



Comune di Podenzano
Provincia di Piacenza

**Impianto fotovoltaico
in loc. Cascina del Custode (potenza 5,8 MWp)**

Procedura Abilitativa Semplificata (Pas)
di cui ai sensi dell'art.6 D.Lgs. 28/2011

a cura:

studio Lusignani

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committente:

Società Agricola San Luca s.r.l.

Località Torricelle 58, 29021 Bettola (PC)

**Verifica abbagliamento
Aeroporto Militare San Damiano**

Maggio 2024

Sommario

1. Introduzione	3
2. Dati generali.....	4
3. Scopo del documento.....	5
4. Inquadramento generale impianto FV	6
5. Aeroporto di San Damiano	7
6. Risultati delle simulazioni	8
Asseverazione.....	9

1. Introduzione

Il presente elaborato costituisce parte integrante del Progetto Definitivo redatto ai sensi della norma CEI 0-2 ai fini dell'ottenimento della PAS, in favore della Società Agricola San Luca srl per la costruzione e l'esercizio di un impianto fotovoltaico da realizzarsi nel comune di Podenzano (PC) in Località San Rocco all'interno della particella catastale n° 49 del Foglio 39 e delle relative opere connesse.

L'impianto avrà una potenza installata di 5.803,20 kWp, sarà esercito in parallelo alla RTN e l'intera produzione sarà immessa in rete.

Tabella 1: Progettista

Progettista	Dott. Geol. Filippo Lusignani
Albo – numero di iscrizione	Geologi Emilia Romagna al n°647
Indirizzo	Via Arata 18 Piacenza
PEC	lusignanifilippo@pec.epap.it
e-mail	glusig@tin.it
Recapito telefonico	0523-454120

2. Dati generali

Tabella 2: Ubicazione impianto fotovoltaico - Impianto di utenza

Indirizzo	Località San Rocco Podenzano (PC)
Dati Catastali	Foglio 39 Particella n°49
Coordinate Geografiche	44.951875° N – 9.717910° E
Potenza nominale DC	5.803,20 kWp
Potenza nominale AC	5.000 kW

Tabella 3: Impianto di rete per la connessione

Tipologia collegamento	entra-esce su linea MT
Tensione nominale	15.000 V
Soluzione di connessione da STMG	L'impianto sarà allacciato alla rete di Distribuzione tramite realizzazione di una nuova cabina di consegna collegata in entra-esce su linea MT esistente ALTOE', uscente dalla cabina primaria AT/MT GRAZZANO V.

3. Scopo del documento

Il presente documento è stato redatto al fine effettuare una valutazione dell'impatto visivo dell'impianto fotovoltaico a progetto per dimostrare che, in maniera conforme a quanto stabilito dalle Linee Guida di ENAC Edizione n. 1 del 26/04/2022, l'abbagliamento non comporti pericoli per la sicurezza delle operazioni dell'aeroporto militare San Damiano sito a circa 3 km di distanza.

La verifica è stata effettuata in maniera quantitativa utilizzando il **software Forge Solar**.

Viene allegata al presente elaborato una apposita asseverazione redatta da un tecnico abilitato.

4. Inquadramento generale impianto FV

L'impianto fotovoltaico sarà installato nel Comune di Podenzano (PC) in località San Rocco sui terreni censiti al Foglio 39 particella n°49. La potenza installata sarà pari a 5.803,20 kWp. L'area interessata dal progetto si trova alle coordinate geografiche 44.951875° N e 9.717910° e ad una distanza di circa 3 km dalla recinzione perimetrale esterna dell'aeroporto militare di San Damiano.

La Figura 1 riporta un inquadramento su ortofoto dell'area di impianto e indicazione della posizione dell'aeroporto San Damiano.



Figura 1: Area dell'impianto fotovoltaico (in rosso) ed indicazione dell'aeroporto San Damiano

5. Aeroporto di San Damiano

Tabella 5 riporta le caratteristiche tecniche dell'aeroporto militare San Damiano, utilizzate all'interno delle simulazioni effettuate con Forge Solar.

Tabella 5: Caratteristiche dell'Aeroporto San Damiani

Nome dell'impianto	Aeroporto "Gaetano Mazza"
Regione	Emilia-Romagna
Indirizzo	San Giorgio Piacentino (PC) frazione di San Damiano
Lunghezza	2.600 m circa
Orientamento pista	12/30
Fondo	Asfalto
Coordinate	44.913056° N – 9.723333° E
Elevazione	132 – 138 m
ATCT	44.911226 N - 9.717623 E 15,00 m di altezza

6. Risultati delle simulazioni

Le simulazioni effettuate con il software Forge Solar hanno evidenziato la completa assenza di fenomeni di abbagliamento (giallo o verde) sia per quello che riguarda la torre di controllo che i sentieri di atterraggio e decollo dell'aeroporto.

