20:16	20:36	20:29	19:53	19:01	18:11	22	17:13 (16)
21 07:26		16:18 (15)	16:47	06:02	06:11	05:34	05:24	05:41	06:12	06:44	07:17	16:50 (16)	16:23 (16)
16:59	16	16:34 (15)	17:38	18:11	19:45	20:17	20:37	20:28	19:51	18:59	18:10	25	17:15 (16)
22 07:26		16:17 (16)	16:46	06:00	06:09	05:33	05:24	05:42	06:13	06:45	07:18	16:48 (16)	16:23 (16)
17:00	18	16:35 (15)	17:39	18:12	19:46	20:17	20:37	20:27	19:50	18:58	18:08	29	17:17 (16)
23 07:26		16:15 (16)	16:44	06:00	06:08	05:33	05:24	05:43	06:14	06:46	07:19	16:46 (16)	16:23 (16)
17:02	21	16:36 (15)	17:41	18:13	19:47	20:18	20:37	20:26	19:48	18:56	18:07	32	17:18 (16)
24 07:26		16:15 (16)	16:43	06:03	06:11	05:32	05:24	05:44	06:15	06:47	07:20	16:44 (16)	16:23 (16)
17:03	23	16:38 (15)	17:42	18:14	19:48	20:19	20:37	20:26	19:46	18:54	18:05	35	17:19 (16)
25 07:26		16:14 (16)	16:41	06:05	06:13	05:31	05:25	05:45	06:16	06:48	07:21	16:44 (16)	16:23 (16)
17:04	25	16:39 (15)	17:43	18:15	19:49	20:20	20:37	20:25	19:45	18:52	17:04	36	16:20 (16)
26 07:26		16:13 (16)	16:40	06:04	06:12	05:30	05:25	05:46	06:17	06:49	07:22	16:42 (16)	16:23 (16)
17:05	28	16:41 (15)	17:44	18:16	19:50	20:21	20:37	20:24	19:43	18:51	17:02	39	16:21 (16)
27 07:26		16:12 (16)	16:38	06:02	06:10	05:30	05:25	05:47	06:18	06:50	07:24	16:41 (16)	16:23 (16)
17:07	30	16:42 (15)	17:46	18:18	19:51	20:22	20:37	20:23	19:42	18:49	17:01	40	16:21 (16)
28 07:26		16:11 (16)	16:37	06:00	06:08	05:31	05:29	05:48	06:19	06:51	07:25	16:40 (16)	16:23 (16)
17:08	32	16:43 (15)	17:47	18:19	19:53	20:23	20:37	20:22	19:40	18:47	17:00	41	16:21 (16)
29 07:26		16:11 (16)	16:36	06:01	06:09	05:32	05:26	05:49	06:20	06:52	07:26	16:40 (16)	16:23 (16)
17:09	33	16:44 (15)	17:48	18:16	19:54	20:24	20:37	20:21	19:38	18:45	16:58	43	16:23 (16)
30 07:26		16:10 (16)	16:35	06:00	06:07	05:32	05:27	05:50	06:21	06:53	07:27	16:40 (16)	16:23 (16)
17:10	36	16:46 (16)	17:50	18:18	19:55	20:25	20:37	20:20	19:37	18:44	16:57	43	16:23 (16)
31 07:26		16:10 (16)	16:35	06:00	06:07	05:32	05:27	05:51	06:22	06:54	07:28	16:40 (16)	16:23 (16)
17:12	37	16:47 (16)	17:51	18:19	19:56	20:25	20:37	20:20	19:35	18:42	16:56	44	16:23 (16)
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	286	
Total, worst case	374	867									805	1	
Sun reduction	0,43	0,44									0,52	0,41	
Clear time red.	0,92	0,92									0,92	0,92	
Wind dir. red.	0,48	0,48									0,48	0,48	
Total reduction	0,19	0,20									0,23	0,18	
Total, real	71	170									103	0	

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

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

Calculation: Wind Farm Apricena - Project Shadow receptor: AH - SHR_34
 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
 1.079 389 87 129 649 1.026 640 444 322 284 1.158 1.812 8.020
 Idle start wind speed: Cut in wind speed from power curve

