AUGUSTA COUNTY

APPLICATION FOR SPECIAL USE PERMIT

DISTRICT: WAYNESBORO PERMIT NUMBER: _____

DATE: July 6, 2026 RECEIPT NUMBER: _____

FEE PAID: ~~$250.00~~

TO THE AUGUSTA COUNTY BOARD OF ZONING APPEALS:

Application is hereby made for a Special Use Permit, in accordance with the description and for the purpose hereinafter set forth. This application is made subject to all the County and State laws, ordinances, rules and regulations now in force effecting thereto; and which are hereby agreed to by the undersigned applicant and which shall be deemed a condition entering into the exercise of the permit.

1. Land Owner's Name: CRAWFORD S PATTERSON

2. Land Owner's Address: 1840 ROCKFISH RD. WAYNESBORO, VA 22980

3. Occupant or User's Name: CVE US VA WAYNESBORO 426. LLC

4. Occupant or User's Address: 109 W. 27TH ST. NEW YORK, NY 10001

5. Location of Property: SOUTH OF THE INTERSECTION OF ROCKFISH RD AND NEW HOPE-CRIMORA RD.

NORTH OF THE INTERSECTION OF ROCKFISH RD AND HILDEBRAND CHURCH RD.

6. Real Estate Map and Parcel Number: 058-93B 7. Zoning: GENERAL AGRICULTURE

8. Subdivision: N/A 9. Present Use: RESIDENCE/FARM

10. Section(s) of the Zoning Ordinance that permit is being applied for: 25-70.4B

11. Describe request: TO CONSTRUCT A SMALL SOLAR ENERGY SYSTEM.

I hereby authorize appropriate County Officials to enter upon the above described property during normal business hours to conduct required inspections. I hereby certify, under the penalties of perjury, that the above information is true and correct.

SEND CORRESPONDENCE TO:

CARRIE CONSENTINO
109 W. 27TH ST.
NEW YORK, NY 10001

WILLIAM DOUGLAS HUME, PE

Digitally signed by WILLIAM DOUGLAS HUME, PE
DN: C=US, E=mhume@penn-er.com, O=Penn E&R, OU=Virginia, CN="WILLIAM DOUGLAS HUME, PE"
Reason: I am approving this document
Date: 2026.07.06 13:30:26-04'00'

(Signature of Applicant or Agent)

(716) 830-3054

(Phone Number)

ACTION BY BOARD OF ZONING APPEALS

Approved: _____ Disapproved: _____

Stipulations: _____

Date of Final Action: _____ Signed: _____

Secretary, Board of Zoning Appeals

(PLEASE READ BACK OF APPLICATION)

NOTICE

PRE-CONDITIONS - The Board of Zoning Appeals may make your Special Use Permit subject to certain "pre-conditions" which must be satisfied before your permit is issued.

OPERATING CONDITIONS - The Board of Zoning Appeals may make your Special Use Permit subject to certain "operating conditions" with which you must comply so long as you operate your special use. If you fail to comply with one (1) or more of the operating conditions, your permit may be revoked by the Board of Zoning Appeals after a public hearing and advance written notice to you as required by law.

ABANDONMENT - If you should cease the use authorized by your Special Use Permit for two (2) years or more, the Zoning Administrator shall seek revocation of the permit by the Board of Zoning Appeals.

The Augusta County Zoning Ordinance establishes the following requirements of all Special Use Permits:

"Section 25-584. Requirements of Special Use Permits.

A. A Special Use Permit shall not be issued until all **pre-conditions**, if any, imposed by the Board of Zoning Appeals have been met. Commencement of a Special Use Permit prior to the issuance of the Permit shall be a violation of this chapter. Whenever the Board of Zoning Appeals has required pre-conditions, the pre-conditions shall be established, constructed or diligently pursued within a reasonable time as determined by the Board of Zoning Appeals. If in the opinion of the Zoning Administrator, compliance with the pre-conditions is not diligently pursued within one year or other time as specified by the Board of Zoning Appeals, the approval of the Special Use Permit shall automatically expire without notice and the Special Use Permit will not be issued.

B. Any BZA review plan submitted to and approved by the Board of Zoning Appeals shall be followed.

C. Unless otherwise provided by the Board of Zoning Appeals, the Special Use Permit shall be issued to the applicant and shall be non-transferable

D. All Special Use Permits are subject to and conditioned upon compliance with any applicable federal, state or local licensing or regulatory requirements, and may be revoked upon failure to so comply."

Submission Package
CVE US VA Waynesboro 426
Proposed Small Solar Farm

1840 Rockfish Road
Waynesboro, Virginia 22980

Owner: Crawford S. Patterson

Submitted to Augusta County (Virginia) Planning
18 Government Center Lane, Suite 1106
Verona, Virginia 24482

Prepared for:
CVE US VA Waynesboro 426, LLC
29 West 38th Street, 15th Floor
New York, New York 10018

Prepared by:

Penn Environmental & Remediation, Inc.
10346 Cabin Ridge Court
Manassas, Virginia 20110

CVE US VA Waynesboro 426, LLC
West 27th St, 8th Floor
New York, NY 10001
www.cvenorthamerica.com

Date: July 2, 2026

Subject: Property Owner Authorization Letter for Project in Waynesboro, Augusta County, Virginia

I, Crawford S. Patterson, owner of the potential solar development tract, hereby authorize CVE US VA Waynesboro 426, LLC, as the project developer/applicant, to submit an application for the subject project on my property.

