

Appendix C:

Marshall Solar Responses to EERA Environmental Review Questions

September 2, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Questions 1-12**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the August 27, 2015 requests for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached responses to EERA Questions 1-12 contained in EERA's August 27, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

In the Matter of the Application)
of Marshall Solar, LLC for a)
Site Permit for the Marshall) **Docket No. IP-6941/GS-14-1052**
Solar Energy Project and)
Associated Facilities)
in Lyon County, Minnesota)

**RESPONSES OF MARSHALL SOLAR, LLC
TO
ENERGY ENVIRONMENTAL REVIEW AND ANALYSIS QUESTIONS FOR
DEVELOPMENT OF ENVIRONMENTAL REVIEW,
QUESTIONS 1-12**

Marshall Solar, LLC ("Marshall Solar") respectfully submits the following responses to Questions 1-12 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Questions 1-12 are repeated below, with Marshall Solar's response immediately following.

1. Developed Area

***Question:** Marshall Solar's Reply Comments filed March 27, 2015 (at p. 3), identify an "inside the fence area" of up to 474 acres. Does Marshall Solar have any changes or modifications to the up to 474 acre estimate?*

Response: Yes, the latest version of the site layout contemplates that all project components will be located inside a perimeter fence and that this area would encompass approximately 364 acres within the 515-acre Marshall Solar Project ("Project") area. This "inside the fence area" may be further revised as the Project layout is refined during final site development and engineering.

2. Solar Module Design

- a. ***Question:** Please describe the approximate dimensions of the solar modules (approximate width and length).*

Response: Each individual solar module will be approximately 78.5-inches long by 39.4-inches wide.

- b. **Question:** *Please provide a range of the distances between strings of modules.*

Response: There are 13-feet, 1.25-inches of open space between each row of racked modules. This distance is measured from the back edge of a panel to the front edge of a panel.

- c. **Question:** *The Application, at p. 13 refers to a “foundation” upon which the arrays are mounted, but the composition of a foundation beyond the racking and steel posts is not discussed. Please describe the foundation.*

Response: The racking will be mounted to galvanized steel H-piles that will be individually driven into the ground. These driven piles will form the racking system’s foundation. No other foundations, such concrete piers, will be constructed.

3. **Operations and Maintenance Facility**

Please clarify Marshall Solar’s plans for an Operations and Maintenance Facility. The Application, at pp. 14-15, states “The Project may include a pre-fabricated metal building to serve the operational needs of the Project.” It is unclear whether the “may” in this statement refers to the O&M facility generally or the use of a pre-fabricated building.

- a. **Question:** *Does Marshall Solar anticipate construction of an O&M facility as part of the Project?*

Response: An O&M building is no longer planned for installation at the Project site.

- b. **Question:** *If no O&M facility is constructed as part of the Project, where would the O&M equipment and materials be kept?*

Response: Marshall Solar has concluded that it would be more cost effective to utilize alternate locations for the Project’s O&M facility. Two different options are currently being evaluated. The first option would involve the rental of office/storage space within the city of Marshall, MN given the Project’s proximity to Marshall. The second option is to locate the Project’s O&M facility at an existing wind facility located near the Buffalo Ridge (approximately 30 miles from the Project site), which is owned and operated by an affiliate of Marshall Solar. Also, limited quantities of materials may also be stored in the Project’s substation control house.

- c. **Question:** *If an O&M facility is constructed as part of the Project,*

1. *Would a building necessarily be part of the facility? If so, would Marshall Solar seek a local permit, or would it seek to have the O&M facility permitted through the Site Permit?*
2. *Would Marshall Solar seek to install a well or septic system as part of the O&M facility?*
3. *Would the O&M facility include any above-ground or below-ground storage tanks? If so, please describe the contents of the tanks and procedures to minimize the potential damages resulting from leaks or spills from any tanks.*

Response: No longer applicable. See response to Question 3.a.

4. **Land Cover**

Question: *Please describe the crop cover of the proposed site in the summer of 2015 (e.g. approximately 35 percent corn, 60 percent soybeans, 5 percent alfalfa). Is there much variation in the crop cover from year to year?*

Response: The proposed Project site is currently planted with a combination of corn (36%), soybeans (63%), and wheat (1%) for the 2015 summer growing season. With respect to variations in the crop, based on crop remnants from the 2014 growing season, it appears that corn and soybeans are the typical crop types grown within the proposed Project site.

5. **Electrical System**

- a. **Question:** *It is unclear from the description on p. 13 of the Application whether each inverter in a PCS is coupled with an individual transformer, or whether a single transformer on each pad will serve several inverters. Please clarify.*

Response: Each PCS container will have a single transformer which is located immediately adjacent. This single transformer will serve each inverter within the PCS.

- b. **Question:** *The Application, at p. 14, states “Marshall Solar expects nearly all of the AC collection systems to be placed underground.” Please describe the situations which would dictate the use of overhead collector lines.*

Response: The current plan is for all AC collection to be installed underground. The only situation in which overhead would be required is in those areas in which the collection line would cross an existing transmission easement, ditch, or road right-of-way. In general, the preference in these locations is to bore underneath the item and install the collection line underground. To date, Marshall Solar has not received

feedback from any party owning an easement or right-of-way that must be crossed requesting that the lines be overhead. Thus, Marshall Solar expects to install the entire AC collection system underground.

6. Home Removal

Question: *Please provide an overview of the process for removing the home and outbuildings on the additional 4.3 acre parcel.*

Response: A full assessment of the property will be conducted prior to the start of any demolition. This assessment will include an analysis for the presence of asbestos, lead, or any other hazardous materials which would require special consideration or treatment. If the building contains hazardous materials that need to be removed, proper procedures for abatement will be followed. House demolition will involve large equipment, such as a hydraulic excavator, to tear down the structure and foundations as well as trucks and dumpsters for material removal. The removal of all demolition debris from the site and all materials will be dumped at local garbage debris disposal stations.

- a. **Question:** *Is water to the existing home provided through a well or water service? If a well is present, please describe the measures to seal the well and prevent groundwater contamination?*

Response: A single domestic well is located on the property. During construction, the well and pump will be left in place to support any construction water use requirements (domestic uses, dust control, compaction, etc). Following construction, the well may be left in-service to support any continuing water requirements at the Project site, or, if not left in-service, the well would be filled with concrete, capped, and abandoned. Marshall Solar will assess its options and preferences for well abandonment in the future.

- b. **Question:** *Please describe how the septic system at the existing home will be handled.*

Response: After removal of construction debris from around the property, Marshall Solar will arrange for the septic tank to be completely pumped out. The inlet and outlet of the tank will be capped and sealed and the tank itself will be left in place. Marshall Solar will arrange for the excavation and removal of the drain field, back fill the hole with the excavated spoil, and re-spread topsoil, as appropriate. It is Marshall Solar's understanding that the septic tank removal procedures will require a permit from Lyon County and the work would be conducted in accordance with all permit stipulations.

7. Hazardous Materials

- a. **Question:** *Please discuss any known environmental hazards (e.g. abandoned wells, chemical storage, dumps, etc.) on the site.*

Response: Two Phase I Environmental Site Assessments (“ESAs”) were performed for this Project site to examine the site for potential environmental hazards (or Recognized Environmental Conditions as per ASTM Practice E 1527-13). No Recognized Environmental Conditions were noted within the Project site. Small areas of soil staining and stressed vegetation were noted on the property; however, these conditions were all considered *de minimis* in nature. A burn pit containing remnants of burned material (likely household trash) was also noted on the property.

- b. **Question:** *Has an Environmental Site Assessment or any other type of site characterization been done for the site? If so, does the site characterization include the additional parcel?*

Response: Yes, as noted above, two Phase I ESAs were performed for this Project site: one that included the general Project site and another that was specific to the additional 4.3-acre parcel. No Recognized Environmental Conditions were identified in the ESAs.

8. **Construction Timeline**

Question: *Are there any changes or updates to the Construction Activity Timeline represented in Table 4 of the Site Permit Application?*

Response: No.

