# EXHIBIT D
# COMPLIANCE WITH LOCAL ORDINANCES, REGULATIONS, AND SETBACK REQUIREMENTS

## Requirement

*KRS 278.706(2)(d): A statement certifying that the proposed plant will be in compliance with all local ordinances and regulations concerning noise control and with any local planning and zoning ordinances. The statement shall also disclose setback requirements established by the planning and zoning commission as provided under KRS 278.704(3).*

*KRS 278.706(2)(e): If the facility is not proposed to be located on a site of a former coal processing plant and the facility will use on-site waste coal as a fuel source or in an area where a planning and zoning commission has established a setback requirement pursuant to KRS 278.704(3), a statement that the exhaust stack of the proposed facility and any wind turbine is at least one thousand (1,000) feet from the property boundary of any adjoining property owner and all proposed structures or facilities used for generation of electricity are two thousand (2,000) feet from any residential neighborhood, school, hospital, or nursing home facility, unless facilities capable of generating ten megawatts (10 MW) or more currently exist on the site. If the facility is proposed to be located on a site of a former coal processing plant and the facility will use on-site waste coal as a fuel source, a statement that the proposed site is compatible with the setback requirements provided under KRS 278.704(5). If the facility is proposed to be located in a jurisdiction that has established setback requirements pursuant to KRS 278.704(3), a statement that the proposed site is in compliance with those established setback requirements.*

## Compliance

The Golden Solar Facility (Project) will be sited in Caldwell County. Caldwell County does not have a planning and zoning commission with jurisdiction over the site. The Project is thus subject to the setbacks defined in KRS 278.706(2)(e) and KRS 278.704(2). The Project is not proposed to be located on the site of a former coal processing plant, and it will not use any waste coal as a fuel source. The Project site will not have any existing electricity generating facilities on-site. The Project will not include any exhaust stacks or wind turbines. Therefore, the setback requirement of 1,000 feet from the property line of adjacent properties does not apply. Pursuant to KRS 278.706(2)(e), all proposed structures or facilities used for generation of electricity must be 2,000 feet from any residential neighborhood, school, hospital, or nursing home facility.

As shown in Figure 1, attached hereto, there are no schools, hospitals, or nursing home facilities within 2,000 feet of any proposed structure or facility used for electricity generation. There is one cluster of residences within 1,000 feet of the Project area that is adjacent to the southeastern boundary of the Project and that could meet the criteria of a “residential neighborhood” as defined in KRS 278.700(6). Some generation facilities and structures are proposed within 2,000 feet of this residential community. Golden will file a request, separate from this application, for any deviation needed from the 2,000-feet setback requirement.

Golden has committed to a minimum setback of 200 feet for panels and 450 feet for central inverters from all residences. A statement of compliance as required by the statute is provided as an attachment to this exhibit.

**KENTUCKY STATE BOARD ON ELECTRIC GENERATION AND TRANSMISSION SITING**

**GOLDEN SOLAR, LLC**
**CASE NO. 2020-00243**

## Statement of Certification
## (KRS 278.706(2)(d))

Comes the Affiant, Melissa Schmit, and after first being duly sworn, hereby states as follows:

1. I am over the age of 18 and have personal knowledge of the information contained herein, and have further conducted an inquiry into the facts contained in this Statement and have found them to be true to best of my knowledge; and,

2. I am the Director of Permitting for National Grid Renewables, the direct parent company of Golden Solar, LLC; and,

3. I have overseen the proposed facility project, the subject of this Application in Case No. 2020-00243, by reviewing the proposed plan and design for the project; and,

4. I hereby certify that proposed plant will be in compliance with all local ordinances and regulations concerning noise control and with any local planning and zoning ordinances.

5. There is no planning and zoning commission with jurisdiction over the site located in Caldwell County.

Further Affiant sayeth naught.

Melissa Schmit, Affiant

STATE OF Minnesota )
)
COUNTY OF Hennepin )

Subscribed, acknowledged and sworn to before me by Melissa Schmit on this the 9th day of August 2022.