County Parcel ID: 058 93B

Property Location Coordinates: 38° 8'53.91"N, 78°52'24.99"W

Owner: Crawford S. Patterson

Developer: CVE US VA Waynesboro 426, LLC

I wish for CVE US VA Waynesboro 426, LLC staff and design team to attend County meetings on my behalf for the property/project described above and thus I have explicitly authorized them to do so. Thank you for reviewing the application and I look forward to potentially having solar on my property.

Sincerely,

Signature Crawford S. Patterson

Print name: Crawford S. Patterson

Date Received:
Date of Completeness Review:

Small Solar Energy Systems

Application Completeness Review Checklist

Project Name: CVE US VA WAYNESBORO 426

Occupant: CRAWFORD S. PATTERSON

Developer: CVE US VA WAYNESBORO 426, LLC

☑ **Standards Applicable to small energy systems (Sec. 25-70.4 C.)**

- ☒ A solar facility shall not be sited within two miles of an approved or existing small or large energy system.
- ☒ Setbacks- 25 feet from side and rear property lines and 50 feet from the right of way
- ☒ Height limit- 15 feet
- ☒ Proof of control over the land or possession of the right to use the land in the manner requested.
- ☒ Documentation that the design of any buildings and structures associated with or part of the solar energy system complies with applicable sections of the Uniform Statewide Building Code (USBC) (13VAC5-63). This requirement includes all electrical components of the solar energy system.
- ☒ Glare mitigation
- ☒ Parcel has frontage on a state-maintained road or expected traffic on a legal right of way can be accompanied by the intersection with the state-maintained road per approval of VDOT.
- ☒ A solar facility cannot be located within an Urban Service or Community Development Area

☑ **Project description**

- ☒ A narrative identifying the applicant and overview of the project and its location
- ☒ Approximate rated capacity
- ☒ Approximate number of modules, representative types and expected footprint of solar equipment
- ☒ Description of ancillary facilities
- ☒ Description of buffering alternative around all property lines

☑ **Narrative of Compliance with the Comprehensive Plan addressing the 9 strategies**

☑ **Site plan**

- ☒ Property lines and setback lines
- ☒ Existing and proposed buildings and structures, including locations of the proposed solar equipment
- ☒ Existing and proposed access roads, drives, turnout locations, and parking
- ☒ Location and setbacks of substations, electrical cabling to the substations, accessory equipment, inverter pads, buildings, and structures.
- ☒ Landscaping of buffer yards along all property lines
- ☒ Required 35 ft. buffering around wetlands from panels. In ACA and RCA, the recommended 100 ft. setback from wetlands.

☑ **Fiscal Impact Analysis**

☐ **Traffic impact statement (for Large Solar Energy Systems)**

☑ **Decommissioning Plan**

- ☒ Anticipated life of the project
- ☒ Estimated decommissioning cost in current dollars
- ☒ Description of how such estimate was determined
- ☒ Method of ensuring funds will be available for decommissioning and restoration
- ☒ Method of how the decommissioning cost will be kept current
- ☒ Description of how the project will be decommissioned and the site restored

PROJECT NARRATIVE

CVE US VA Waynesboro 426 LLC proposes the CVE US VA Waynesboro 426 project, located in Augusta County off Rockfish Road (SR 865). The leased land is owned by Crawford S. Patterson, and covers 25 acres.

The fenced-in area will cover approximately 22.12 acres and will include approximately 9,200 solar arrays, equaling 6.05 acres of impervious space, an access road equaling approximately 1.06 acres of impervious space, stormwater management facilities, and associated electrical equipment. The facility will have a capacity of approximately 5 MW AC and 6.0614 MW DC. The facility is connected to the grid with Dominion Energy infrastructure.

Access from Rockfish Road to the leased property is provided by a gravel access drive, which will run alongside the two transformer and system connection infrastructure pads.

A vegetative buffer is proposed to the west and north of the site. The east and south of the site will utilize existing vegetation as a buffer.

The proposed development has been evaluated for glare and that study determined no glare is predicted upon any of observation points or Rockfish Road. Please refer to the Photovoltaic Module Solar Glare Study, by Pure Power Engineering appearing later in this package.

SMALL ENERGY SYSTEMS NOTES

- CVE US VA Waynesboro 426 is not located within two miles of another approved or existing small or large energy system.
- Setbacks are set at 25 feet from the side and rear properties, 50 feet from the right of way, and 200 feet from residential properties.
- Height limit for the site is 15 feet.
- CVE US VA Waynesboro 426 LLC maintains control over the land for small energy systems use. Documentation will be provided.
- Proposed structures and electrical components are designed to comply with the applicable sections of the uniform statewide building code (USBC) (13VAC5-63). Documentation will be provided.
- Proposed parcel has frontage on a state-maintained road.
- The proposed facility is not located within an urban service or community development area.

FISCAL IMPACT ANALYSIS

DETAILED NARRATIVE

Cost vs. Revenue analysis:

- Expected real estate: due to its geographic location relative to the surrounding residential and farming communities, and screening efforts, it is not expected that adverse effects will be observed regarding real estate.

  This is a passive system and neither costs nor benefits to personal property, or local meals/lodging tax revenues will be generated by this proposed development.
  This 5 MW AC solar farm is expected to generate between $250,000 and $450,000 in gross annual revenue. Actual earnings will depend on how the power is sold (Wholesale Market vs. Corporate PPA) and local insolation.

KEY REVENUE FACTORS

Energy production: a 5 MW AC utility-scale array produces roughly 8,000 to 10,000 MWh of electricity per year.

