

**BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN**

Application for Grant County Solar, LLC to Construct a New
Solar Electric Generation Facility located near Potosi and
Harrison Townships, in Grant County, Wisconsin

Docket No. 9804-CE-100

**RESPONSES OF GRANT COUNTY SOLAR, LLC TO GRANT COUNTY
INTERVENORS FIRST SET OF DATA REQUESTS**

Pursuant to Wis. Admin. Code § PSC 2.24, and Wis. Stat. ch. 804, Grant County Solar, LLC (“Grant County Solar”) provides the following responses and written objections to the Grant County Intervenors First Set of Data Requests, which were served on August 26, 2020.

GENERAL OBJECTIONS

1. Hearing preparation and factual investigations are ongoing in this proceeding. Grant County Solar’s responses and objections will therefore be based on and necessarily limited by the records and information in existence, presently recollected, and thus far discovered in the course of preparation of the responses and objections. Consequently, Grant County Solar reserves the right to make any changes in these objections or their responses if it appears at any time that omissions or errors have been made or that more accurate information becomes available. By this reservation, Grant County Solar does not in any way assume a continuing responsibility to update their responses to the Requests.
2. Grant County Solar objects to these Requests to the extent that they seek production of information protected by the attorney work product doctrine, the attorney-client privilege, joint defense/prosecution privilege, common interest doctrine, or any other applicable privilege. Nothing contained in the responses will be intended to, or shall in any way be deemed, a waiver of any such privilege or doctrine.
3. Grant County Solar objects to each and every one of the Requests to the extent that they seek documents or information that are not in Grant County Solar’s possession, custody, or control.
4. Grant County Solar objects to each and every one of the Requests to the extent they seek documents or information equally or more readily available to Intervenor.
5. Grant County Solar objects to each and every one of the Requests to the extent that the information has already been provided in Grant County Solar’s filings in this case and is already available to Intervenor.
6. Grant County Solar objects to the instructions as an attempt to impose obligations on them beyond what is required when responding to discovery by Chapter 804 of the Wisconsin Statutes, and PSC 2.24, Wis. Admin. Code.

7. Grant County Solar objects to each and every Request to the extent that it is vague, ambiguous, overly broad, unduly burdensome, or not reasonably calculated to lead to the discovery of relevant information or admissible evidence.
8. Grant County Solar objects to each and every Request to the extent that it seeks information that is confidential. The production of confidential information will be limited to an individual or entity that has signed and submitted the necessary exhibits pursuant to a confidentiality agreement between the parties and otherwise complied with the terms of such confidentiality agreement.
9. Grant County Solar objects to each and every Request to the extent that it is unduly burdensome and seeks to make Grant County Solar function as consultants for Intervenor in that the Requests would require Grant County Solar to perform studies, gather information, or undertake other tasks that Grant County Solar has not completed.
10. Grant County Solar objects to each and every Request to the extent that it seeks information that the Grant County Solar did not use in analyzing the Project and such information is not relevant to the issues in this docket.
11. Grant County Solar objects to each and every Request to the extent that the burden and expense of producing the requested information far exceeds its probative value to any issue in this case or is disproportionate to the needs of the case.
12. The fact that the response to a particular Request may repeat one or more of these General Objections is not a waiver of the other General Objections, each and all of which are incorporated into the responses to each specific Request.
13. By submitting responses, Grant County Solar does not in any way adopt Intervenor's purported definitions of words and phrases.

**Response of
Grant County Solar
to GCI-6.5**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.5 Studies provided in response to PSC 2.01 were performed in areas with little or no vegetation within or surrounding project area. Please provide studies of heat island effect in project areas in and surrounded by farmland.

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is argumentative, overly broad, ambiguous, and subject to various interpretations. Grant County Solar further objects to the extent that the question requests information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds that as noted in its Response to PSCW Data Request No. 2.01, the Barron-Gafford Research Group (2019) hypothesized that re-introducing vegetation in solar installations would reduce PVHI effect. As discussed in the response, in additional unpublished work by the Barron-Gafford Research Group (2018), PV installations in southern Arizona that were re-vegetated with grasses under the panels showed the revegetation had a cooling effect, significantly lowering air temperatures within the array (up to 7°C during the daytime and 1.5°C at nighttime) when compared to PV arrays underlain by bare ground.