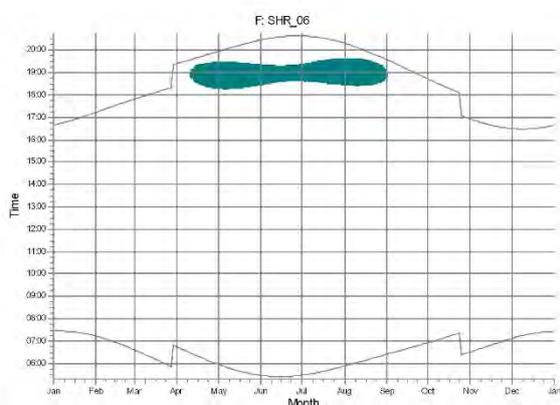
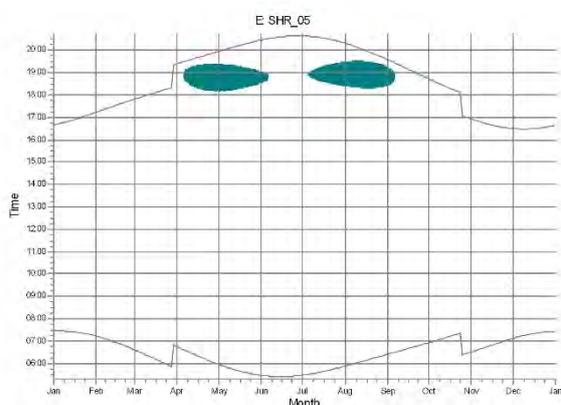
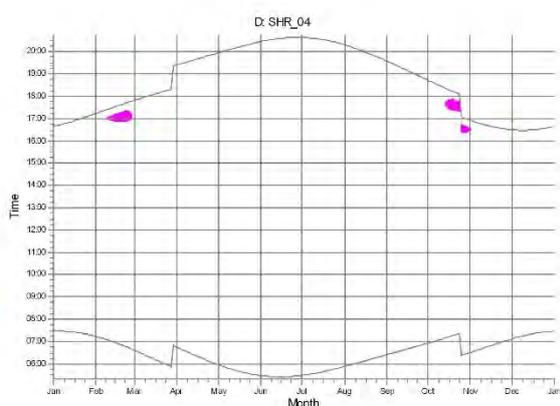
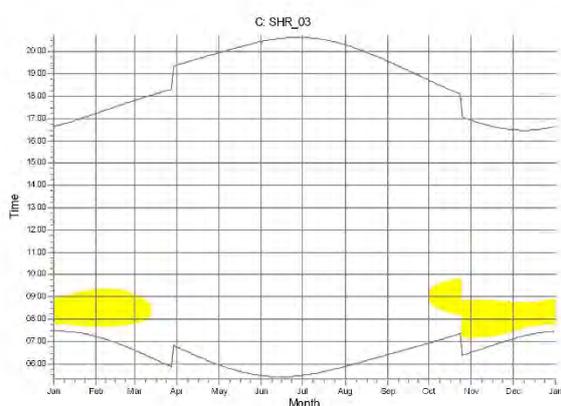
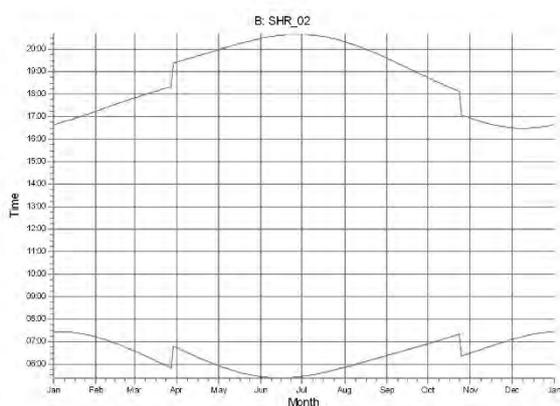
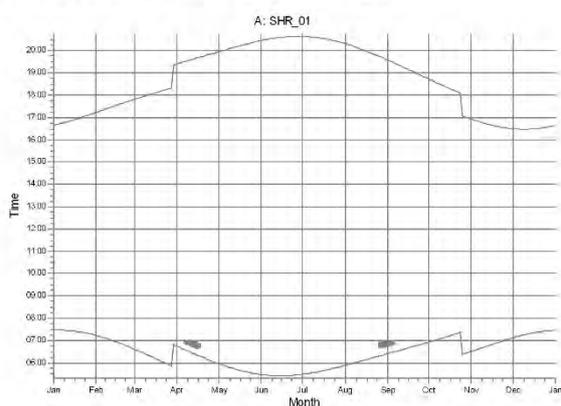
	January	February	March	April	May	June	July	August	September	October	November	December
1	07:26	07:12	16:29 (15) 06:35	16:40 (16) 06:43	05:56	05:27	05:27	05:52	06:23	06:54	06:30	15:55 (16) 07:05
2	07:26	07:11	16:29 (15) 06:33	16:40 (16) 06:42	05:55	05:26	05:28	05:53	06:24	06:55	06:31	15:56 (16) 07:06
3	07:26	07:10	16:30 (15) 06:32	16:41 (16) 06:43	05:54	05:26	05:28	05:54	06:25	06:57	06:32	15:56 (16) 07:07
4	07:26	07:09	16:30 (16) 06:30	16:42 (16) 06:44	05:53	05:26	05:29	05:55	06:26	06:58	06:33	15:57 (16) 07:08
5	07:26	07:08	16:29 (16) 06:29	16:43 (16) 06:45	05:52	05:25	05:29	05:56	06:27	06:59	06:34	15:58 (16) 07:09
6	07:26	07:07	16:28 (16) 06:27	16:44 (16) 06:46	05:51	05:25	05:30	05:57	06:28	07:00	06:35	15:59 (16) 07:10
7	07:26	07:05	16:27 (16) 06:25	16:45 (16) 06:47	05:50	05:24	05:31	05:58	06:30	07:01	06:36	16:00 (16) 07:11
8	07:26	07:04	16:26 (16) 06:24	16:46 (16) 06:48	05:49	05:24	05:32	05:59	06:31	07:02	06:37	16:01 (16) 07:12
9	07:26	07:03	16:26 (16) 06:22	16:47 (16) 06:49	05:48	05:24	05:32	06:00	06:32	07:03	06:38	16:02 (16) 07:13
10	07:26	07:02	16:26 (16) 06:21	16:48 (16) 06:50	05:47	05:24	05:33	06:01	06:33	07:04	06:39	16:03 (16) 07:14
11	07:25	07:01	16:25 (16) 06:19	16:49 (16) 06:51	05:46	05:23	05:33	06:02	06:34	07:05	06:40	16:04 (16) 07:15
12	07:25	06:59	16:25 (16) 06:17	16:50 (16) 06:52	05:45	05:23	05:34	06:03	06:35	07:06	06:41	16:05 (16) 07:16
13	07:25	06:58	16:25 (16) 06:16	16:51 (16) 06:53	05:44	05:23	05:35	06:04	06:36	07:07	06:42	16:06 (16) 07:17
14	07:24	06:57	16:25 (16) 06:14	16:52 (16) 06:54	05:43	05:23	05:35	06:05	06:37	07:09	06:43	16:07 (16) 07:18
15	07:24	06:56	16:24 (16) 06:12	16:53 (16) 06:55	05:42	05:23	05:36	06:06	06:38	07:10	06:44	16:08 (16) 07:19
16	07:24	06:54	16:25 (16) 06:11	16:54 (16) 06:56	05:41	05:23	05:37	06:07	06:39	07:11	06:45	16:09 (16) 07:20
17	07:23	06:53	16:24 (16) 06:09	16:55 (16) 06:57	05:40	05:23	05:38	06:08	06:40	07:12	06:46	16:10 (16) 07:21
18	07:23	06:51	16:25 (16) 06:07	16:56 (16) 06:58	05:39	05:23	05:39	06:09	06:41	07:13	06:47	16:11 (16) 07:22
19	07:22	06:50	16:26 (16) 06:05	16:57 (16) 06:59	05:38	05:23	05:40	06:10	06:42	07:14	06:48	16:12 (16) 07:23
20	07:21	06:49	16:26 (16) 06:04	16:58 (16) 07:00	05:37	05:24	05:40	06:11	06:43	07:15	06:49	16:13 (16) 07:24
21	07:21	16:31 (15) 06:47	16:26 (16) 06:02	16:59 (16) 07:01	05:36	05:24	05:41	06:12	06:44	07:17	06:50	16:14 (16) 07:25
22	07:20	16:30 (15) 06:46	16:27 (16) 06:00	17:00 (16) 07:02	05:35	05:24	05:42	06:13	06:45	07:18	06:51	16:15 (16) 07:26
23	07:19	16:29 (15) 06:44	16:28 (16) 05:59	17:01 (16) 07:03	05:34	05:24	05:43	06:14	06:46	07:19	06:52	16:16 (16) 07:27
24	07:19	16:29 (15) 06:43	16:28 (16) 05:57	17:02 (16) 07:04	05:33	05:24	05:44	06:15	06:47	07:20	06:53	16:17 (16) 07:28
25	07:18	16:29 (15) 06:41	16:30 (16) 05:55	17:03 (16) 07:05	05:32	05:25	05:45	06:16	06:48	07:21	06:54	16:18 (16) 07:29
26	07:17	16:29 (15) 06:40	16:31 (16) 05:53	17:04 (16) 07:06	05:31	05:25	05:46	06:17	06:49	07:22	06:55	16:19 (16) 07:30
27	07:16	16:28 (15) 06:38	16:32 (16) 05:52	17:05 (16) 07:07	05:30	05:25	05:47	06:18	06:50	07:23	06:56	16:20 (16) 07:31
28	07:16	16:28 (15) 06:37	16:33 (16) 05:50	17:06 (16) 07:08	05:29	05:26	05:48	06:19	06:51	07:24	06:57	16:21 (16) 07:32
29	07:15	16:28 (15) 06:35	16:34 (16) 05:48	17:07 (16) 07:09	05:28	05:26	05:49	06:20	06:52	07:25	06:58	16:22 (16) 07:33
30	07:14	16:28 (15) 06:34	16:35 (16) 05:47	17:08 (16) 07:10	05:27	05:27	05:50	06:21	06:53	07:26	06:59	16:23 (16) 07:34
31	07:13	16:28 (15) 06:33	16:36 (16) 05:45	17:09 (16) 07:11	05:26	05:27	05:51	06:22	06:54	07:27	07:00	16:24 (16) 07:35
Potential sun hours	295	296	369	400	450	455	461	429	375	345	296	286
Total, worst case	0,43	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44	0,44
Sun reduction	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92	0,92
Wind dir. red.	0,49	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
Total reduction	0,19	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,21
Total, real	24	182	2	2	2	2	2	2	2	2	2	83