9. **Project Substation**

- a. **Question:** *Will the entire 1-2 acres inside the fence be covered with rock?*

Response: Yes, the entire area inside the substation fence will be covered with rock.

- b. **Question:** *Will there be a parking area at the Project Substation?*

Response: No parking area specific to the substation is planned. Any vehicle parking can be accommodated by the open space within the completed substation.

- c. **Question:** *Will there be a separate gate to the Project Substation, as opposed to the fencing of the entire facility?*

Response: The Project substation will have its own fence and its own access gates which are separate from the solar facilities perimeter fence. This substation security fence/access gate will be internal to the main perimeter fence and gates. Access to the substation is through the main site entrance.

10. **Laydown Area**

- a. **Question:** Please describe the criteria for selecting a construction staging/laydown area.

Response: Marshall Solar selects staging/laydown areas by evaluating ease of access to suitable roadways near the primary access points to the Project site. Laydown areas are also located with the intention of minimizing the number of times materials and equipment are handled between delivery and ultimate installation, so central location is preferable. In all cases, laydown areas are temporary and removed/reclaimed during the final stages of construction.

- b. **Question:** Would this area be fenced separately from the perimeter fencing?

Response: No, if the laydown is established on-site, because the staging/laydown area will be established within the site's perimeter fencing. Yes, if an off-site area is used for staging/laydown. Marshall Solar's preference is to utilize an on-site staging/laydown area.

- c. **Question:** Please describe the procedures for restoration of the laydown area.

Response: At the completion of construction, any rock used on the surface or spread on interior roads will be removed. The subgrade materials would be de-compacted using a tractor and disc, and topsoils would be re-spread over the entire area.

11. **Project Roads**

Question: The Preliminary Design Specifications in Appendix A of the Application indicates approximately 33,450 feet of access roads. Please provide an estimate of the total length of internal access roads. A range of lengths is acceptable.

Response: The latest estimated length of the internal access road system totals approximately 25,000 – 28,000 linear feet.

12. **Fences**

- a. **Question:** The Application, at p. 36, describes the perimeter fencing as an eight-foot chain link fence without barbed wire. Are there any design options under consideration to minimize the potential for unauthorized entrance into the facility by either humans or animals?

Response: The perimeter fencing type described on page 36 of the Application - an 8-foot chain link fence without barbed wire – is planned for the Project site at the request of the Minnesota Department of Natural Resources. Access gates will involve a combination of swinging or roller gates, secured by locks. The construction of an 8-foot fence and locked gates will enclose the perimeter and prevent the unauthorized entrance

into the facility by humans and large animals, such as deer. Marshall Solar is considering the use of other passive security systems (cameras, etc) to minimize the potential for human intrusion and has also consulted with the Lyon County Sheriff's office on security measures.

- b. **Question:** *At what point in the construction process would the perimeter fencing be installed?*

Response: The perimeter fence would be installed early in the construction process. Installation typically happens after grading is complete and the site's final grade is established, but before the start of installation of any cables or racking piles.

- c. **Question:** *Does Marshall Solar anticipate that a single perimeter fence will surround the perimeter of the entire developed area, or might there be multiple fences? There is some discussion of the main gate, will there be other entrances?*

Response: There will be multiple fences. Since the Project is essentially bisected by 290th Street, there are two main sections of the overall Project. Each of these main areas will have their own continuous perimeter fence. Also, in the northern segment, the existing transmission easements might require further segmentation of a continuous perimeter fence, but these details will be finalized in the future as Marshall Solar concludes the process of negotiating with these easement owners.

The main Project entrance will be located north of the Lyon County Substation along County Highway 9, but there will also be secondary access gates to allow access from other main roads (290th Street and 320th Avenue). Each of the Project's two main areas will have at least two access points.

- d. **Question:** *Figures 3.1 and 4.1 in Marshall Solar's July 27, 2015 update appear to show the Otter Tail Power Substation within the fence line. If the Otter Tail Power Substation is within the fence line, what are the provisions for Otter Tail Power to access the substation?*

Response: The Otter Tail Power Substation will be located outside the Project's perimeter fence line. Marshall Solar cannot fence in this substation as it is located on property not under the control of Marshall Solar. The map scale in Figures 3.1 and 4.1 make it difficult to clearly indicate the fence location in relation to the other facilities in that particular area.

September 17, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Questions 13-15**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the September 11, 2015 requests for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached responses to EERA Questions 13-15 contained in EERA's September 11, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

In the Matter of the Application)
of Marshall Solar, LLC for a)
Site Permit for the Marshall) **Docket No. IP-6941/GS-14-1052**
Solar Energy Project and)
Associated Facilities)
in Lyon County, Minnesota)

**RESPONSES OF MARSHALL SOLAR, LLC
TO
ENERGY ENVIRONMENTAL REVIEW AND ANALYSIS QUESTIONS FOR
DEVELOPMENT OF ENVIRONMENTAL REVIEW,
QUESTIONS 13-15**

Marshall Solar, LLC ("Marshall Solar") respectfully submits the following responses to Questions 13-15 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Questions 13-15 are repeated below, with Marshall Solar's response immediately following.

Question 13:

Project Decommissioning:

(a) Please describe the factors Marshall Solar will consider in determining the useful life of the plant.

(b) Please describe the factors Marshall Solar will assess when determining whether to cease operations at the site or seek to replace equipment and seek a new Power Purchase Agreement.

Response (a): A minimum useful life of 20 to 25 years is expected for the photovoltaic ("PV") facility and the other major facility components (power inverters, combiner boxes, transformers) based on the expected degradation and physical durability of the individual PV modules and other major facility components. The expected useful life is supported by manufacturers' solar facility equipment warranties that match this 20-25 year time period, as well as by numerous successful project financings that were based on this useful life expectation and validated by independent engineers in those deals.

Response (b): At the conclusion of the existing Power Purchase Agreement (“PPA”) with Northern States Power (“NSP”), Marshall Solar will assess the condition and performance of the solar facility and weigh the advantages and disadvantages of continuing operations. If the PV equipment is performing well and it makes economic sense to continue operations (with the installed equipment or with replacement equipment), Marshall Solar will likely continue operations. With that said, it is difficult at this time to foresee what types of generating technologies will be commercially available and cost competitive 25 years from now.

Another factor in the decision to continue commercial operations of the Marshall Solar site will be the availability of an interested customer. Ideally, Marshall Solar would prefer to extend or negotiate a new PPA with NSP or another interested party. Alternatively, Marshall Solar will consider sales at the locational marginal pricing available in the Midcontinent Independent System Operator wholesale energy-market. In either case, the decision whether to continue operations of Marshall Solar will be based on the economics of continued operations.

Question 14:

Subsurface Drainage

(a) Are the existing subsurface drainage systems on the site connected with any subsurface drainage systems that are not part of the site?

(b) Please describe how Marshall Solar will avoid impacts to existing subsurface drainage at the site and near the site.

Response (a): The site’s existing subsurface drainage systems are connected to the county drainage system at three known locations. The first location is at the northern edge of the site across the borderline of the property at a county drainage ditch. The second location is southwest of the site where the county drain tile crosses the Lyon County Substation and 290th Street. The third location is south of the site near the borderline at a second county drainage ditch. All three areas where the site drainage system is connected to the county drainage system are not planned to be utilized for equipment installation, including photovoltaic (“PV”) modules or racking, which will avoid potential impacts. Therefore, the

county drainage system will be operational as it exists today without any impact or interference from Marshall Solar Project.

Response (b): Marshall Solar has hired a professional drainage tile company to locate all drainage tiles on the site in the fall of 2015, as soon as possible after harvesting is complete. With this mapping data, Marshall Solar will be able to determine any unknown subsurface connections to and from the site. Once these tile lines are located and logged using Global Positioning System (“GPS”) coordinates, Marshall Solar will utilize the data to refine the site layout to avoid impacts to the existing drainage system. The placement of the PV racking, roads, and underground conductors will be planned to avoid disturbance to subsurface drainage patterns both at the site and near the site.