Risultano soddisfatti tutte le verifiche imposte dalle seguenti normative:

- 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276
- 2021 U.S. Federal Aviation Administration Policy

I risultati sono riportati nei report allegati alla presente relazione tecnica ed identificati come:

- FAA 2013 Report - Podenzano 5 MW
- FAA 2021 Report - Podenzano 5 MW

Asseverazione

All'attenzione di

*Aeronautica Militare – Comando 1^a Regione Aerea
Reparto Territorio e Patrimonio
Piazza E. Novelli 1, 20129 MILANO (MI)*

e P.C.

*Comando Logistico – Serv. Infrastrutture -
V. le Università, 4 – 00185 Roma
Distaccamento Aeroportuale San Damiano –
San Giorgio Piacentino (PC)*

Oggetto: Asseverazione di valutazione dell'abbagliamento nei confronti delle operazioni aeronautiche

Rif. Impianto fotovoltaico: Soc. Agricola San Luca srl, in Località Cà Rotta – Podenzano (PC)

Rif. Aeroporto: San Damiano

In relazione all'istanza presentata per la realizzazione dell'impianto fotovoltaico in oggetto, il sottoscritto Filippo Lusignani in qualità di Geologo iscritto all'Ordine Professionale dei geologi della Regione Emilia Romagna n° iscrizione 647 consapevole che le dichiarazioni false, la falsità negli atti e l'uso di atti falsi comportano l'applicazione delle sanzioni penali previste dagli artt.75 e 76 del D.P.R. n. 445/2000,

DICHIARA

sotto la propria responsabilità, che:

- l'installazione si configura di "interesse aeronautico" in base alle seguenti caratteristiche:
 - X Distanza dall'aeroporto: 2,680 km
 - X Tipo di installazione: Fotovoltaico a terra
 - X Estensione impianto: > 500 m²
 - X Potenza impianto: > 1 MW
- è stata condotta la valutazione di impatto visivo con verifica della non sussistenza di fenomeni di abbagliamento per i piloti e per gli operatori in torre di controllo secondo le seguenti modalità:
 - Analisi qualitativa:
 - X
 - Analisi quantitativa:
 - X Assenza di fenomeni di abbagliamento nelle direzioni di interesse aeronautico
 - Basso potenziale di immagine residua (Green glare), con tempo di esposizione pari a minuti
 - Potenziale di immagine residua (Yellow glare), con tempo di esposizione pari a minuti

Si allega alla presente asseverazione la seguente documentazione giustificativa:

- X Relazione tecnica di analisi del fenomeno dell'abbagliamento
- Risk assessment

Data 14 Maggio 2024



FORGESOLAR GLARE ANALYSIS

Project: **Podenzano**

Site configuration: **Podenzano 5 MW**

Analysis conducted by GIOVANNI SCAGNELLI (scagnelligiovanni@gmail.com) at 20:26 on 08 May, 2024.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
2-mile flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

Default glare analysis parameters and observer eye characteristics (for reference only):

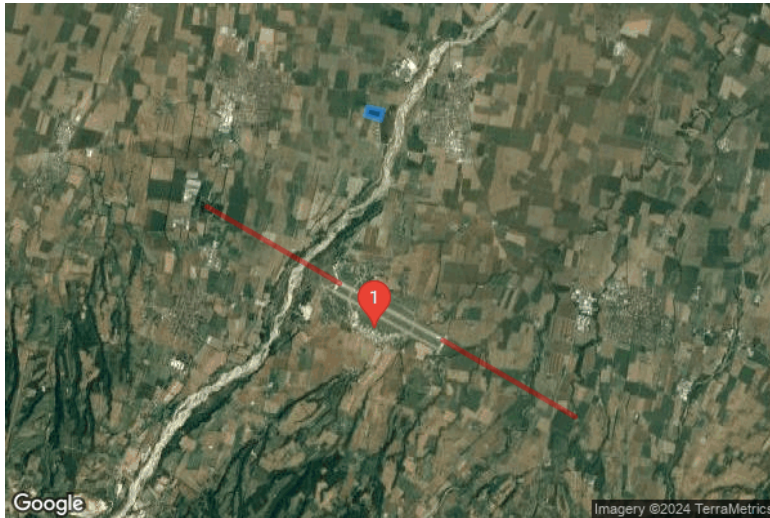
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at <https://www.federalregister.gov/d/2013-24729>

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m²
 Time interval: 1 min
 Ocular transmission coefficient: 0.5
 Pupil diameter: 0.002 m
 Eye focal length: 0.017 m
 Sun subtended angle: 9.3 mrad
 Site Config ID: 118689.20376
 Methodology: V2



PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	44.953151	9.715741	111.04	1.60	112.64
2	44.951496	9.715226	111.96	1.60	113.56
3	44.950638	9.719325	111.98	1.60	113.58
4	44.952528	9.720011	109.96	1.60	111.56

Flight Path Receptor(s)

Name: FP1
Description: None
Threshold height: 15 m
Direction: 120.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	44.919851	9.708397	138.50	15.20	153.70
Two-mile	44.934307	9.672994	142.60	179.80	322.40

Name: FP2
Description: None
Threshold height: 15 m
Direction: 300.0°
Glide slope: 3.0°
Pilot view restricted? Yes
Vertical view: 30.0°
Azimuthal view: 50.0°



Point	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
Threshold	44.909175	9.735828	132.80	15.30	148.10
Two-mile	44.894719	9.771224	136.40	180.30	316.70

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	44.911226	9.717623	140.40	15.00

Map image of 1-ATCT



GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
FP1	0	0
FP2	0	0
1-ATCT	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
FP1	0	0
FP2	0	0
1-ATCT	0	0

Flight Path: FP1

0 minutes of yellow glare
0 minutes of green glare

Flight Path: FP2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: 1-ATCT

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to V1 algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size.

Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

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FORGESOLAR GLARE ANALYSIS

Project: **Podenzano**

Site configuration: **Podenzano 5 MW**

Created 08 May, 2024

Updated 08 May, 2024

Time-step 1 minute

Timezone offset UTC1

Minimum sun altitude 0.0 deg

DNI peaks at 1,000.0 W/m²

Site ID 118689.20376

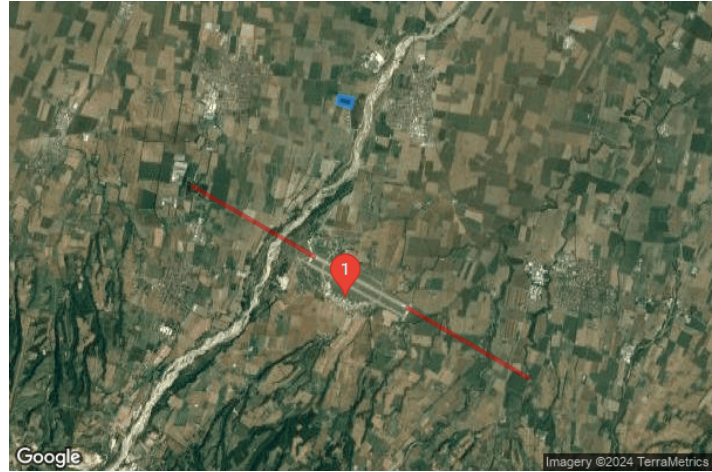
Ocular transmission coefficient 0.5

Pupil diameter 0.002 m

Eye focal length 0.017 m

Sun subtended angle 9.3 mrad

PV analysis methodology V2



Glare Policy Adherence

The following table estimates the policy adherence of this glare analysis according to the **2021** U.S. Federal Aviation Administration Policy:

Review of Solar Energy System Projects on Federally-Obligated Airports

This policy may require the following criteria be met for solar energy systems on airport property:

- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics, including 1-minute time step.

ForgeSolar is not affiliated with the U.S. FAA and does not represent or speak officially for the U.S. FAA. ForgeSolar cannot approve or deny projects - results are informational only. Contact the relevant airport and FAA district office for information on policy and requirements.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
ATCT(s)	PASS	Receptor(s) marked as ATCT do not receive glare

The referenced policy can be read at <https://www.federalregister.gov/d/2021-09862>

Component Data

This report includes results for PV arrays and Observation Point ("OP") receptors marked as ATCTs. Components that are not pertinent to the policy, such as routes, flight paths, and vertical surfaces, are excluded.

PV Arrays

Name: PV array 1
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 0.0°
Ground Coverage Ratio: 0.5
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	44.953151	9.715741	111.04	1.60	112.64
2	44.951496	9.715226	111.96	1.60	113.56
3	44.950638	9.719325	111.98	1.60	113.58
4	44.952528	9.720011	109.96	1.60	111.56

Observation Point ATCT Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
1-ATCT	1	44.911226	9.717623	140.40	15.00

Map image of 1-ATCT



Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV array 1	SA tracking	SA tracking	0	0.0	0	0.0	-

Total annual glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
1-ATCT	0	0.0	0	0.0

PV: PV array 1

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
1-ATCT	0	0.0	0	0.0

PV array 1 and 1-ATCT

Receptor type: ATCT Observation Point

No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.

Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.

Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.

Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.

The analysis does not automatically consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.

The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.

The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.

The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.

Refer to the Help page at www.forgesolar.com/help/ for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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