Table layout: For each day in each month the following matrix apply
 Day in month Sun rise (hh:mm) Sun set (hh:mm) Minutes with flicker First time (hh:mm) with flicker Last time (hh:mm) with flicker (WTG causing flicker first time) (WTG causing flicker last time)

ALLEGATO 3: "CALENDAR GRAPHICAL": RAPPRESENTAZIONE GRAFICA DELL'OMBREGGIAMENTO ANNUO INDOTTO DALL'IMPIANTO DI PROGETTO PRESSO I SINGOLI RECETTORI

SHADOW - Calendar, graphical

Calculation: Wind Farm Apricena - Project

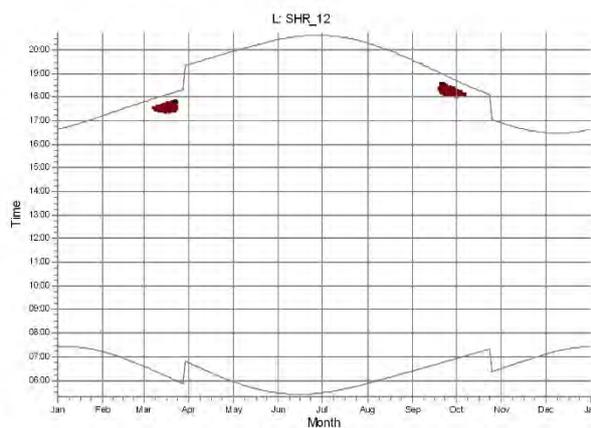
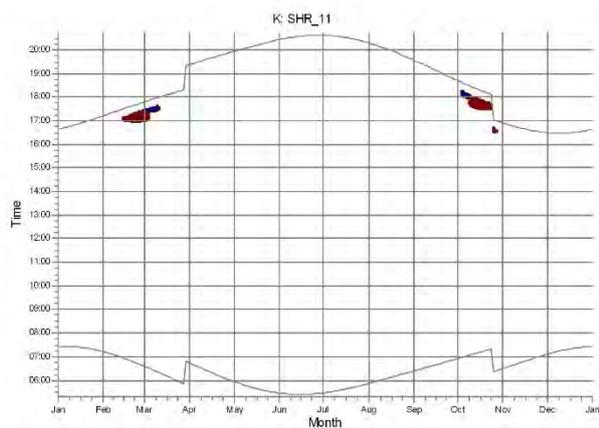
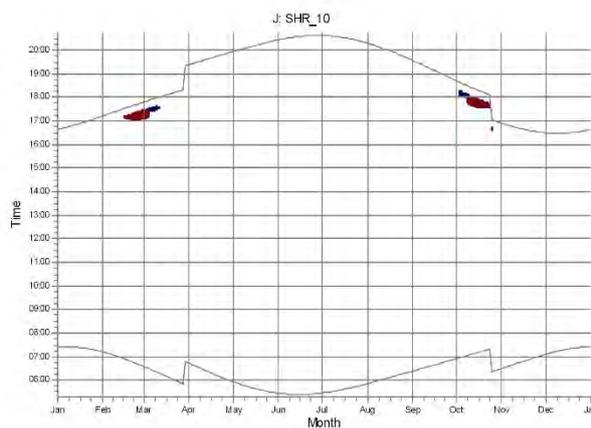
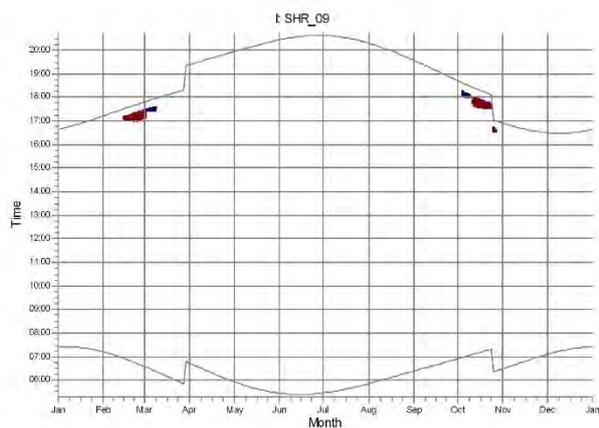
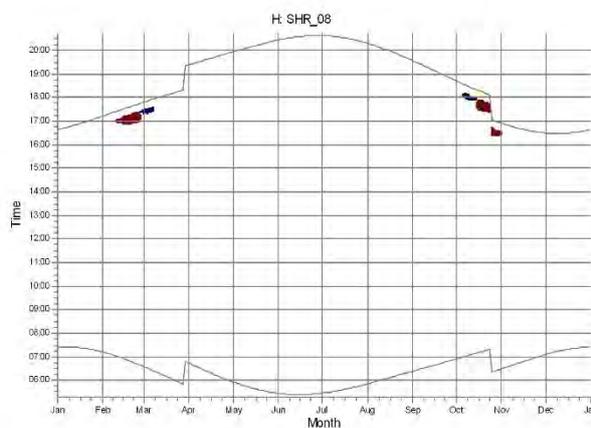
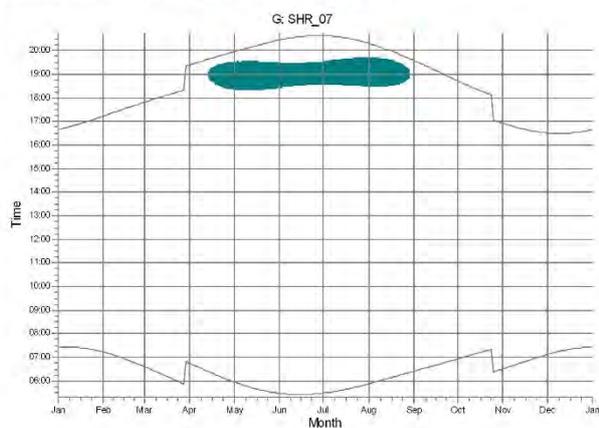