Also, several construction measures will be implemented to prevent impacts on the site drainage system:

- i. Damaged or weak tiles that are discovered during the mapping phase will be repaired or replaced depending upon their structural condition.
- ii. To the extent possible, major tile channels will be completely avoided. If impacts to a major tile line are unavoidable, the line will be re-routed.
- iii. Marshall Solar expects that there may be limited impact to tile during the installation of AC collection lines. In this situation, the damaged tiles will be rerouted or repaired once the collection line is installed. Since only four major AC collection lines will be planned for the site, these impacts should be minimal.
- iv. Underground DC conductors will not impact the drainage system. The DC lines will be installed at a depth of 3-feet, which should be above any drainage tile.

Question 15:

It is unclear from the information contained in Application (specifically Section 4.4 and Appendices D & F) whether SHPO has reviewed the Phase Ia Literature Survey provided in Appendix D of the application and whether or not a pre-construction archaeological field survey is recommended. Please provide any additional correspondence with the SHPO on this issue. ¹

Response: Attachments 1 and 2 to this response provide the additional correspondence with the Minnesota History Society, State Historic Preservation Office (“SHPO”).

Attachment 1 is a letter from SHPO dated March 5, 2015, in which SHPO concludes that “there are no properties listed in the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project.” Attachment 2 contains emails between Marshall Solar’s environmental consultant and SHPO prior to the issuance of the March 5, 2015 letter discussing whether a meeting regarding the project is necessary.

¹ In the second set of questions, this question was identified as question No. 16, but since question No. 14 was the same as Question No. 15, and the third set of questions starts with Question No. 16, this question has been renumbered for ease of review.

STATE HISTORIC PRESERVATION OFFICE

March 5, 2015

Mr. Brandon Stankiewicz
NextEra Energy Resources
700 Universe Blvd
Juno Beach, FL 33408

RE: Marshal Solar Energy Project – construct a solar energy project on current agricultural land
Stanley Twp., Lyon County
T112 R40 S28, 33
SHPO Number: 2015-0543

Dear Mr. Stankiewicz:

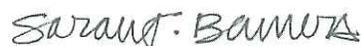
Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the Minnesota Historical Society by the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act.

Based on our review of the project information, we conclude that there are **no properties** listed in the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project.

Please note that this comment letter does not address the requirements of Section 106 of the National Historic Preservation Act of 1966 and 36CFR800, Procedures of the Advisory Council on Historic Preservation for the protection of historic properties. If this project is considered for federal assistance, or requires a federal permit or license, it should be submitted to our office by the responsible federal agency.

Please contact our Compliance Section at (651) 259-3455 if you have any questions regarding our review of this project.

Sincerely,



Sarah J. Beimers, Manager
Government Programs and Compliance

From: Kelly Gragg-Johnson [<mailto:kelly.graggjohnson@mnhs.org>]
Sent: Tuesday, December 02, 2014 2:01 PM
To: Justin, Michael
Cc: sarah.beimers@mnhs.org; Rolfes, Christina
Subject: Re: NextEra proposed Marshall solar facility

Hi Mike and Christina-

Thanks for the email. We don't believe a meeting is necessary at this time. This seems like a pretty straight forward project. We will review the results of the Phase IA lit search and any recommendations that come out of that, once it becomes available, and the results of any Phase I survey, if deemed warranted. If there are any big concerns as a result of the surveys and further consultation is needed, we would be happy to meet at that time. Meanwhile, we look forward to reviewing the results of the Phase IA and any pending Phase I surveys as they become available.

Best,
Kelly

Kelly Gragg-Johnson, Review & Compliance Specialist

Government Programs & Compliance | State Historic Preservation Office
Minnesota Historical Society | 345 Kellogg Blvd W | St. Paul, MN 55102
tel: 651.259.3455 | fax: 651.282.2374 | e: kelly.graggjohnson@mnhs.org

On Tue, Dec 2, 2014 at 1:19 PM, Justin, Michael <Michael.Justin@hdrinc.com> wrote:

Kelly and/or Sarah;

NextEra and HDR are planning on meeting with the Department of Commerce on Wednesday, December 10, 2014 to discuss the status of the proposed solar energy facility near Marshall, Minnesota. We would also very much like to discuss the project with you on that date also. Would SHPO staff be available for a meeting at 3:30 pm on Dec. 10th? *Any time during the morning of the 10th would also work as the meeting with DOC is at 2:30 pm.* The purpose of the meeting will be to familiarize SHPO with the proposed project development and NextEra's plans for dealing with historic properties. We do not anticipate a lengthy meeting. An initial letter introducing the project was sent to SHPO in November (see attachment).

Please reply to either Ms. Christina Rolfes (christina.rolfes@hdrinc.com) or me (michael.justin@hdrinc.com).

Sincerely,

Michael Justin, RPA

Archaeology Project Manager

HDR

701 Xenia Ave South, Suite 600
Minneapolis, MN 55416

D 763.591.5423 M 612.615.2460
michael.justin@hdrinc.com

September 23, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Questions 16-18**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the September 16, 2015 requests for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached responses to EERA Questions 16-18 contained in EERA's September 16, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
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In the Matter of the Application)
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Marshall Solar, LLC ("Marshall Solar") respectfully submits the following responses to Questions 16-18 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Questions 16-18 are repeated below, with Marshall Solar's response immediately following.

Question 16:

Please describe the procedures for restoration of the site following construction.

Response: Marshall Solar will restore temporary disturbance areas through re-vegetation. Marshall Solar will contract with a local restoration company to create a native prairie landscape within the solar facility. The areas to be re-vegetated include the rows between the solar panels, areas between the solar arrays and perimeter fencing and any vacant laydown areas used during construction. Access roads that will need to be traveled during operation and maintenance will remain as simple compacted dirt roads.

To re-vegetate the site with native prairie vegetation, the exposed areas to be planted will first need to be fine graded and all existing weeds that may have sprouted during construction would need to be removed (either manually or by spaying with herbicide). Site preparation may also include disking and harrowing the soil to create viable seedbeds. Following site preparation, a mixture of native prairie grasses and wildflowers (developed in concert with Minnesota Department of Natural Resources and the Natural Resources Conservation Service) will be seeded using broadcasting and/or a seed drill designed for

native seeding. Seeding is heavily dependent on timing. Seeding dates for prairie grasses native to this specific region would likely need to occur in the spring or summer.

During early establishment of prairie grasses and wildflowers, maintenance will be important. Mowing will most likely be required to control growth of unwanted weed species. The species of grasses and wildflowers selected for the areas in the vicinity of the arrays will be those that do not grow higher than the lowest edge of the solar panels. Optimum mowing height to encourage establishment will be approximately 4-6 inches. A slightly different mix of prairie grasses and wildflowers with some taller species may be developed for areas away from the arrays. The native seed mixtures are still being developed at this time. Following the initial growing season, other maintenance to encourage successful establishment may involve spot spraying, herbicide wicking or hand weeding.

The procedures for the reestablishment of prairie habitat at the Project Site will be outlined in greater detail in the Agricultural Impact Mitigation Plan which Marshall Solar is currently developing.

Question 17:

Please provide an estimate of the annual electric production in MWh for the Project. A range is acceptable.

Response: Marshall Solar currently estimates the annual electric production for the Project will be in the range of 100,000 – 130,000 MWh.

Question 18:

a. *Has Marshall Solar modeled the potential for glint and glare from the Project? If so, please summarize the results.*

Response: Marshall Solar conducted a high-level screening using a process known as the Solar Glare Hazard Analysis Tool (“SGHAT”) created by Sandia National Laboratories to assess the potential for glint and glare at the Project site. The results of the screening are attached as Attachment 1 to this response. The results of the SGHAT indicate that at certain times throughout the year there may be a low potential for glare at certain observation points. Marshall Solar has also prepared a number of visual simulations meant to model the future condition from various observation points around the Project site. Those simulations were previously provided in the Site Permit Application submitted on March 4, 2015. Based on these results, Marshall Solar does not believe a comprehensive glint and glare analysis is warranted for this proposed Project site.

b. *If a glare analysis has not been performed, please describe why not.*

Response: As noted above, a high-level glint and glare screening was completed for the Project site. Based on the results of that screening, and for the reasons described below, Marshall Solar does not believe a comprehensive modeling effort is warranted.

