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SOLAR GLARE HAZARD ANALYSIS TOOL (SGHAT) v. 3.0

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Technology Readiness Level:8

Actual technology is completed and qualified through test and demonstration

TECHNOLOGY DESCRIPTION

With growing numbers of solar energy systems being proposed and installed throughout the United States, the potential impact of glint and glare from photovoltaic modules, concentrating solar collectors, receivers, and other components is receiving increased attention as a potential hazard or distraction for pilots, air-traffic control personnel, motorists, and residents. Hazards from reflection of solar radiation from solar power plants include the potential for permanent eye injury (e.g., retinal burn from concentrated sunlight) and temporary disability or distractions (e.g., after-image). Visual impairment can be mitigated by thoughtful application of analytical tools. Traditionally, glare hazards are analyzed in terms of the geometry of the proposed solar installation relative to key observation points. However, such geometric methods fail to provide an indication of the intensity of the reflected light or the potential ocular impacts.

Sandia developed SGHAT v. 2.0, a web-based tool and methodology to evaluate potential glint/glare hazards associated with solar energy installations. The validated tool provides a quantified assessment of when and where glare will occur, as well as information about potential ocular impacts. The tool can also be used for design optimization (tilt and orientation) to evaluate alternative configurations, orientations, and locations of solar installations that not only mitigate the impacts of glint/glare, but also optimize energy production. It also has the ability to model fixed, single-axis, and dual-axis photovoltaic tracking systems.

U.S. DEPARTMENT OF ENERGY

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Following the success of SGHAT v. 2.0, Sandia researchers developed a newer version with increased functionality and improved performance. SGHAT v. 3.0 features automated optimization to select PV configurations (tilt and orientation) that mitigate glare while maximizing annual energy production. The built-in flight path tool has been enhanced to evaluate continuous flight paths rather than discrete points along a flight path. It also has the ability to analyze glare from vertical surfaces, such as glass buildings. The calculations and methods are based on analyses, test data, a database of different photovoltaic module surfaces (e.g. anti-reflective coating, texturing), and models developed over several years at Sandia to evaluate ocular hazards. The results are presented in a simple easy-to-interpret plot that specifies when glare will occur throughout the year, with color indicating the potential ocular hazard.

TECHNOLOGICAL BENEFITS

- Quantifies when and where glare will occur throughout they year
- Quantifies glare intensity and potential ocular impact
- Determines annual energy production so that PV configurations can be optimized for maximum energy production with minimal glare

POTENTIAL APPLICATIONS

- Glint and glare ocular hazard analyses for proposed/existing solar installations near airports, roads, work-places, and communities
- Studies to ensure safe siting and expedited permitting
- Design optimization to maximize energy production while mitigating glare from solar installations

CONTACT US

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