WTGs

2: AP02 4: AP04 5: AP05 6: AP06

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SHADOW - Calendar, graphical
Calculation: Wind Farm Apricena - Project

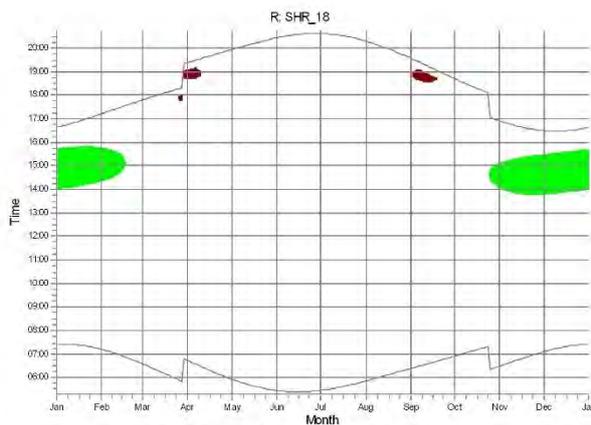
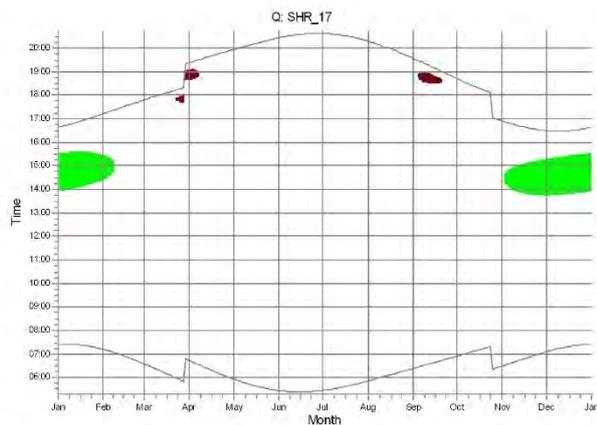
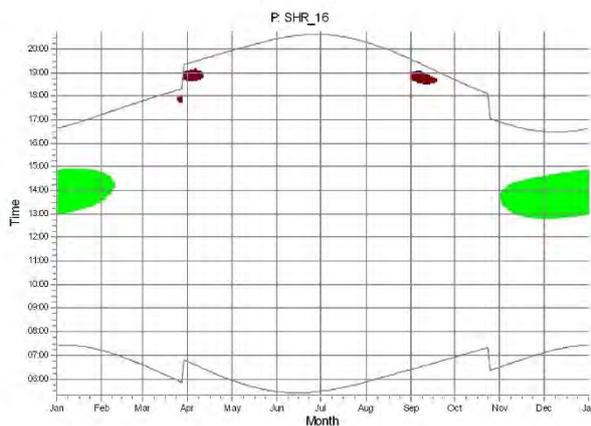
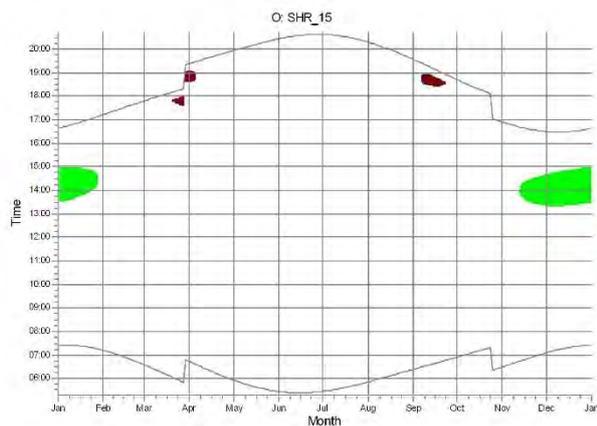
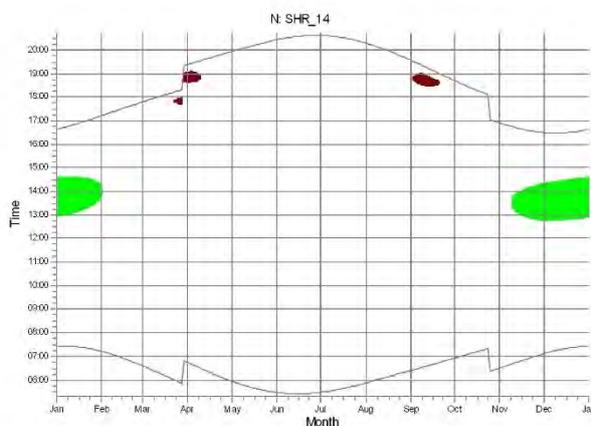
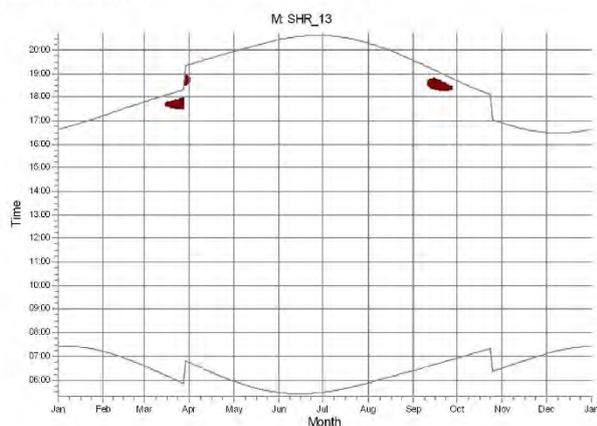


WTGs

6: AP06 7: AP07 8: AP08

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SHADOW - Calendar, graphical
Calculation: Wind Farm Apricena - Project