Armstrong et al., (2017), provided in Response to GCI Data Request No. 6.4, was conducted on a solar facility in the southern United Kingdom that transitioned from cropland prior to construction into managed grassland throughout the solar facility. Based on aerial review, the site is surrounded on three sides by cropland and by commercial/residential development to the south. The temperature in areas directly beneath arrays or in the alleys between arrays, depending on the season, varied from the temperature identified in control areas. However, variation was highly localized to areas directly beneath arrays or between arrays, and generally indicated cooling trends. See Response to GCI Data Request No. 6.4.

Due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, the PVHI effect will not result in a significant impact to the community surrounding the Project.

Grant County Solar is not aware of any additional studies evaluating the PVHI effect in areas within or surrounded by farmland. As stated in Grant County Solar's Response to PSCW Data Request No. 2.01, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

**Response of
Grant County Solar
to GCI-6.6**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.6 What increment of surface temperature decrease does the Grant County Solar predict would be achieved through vegetation? Provide studies that support this prediction.

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the question requests information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds that to the extent the question is requesting Grant County Solar to predict potential surface temperature decreases at the Project, the literature review provided in Grant County Solar’s Response to PSCW Data Request No. 2.01 indicates no consistent pattern of significant temperature differences across empirical, measurement-based studies of the PVHI effect.

However, in unpublished work by the Barron-Gafford Research Group (2018), PV installations in southern Arizona that were re-vegetated with grasses under the panels showed the revegetation had a cooling effect, significantly lowering air temperatures within the array (up to 7°C during the daytime and 1.5°C at nighttime) when compared to PV arrays underlain by bare ground. Armstrong et al., (2017), provided in Grant County Solar’s Response to GCI Data Request No. 6.4, indicates potential localized air and soil temperature cooling directly beneath or between arrays at a fully vegetated solar facility in the United Kingdom.

Grant County Solar is not aware of additional published work evaluating the PVHI effect with implementation of vegetation beneath and around arrays. However, the cooling effect of vegetation for the Urban Heat Island effect is well documented and is discussed in Grant County Solar’s Response to PSCW Data Request No. 2.01.

As stated in Grant County Solar’s Response to PSCW Data Request No. 2.01, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

**Response of
Grant County Solar
to GCI-6.7**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.7 Air temperatures in and near project area:

- a. Would you agree that Fthenakis and Yu and Barron-Gafford both focus on air temperatures beyond the project edge, in the surrounding area?
- b. Would you agree that, as shown in Attachment A, temperatures in the project area surrounded by panels would be higher than temperature outside of the project area?
- c. Would you agree that, as shown in Attachment A, that nighttime temperature difference between project area and native vegetation within the project has a greater delta than daytime temperatures?
- d. Would you agree that temperatures at project edge would be lower than temperatures within project area surrounded by panels?
- e. Would you agree that temperatures 100 meters from project edge would be lower than points surrounded by panels within project area.
- f. Would you agree that temperatures 300 meters from project edge would be lower than points surrounded by panels within project area.
- g. Are there hot air gusts from the panels not captured by the sampling intervals in cited studies? Has the phenomenon of hot air gusts associated with solar panels been studied?

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the questions request information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds:

- a. The Fthenakis and Yu and Barron-Gafford studies speak for themselves.
- b. No. Assuming that “Attachment A” references all of the supporting citations provided in Response to PSCW Data Request No. 2.01, studies evaluating the potential photovoltaic heat island (PVHI) effect do not indicate a consistent pattern of significant temperature differences. For instance, initial data from Demirezen et al. (2018) did not identify

statistically significant differences in temperature distributions inside and outside the array for any timeframe. Armstrong et al., (2017), provided in Response to GCI Data Request No. 6.4, indicated potential localized air and soil temperature cooling directly beneath or between arrays at a fully vegetated solar facility in the southern United Kingdom.

