

## Solar Glare Hazard Analysis Report Explanation

### Purpose & Methodology

The Solar Glare Hazard Analysis Tool (SGHAT) is an application developed by Sandia National Laboratories, a Federally Funded Research and Development Center that primarily supports the U.S. Department of Energy. This tool meets FAA glare analysis requirements (78 FR 63276) and is the standalone report submitted to the FAA for consultation on Cypress Creek projects, when required. The SGHAT outputs the *potential* and *intensity* of glare at chosen observation points surrounding the proposed array area with set project-specific inputs. An explanation of each input is as follows:

- PV array axis tracking: indicates if the project is utilizing “fixed tilt” (static) or “single-axis tracking” (moving) modules. “None” indicates fixed tilt modules.
- Orientation of array (deg): direction of solar panels, 180 degrees indicates “south”
- Tilt of solar panels (deg): tilt upwards of the solar panels, as referenced to ground-level
- Rated power (kW): capacity of the proposed project
- Vary reflectivity: indicates if the tool varies panel reflectivity based on time and sun position
- PV surface material: module type material
- Timezone offset: timezone the proposed project is located within
- Subtended angle of sun (mrad), Peak DNI ( $W/m^2$ ), Ocular transmission coefficient, pupil diameter (m), eye focal length (m), time interval (min), correlate slope error with material, slope error (mrad): automated stock responses from the SGHAT application
- PV array vertices: elevation, latitude, and longitude of each chosen PV array area point
- Observation Points: elevation, latitude, and longitude of each chosen observation point

### Interpretation of Results

- *Duration*: Each point represents one one-minute time interval over the course of one calendar year
- *Hour*: The hour of the day in which glare *potential* is observed, the morning hours at the bottom of the figure and the evening hours at the top
- *Date*: The month in which glare *potential* is observed
- *Color of Duration Point*:
  - o Green: indicates low *potential* for low *intensity* glare
  - o Yellow: indicates *potential* for low *intensity* glare
  - o Red: indicates *potential* for high *intensity* glare

### Salt Point Solar Results

- The Salt Point Solar SGHAT indicates no potential for glare at the four observation points studied with the analysis tool. The tool also analyzes FAA criteria in the table near the beginning of the report
  - o At Observation Point 1, no glare is observed

- At Observation Point 2, no glare is observed
- At Observation Point 3, no glare is observed
- At Observation Point 4, no glare is observed



# FORGESOLAR GLARE ANALYSIS

---

Project: **Donati**

A 2 MW Photovoltaic Solar farm

Site configuration: **Salt Point-temp-7**

Analysis conducted by Hugh Tillett (hugh.tillett@ccrenew.com) at 17:18 on 05 Apr, 2018.

## 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
Flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis and observer eye characteristics are as follows:

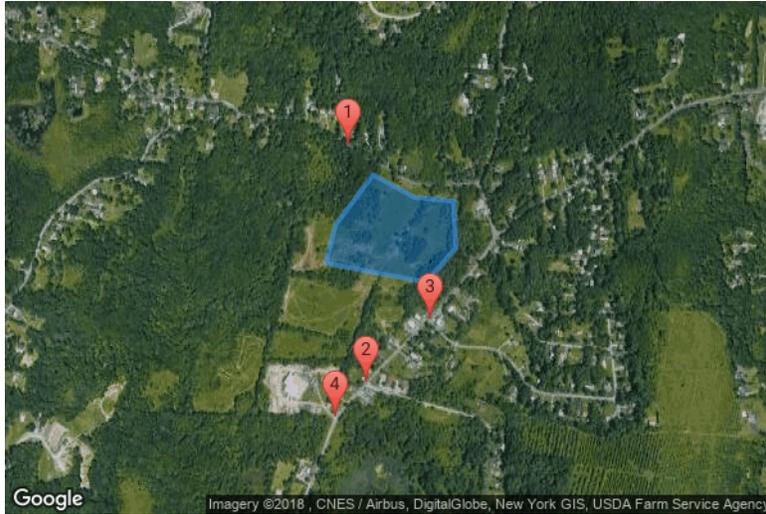
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

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/m<sup>2</sup>  
 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: 17052.2127



## PV Array(s)

**Name:** Salt Point  
**Description:** A 2 MW Photovoltaic Solar Farm  
**Axis tracking:** Fixed (no rotation)  
**Tilt:** 30.0°  
**Orientation:** 180.0°  
**Rated power:** 2000.0 kW  
**Panel material:** Smooth glass without AR coating  
**Reflectivity:** Vary with sun  
**Slope error:** 10.0 mrad

PV google static map

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	41.741944	-73.880009	268.19	12.00	280.19
2	41.742032	-73.881318	277.33	12.00	289.33
3	41.742596	-73.882712	287.48	12.00	299.48
4	41.741336	-73.883978	238.27	12.00	250.27
5	41.740391	-73.884290	242.07	12.00	254.07
6	41.740191	-73.882927	286.62	0.00	286.62
7	41.739911	-73.880931	326.85	12.00	338.85
8	41.740767	-73.879934	277.58	12.00	289.58

## Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	41.743339	-73.883521	299.52	6.00
OP 2	2	41.737395	-73.882910	211.80	6.00
OP 3	3	41.738964	-73.880764	223.75	6.00
OP 4	4	41.736531	-73.883945	211.25	6.00

## GLARE ANALYSIS RESULTS

### Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
Salt Point	30.0	180.0	0	0	4,714,000.0

*Total annual glare received by each receptor*

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
1	0	0
2	0	0
3	0	0
4	0	0

### Results for: Salt Point

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0

### Point Receptor: OP 1

0 minutes of yellow glare

0 minutes of green glare

### **Point Receptor: OP 2**

0 minutes of yellow glare

0 minutes of green glare

### **Point Receptor: OP 3**

0 minutes of yellow glare

0 minutes of green glare

### **Point Receptor: OP 4**

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.

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