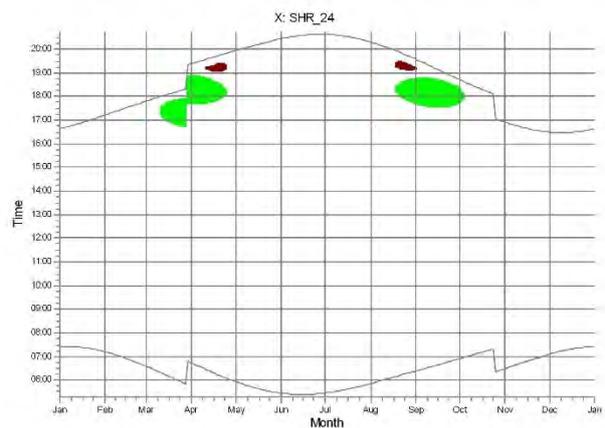
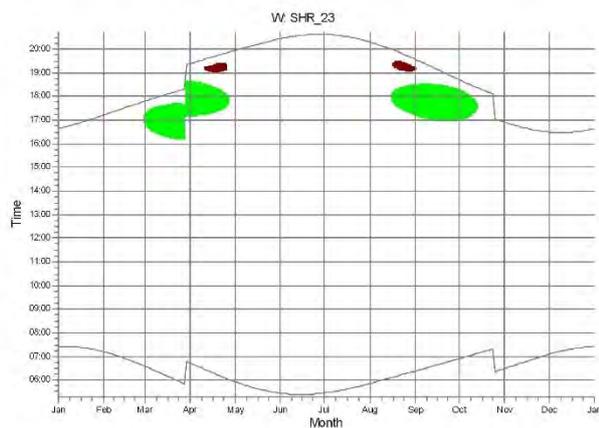
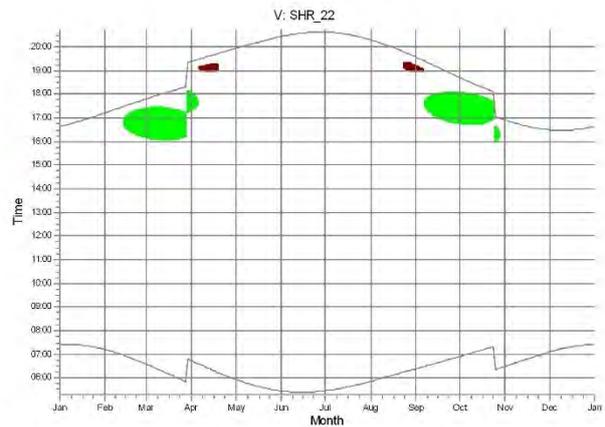
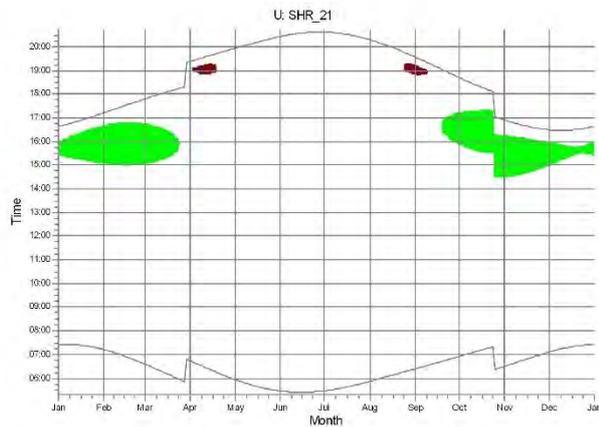
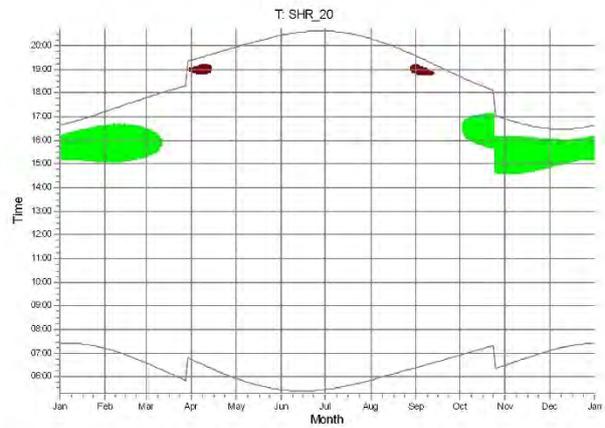
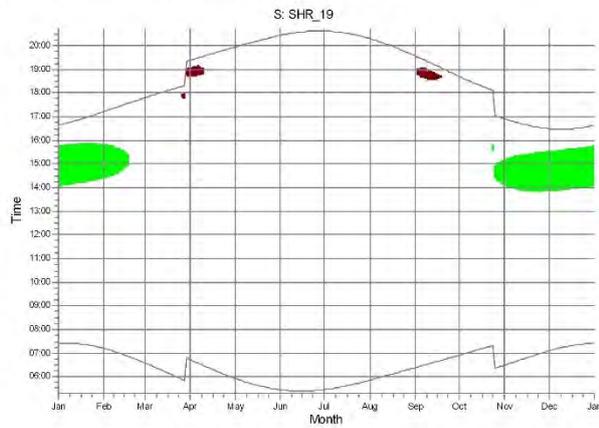


WTGs

7: AP07 8: AP08 9: AP09

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SHADOW - Calendar, graphical
Calculation: Wind Farm Apricena - Project

