



Auburn Lewiston Municipal Airport

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Solar Energy Generating Systems near the Airport By Rick Lanman, AAE ACE Airport Director

While solar photovoltaic panels sited to create a Solar Energy Generating Station (SEGS) are considered appropriate land use around airports, care must be taken to not create temporary visual impairment of safe flight or worst ocular damage to the aircraft occupants. This is true of not only General Business and Industrial zoning designations but also all residential zoned areas within a two (2) nautical mile radius of the airport as well. Requiring a Solar Glare Hazard Analysis Tool (SGHAT) report is a permitting level activity that can guard for these undesirable conditions for the City of Auburn.

An issue for airports since 2010 with the first on-airport installations of a SEGS, the FAA established a standard for measuring glint and glare, and clear thresholds for when glint and glare would impact aviation safety. The sponsor's obligation to obtain FAA review and approval to construct or allow certain proposed solar energy installation projects at an airport is found in 14 CFR Part 77 and 49 U.S.C. 47107(a)(16) supported by MRSA Title 6. Where the project might, in the opinion of the FAA, adversely affect the safety, utility or efficiency of the airport sponsors and project proponents must comply with the policies and procedures to demonstrate to the FAA that a proposed solar energy system will not result in an ocular impact that compromises the safety of the air transportation system. The standard set is that there is no potential for glare or "low potential for after-image" along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glide-path. Ocular impact must be analyzed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

All sponsors of federally obligated airports who propose to install or to permit others to install solar energy systems on or near the airport must attach the Solar Glare Hazard Analysis Tool (SGHAT) report, outlining solar panel glare and ocular impact, for each point of measurement to the Notice of Proposed Construction Form 7460-1. The SGHAT was designed to determine whether a proposed solar energy project would result in the potential for ocular impact as depicted on the Solar Glare Hazard Analysis Plot shown in the included sample.

The SGHAT employs an interactive Google map where the user can quickly locate a site, draw an outline of the proposed solar energy system, and specify observer locations (Airport Traffic Control Tower cab) and final approach paths. Latitude, longitude, and elevation are automatically recorded through the Google interface, providing necessary information for sun position and vector calculations. Additional information regarding the orientation and tilt of the solar energy panels, reflectance, environment, and ocular factors are entered by the user. If

glare is found, the tool calculates the retinal irradiance and subtended source angle (size/distance) of the glare source to predict potential ocular hazards ranging from temporary afterimage to retinal burn. The results are presented in a simple, easy-to-interpret plot that specifies when glare will occur throughout the year, with color codes indicating the potential ocular hazard. The tool can also predict relative energy production while evaluating alternative designs, layouts, and locations to identify configurations that maximize energy production while mitigating the impacts of glare.

The SGHAT software is inexpensive to obtain and reasonably simple to operate. The reports are simple to interpret and act on. It is recommended that ordinance requirements to obtain and submit SGHAT reports with permit requests inside the airport overlay zone would be beneficial to the airport users through enhanced safety and the City of Auburn through risk mitigation by preventing unsafe situations or worse causing ocular damage in users of the airspace around the airport.