Grant County Solar has not conducted a study of temperatures in the Project Study Area surrounded by panels or a comparison of temperatures in the Project Study Area to areas outside the Project Study Area. Nor is Grant County Solar aware of any such studies.

c. No. Assuming that “Attachment A” references all of the supporting citations provided in Response to PSCW Data Request No. 2.01, studies evaluating the potential PVHI effect do not indicate a consistent pattern of significant temperature differences across nighttime or daytime temperatures. Moreover, Grant County Solar has not conducted a study of the difference between nighttime and daytime temperatures in the Project Study Area.

d-f.No. Grant County Solar has not conducted a study of the temperatures at the Project edge versus areas in the Project Site that contain panels. However, as stated in Grant County Solar’s Responses to PSCW Data Request No. 2.01 and GCI Data Request No. 6.4, due to the documented dissipation of PVHI with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures present at the Grant County location, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, the PVHI effect will not result in a significant impact to the community surrounding the Project.

As stated in Grant County Solar’s Response to PSCW Data Request No. 2.01, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

g. Grant County Solar is not aware of a hot air gust phenomenon associated with solar facilities and is not aware of studies addressing the purported phenomenon. The studies cited in Grant County Solar’s Response to PSCW Data Request No. 2.01 speak for themselves.

**Response of
Grant County Solar
to GCI-6.8**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.8 Refer to project map 4.1.2, attached.

- a) What temperature increases are expected at points within the project, specifically, at these points surrounded by the project:
 - i. At “9” above E9 on map.
 - ii. At “4” above G-4 and G-5 on map.
 - iii. At the non-participant area to NW of “7,” north of G-8 and G-9?
 - iv. At the Langmeier property just north of “8” between F-9 and F-10.

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the question calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds:

As set forth in Grant County Solar’s Responses to PSCW Data Request No. 2.01 and GCI Data Request No. 6.4, studies evaluating the potential PVHI effect do not indicate a consistent pattern of significant temperature differences.

Due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

**Response of
Grant County Solar
to GCI-6.9**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.9 Regarding response to PSC Data Request 2.01, potential for “thermal heat” and “heat island” effect:

- a. First paragraph, “any effect... is highly-localized and is not expected to extend far beyond the solar array edge...”
 - i. Is heat island effective cumulative? Provide citation for response.
 - ii. How far beyond the edge? 100 meters? 300 meters? 800 meters?
 - iii. How many linear feet does the project edge encompass?
 - iv. For a project on 2,058 acres, covering 1,403 acres, how many acres beyond 1,403 are potentially affected by “thermal heat” and “heat island” effect?

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the questions request information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds:

The referenced statement is based upon the literature review provided in Response to PSCW Data Request No. 2.01. Armstrong et al., (2017), provided in Grant County Solar’s Response to GCI Data Request No. 6.4, further supports the conclusion that potential temperature variations are highly localized to within and between arrays.

- i. The magnitude of heat island effects, both urban and photovoltaic, are dependent on numerous variables including but not limited to: background temperatures at the geographic location, seasonal variation, density and spatial pattern of developed areas, physical properties of urban materials, and presence and distribution of vegetation. See the Taha (2017) and U.S. Environmental Protection Agency (2018) citations included in Grant County Solar’s Response to PSCW Data Request No. 2.01.
- ii. Grant County Solar has not conducted a study of either temperatures in the Project Study Area surrounded by panels or a comparison of temperatures in the Project Study Area to areas outside the Project Study Area. Nor is Grant County Solar aware of any such

studies. Due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

- iii. Grant County Solar interprets the “Project edge” as requested to be the linear footage of fencing surrounding the proposed 1,403-acre Project Site, excluding fencing that is entirely internal such as that around the substation and portions of the switchyard and laydown yard. As demonstrated by Figure 4.1.2 - Detailed Project Area Map to the Application, the 1,403-acre Project Site is composed of separately fenced, discrete array areas. Array areas are typically separated by avoided natural areas 150 feet wide or larger, or by public road right-of-ways. The Project edge as defined above totals approximately 148,336 linear feet.
- iv. Grant County Solar does not recognize “thermal heat” as a scientific concept. Thermal energy is energy in a system produced by a rise in temperatures and is also referred to as heat energy. Examples of thermal energy include a cup of hot tea and warmth from the sun. Thermal energy is ubiquitous and not recognized as conveying a positive or negative effect in and of itself, although in engineering it can refer to waste/inefficiently used energy. Grant County Solar has not conducted a study of either temperatures in the Project Study Area surrounded by panels or a comparison of temperatures in the Project Study Area to areas outside the Project Study Area. Nor is Grant County Solar aware of any such studies.