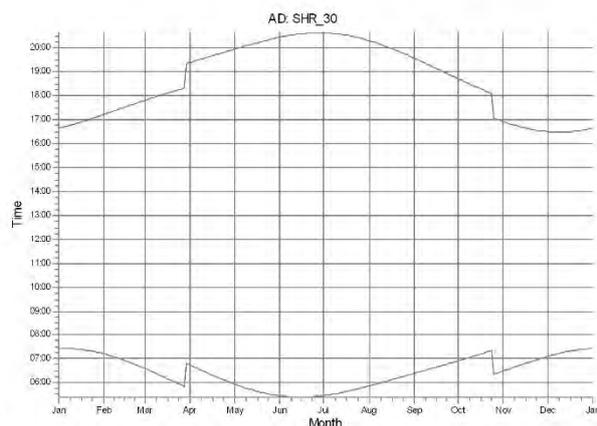
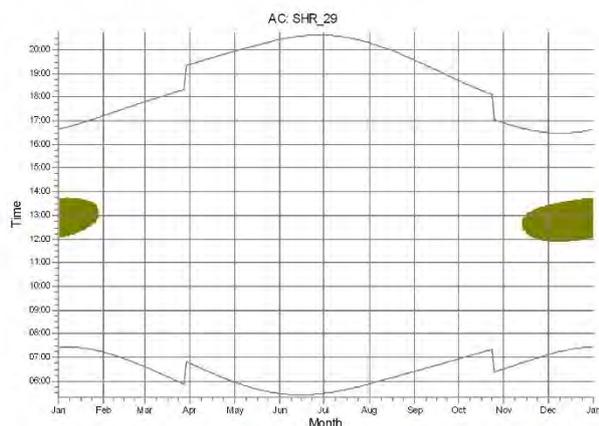
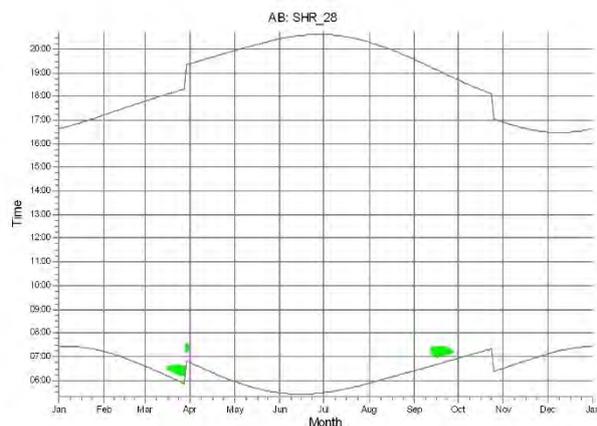
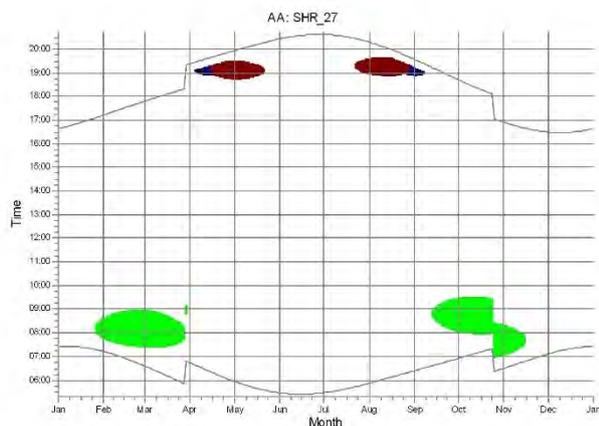
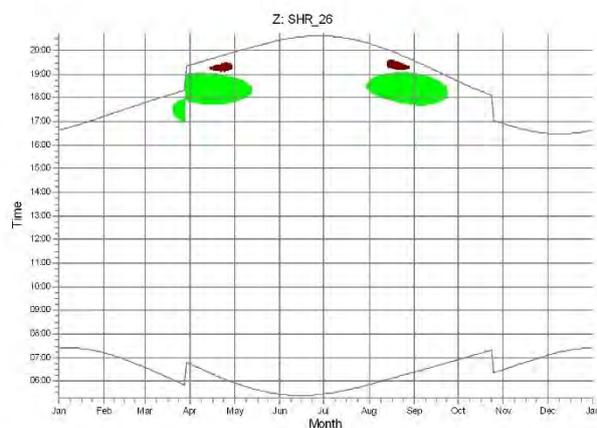
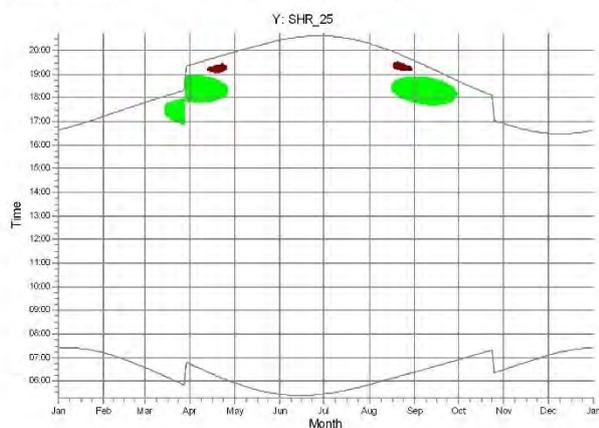


WTGs

8: AP08 9: AP09

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SHADOW - Calendar, graphical
Calculation: Wind Farm Apricena - Project

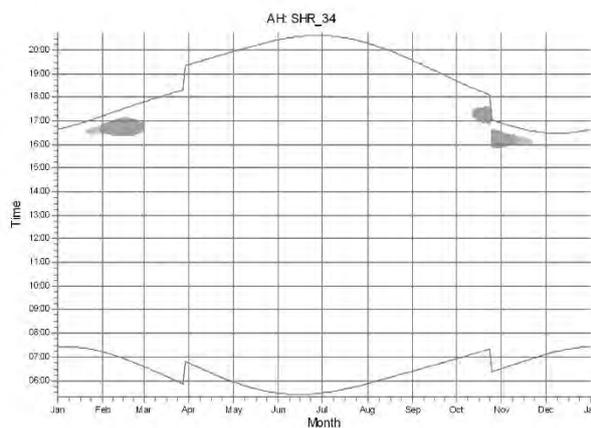
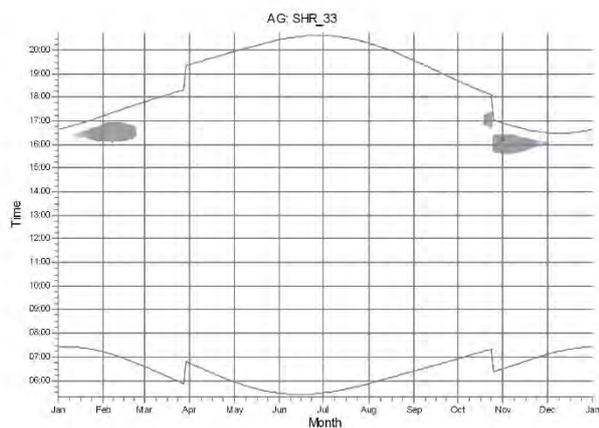
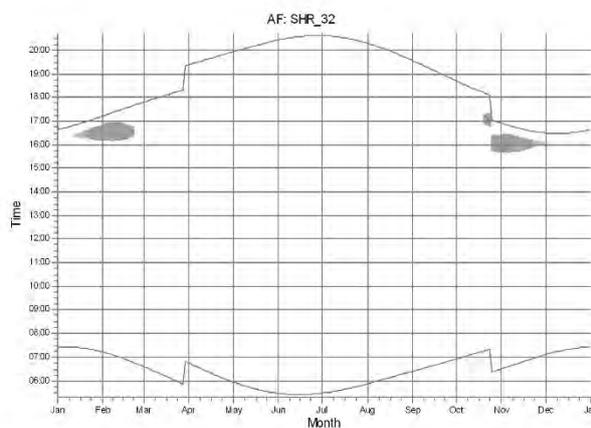
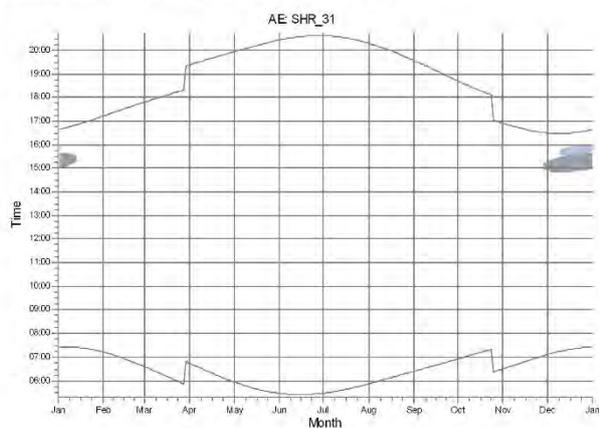