NOTARY PUBLIC, STATE AT LARGE

My Commission Expires: 1/31/23

AMY L. MALEK
NOTARY PUBLIC
MINNESOTA
My Commission Expires January 31, 2023

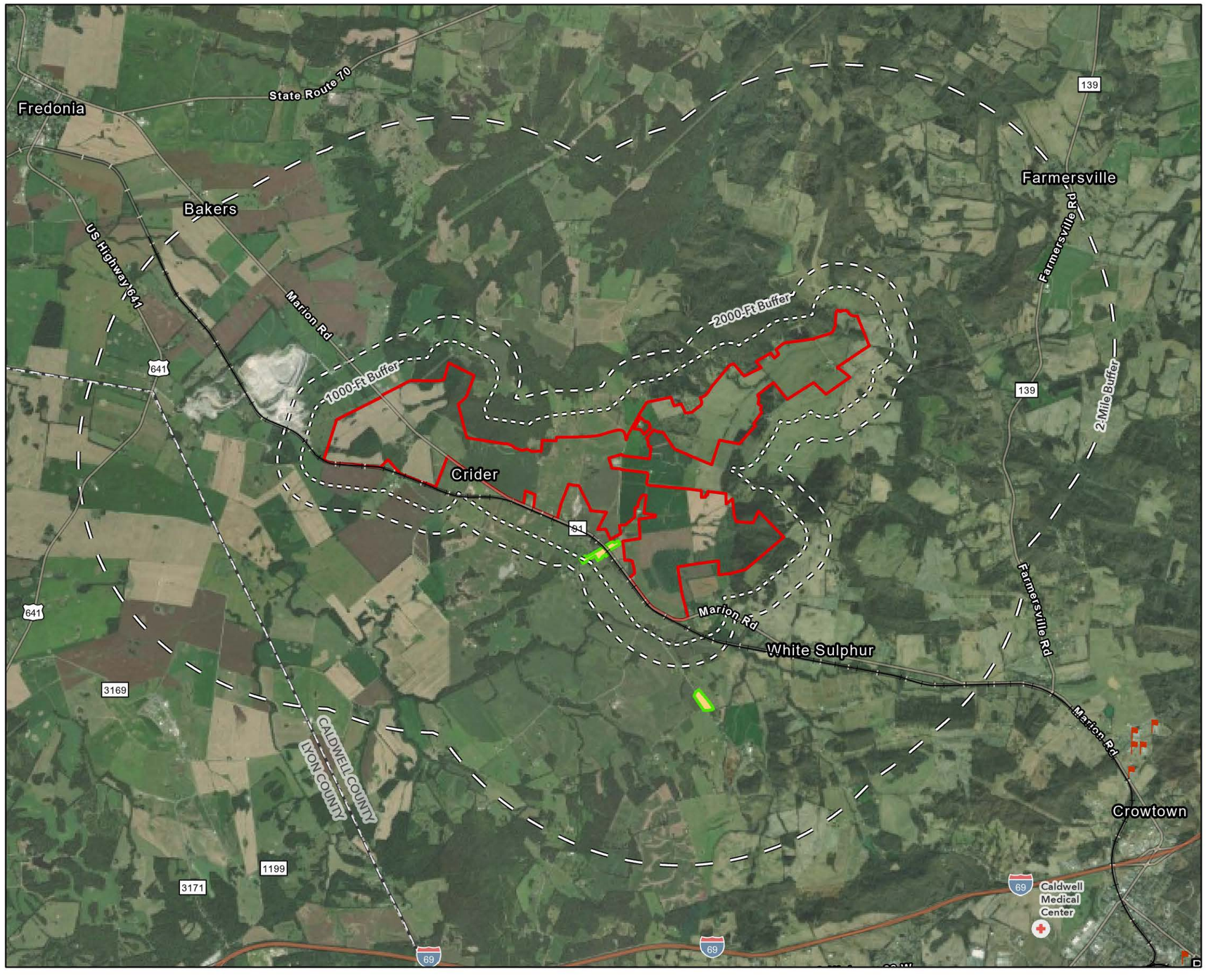



*Figure No.*
**1**

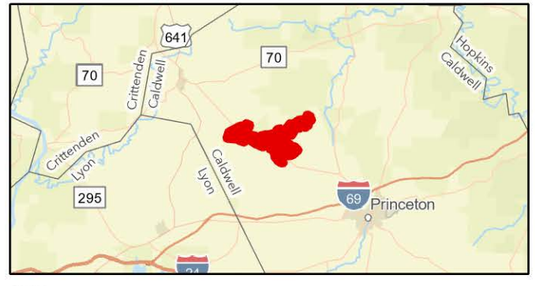
*Title*
**Surrounding Communities Map**

*Client/Project*
Golden Solar Project

*Project Location*
Caldwell County, Kentucky

- Project Area
- Hospitals
- Schools
- Railway
- Residential Communities
- 1000-Ft Buffer
- 2000-Ft Buffer
- 2-Mi Buffer
- County Boundary