As discussed in the Site Permit Application, photovoltaic modules are specifically designed to avoid reflecting sunlight. The modules are manufactured with an anti-reflective coating to minimize the sunlight that is scattered and maximize the amount that is absorbed. The regional topographical character in this area of Minnesota is predominantly flat, which means there are no mountains, hills, or other prominent topographical features that would provide a viewer with an unobstructed view of the entire solar project. Instead, viewers traveling on the adjacent roads or living in residences are likely to have views of only portions of the Marshall Solar Project. These partial views are also mitigated by the micro-terrain of the Project site, which does have various undulations and small elevation changes that serve to obstruct views of the entire site. Also, tree groves, ditch embankments, vegetation, and row crops that will be growing all around the Project site will further disrupt unobstructed views and mitigate any potential impacts from glint and glare.

In addition to these site specific factors, there is a significant amount of publically available information, such as the information attached to this response as Attachment 2, suggesting that glint/glare from a photovoltaic project is not likely to cause significant impacts for ground based viewers, and, more importantly, for aircraft flying above or near the Project site. Given a combination of the available research and the observed character of the Project Site, Marshall Solar does not believe a comprehensive glare modeling effort is warranted.

c. *What would Marshall Solar consider to be the most relevant inputs into modeling of potential glint and glare from the Project?*

Response: The most relevant inputs into a glint/glare model would be the types of materials used in the construction of the solar facility (most importantly the panels), the mounting azimuth, and information about weather patterns and the sun's path across the sky at various times of day and times of year. Finally, the model must identify the points on the ground at which the analysis is to be conducted. Different points on the ground may experience completely different effects at the same time of day depending on the viewing angle, elevation differences, and other factors.

d. *Please describe any existing site constraints that may affect the amount of glare experienced by those living and traveling near the Project.*

Response: The effects observed by individuals living or travelling near the Marshall Solar Project would be heavily influenced by their location in relation to the Project. Terrain and

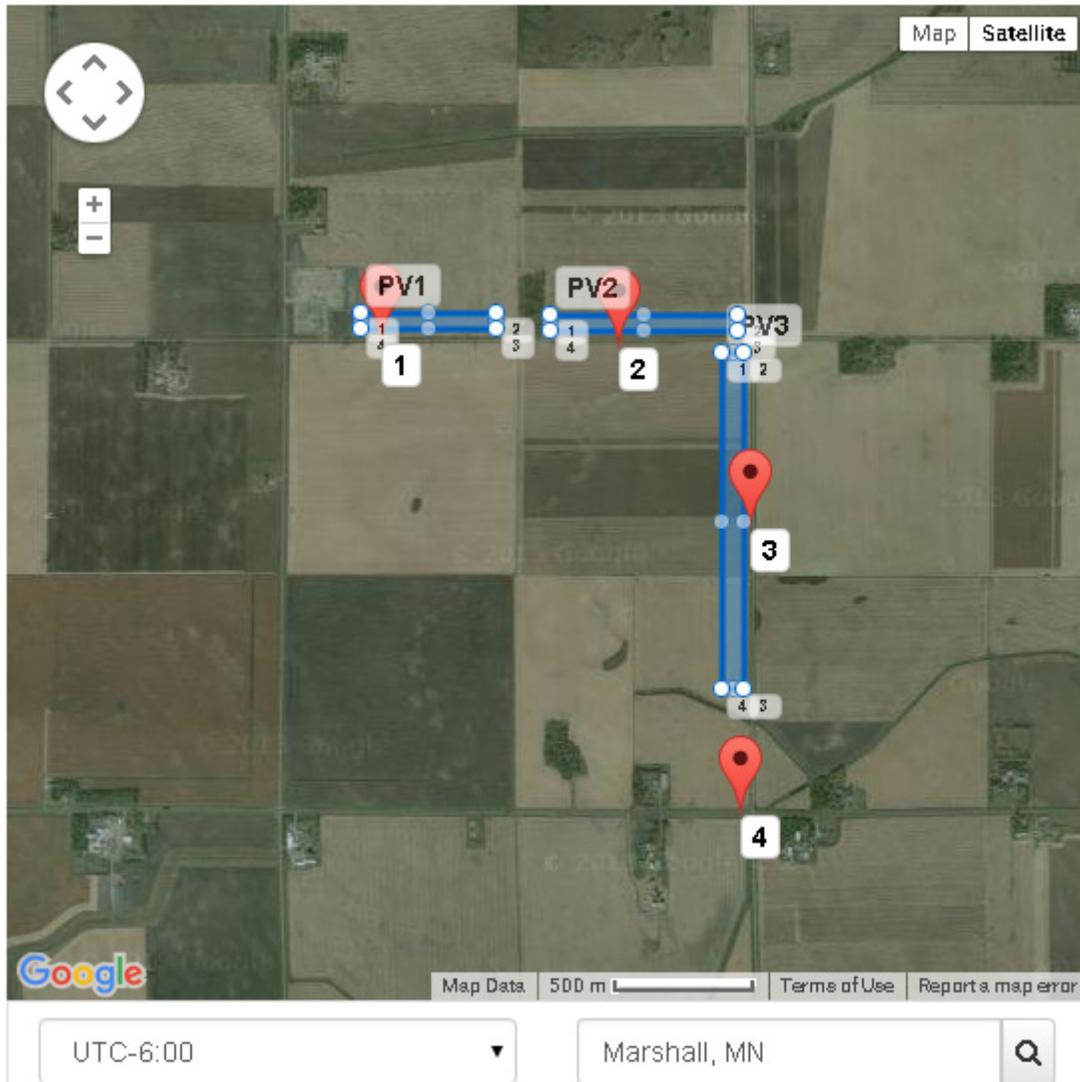
vegetation between the viewer and the Project would also influence any detected glint or glare. Finally, a viewer observing the Project from the north is only likely to observe the back side of the photovoltaic modules, which are generally white in color and shaded from the sun.

In general, the site and surrounding terrain has some small undulations which will make it difficult to view the entire Project at any given time from any location and a viewer is likely to see only a portion of the solar array. Despite these undulations, the overall topographical character of the area is predominantly flat, which means there are no areas of elevated terrain from which a viewer would be able to achieve a superior view of the Project site. Finally, tree groves and embankments in the area along the roads and near the homesteads in the vicinity of the Project will also reduce the ability of viewers to gain unobstructed views of the project.

Marshall Solar Energy Project

Solar Glare Hazard Analysis Tool Results

PV Array Blocks & Observation Points



- Observation Point (OP)
- PV Array Block

Observation Info

PV Array Info*

Axis tracking:

Module surface material:

Panel tilt: deg

Orientation (Calculate declination): deg

Rated power: kW

Reflectivity varies with incidence angle ([view data](#))

Correlate slope error to module surface type ([view data](#))

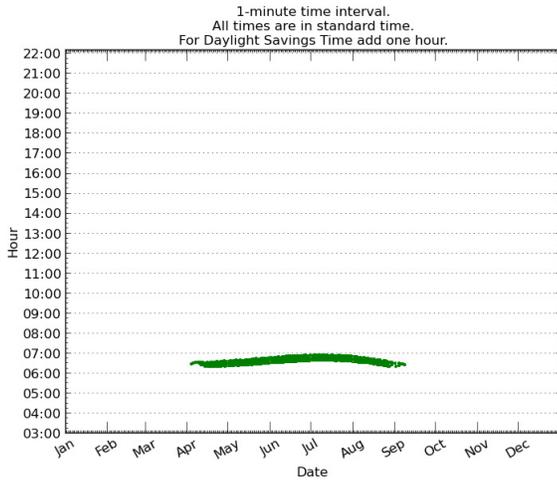
name	latitude	longitude	ground elevation	Eye-level height above ground	
	deg	deg	ft	ft	
<input type="text" value="1"/>	<input type="text" value="44.47213"/>	<input type="text" value="-95.67109"/>	<input type="text" value="1104.37"/>	<input type="text" value="5"/>	<input type="button" value="✕"/>
<input type="text" value="2"/>	<input type="text" value="44.47201"/>	<input type="text" value="-95.66088"/>	<input type="text" value="1110.6"/>	<input type="text" value="5"/>	<input type="button" value="✕"/>
<input type="text" value="3"/>	<input type="text" value="44.46647"/>	<input type="text" value="-95.65526"/>	<input type="text" value="1110.73"/>	<input type="text" value="5"/>	<input type="button" value="✕"/>
<input type="text" value="4"/>	<input type="text" value="44.45765"/>	<input type="text" value="-95.65568"/>	<input type="text" value="1108.11"/>	<input type="text" value="5"/>	<input type="button" value="✕"/>

*PV Blocks created in this tool are representative and do not reflect final array locations.