WTGs

- 7: AP07
- 8: AP08
- 9: AP09
- 10: AP10

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SHADOW - Calendar, graphical
Calculation: Wind Farm Apricena - Project



WTGs

15: AP15 16: AP16



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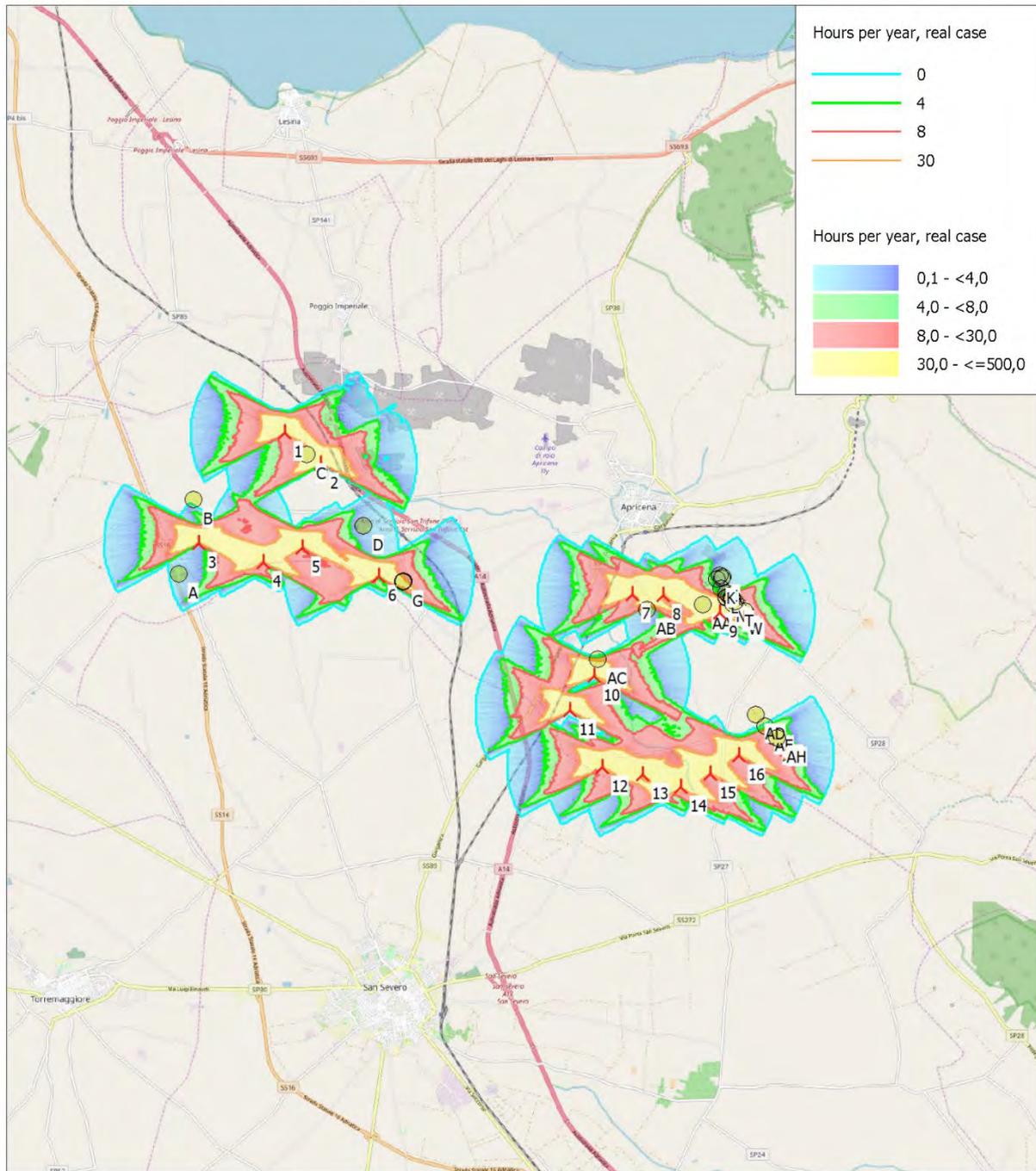
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**ALLEGATO 4: “SHADOW MAP” IMPIANTO DI PROGETTO: RAPPRESENTAZIONE
GRAFICA DELL’EVOLUZIONE DEL FENOMENO GENERATO DALLE TURBINE DI
PROGETTO CON EVIDENZA DELLE AREE DI ISO-OMBREGGIAMENTO ORARIO**

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SHADOW - Map

Calculation: Wind Farm Apricena - Project



0 2,5 5 7,5 10km

Map: EMD OpenStreetMap , Print scale 1:125.000, Map center UTM (north)-WGS84 Zone: 33 East: 534.330 North: 4.623.990

 New WTG

 Shadow receptor

Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_2.wpo (22)