N
0 0.7 1.4 Miles
(At original document size of 11x17)
1:55,000




***Notes***
1. NAD 1983 2011 StatePlane Kentucky FIPS 1600 Ft US
2. Basemap Sources: Earthstar Geographics, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Cardno
now
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Revised: 8/11/2022 By: leonard.luz

Path: K:\Project_Data\Geronimo\Golden\ProjectsMxds\Golden.aprx

# EXHIBIT E
# EFFECT ON KENTUCKY ELECTRICITY TRANSMISSION SYSTEM

## Requirement

*KRS 278.706(2)(i): An analysis of the proposed facility's projected effect on the electricity transmission system in Kentucky.*

## Compliance

Golden Solar, LLC (Golden Solar) will interconnect with Louisville Gas & Electric Company/Kentucky Utilities Company (LGE/KU) at the North Princeton Switching Station. The Golden Solar Facility (Project) is currently part of the LGE/KU interconnection cycle and was assigned Queue Number LGE-GIS-2019-008.

LG&E/KU released the Feasibility Study results on November 6, 2019, System Impact Study results on September 22, 2020, and Facilities Study report on January 22, 2021. The Facilities Study report has a total conceptual cost estimate of $2,756,709. These reports are attached hereto.

Golden Solar is analyzed on MISO and TVA systems due to its proximity to the areas. Both MISO and TVA conducted an affected system study and found no violations.

The Project signed a Large Generator Interconnection Agreement with LG&E/KU on August 23, 2021.

# LGE-GIS-2019-008
# Generation Interconnection Request
# Feasibility Study Report
# Executive Summary

Version Number: 1.0

Report Issue Date: November 6, 2019

Report Study Title Posted Date: November 6, 2019

**TranServ International, Inc.**
3660 Technology Drive NE
Minneapolis, MN 55418
Phone: 763.205.7080

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# Table of Contents

# 1. Executive Summary

TranServ International, Inc. (TranServ), as an Independent Transmission Organization (ITO) of Louisville Gas & Electric/Kentucky Utilities (LG&E and KU), has received the following Generation Interconnection (GI) Request to provide Network Resource Interconnection Service (NRIS) and Energy Resource Interconnection Service (ERIS) to the LG&E and KU Transmission Network. After the scoping meeting, the customer decided to proceed with a Feasibility Study (FeS). TranServ has performed the GI FeS to evaluate the impact of the addition of the new generation on the LG&E and KU Transmission Network. TranServ has evaluated the GI Request listed in Table E-1. This report contains the FeS results for Generation Interconnection Request LGE-GIS-2019-008.

**Table E-1**
**Request Details**

| Queue Position | Queue Date | County | State | Max Output (MW) | Point of Inter-connection | In-Service Date | Inter-connection Service Type | Generator Type |
|---|---|---|---|---|---|---|---|---|
| LGE-GIS-2019-008 | 03/22/2019 | Caldwell | KY | 100 | North Princeton 161 kV Substation | 12/31/2021 | NRIS/ERIS | Solar |

As shown in Table 1-1, the LGE-GIS-2019-008 request seeks to interconnect a generator by connecting to the North Princeton 161 kV bus. The customer may choose to proceed with the GI System Impact Study (SIS) on completion of the Feasibility Study (FeS) and review of the results. The in-service date of the LGE-GIS-2019-008 request is December 31, 2021. A one-line diagram of the proposed interconnection is given in Figure 1-1 of the full report. This FeS analyzed the impact of this addition, located in Caldwell County, Kentucky, in accordance with the LG&E and KU Generator Interconnection Study Criteria and LG&E and KU Planning Guidelines. Both of these documents are posted on the LG&E and KU Open Access Same-Time Information System (OASIS).

An Ad Hoc Study Group was not involved in the FeS study process as is consistent with the FeS study procedure given in the LG&E and KU GI Study Criteria document.

The GI request, LGE-GIS-2019-008, was source from the new generation connecting to the North Princeton 161 kV bus and then sink into the LG&E and KU system in merit order (NRIS) or beyond the LG&E and KU BA equally in 4 directions (North, South, East, and West) (ERIS). TranServ performed this FeS to determine the impact of this GI on the transmission network. This document

describes the scope of that FeS. This analysis considered the subject request's impact on system intact (P0 Events), single-event (P1, P2 EHV, and P4 EHV Events) and selected double-event (P3 Events) contingency conditions.