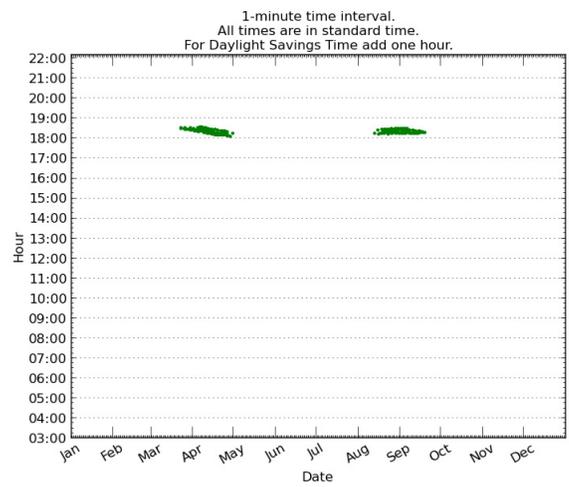
Glare Results

PV Array Block 1

Observation Point 1

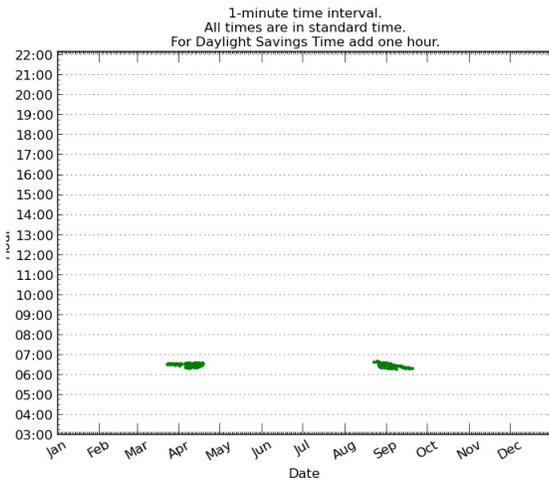


Observation Point 2

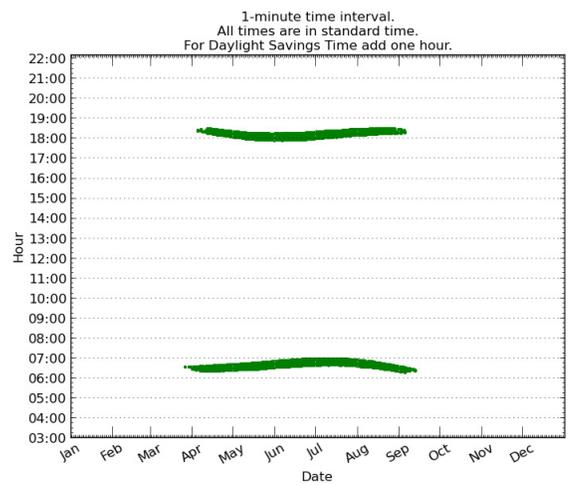


PV Array Block 2

Observation Point 1

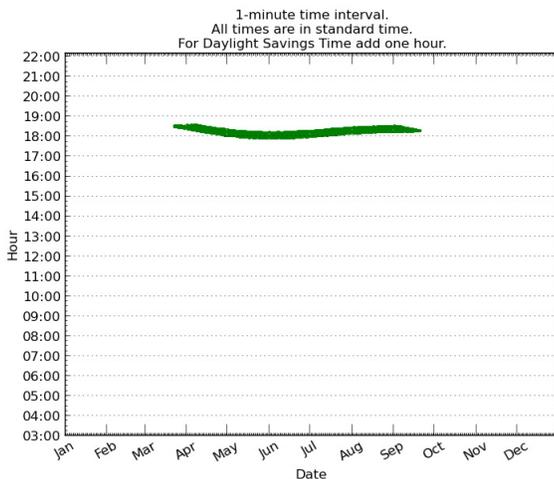


Observation Point 2



PV Array Block 3

Observation Point 3



NOTES

Glare analysis is based on sun data from 2014

- Low potential for temporary after-image
- Potential for temporary after-image
- Potential for permanent eye damage

Analysis run on September 19, 2015 via
<https://share.sandia.gov/phlux/sghat/>



PV Systems: Low Levels of Glare and Reflectance vs. Surrounding Environment

by Mark Shields
2010

SUNPOWER™

EXECUTIVE SUMMARY

The glare and reflectance levels from a given PV system are decisively lower than the glare and reflectance generated by the standard glass and other common reflective surfaces in the environments surrounding the given PV system. Possibilities of random glare and reflectance observed from the air: the PV industry has multiple large projects installed near airports or on air force bases. Each of these large projects has passed FAA or Air Force standards and all projects have been determined as “No Hazard to Air Navigation”. Although the possible glare and reflectance from PV systems are at safe levels and are decisively lower than other standard residential and commercial reflective surfaces, it is suggested that customers and installers discuss any possible concerns with the neighbors/cohabitants near the planned PV system installation.

EXPLANATION OF REFLECTANCE AND PV GLASS

SECTION 1

In general, since the whole concept of efficient solar power is to absorb as much light as possible while reflecting as little light as possible, standard solar panels produce less glare and reflectance than standard window glass. This is pointed out very well in US patent # 6359212 (Method for testing solar cell assemblies and second surface mirrors by ultraviolet reflectometry for susceptibility to ultraviolet degradation), which explains the differences in the refraction and reflection of solar panel glass versus standard window glass. Specifically, on a more technical level, solar panels use “high-transmission, low-iron” glass, which absorbs more light, producing smaller amounts of glare and reflectance than normal glass. In order to further explain these differences, we will need to explain some basic scientific terms that are used when discussing beams of light impacting the surfaces of other mediums, as the light beams leave air to enter the other mediums.

Reflection, Refraction and Angles-of-incidence

The imaginary line at 90° to a given reflective surface is called the Normal. The original beam of light is called the incident beam, and the angle at which it strikes the surface is called the incident angle. The quantity of reflected light is called the reflectance, and the angle at which it leaves the surface is the angle of reflectance. With transparent surfaces, the amount of light which bends slightly as it goes through the surface is called the refracted beam OR transmittance. These basic concepts of reflection (return of light from a surface) and refraction (bending and transmission of light through a surface) are pointed out in the first two figures on the next page. Both have a normal, an incident beam and an incident angle;

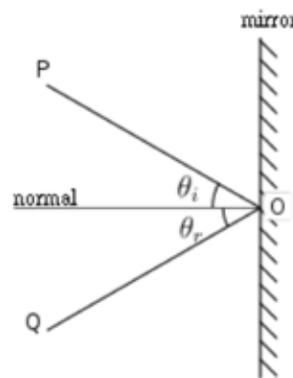


Figure 1.1; Reflection

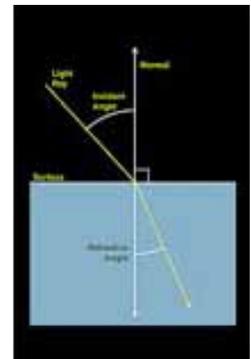


Figure 1.2: Refraction

SECTION 1

Since our main discussion concerns types of glass and sunlight, we will further our explanation using glass as the example and speaking in terms of reflected energy percentages:

Incident light and Reflected Energy percentages. When a beam of light falls on a piece of glass, some of the light is reflected from the glass surface, some of the light passes through the glass (transmitted), and some (very little) is absorbed by the glass.