Pricing mechanisms:

- PPA (power purchase agreement): direct power sales to a corporate off-taker typically yield a fixed $40 to $60 per MWh.
- Wholesale market: selling on the wholesale electricity marketplace through pjm interconnection may cause revenue to fluctuate depending on spot prices.
- Service demands:

  There are not expected to be projected impacts on public schools, Augusta County fire-rescue, police (sheriff's office), and road infrastructure as this project does not create any traffic or other community adverse effects. The site will not be occupied by personnel on a regular basis. Only regular and occasional maintenance with generate and traffic onto and from the development

Proffers:

The developer is not aware of any existing required or voluntary commitments or financial contributions (cash proffers) to offset capital improvements necessary for the development.

COMPREHENSIVE PLAN COMPLIANCE NARRATIVE

Agriculture: commitment to preserving prime agricultural soils and rural character (e.g., agricultural and forestal districts).

This project proposes to develop an empty 25-acre lease parcel adjacent to open fields in Waynesboro. The project remains consistent with agricultural interests by the use of livestock to graze within open spaces between the panels. Screening from public will mitigate impacts to rural viewsheds.

Economy: alignment with goals to attract higher-paying jobs and support established local industries.

While this project does not directly contribute to higher paying jobs, power provided by the development will attract business with needs for such lower-cost power, and the jobs they will create will serve this particular strategy.

Community facilities: ensuring proximity and access to public infrastructure, parks, and the new Augusta County courthouse.

This project does not adversely impact access to such facilities, and power provided may increase the utility of existing infrastructure (lighting for parks and other outdoor recreation facilities).

Public education: addressing how development impacts student capacity and school facility planning.

Addition of ready-available lower-cost power is a value add to public education facilities without any adverse effect. The project does not directly increase student population or the need for school system requirements (buses, classrooms, teachers).

Land use & growth management: demonstrating that the project conforms to the county's designated planning policy areas (e.g., whether the project falls within designated urban service areas like fishersville or stuarts draft).

This project is outside designated urban service areas but will provide ready-available power to support development of such areas via existing infrastructure.

Environment: compliance with modern Virginia Stormwater (SWM) and Erosion (ESC) Regulations as well as local watershed protection.

This project is required to, and will meet all commonwealth SWM, ESC, and watershed protection interests. The infrastructure itself does not introduce any deleterious materials or compounds to the areas water shed. Increases in runoff

from the site will be mitigated by onsite stormwater management and treatment facilities.

Energy: consideration of energy resiliency, including the designated policies for solar energy facilities.

This is by its nature, the expression of these interests.

Housing: provision of diverse housing typologies to meet local demographics and workforce needs.

This project is silent on the issues of this strategy - it neither adversely nor favorably impacts housing, and therefore workforce directly. It will serve to reduce financial burdens to be borne by the local population.

Transportation & thoroughfare: consistency with the thoroughfare plan, addressing traffic impacts, road improvements, and multi-modal access.

As this is a small proposed solar facility, it represents no impacts to transportation and thoroughfare interests, not traffic.

DECOMMISSIONING PLAN

CVE US VA WAYNESBORO 426, LLC
5 MW AC SOLAR PV

Prepared for:

109 W. 27th Street
8th Floor
New York, NY 10001

July, 2026
PER Project No.: PA009927

Prepared by:

PENN ENVIRONMENTAL & REMEDIATION, INC.
100 Ryan Court
Suite 20
Pittsburgh, PA 15205

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1.0 INTRODUCTION

CVE North America is proposing to construct and operate a 6 MWAC solar site that will be called CVE US Patterson 426 LLC (the "Project"). This project will be located in Augusta County, Virginia, and will operate for a proposed lifespan of 30-35 years.

Currently, the site of the project is used as agricultural land. After construction is completed, this site will include an array of solar panels and all necessary supporting equipment. This includes but is not limited to a perimeter fence, an access road, reinforced concrete equipment pads, electrical equipment such as power inverters and switchboards, solar module racking, and electrical wiring.

The purpose of this document is to outline the decommissioning activities CVE North America and thus CVE plan to complete upon the end of the project lifespan, or another event that is grounds for decommissioning. These activities, outlined below, include but are not limited to the procedure for removal of all on-site equipment and the restoration of the site to pre-construction conditions.

In order to ensure Augusta County that these decommissioning activities are adequately funded in any possible case where decommissioning is triggered, a security bond will be given to the town prior to the start of construction. This amount, calculated as shown in Exhibit A of this document, has been shown to be enough to cover the estimated costs for the equipment decommissioning of this site and was agreed upon by both parties. Should CVE North America not fulfill their obligation to adequately decommission this site in accordance with the terms in the bond agreement, Augusta County has the right to use these funds to complete the decommissioning of the site. Once the town has declared the site adequately decommissioned, the remaining funds from the bond will be returned to CVE North America.

2.0 DECOMMISSIONING RULES

CVE North America recognizes that there are multiple triggers that are grounds for decommissioning this project. These triggers include:

- Abandonment of the project – where project is not generating electricity or under any form of construction/remediary maintenance for 12 months.
- Construction is never started or remains unfinished
- End of project lifespan – starting from the first date of commercial operation

For any of these triggers, CVE North America is responsible for beginning the decommissioning process. As aforementioned, if CVE North America cannot or does not start this process in a timely manner, specifically within a period of 6 months, Augusta County will use the financial security associated with this project to fund decommissioning activities.

In any case, the decommissioning of this project will require notification of all interested parties 6 months before the start of these activities. Each of these parties will also be contacted prior to the start of construction and offered a copy of the decommissioning plan. Any changes made to this plan over the course of the project lifespan will require CVE North America to notify all of these parties. The interested parties include:

- Crawford S. Patterson, Landowner
- CVE North America

3.0 SYSTEM DECOMMISSIONING

Due to the project's location, amongst other factors, decommissioning of this project will require a NPDES general permit. These permits must be applied for and granted by the appropriate bodies/agencies before the start of decommissioning activities.