This study included the effect of all earlier queued LG&E and KU GI requests. This study also included the effect of all confirmed Transmission Service Requests (TSRs) except confirmed TSRs which are associated with lower queued GI requests. Representation of these GI and TSR requests may also have necessitated representation of associated planned transmission improvements. Thus, it is important to realize that if the planned improvements do not come to fruition, the subject request's impact on the transmission system as identified by this study may become invalid and a revised study may become necessary before GI service can be granted.

## 1.1. Steady-State Analysis Results

No LG&E and KU or third party potential thermal constraints due to the subject request were identified.

No LG&E and KU potential voltage constraints due to the subject request were identified.

The third party voltage constraints, impacted by the subject request are given in Table E-2. This constraint was found only in the 2022 Summer NRIS Analysis.

**Table E-2**
**2022 Summer NRIS Voltage Constraint**

| Facility | 2022S Pre TSR | 2022S Post TSR | Delta Volt (%) |
|---|---|---|---|
| 2PLEAS GRV 69 kV | 0.9105 | 0.8937 | -1.68% |

## 1.2. Flowgate Analysis Results

As given in the LGI study criteria document, the flowgate analysis did not include evaluation of LG&E and KU flowgates. No third party flowgates were identified as potential constraints to the subject request.

## 1.3. Short Circuit Analysis Results

The Short Circuit Analysis results indicate that the transmission system has adequate interrupting capabilities to accommodate the addition of the generator.

## 1.4. Stability Analysis Results

Since this is a FeS, stability analysis was not a part of the scope of the study. If the customer decides to proceed with the SIS, a stability analysis will be a part of that SIS.

## 1.5. Conclusion

One third party potential voltage constraint due to the subject request was identified as shown in Table E-2. If this same voltage constraint is identified in the SIS, the customer will need to work with the third party to ameliorate the constraint. No LG&E and KU potential voltage constraints due to the subject request were identified. No LG&E and KU or third party potential thermal, flowgate or short circuit constraints due to the subject request were identified. If the customer proceeds to the SIS, the SIS results could differ. The customer would need to mitigate any constraints identified in the SIS.

The study determined that the inverters' 0.95 PF capability along with the customer indicated inclusion of four 8 MVAR switched capacitors is expected to provide at least +/- 0.95 power factor at the high side of the customer main transformer.

It should be noted that during the SIS phase some third parties may choose to perform an independent affected system study and may identify additional impacts through that study. The customer would also need to work with the impacted third party to mitigate those impacts.

LG&E and KU has provided good faith estimates of interconnection costs. A summary of LG&E and KU's non-binding planning level cost estimates is given below:

- Generator Owner Facilities: Customer to Determine.
- Transmission Interconnection Facilities: **$694,112**.
- Network Interconnection Facilities: **$864,066**.
- Network Upgrade Facilities: **$0**.
- Distribution Facilities: **$0**.

LG&E and KU's good faith estimate of the total cost for facilities is **$1,558,178.**

Detailed non-binding planning level cost estimates are given in Section 6 of the Full Report.

The full report is available on the LG&E and KU Critical Energy Infrastructure Information (CEII) File Transfer Protocol (FTP) site. See study report title posting on OASIS for instructions for accessing LG&E and KU CEII FTP site. The LG&E and KU secure CEII FTP site URL is: https://eft.lge-ku.com/EFTClient/Account/Login.htm.

# LGE-GIS-2019-008
# Generation Interconnection Request

# System Impact Study Report
# Executive Summary

Version 1.0

Report Issue Date: September 22, 2020

Report Study Title Posted Date: September 22, 2020

**TranServ International, Inc.**
3660 Technology Drive NE
Minneapolis, MN 55418
Phone: 763.205.7099

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# Table of Contents

# 1. Executive Summary

TranServ International, Inc. (TranServ), as an Independent Transmission Organization (ITO) of Louisville Gas & Electric/Kentucky Utilities (LG&E and KU), has received the following Generation Interconnection (GI) Request to provide a Network Resource Interconnection Service (NRIS) and Energy Resource Interconnection Service (ERIS) to the LG&E and KU Transmission Network. TranServ has evaluated the GI Request listed in Table E-1. This report contains the System Impact Study (SIS) results for GI Request LGE-GIS-2019-008.