Due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

**Response of
Grant County Solar
to GCI-6.10**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

GCI-6.10 Regarding the Fthenakis and Yu study:

- a. Paragraph 2, if the study site area was 1 million square meters (~247 acres), what is basis for application of that study's findings to a project with a site area of 2,058?
- b. Fn. 1, - identify all studies for "utility-scale" facilities, including link to study and acreage of subject project.
- c. P. 2 of response to PSC 2.01, that "the panels were completely cooled overnight and the facility was therefore unlikely to contribute to a heat island effect," does that mean that impacts must be 24/7 to be heat island effect? Provide supporting citation.
- d. P. 2 of response, if "simulations conducted as a part of the study indicated that access roads between solar fields allowed for substantial cooling," does that not imply that there is "substantial" heating? Explain answer.

Response:

Subject to the General Objections identified above, Grant County Solar, LLC ("Grant County Solar") responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the question requests information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds that Fthenakis and Yu study speaks for itself. Items c and d are addressed within the study.

a-b. Based on review of aerial imagery within the Fthenakis and Yu study, the study area in Fthenakis and Yu appears to be distributed across the geographic location with undeveloped areas between areas of arrays. The array areas appear to range from approximately 62 acres to 370 acres or more. Similarly, the proposed Grant County Solar facility is composed of discrete array areas separated by undeveloped tracts of lands 150-foot wide or wider, or by public road right-of-ways. The Proposed Array and Alternative Array areas for Grant County Solar range from 24 acres to 334 acres, with a median size of 68 acres. As stated in the Fthenakis and Yu study, *"the access roads between solar fields allow for substantial cooling, and therefore, increase of the size of the solar farm may not affect the temperature of the surroundings."*

- c. The conclusion provided is taken directly from the Fthenakis and Yu study. See Grant County Solar's Response to GCI Data Request No. 6.9(i).
- d. The conclusion provided is taken directly from the Fthenakis and Yu study, in which the study area is located in the desert Southwest and appears to be unvegetated within and surrounding arrays. As stated in Grant County Solar's Responses to PSCW Data Request No. 2.01 and GCI Data Request No. 6.4, due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, the PVHI effect will not result in a significant impact to the community surrounding the Project. Thus, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.

**Response of
Grant County Solar
to GCI-6.11**

Docket Number: 9804-CE-100
Date of Request: August 26, 2020
Information Requested by: Grant County Intervenors
Respondent: Hannah Marsico and Valerie Locker

- GCI-6.11 Temperature increase under panels:
- a. What is expected temperature increase directly under the panels?
 - b. What is impact of 30 years of this temperature increase? 50 years?

Response:

Subject to the General Objections identified above, Grant County Solar, LLC (“Grant County Solar”) responds as follows:

Grant County Solar objects to the form of this question and assumptions. Grant County Solar also objects to this question on the grounds that it is overly broad, ambiguous, calls for speculation, and subject to various interpretations. Grant County Solar further objects to the extent that the question requests information that is equally accessible to the Grant County Intervenors and/or calls for an analysis of study not performed by Grant County Solar.

Without waiving any objections, Grant County Solar responds that, to the extent that the question is asking whether Grant County Solar has conducted a study of the expected temperatures under the Project panels over the course of time including and up to 50 years from present, no such study has been conducted.

As stated in Grant County Solar’s Responses to PSCW Data Request No. 2.01 and GCI Data Request No. 6.4, due to the documented dissipation of potential PVHI effect with distance from the facility, the decreased PVHI effect anticipated for lower background temperatures, and the anticipated temperature reducing effects of vegetation established beneath and around the arrays, the PVHI effect will not result in a significant impact to the community surrounding the Project. Thus, there is a low risk for the Project to have a significant effect on temperature and no further study is warranted.