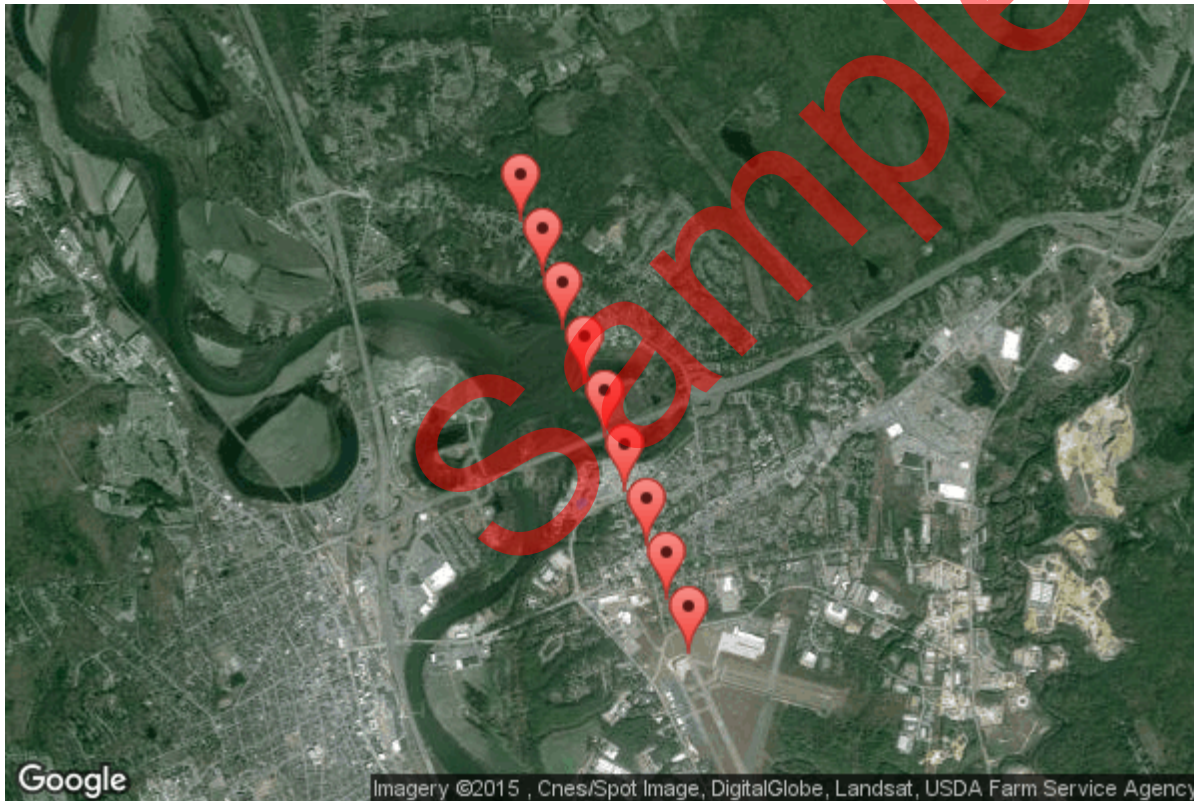
Solar Glare Hazard Analysis Flight Path Report

Generated Oct. 7, 2015, 9:12 a.m.

Flight path: 3

Glare found

 Print



Analysis & PV array parameters

Analysis name	Concord NH 2
PV array axis tracking	none
Orientation of array (deg)	145.0
Tilt of solar panels (deg)	26.0
Rated power (kW)	32.5
Vary reflectivity	True
PV surface material	Smooth glass with ARC

Timezone offset	-4.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m ²)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Correlate slope error with material	False
Slope error (mrad)	10.0

Flight path parameters

Direction (deg)	158.9
Glide slope (deg)	3.0
Consider pilot visibility from cockpit	True

Max downward viewing angle (deg)	30.0
Azimuthal viewing angle (deg)	180.0

Sample

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	43.2176175362	-71.5170291066	342.66	25.0	367.66
2	43.21751802	-71.5169808269	341.39	25.0	366.39
3	43.2177115236	-71.5166696906	341.26	25.0	366.26
4	43.2178055109	-71.5167286992	340.8	25.0	365.8

Flight Path Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)	Glare?
Threshold	43.2082100265	-71.5076708794	335.89	50.0	No
1/4 mi	43.2115814813	-71.5094578331	339.08	115.98	No
1/2 mi	43.2149529361	-71.5112447869	340.53	183.73	No
3/4 mi	43.2183243909	-71.5130317407	341.45	251.97	Yes
1 mi	43.2216958457	-71.5148186945	228.37	434.23	No
1 1/4 mi	43.2250673005	-71.5166056483	235.99	495.8	No
1 1/2 mi	43.2284387554	-71.518392602	229.66	571.3	No
1 3/4 mi	43.2318102102	-71.5201795558	345.66	524.49	No
2 mi	43.235181665	-71.5219665096	341.48	597.84	No

Glare occurrence plots

All times are in standard time. For Daylight Savings Time add one hour.