Because a significant amount of the equipment and materials on-site will be salvageable at the end of the project timeline, this will be the most desirable option when CVE North America is decommissioning this project. For equipment that cannot be salvaged, the next most desirable option will be to recycle or reuse these materials elsewhere. If neither of these options is applicable, the equipment in question will be disposed of at appropriate facilities. During the decommissioning process, CVE North America plans to take measures to ensure that no damage is done to the site or equipment as a result of decommissioning activities, including ensuring that wetlands on or near the site will not be disturbed in any way during this process. This outlines the general strategy that will be used when decommissioning this site. The remainder of this section will focus on specific equipment types and how this strategy will be applied to each one.

3.1 PV Modules

The PV modules on site will be properly removed from their racking and transported off site. They will either be tested for reuse or brought straight to a recycling facility equipped to recycle PV solar modules. The details surrounding this testing and recycling process will be determined at or near the time of decommissioning.

3.2 Electrical Equipment

All electrical equipment on site will be removed from concrete equipment pads or other locations and disposed of at the proper facilities. This equipment includes but is not limited to power inverters, other power converters, switchboards, transformers, meters, and combiner boxes. It does not include electrical wiring.

3.3 Electrical Wiring

All wiring will be removed from the site and recycled at appropriate facilities. This includes all DC wiring and conduit, all underground AC wiring, and all above ground AC wiring and conduit up until the point of interconnection.

3.4 Concrete Pads

All concrete pads will be broken down and excavated. This includes any rebar, bolts, or other materials used to reinforce the concrete. All clean concrete will be broken down further to be reused on another site or future project. The remaining concrete and materials will be disposed of at appropriate facilities.

Any disturbance to the land created as a result of excavation will be backfilled with imported soil similar to the soil on site, in an attempt to restore pre-construction conditions at the pad locations.

3.5 Racking and Fencing

All racking and fencing will be properly disassembled on site and either recycled or properly disposed of. This includes any piles, posts, screws, footings, or other structure that supported the racking or fencing on site.

3.6 Access Road

The landowner has the option to request that the access road is left on site after decommissioning, should they want to use it for a future project or for personal use. If this is not requested, all material used for the construction of this road will be excavated and removed from the site. Clean material will be reused elsewhere, and the remaining materials will be properly disposed of at appropriate facilities.

Any disturbance to the land created as a result of excavation will be backfilled in an attempt to restore pre- construction conditions along the former access road.

4.0 SITE RESTORATION

After equipment removal has been completed, important measures will be taken by CVE North America to restore the site to pre-construction conditions. This includes but is not limited to filling any disturbed areas with imported soil similar to the soil on site, reseeding disturbed areas and restoring vegetation, removing vegetative screening, and restoring stormwater management to pre-construction condition. Any erosion or sediment control will remain in place until the restored site has achieved the necessary level of stabilization.

5.0 DECOMMISSIONING SCHEDULE

In the following table, a rough schedule for decommissioning activities is shown.

Activity	Timeline
Panel, above ground conductor, and equipment removal	[Months 1-2]
Racking removal	[Months 2-3]
Concrete pad removal	[Months 3-4]
Below grade conductor removal	[Months 4-5]
Fence removal	[Month 5]
Access road removal	[Months 5-6]
Active site restoration (not including time needed for vegetation to grow)	[Months 6-7]

Keep in mind that this table does not include time needed for proper notifications and other considerations not involved with equipment removal and active site restoration.

6.0 CONCLUSION

As CVE North America approaches the construction of this project, it is important to keep in mind that the County and any other interested parties should be contacted about any difficulties or issues encountered that would cause changes to this decommissioning plan. In addition, this plan must be agreed upon by all parties prior to the issuance of any construction permits. Discussions about possible edits and revisions to this plan should be had throughout the lifespan of the project, primarily between CVE North America and Augusta County.

ATTACHMENT A
ENGINEER'S OPINION OF PROBABLE DECOMMISSIONING COSTS

Engineer's Opinion of Probable Decommissioning Costs

Shown below is the summary for the cost estimate of decommissioning this site. Note that the price and salvage values are totals for each line item.

Items	Amount	Unit	Unit Cost	Total Cost	Salvage Value	Net Cost
Modules	8658	EA	$ 8.22	$ 71,139.90	$ -	$ 71,139.90
Racks	333	EA	$ 55.08	$ 18,342.75	$ 17,549.83	$ 792.92
Inverters	34	EA	$ 175.25	$ 5,958.50	$ -	$ 5,958.50
Transformers	2	EA	$ 701.00	$ 1,402.00	$ -	$ 1,402.00
Switchboards	2	EA	$ 701.00	$ 1,402.00	$ -	$ 1,402.00
DC String/Rack Wiring	0	LF	$ 12,106.95	$ 12,106.95	$ 5,971.27	$ 6,135.68
DC Wiring	0	LF		$ -	$ 2,745.61	$ (2,745.61)
AC Wiring	0	LF		$ -	$ 837.59	$ (837.59)
Utility Poles	6	EA	$ 1,250.00	$ 7,500.00	$ -	$ 7,500.00
Equipment Pads	2	EA	$ 2,644.00	$ 5,288.00	$ -	$ 5,288.00
Rack Foundations	1597	EA	$ 19.83	$ 31,668.51	$ 15,566.07	$ 16,102.44
Fence Removal	6191	LF	$ 3.18	$ 19,687.38	$ 216.96	$ 19,470.42
Seeding	25	AC	$ 200.00	$ 5,000.00	$ -	$ 5,000.00
Silt Fence		LF	$ 2.75	$ -	$ -	$ -
Wetland Fence		LF	$ -	$ -	$ -	$ -
Soil Import	0	CY	$ -	$ -	$ -	$ -
Access Road	1709.93	CY	$ 18.00	$ 30,778.74	$ -	$ 30,778.74
Grading	2	Day	$ 2,400.00	$ 4,800.00	$ -	$ 4,800.00
			Total:	$ 215,074.74	$ 42,887.34	$ 172,187.40