- The measure of the proportion of light reflected from the surface is called reflectance (reflection).
- The measure of the proportion transmitted is the transmittance (This is where the term high light-transmission glass comes from because the glass is formulated to allow more light to pass through its surface than would pass through a standard glass surface).
- The measure of the proportion absorbed is the absorptance (absorption (this amount is very small for clear glass – much, much smaller proportionately, than the other two components).
- Each quantity is expressed as a fraction of the total quantity of light in the beam. If the intensity of the beam is represented by the numerical 1, reflectance by R, absorptance by A and transmittance by T, intensity may be expressed as follows: $R + A + T = 1$, where glass is the glazing material pointed out in figure 2-2 in the next column (Figure 2-1 is a rough depiction of the percentages of light for each component of the equation).

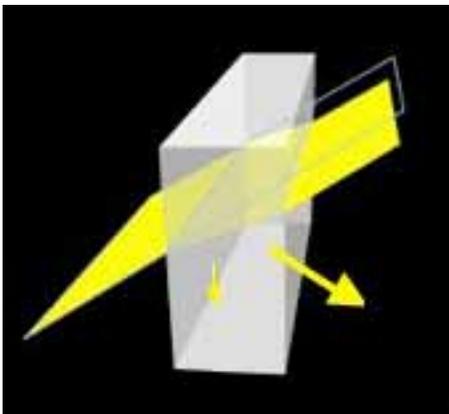


Figure 2.1: Depiction of resultant percentages for incident components

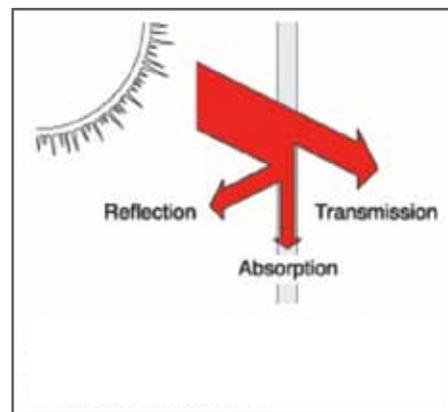


Figure 2.2: Solar radiation through a glazing material is either reflected, transmitted or absorbed

SECTION 1

The reflection/refraction behavior of a medium is directly related to its index of refraction. The lower the index of refraction for a medium, the less light it reflects because the medium is allowing more of the incident beam to pass directly through (in our case, directly through the glass to the solar cells). The following list and graphical representation are one-to-one in the order of a materials' representation;

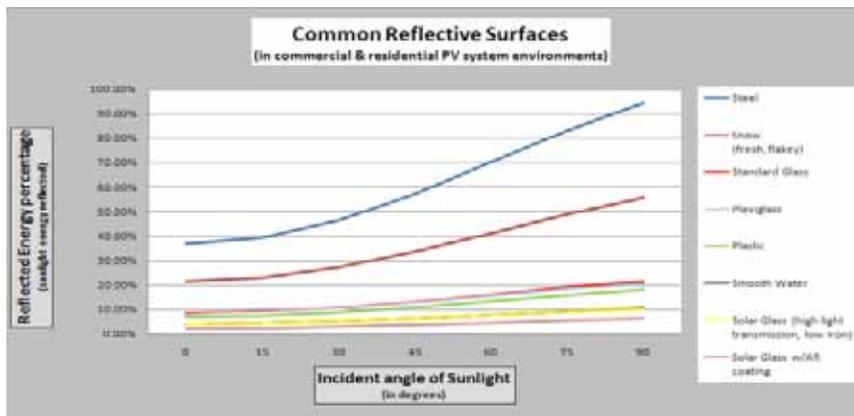


Figure 2.4: Common Reflective Surfaces and reflectance percentages.

In the below we show the reflected energy percentages of sunlight, off of some common residential and commercial surfaces. The legend and the graph lists the items from top to bottom in order of the highest percentage of reflected energy (as does the list of Common Reflective Surfaces); E.g. – ‘Steel’ reflects more energy than ‘Snow’. ‘Snow’ reflects more energy than ‘standard glass’, etc. It should be noted from the graph and the table below, that the reflected energy percentage of Solar Glass is far below that of standard glass and more on the level of smooth water.

Common Reflective Surfaces (in surrounding environments for PV systems)	
n	
2.500	Steel
1.980	Snow (fresh, flakey)
1.517	Standard Glass
1.500	Plexiglass
1.460	Plastic
1.333	Smooth Water
1.329	Solar Glass (high light transmission, low iron)
1.250	Solar Glass w/AR coating

Figure 2.3: Common Reflective Surfaces and Index of Refraction, “n” (the value “n” may vary by reference source, but the hierarchy of “n” values from one material to another will remain the same).

Common Reflective Surfaces (in surrounding environments for PV systems)	Incident angle in degrees						
	0	15	30	45	60	75	90
Steel	38.73%	39.22%	46.34%	57.11%	70.02%	81.15%	94.40%
Snow (fresh, flakey)	23.63%	23.09%	27.20%	33.63%	41.23%	48.96%	55.59%
Standard Glass	8.44%	9.01%	10.45%	13.12%	16.09%	19.10%	21.09%
Plexiglass	6.00%	6.54%	10.09%	12.44%	15.25%	18.11%	20.16%
Plastic	5.99%	7.04%	8.82%	10.87%	13.17%	15.83%	17.57%
Smooth Water	6.07%	6.03%	5.18%	6.87%	7.76%	8.27%	10.47%
Solar Glass (high light transmission, low iron)	3.99%	4.34%	5.03%	6.20%	7.61%	8.01%	10.36%
Solar Glass w/AR coating	2.47%	2.64%	3.12%	3.84%	4.71%	5.19%	6.73%

Figure 2.5: Common Reflective Surfaces and reflectance percentage values.

SECTION 1

Stippled Glass” and “Light Trapping”

In addition to the superior refractive/reflective properties of solar glass versus standard glass, many PV suppliers use stippled solar glass for their panels. Stippled glass is also used with high powered telescopes and with powerful beacons and flashlights. The basic concept behind stippling is for the surfaces of the glass to be “textured” with small types of indentations. As a result, stippling allows more light energy to be channeled/transmitted through the glass while diffusing (weakening) the reflected light energy. “Light trapping” is also used by more high-quality PV suppliers. “Light Trapping” is the practice of using additional techniques like mirrors and natural surface textures to “trap” light within the layers of the solar cell, allowing even less light to escape by reflection. These concepts are why a reflection of off a high-quality solar panel will look hazy and less-defined than the same reflection from standard glass. This occurs because the stippled and light-trapping PV glass and cell texture are transmitting a larger percentage of light to the solar cell while breaking-up the intensity of the reflected energy.

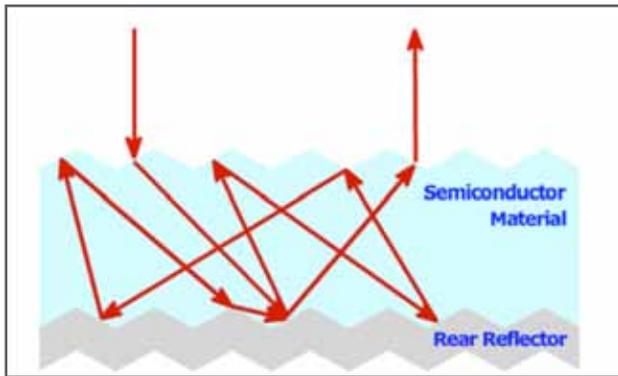
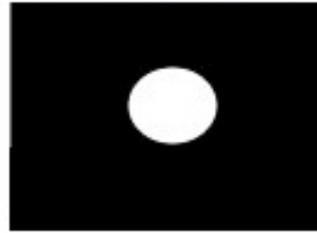


Figure 3.1: Light Trapping. More light energy is absorbed by the cell with each ensuing reflection of the initial light beam.