Sample

Threshold

No glare

Sample

1/4 mi

No glare

Sample

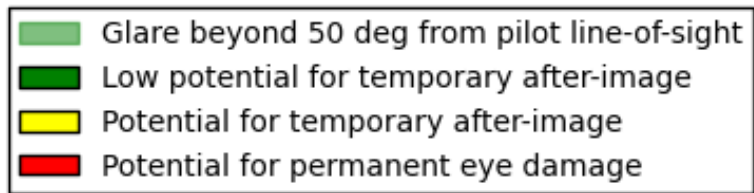
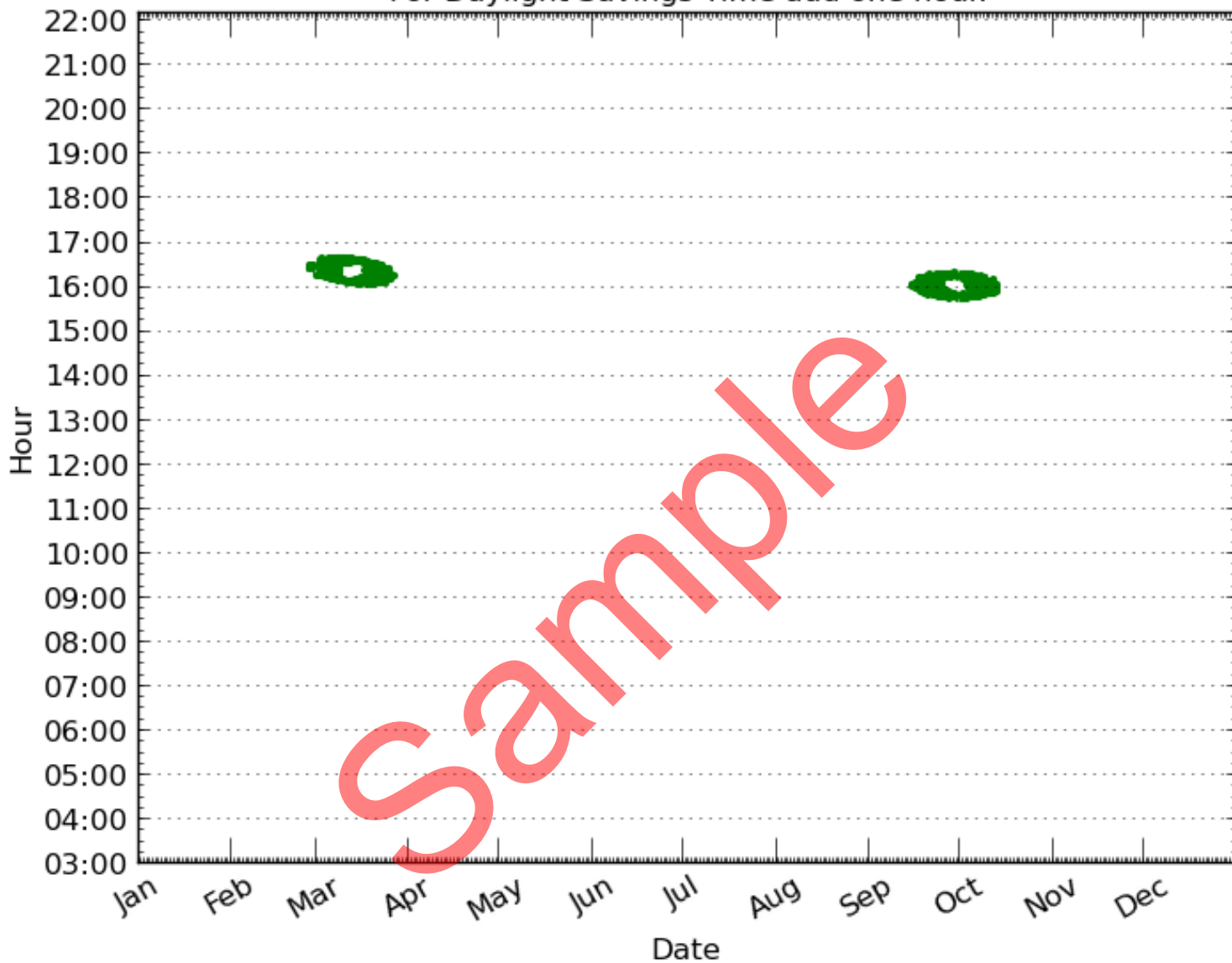
1/2 mi

No glare

Sample

3/4 mi

1-minute time interval.
All times are in standard time.
For Daylight Savings Time add one hour.



1 mi

No glare

Sample

1 1/4 mi

No glare

Sample

1 1/2 mi

No glare

Sample

1 3/4 mi

No glare

Sample

2 mi

No glare

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Sample