Factor of Safety:	15.00%
Present Day $ Total:	**$ 198,015.51**
Inflation rate:	2.00%
Lifespan in years:	30
Cost at time of decommissioning:	**$ 387,574.35**

Photovoltaic Module Solar Glare Study

for the solar project at:

CVE US VA Waynesboro 426

Waynesboro City, Virginia

presented to:

CVE US VA Waynesboro 426, LLC

29 W 38th Street

New York, NY 10018-5504

by:

PURE POWER ENGINEERING

111 River Street, Suite 1110

Hoboken, NJ 07030

www.purepower.com

(201)687-9975



Pure Power Engineering
111 River Street
Suite 1110
Hoboken, NJ 07030
(201) 687-9975
www.purepower.com

Project Information

Pure Power Engineering Project Number: 15116

Study commissioned by: CVE North America

Revision History

Date	Revision Description	ENG	CHK
07/02/2026	Glare Report REV0	JB	SRM

Pure Power Engineering
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Executive Summary

The project **CVE US VA Waynesboro 426** is a proposed solar PV installation in Waynesboro City located in Augusta County, Virginia. The modules are installed at ground level oriented at 180° and are mounted on a single axis tracker racking system.
The proposed PV system is located within proximity of various roadways and buildings where a glare study has been deemed necessary to assess the potential for glare upon:

1. (7) Buildings
    a. See glare study data for exact coordinates of each building
2. (1) Roadway
    a. Rockfish Road

To evaluate whether the revised proposed project has the potential to impact the prescribed observation points, a glare analysis has been completed using the Forge Solar PV Planning & Glare Analysis Program. The potential for ocular impacts was analyzed over the entire calendar year from when the sun rises above the horizon until the sun sets below the horizon.
The modeling of residences assume (2) level vantage points an observation height of 5' for ground level vantages and 15' for second story vantages. Roadway observation heights are assumed at 4' and two-way traffic was analyzed.
The project array was modeled per the latest project documents furnished by Penn E&R. The entire project was analyzed at six-foot average array panel height. SAT arrays were analyzed at a 10-degree resting angle. Additional model parameters such as ground coverage ratio (GCR) and solar module surface type are detailed in the ForgeSolar output report.

Results

Based on the modeling and simulation, **no glare is predicted upon any of the (14) observation points or (1) roadway**. Sensitivity analysis and glare mitigation techniques have been successfully implemented to eliminate the potential for glare- in this case, resting angle adjustment. An assigned resting angle of 10 degrees resulted in reducing the potential for annual green glare down to zero hours. Due to this mechanical adjustment, no screening is deemed required nor suggested to mitigate predicted glare. Details and modeling are included in the ForgeSolar output report. Please see the Considerations and Output Report Keys section for important notes.

Should you have any questions or require any additional information, please do not hesitate to contact us.

Sincerely,

PURE POWER ENGINEERING, INC.



Scott R. Meacham
Senior Project Manager
NABCEP Certified PV Installation Professional

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Glint-Glare Overview

Renewables are the fastest-growing energy source in the United States, with photovoltaic (PV) module-based solar power being among the major drivers behind this growth. PV solar power projects large and small are collectively producing a considerable source of clean and affordable energy in both sparsely populated rural areas as well as densely populated urban centers, providing a positive environmental impact on their surrounding communities. These installations have also been evaluated to yield the potential for glint and glare exposure by way of sunlight reflected from the PV solar modules of which they are comprised, where glint is defined as a momentary flash of light, while glare is a continuous source of brightness. Both glint and glare reflections are abundant in existing environments. Commonly encountered forms of each respectively are shimmers of light viewed on the surface of wavy water and sustained bright spots of light reflecting off of standing water or residential and vehicle glass. From here on, glint and glare will be generalized as "glare".

Relative size of the point of origin with respect to an observer, reflectivity of the origination surface, and viewing duration are all key factors in estimating the intensity of reflected light at a viewer's eye and the potential effects of viewing any given reflection. Effects of viewing glare can range from nuisance or distraction, which is associated with low potential and potential for flash-blindness/after-image, and in severe cases, potential for permanent eye damage in the form of retinal burn. The three classifications of glare are presented as green, yellow, and red zones respectively in Figure 1, which considers glare in a given instant of time as a function of relative reflection spot size as an angle, and light intensity at an observer's eye. Note that for comparison, a datapoint corresponding to direct and unfiltered viewing of the sun is included and falls in the upper range of the yellow glare region.

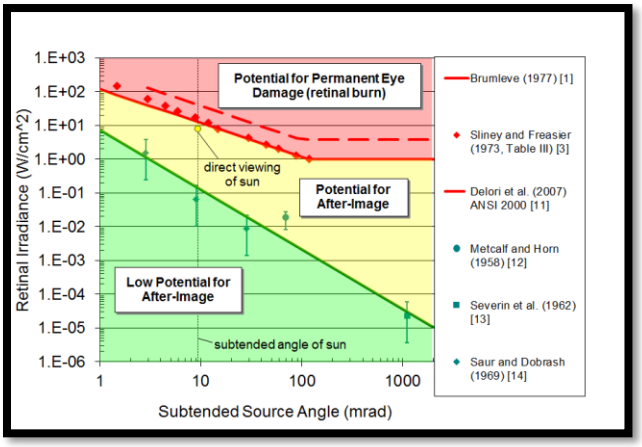


Figure 1 – Types of glare hazards categorized by severity [1]

[1] Sims, C. A. (n.d.). Solar glare and Flux analysis tools. Solar Glare | SNL. https://share-ng.sandia.gov/glare-tools/.