Try this basic optical experiment where ever a reflection comparison can be safely made between a high-efficiency/high-quality PV panel and a large window or plate of glass.

Regular (Float) Glass



PV Glass (low Fe, high trans.)



Figure 3.2: Reflection Characteristic example

No Hazard to Air Navigation

A handful of PV suppliers are proud to point out their PV installations at airports and on Air Force bases. The statement “No Hazard to Air Navigation” is the FAA status consistently applied to the large system arrays and power-plants which are continuously being erected on and around airports and Air Force bases. After covering the information prior to this section, it should come as no surprise that PV installations have this status concerning air navigation.

CONCLUSION

SECTION 2

In support of the executive summary, the studies, data and light-beam physics behind the charts and graphs prove beyond a reasonable doubt that solar glass has less glare and reflectance than standard glass. The figures also make it clear that the difference is very decisive between solar glass and other common residential and commercial glasses. In addition, not to be lost in the standard light/glass equations and calculations, PV solar-glass is often stippled and has a light-trapping, very photon-absorbent solar cell attached to its' back side, contributing additional factors which result in even less light energy being reflected.

REFERENCES

SECTION 3

- 4.1. Center for Sustainable Building Research. College of Design · University of Minnesota. All rights reserved. JDP activity by the University of Minnesota and Lawrence Berkeley National Laboratory.
- 4.2. H. K. Pulker, *Coatings on glass*, (1999), 2ed, Elsevier, Amsterdam.
- 4.3. C. G. Granqvist, *Materials Science for Solar Energy Conversion Systems*, (1991), Pergamon, G B.
- 4.4. D. Chen, *Anti-reflection (AR) coatings made by sol-gel processes: A review*, *Solar Energy Materials and Solar Cells*, 68, (2000), 313-336.
- 4.5. P. Nostell, A. Roos, B. Karlsson, *Antireflection of glazings for solar energy applications*, *Solar Energy Materials and Solar Cells*, 54, (1998), 23-233.
- 4.6. M. Fukawa, T. Ikeda, T. Yonedaans K. Sato, *Antireflective coatings y single layer with refractive index of 1.3*, *Proceedings of the 3rd International Conference on Coatings on Glass (ICCG)*, (2000), 257-264.
- 4.7. J. Karlsson and A. Roos, *Modeling the angular behavior of the total solar energy transmittance of windows*, *Solar Energy*, 69, 4, (2000).
- 4.8. J. Karlsson, B. Karlsson and A. Roos, *A simple model for assessing the energy efficiency of windows*, *In Press, Energy and Buildings*
- 4.9. Saint Gobain; SG Solar Eclipse for Airport Zones

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September 23, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Question 19**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the September 17, 2015 request for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached response to EERA Question 19 contained in EERA's September 17, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

In the Matter of the Application)
of Marshall Solar, LLC for a)
Site Permit for the Marshall) **Docket No. IP-6941/GS-14-1052**
Solar Energy Project and)
Associated Facilities)
in Lyon County, Minnesota)

**RESPONSES OF MARSHALL SOLAR, LLC
TO
ENERGY ENVIRONMENTAL REVIEW AND ANALYSIS QUESTIONS FOR
DEVELOPMENT OF ENVIRONMENTAL REVIEW,
QUESTION 19**

Marshall Solar, LLC ("Marshall Solar") respectfully submits the following response to Question 19 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Question 19 is repeated below, with Marshall Solar's response immediately following.

Question 19:

Please discuss the Project's consistency with Lyon County Ordinances regarding shoreland. The Application, at p. 63, notes that the drainage ditches within the site are not considered public waters, but Figure 4.8 identifies two PWI watercourses adjacent to the site.

Response: Figure 4.8 from Application shows water resources within the Project Area. Marshall Solar used the MnDOT Streams data to show the locations of all types of water resources, including PWI watercourses and water resources not considered public waters. There are no PWI watercourses within the Project Area; however, there are two watercourses that are not public waters within the Project Area that drain into PWI watercourses that run adjacent to the Project Area. First, there is a drainage ditch (Judicial Ditch 18) in the northern portion of the Project Area in Section 28 of Stanley Township. Outside of Section 28 (and on the east side of 320th Avenue), this water flowage is designated as a PWI Stream. Second, there is a drainage ditch (Judicial Ditch 34) in the southern portion of the Project Area. This drainage ditch is not mapped as a water resource in the MnDOT Streams data set and thus is not shown in Figure 4.8 in the Application, but

is considered a judicial ditch by Lyon County. This judicial ditch flows into a PWI Stream to the southeast of the Project Area in Section 34 (also on the east side of 320th Avenue). As noted in the Application, Marshal Solar has and will continue to work with Lyon County to ensure that the Project is sited to be compatible with Lyon County Zoning Ordinance standards. To this end, John Biren of the Lyon County Planning and Zoning Office indicated in correspondence to Marshall Solar that the applicable Lyon County setback distance from drainage ditches is 120 feet (see also Lyon County Zoning Ordinance Section 8.5, Subp D). Marshall Solar also notes that the Lyon County Zoning Ordinance requires a setback of 100 feet from the ordinary high water mark of "Tributary Streams" such as the two PWI watercourses identified near the Project and discussed above (see Lyon County Zoning Ordinance Section 17.1, Subp. B(1)). In compliance with these requirements, Project infrastructure will be located at least 120 feet from the two judicial drainage ditches mentioned above. Additionally, because no PWI watercourses are within the Project Area, Project infrastructure will be located at least 120 feet from the points where the two judicial drainage ditches drain into a PWI watercourse. Project infrastructure will also be located over 1,000 feet from the PWI watercourse to the southeast of the Project. Marshall Solar will continue to work with Lyon County as Project siting and engineering progresses to ensure appropriate Lyon County shoreland standards are met.

September 25, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Questions 20-23**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the September 23, 2015 requests for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached responses to EERA Questions 20-23 contained in EERA's September 23, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

In the Matter of the Application)
of Marshall Solar, LLC for a)
Site Permit for the Marshall)
Solar Energy Project and)
Associated Facilities)
in Lyon County, Minnesota)

Docket No. IP-6941/GS-14-1052

**RESPONSES OF MARSHALL SOLAR, LLC
TO
ENERGY ENVIRONMENTAL REVIEW AND ANALYSIS QUESTIONS FOR
DEVELOPMENT OF ENVIRONMENTAL REVIEW,
QUESTIONS 20-23**

Marshall Solar, LLC ("Marshall Solar") respectfully submits the following responses to Questions 20-23 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Questions 20-23 are repeated below, with Marshall Solar's response immediately following.

Question 20:

The application, at p. 26, lists a variety of decommissioning tasks. These tasks include both removal of "below ground cabling" and "abandonment of underground utilities"

a. Please describe what is meant by "underground utilities."

Response: The "underground utilities" referred to in Section 3.5.1 of the Application refer primarily to any groundwater well facilities or septic system that the project would install to support operations. Since an on-site Operations and Maintenance facility is no longer planned to be constructed on the Project Site, Marshall Solar does not anticipate the need to construct these underground utilities. Consequently, there will not be any need to abandon any newly constructed underground utilities at the end of the Project's life. Marshall Solar does anticipate that work will be required on the existing utilities located at the 4.3-acre parcel. Handling of those facilities were previously discussed in Marshall Solar's response to EERA's question #6.

b. Please clarify what is meant by abandonment.

Response: The term “abandonment” refers to the procedures mandated by a government agency, in this case, the Minnesota Pollution Control Agency or Lyon County, to safely remove, salvage, demolish in place, or leave in place a utility that is no longer required to remain in-service. The procedures are meant to safeguard the surrounding area from future contamination. Leaving certain types of utilities in place rather than excavating to remove can sometimes be the preferred procedure.

c. What would determine whether underground utilities would be removed or abandoned?