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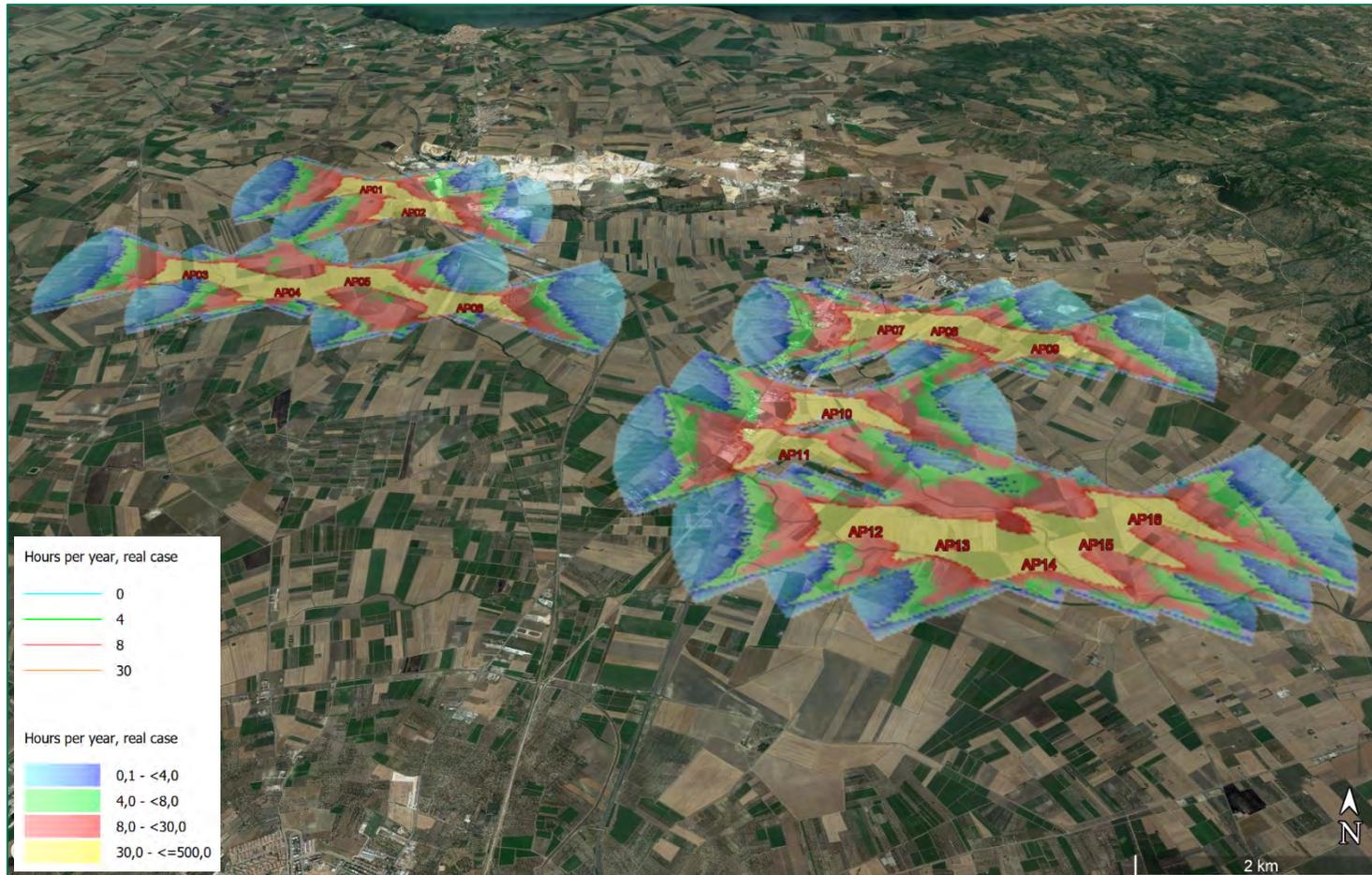
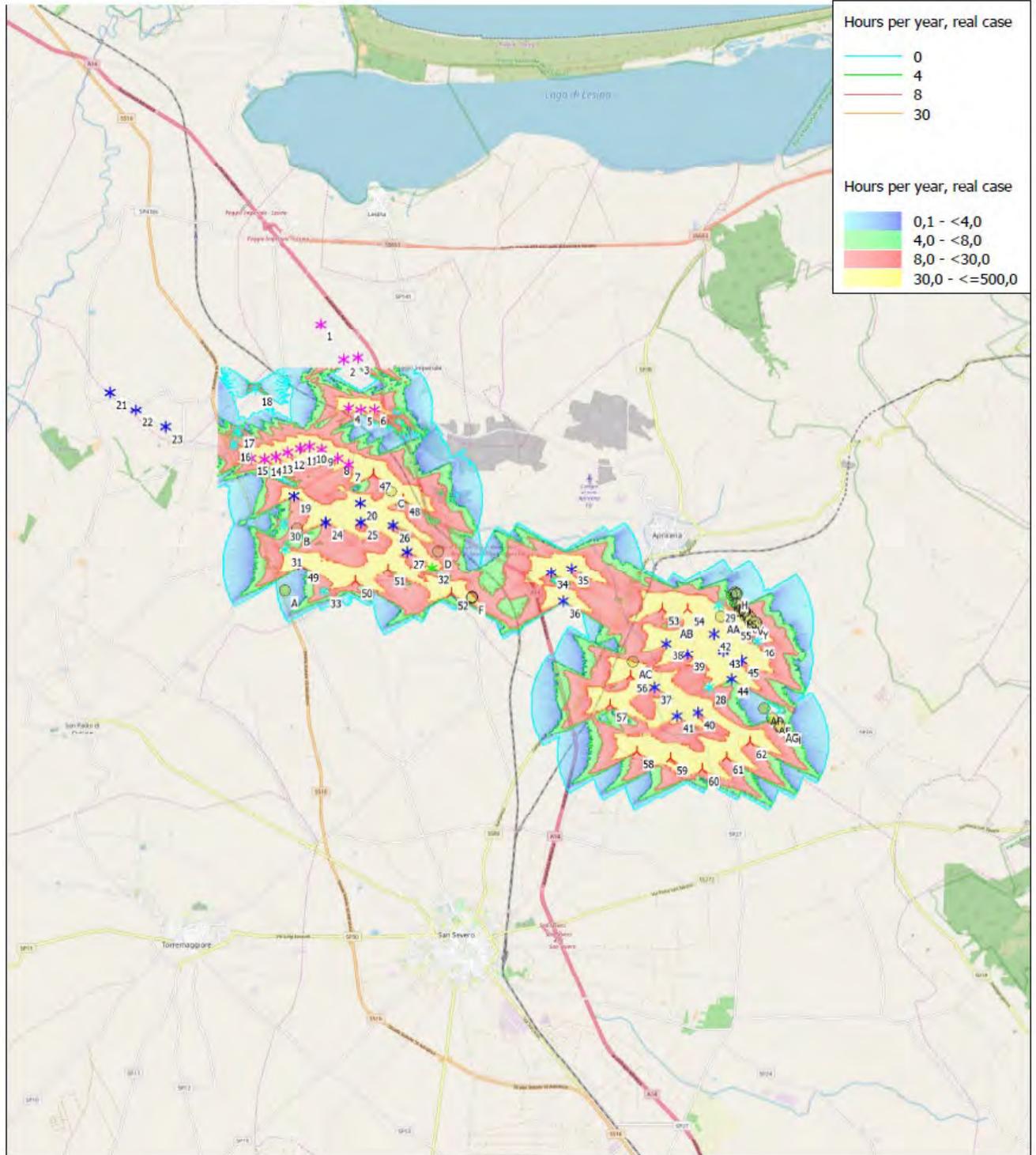


Figura 30: Shadow Map turbine di progetto

ALLEGATO 5: “SHADOW MAP” CUMULATIVA: RAPPRESENTAZIONE GRAFICA DELL’EVOLUZIONE DEL FENOMENO CUMULATIVO GENERATO DALLE TURBINE DI PROGETTO, ESISTENTI E DI POTENZIALE FUTURA INSTALLAZIONE CON EVIDENZA DELLE AREE DI ISO-OMBREGGIAMENTO ORARIO

SHADOW - Map

Calculation: Wind Farm Apricena - Cumulative



0 1 2 3 4 km

Map: EMD OpenStreetMap , Print scale 1:100.000, Map center UTM (north)-WGS84 Zone: 33 East: 532.919 North: 4.624.573
 ▲ New WTG * Existing WTG ● Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_2.wpo (22)