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www.purepower.com

The root desired functionality of solar PV modules is that they should absorb and convert as much incident solar irradiance to electrical power as is possible, therefore reducing the amount of light reflected is inherent to the module design and manufacturing process. While the inner layers of modules are typically comprised of silicon cells that are dark in color, the top layer of PV modules is notably made of high-transmission glass that can either be smooth or textured depending on make and model. This top layer of glass is often treated with an anti-reflective coating (ARC) as illustrated in Figure 2, which is meant to retain light initially reflected from the inner layers of the module for maximum efficiency. These coatings are particularly effective when modules are directly facing the sun.

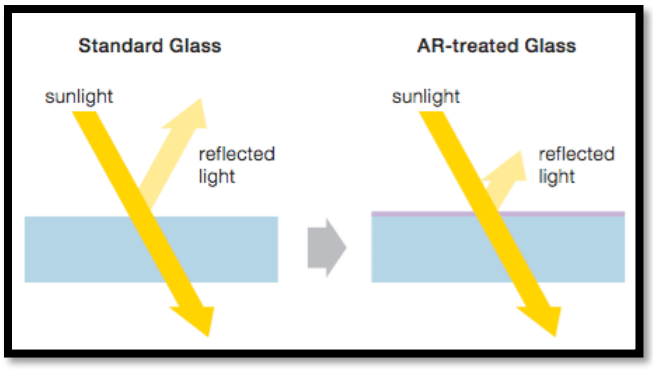


Figure 2 – Reduction of reflected light by Anti-Reflective Coating [2]

Several studies have been conducted to compare the reflectivity of PV glass with other surfaces. In one such study, PV module glass with an ARC was found to be less reflective than smooth water, standard glass, and steel across sunlight incidence angles from zero to 90 degrees (Figure 3).

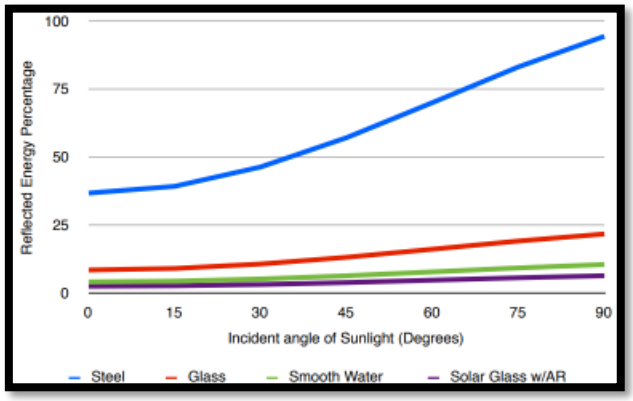


Figure 3 – Analysis of Typical Material Reflectivity - reflected energy from common surfaces with varying sunlight incident angles [3]

[2] Mitsubishi – Anti-Reflective Glass. https://www.yourenergysolutions.com/solar/panels/mitsubishi/mitsubishi-anti-reflective-glass/.

[3] Capital Solar Farm Visual Impact Assessment. | New South Wales Government. https://majorprojects.planningportal.nsw.gov.au.

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The same study also concluded that the glass surface of the studied module was less reflective than the majority of existing environmental surfaces at the project site, only registering greater reflection than asphalt (Figure 4).

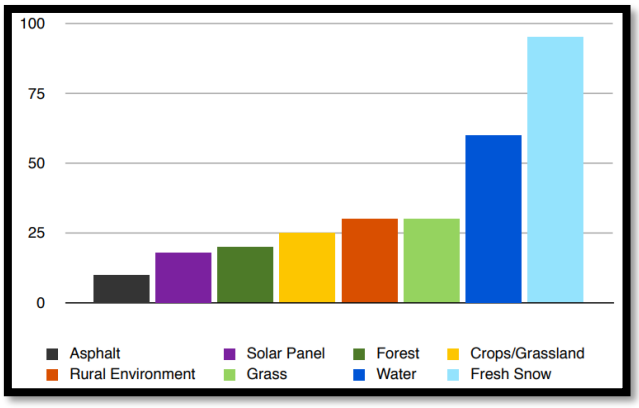


Figure 4 – Comparative Reflection Analysis - reflectivity of common environmental surfaces as a percentage [4]

On an array level, reflection reduction and increased absorption is achieved by positioning and tilting modules to face the sun with the goal of creating low incidence angles with incoming sunlight. Fixed-tilt PV arrays are comprised of modules installed at fixed positions and angles, meaning they remain in the same orientation for the entirety of project life. As a result, incidence angles of incoming sunlight will vary greatly throughout the day as the sun's position in the sky changes, leading to varying levels of reflected light. Axis-tracking PV arrays adjust PV module position and tilt throughout the day to maintain optimal incidence angle as the sun moves across the sky, generally resulting in less reflected sunlight than a fixed-tilt array. It is important to note that under clear sky conditions, both fixed-tilt and axis-tracking type arrays can reflect enough sunlight to create glare conditions, however, reflected light will not always be bothersome or at all observable due to incidence angle, existing topographic features, vegetation, and structures, among other view obstructions and site conditions.