Response: As discussed in response part a. above, Marshall Solar does not intend to construct new utilities on the Project Site and plans to address the existing utilities at the 4.3-acre parcel as previously described.

Question 21: *Please discuss the types of maintenance activities that are likely to be performed between 10 pm and 7 am (considered to be nighttime noise as per PCA noise standards).*

Response: Typically, no routine or scheduled maintenance activities are performed at night at any of the solar facilities owned and operated by indirect affiliates of NextEra Energy Resources, LLC, and no recurring maintenance is planned to take place at night. All routine or scheduled maintenance activities are planned to be performed during daylight hours. With respect to Marshall Solar, the site is also not planned to be staffed 24 hours a day and seven days a week. The only type of work likely to be performed at night will be emergency maintenance on a critical piece of equipment such as the Project’s main transformer. In this case, the work will be performed using the minimum amount of lighting necessary to allow crews to safely operate and in accordance with the applicable noise standards.

Question 22: *Please describe how lighting will be provided during the construction phase of the Project and for maintenance during the operations phase of the Project.*

Response: The Marshall Solar Project will be constructed almost exclusively during daylight hours. In the event that non-labor intensive activities, such as testing or commissioning, need to be performed during hours of darkness temporary lighting will be provided by generator-operated light towers, vehicle headlights, or man-portable shop lighting. Any lighting used will be kept to a minimum and pointed at the areas where work is being performed.

Similarly, during operations, Marshall Solar does not schedule or plan to conduct routine maintenance activities at night. As explained in the response to Question 21, any emergency maintenance activities will be performed using the minimum amount of lighting necessary to allow crews to safely operate.

Question 23:

Gen-Tie Line and Structures

a. Please provide an estimate (a range is acceptable) of the number of gen-tie structures that Marshall Solar anticipates will be installed for the Project.

b. Please provide an estimate of the electric field strength (kV/m at one meter above ground) and the magnetic flux density (milligauss at one meter above ground) for the anticipated gen-tie line.

Response: Marshall Solar has modeled the expected levels of electric field strength and magnetic flux density as requested. It is important to note that the final design of the short generation tie-line is not yet complete, so the model below assumed “typical” line specifications with actual loading data from the proposed solar project. Marshall Solar estimates that one, possibly two structures would be needed between the newly constructed Project substation and the Lyon County Substation. The number of structures will ultimately depend on the final geometry of the interconnection and these details are currently under evaluation by Marshall Solar and Northern States Power.

Electric Field Strength (kV/m)										
Structure Type	Maximum Operating Voltage (kV)	Distance to Centerline								
		-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Horizontal	121	0.003	0.011	0.076	0.453	0.698	0.453	0.076	0.011	0.003
Magnetic Flux Density (mG)										
Structure Type	Average Current (amps)	Distance to Centerline								
		-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Horizontal	72.7	0.1	0.3	1.0	3.6	17.3	3.6	1.0	0.3	0.1
Note: Average current is calculated with an annual average capacity factor in the mid-20% range.										
Assumptions:										
Horizontal configuration										
12.5-foot phase spacing										
25-foot minimum ground clearance										
63 MW _{AC} peak output										
121 kV maximum operating voltage										
DRAKE 795 ACSR single phase conductor (1.107-inch diameter)										
Calculations performed using EPRI's EMF Workstation 2015										

September 28, 2015

Via Electronic Mail

Suzanne Steinhauer
Environmental Review Manager
Energy Environmental Review and Analysis
Minnesota Department of Commerce
85 7th Place East, Suite 500
Saint Paul, MN 55101

Re: **Responses of Marshall Solar, LLC to Energy Environmental Review and Analysis Questions for Development of Environmental Review, Questions 24-25**

In the Matter of the Application of Marshall Solar, LLC for a Site Permit for the Marshall Solar Energy Project and Associated Facilities in Lyon County, Minnesota

Docket No. IP-6941/GS-14-1052

Dear Ms. Steinhauer:

Marshall Solar, LLC ("Marshall Solar") is in receipt of the September 24, 2015 requests for information of the Minnesota Department of Commerce Energy, Environmental Review, and Analysis ("EERA"), in connection with EERA's development of an environmental review document in the above-captioned matter. Marshall Solar hereby submits the attached responses to EERA Questions 24-25 contained in EERA's September 24, 2015 request.

Thank you for your attention to this matter.

Sincerely,



Brandon Stankiewicz
Marshall Solar, LLC

Attachment

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

In the Matter of the Application)
of Marshall Solar, LLC for a)
Site Permit for the Marshall) **Docket No. IP-6941/GS-14-1052**
Solar Energy Project and)
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**RESPONSES OF MARSHALL SOLAR, LLC
TO
ENERGY ENVIRONMENTAL REVIEW AND ANALYSIS QUESTIONS FOR
DEVELOPMENT OF ENVIRONMENTAL REVIEW,
QUESTIONS 24-25**

Marshall Solar, LLC ("Marshall Solar") respectfully submits the following responses to Questions 24-25 from the Minnesota Department of Commerce, Energy Environmental Review and Analysis ("EERA") staff in connection with EERA's development of an environmental review document in the above-captioned matter. Questions 24-25 are repeated below, with Marshall Solar's response immediately following.

Question 24:

Please describe any Reinvest in Minnesota (RIM) or USFWS easements at the site.

Response: Based on the Minnesota Board of Water and Soil Resources' most current (July 2015) dataset of State Funded Conservation Easements ("RIM Reserve"), there are no known RIM Reserve easements within the Marshall Solar Project site.

Likewise, based on the most current (May 2015) USFWS Easement dataset, there are no known USFWS easements within the Marshall Solar Project site.

Question 25:

- a. *Please describe the status of the Agricultural Mitigation Plan being developed for the Project.*
- b. *Please describe the major components of the Agricultural Mitigation Plan (e.g. control of invasive species, soil compaction, topsoil segregation, re-vegetation).*

Response (a): To facilitate the development of the Agricultural Impact Mitigation Plan (“Plan”), Marshall solar has been coordinating with the Natural Resources Conservation Service, the Minnesota Department of Agriculture, the Minnesota Department of Natural Resources, and a research soil scientist, Michael Russelle, (who previously worked at the U.S. Department of Agriculture and now is an Adjunct Professor at the University of Minnesota) on identifying best management practices to avoid, mitigate, repair, and/or compensate for negative agricultural impacts that may result from the construction, operation, and eventual decommissioning of the Project. Marshall Solar is currently drafting the Plan and intends to present the initial draft to both the above mentioned agencies in the October 2015 timeframe. Following the receipt of any agency comments, Marshall Solar will continue to refine the plan as Project design moves towards completion through late 2015 and early 2016. Marshall Solar is anticipating that the requirement to produce a “final” Plan may be a pre-construction stipulation in any Site Permit issued by the Minnesota Public Utilities Commission. Thus, a final Plan will be complete no later than the spring of 2016.

Response (b): The primary focus of the Plan will be to address how Marshall Solar will work to minimize impacts to soil at the Project site so the soil maintains its character as prime farmland. Specifically, the Plan will include components to address potential soil impacts during the construction and operation of the Project, the possible decommissioning of the Project at the end of its useful life, and the ability to return the site to active agricultural use upon decommissioning. More specifically, these Plan components include the following:

- Project Overview – includes detailed descriptions of all Project components as well as the means and methods used to install each of those Project components;
- Best Management Practices Used During Construction – describes the methods the construction contractor will utilize on site during grading, road construction, foundation construction, trenching, and panel installation. This section will also include a discussion of erosion control, weed control, best practices to identify, avoid, and repair drain tile, and construction debris removal;
- Mitigation Measures – this section will focus primarily on the vegetative ground cover Marshall Solar is planning to utilize during both construction and long-term operations, and, specifically, how it will be established and maintained; and
- Decommissioning – this section will discuss the steps and practices that will be employed during any decommissioning of the Project in the future.