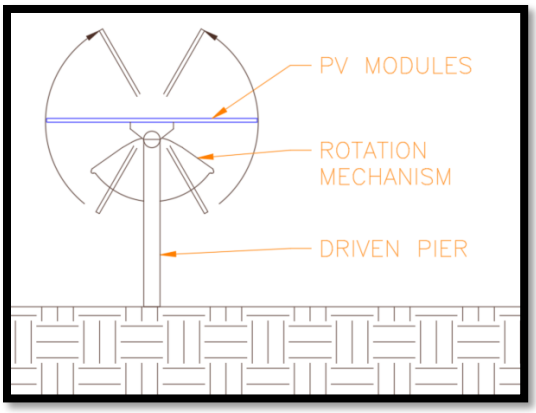


Figure 5 – Single axis-tracking module racking system (by Pure Power Engineering)

[4] Capital Solar Farm Visual Impact Assessment. | New South Wales Government. https://majorprojects.planningportal.nsw.gov.au

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Computational tools have the capability to accurately predict occurrences and intensity of glare from solar PV installations at specified locations (glare analysis). In the best-case scenario glare analysis may conclude that reflections are not predicted to be observable at studied locations, however in cases where glare is predicted to be observable at these locations, the same tools can yield insight on glare minimization and elimination techniques. For fixed-tilt systems, minimization and elimination can often be achieved by adjusting system design parameters such as module type; array azimuth, tilt, and area; and site topography. Axis tracker systems have the additional option of programming movement schemes to avoid positions that create undesirable reflection conditions. For example, it is possible to adjust module resting angle to lessen early morning and late evening glare, which are common glare times due to the combination of low sun angles and typical module stowing positions. In cases where key design parameters cannot be adjusted, other options do exist. If line of sight from an observation point to an array can be obstructed, then potential for viewing glare can be reduced. Further, if there is no line of sight from an observation point to an array, direct reflection is not possible and the potential for viewing glare is eliminated. Screening, the practice of blocking view of reflected sunlight by means of a physical barrier object, can be accomplished using a variety of solutions such as aesthetically pleasing fencing, existing or altered topography, and more commonly vegetative landscape buffers. These considerations, along with tuning design parameters, have successfully enabled solar PV projects to be developed and built in both residential areas and near critical transportation infrastructure such as alongside roads and near or on airport properties with little to zero negative impact.

Pure Power Engineering employs the web-based ForgeSolar PV Planning and Analysis Tool to perform glare analyses of projects. This tool is built with Solar Glare Hazard Analysis Tool (SGHAT) software (commercial name GlareGauge) licensed from the United States Department of Energy and Sandia National Laboratories. Per its developers, the tool provides a quantified assessment of when and where glare will occur throughout the year for a prescribed solar installation, as well as potential effects on the human eye at locations where glare occurs. If glare is found, the tool calculates the retinal irradiance and subtended angle (size/distance) of the glare source to predict potential ocular hazards. The results are presented in simple, easy-to-interpret plots that specify when glare will occur throughout the year, during what times of day, and where on the project array it will originate, with color codes indicating the intensity of the potential ocular hazard.

This introduction addresses the topic of glint and glare and related concepts at a high level to provide a baseline understanding needed for the interpretation of ForgeSolar output reports appended to this deliverable and is not intended to be a comprehensive overview. Portions of this introduction were written referencing content made publicly available by ForgeSolar and the United States Department of Energy and Sandia National Laboratories. For more detailed explanations of concepts including but not limited to array geometry impact on reflections as well as comprehensive overviews of the theory and mathematics supporting SGHAT/GlareGauge, refer to these online publications:

ForgeSolar: https://www.forgesolar.com/help/#appendix

SGHAT Technical Reference Manual: https://www.forgesolar.com/static/docs/SGHAT_Technical_Reference-v6.pdf

FORGESOLAR GLARE ANALYSIS

Project: **Glare Study- CVE US VA Waynesboro 426**

Assess the potential for glare from proposed Solar PV ground mount installation. Assessment will account for any potential glare upon prescribed adjacent observation points.

Site configuration: **REV0-temp-1**

Calculated via ForgeSolar Radiometric Physics Engine v3.2.0

Created 02 Jul, 2026
Updated 02 Jul, 2026
Time-step 1 minute
Timezone offset UTC-5
Minimum sun altitude 0.0 deg
DNI peaks at 1,000.0 W/m^2
Category 5 MW to 10 MW
Site ID 182258.30092

Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Min luminance threshold 5,000 cd/m^2



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 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
Route 1- Rockfish Road	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV array 1
Axis tracking: Single-axis rotation
Backtracking: Shade
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 10.0°
Ground Coverage Ratio: 0.415
Rated power: -
Panel material: Smooth glass with AR coating



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	38.148021	-78.872594	1272.74	6.00	1278.74
2	38.147741	-78.872596	1261.99	6.00	1267.99
3	38.147847	-78.873356	1284.57	6.00	1290.57
4	38.147569	-78.873351	1282.74	6.00	1288.74
5	38.147641	-78.873941	1290.24	6.00	1296.24
6	38.147342	-78.873959	1281.92	6.00	1287.92
7	38.147391	-78.874264	1291.80	6.00	1297.80
8	38.146846	-78.874296	1284.16	6.00	1290.16
9	38.146829	-78.874154	1280.66	6.00	1286.66
10	38.146508	-78.874170	1281.58	6.00	1287.58
11	38.146500	-78.873900	1283.24	6.00	1289.24
12	38.146206	-78.873909	1288.65	6.00	1294.65
13	38.146180	-78.873497	1284.32	6.00	1290.32
14	38.145917	-78.873515	1277.33	6.00	1283.33
15	38.145924	-78.873711	1286.53	6.00	1292.53
16	38.145620	-78.873720	1277.71	6.00	1283.71
17	38.145652	-78.873926	1284.06	6.00	1290.06
18	38.145379	-78.873949	1271.24	6.00	1277.24
19	38.145415	-78.874280	1281.61	6.00	1287.61
20	38.145141	-78.874287	1279.74	6.00	1285.74
21	38.145186	-78.874581	1287.64	6.00	1293.64
22	38.144869	-78.874598	1278.45	6.00	1284.45
23	38.144900	-78.874801	1287.13	6.00	1293.13
24	38.144904	-78.874827	1288.49	6.00	1294.49
25	38.144635	-78.874847	1278.42	6.00	1284.42
26	38.144671	-78.875149	1287.17	6.00	1293.17
27	38.144407	-78.875150	1278.20	6.00	1284.20
28	38.144560	-78.876564	1300.50	6.00	1306.50
29	38.144851	-78.876540	1305.68	6.00	1311.68
30	38.144828	-78.876420	1305.55	6.00	1311.55
31	38.145106	-78.876423	1302.63	6.00	1308.63
32	38.145083	-78.876235	1300.25	6.00	1306.25
33	38.145363	-78.876232	1299.27	6.00	1305.27
34	38.145347	-78.876113	1297.28	6.00	1303.28
35	38.145653	-78.876113	1294.64	6.00	1300.64
36	38.145639	-78.875987	1294.41	6.00	1300.41
37	38.145920	-78.875996	1296.93	6.00	1302.93
38	38.145872	-78.875682	1294.75	6.00	1300.75
39	38.146148	-78.875680	1298.37	6.00	1304.37
40	38.146137	-78.875615	1297.16	6.00	1303.16
41	38.146444	-78.875614	1297.75	6.00	1303.75

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
42	38.146432	-78.875495	1296.57	6.00	1302.57
43	38.146699	-78.875493	1298.17	6.00	1304.17
44	38.146694	-78.875373	1298.28	6.00	1304.28
45	38.146963	-78.875371	1303.55	6.00	1309.55
46	38.146945	-78.875246	1304.36	6.00	1310.36
47	38.147239	-78.875249	1305.81	6.00	1311.81
48	38.147228	-78.875127	1305.07	6.00	1311.07
49	38.147506	-78.875119	1306.51	6.00	1312.51
50	38.147474	-78.874876	1301.20	6.00	1307.20
51	38.147739	-78.874869	1304.42	6.00	1310.42
52	38.147716	-78.874749	1302.12	6.00	1308.12
53	38.148011	-78.874745	1303.59	6.00	1309.59
54	38.148009	-78.874689	1302.19	6.00	1308.19
55	38.148286	-78.874686	1302.66	6.00	1308.66

Route Receptors

Name: Route 1- Rockfish Road
Path type: Two-way
Azimuthal view angle: 50.0°
Downward view angle: 90.0°



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	38.147796	-78.870377	1289.58	4.00	1293.58
2	38.146235	-78.870794	1283.70	4.00	1287.70
3	38.143231	-78.871727	1340.54	4.00	1344.54

Discrete Observation Point Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	38.146556	-78.871386	1293.19	5.00
OP 2	2	38.146482	-78.871243	1296.57	15.00
OP 3	3	38.146165	-78.871724	1298.35	5.00
OP 4	4	38.146136	-78.871494	1301.22	15.00
OP 5	5	38.145707	-78.871728	1294.38	5.00
OP 6	6	38.145587	-78.871335	1303.29	15.00
OP 7	7	38.144931	-78.871943	1312.03	5.00
OP 8	8	38.144869	-78.871679	1315.40	15.00
OP 9	9	38.144469	-78.872102	1324.89	5.00
OP 10	10	38.144348	-78.871737	1330.38	15.00
OP 11	11	38.144087	-78.872242	1326.97	5.00
OP 12	12	38.144024	-78.871796	1333.40	15.00
OP 13	13	38.143396	-78.872351	1320.86	5.00
OP 14	14	38.143293	-78.871954	1335.68	15.00

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 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
Route 1- Rockfish Road	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0

PV: PV array 1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Route 1- Rockfish Road	0	0.0	0	0.0
OP 1	0	0.0	0	0.0
OP 2	0	0.0	0	0.0
OP 3	0	0.0	0	0.0
OP 4	0	0.0	0	0.0
OP 5	0	0.0	0	0.0
OP 6	0	0.0	0	0.0
OP 7	0	0.0	0	0.0
OP 8	0	0.0	0	0.0
OP 9	0	0.0	0	0.0
OP 10	0	0.0	0	0.0
OP 11	0	0.0	0	0.0
OP 12	0	0.0	0	0.0
OP 13	0	0.0	0	0.0
OP 14	0	0.0	0	0.0

PV array 1 and Route: Route 1- Rockfish Road

No glare found

PV array 1 and OP 1

No glare found

PV array 1 and OP 2

No glare found

PV array 1 and OP 3

No glare found

PV array 1 and OP 4

No glare found

PV array 1 and OP 5

No glare found

PV array 1 and OP 6

No glare found

PV array 1 and OP 7

No glare found

PV array 1 and OP 8

No glare found

PV array 1 and OP 9

No glare found

PV array 1 and OP 10

No glare found

PV array 1 and OP 11

No glare found

PV array 1 and OP 12

No glare found

PV array 1 and OP 13

No glare found

PV array 1 and OP 14

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.
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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This analysis was conducted using the best available radiometric modeling at the time of generation. Future updates to the modeling methodology may yield different results.