**Table E-1 Request Details**

| Queue Position | Queue Date | County | State | Max Output (MW) | Point of Inter-connection | In-Service Date | Inter-connection Service Type | Generator Type |
|---|---|---|---|---|---|---|---|---|
| LGE-GIS-2019-008 | 03/22/2019 | Caldwell | KY | 100 | North Princeton 161 kV Substation | 12/31/2021 | NRIS/ERIS | Solar |

As shown in Table E-1, the LGE-GIS-2019-008 request seeks to interconnect a 100 MW generator by connecting to the North Princeton 161 kV Bus. If the LGE-GIS-2019-008 request is granted, the new generation will have interconnection rights for 100 MW net at the POI. The requested in-service date of the LGE-GIS-2019-008 request is December 31, 2021. A one-line diagram of the proposed interconnection is given in Appendix A of the full report. This GI SIS analyzed the impact of this addition, located in Caldwell County, Kentucky in accordance with the LG&E and KU Large Generator Interconnection Study Criteria and LG&E and KU Planning Guidelines. Both of these documents are posted on the LG&E and KU Open Access Same-Time Information System (OASIS).

An Ad Hoc Study Group was involved in the study process. Tables E-2 documents the Ad Hoc Study Group Comments which relate to independent testing performed by the Ad Hoc Study Group members consistent with the allowance for such testing in the LG&E and KU GI Criteria document.

**Table E-2**
**Ad Hoc Study Group Independent Study Comments**

| Ad Hoc Group Member | Date Received | Ad Hoc Group Member Comment provided within the July 30, 2020 Deadline |
|---|---|---|
| PJM | 7/13/2020 | PJM does not see any impacts due to this project. |
| No other Ad Hoc Member chose to provide independent testing results for this request by the July 30, 2020 deadline. | | |

In addition to the Table E-2 Ad Hoc Study Group responses received prior to the July 30, 2020 deadline, Table E-3 documents additional responses received.

**Table E-3**
**Additional Ad Hoc Study Group Comments**

| Ad Hoc Group Member | Date Received | Ad Hoc Group Member Comment provided after the July 30, 2020 Deadline |
|---|---|---|
| TVA | 8/24/2020 | Our planning engineers have indicated that that PTDF values on TVA facilities associated with the GI-2019-008 generator require that TVA perform an Affected System Impact Study on this project.. |
| MISO | 9/18/2020 | MISO will perform Affected System Studies for LKE-GI-2019-008 as impacts on MISO facilities are greater than screening threshold. |
| No other Ad Hoc Member chose to provide a response between July 31, 2020 and issuance of this report. | | |

The GI request, LGE-GIS-2019-008, is a NRIS and ERIS request and thus was studied as sourcing from the new solar generation interconnected by connecting to the North Princeton 161 kV Substation and then sinking into the LG&E and KU system in merit order (NRIS) or beyond the LG&E and KU Balancing Authority (BA) equally in four directions (North, South, East, and West) (ERIS). TranServ performed this SIS to determine the impact of this GI on the transmission network. The simulations performed considered steady-state contingencies in Categories P0, P1, P2 EHV, P3, and P4 EHV and stability disturbances in Categories P0 - P7 of the current effective versions of North American Electric Reliability Corporation (NERC) TPL-004 standards and the LG&E and KU Planning Guidelines.

The subject request was evaluated using a 2022 Off Peak, 2022 Summer Peak and 2029 Summer Peak steady state powerflow model with roots in the LG&E and KU 2020 Transmission Expansion Plan (TEP) models. The GI-2019-008 stability and short circuit models were rooted in LG&E and KU 2020 TEP models. All models used included the 2020 TEP approved projects.

This study included the effect of all earlier queued LG&E and KU GI requests. This study also included the effect of all confirmed Transmission Service Requests (TSRs). There are no planned transmission improvements associated with any earlier queued LG&E and KU GI requests as detailed in Section 1.3. Representation of the confirmed TSRs may have necessitated representation of associated planned transmission improvements. Thus, it is important to realize that if the planned improvements do not come to fruition, the subject request's impact on the transmission system as identified by this study may become invalid and a revised study may become necessary before GI service can be granted.

## 1.1 Steady-State Analysis Results

No thermal constraints due to the subject request were found. No voltage constraints due to the subject request were found.

## 1.2 Flowgate Analysis Results

No flowgate constraints due to the subject request were found.

## 1.3 Contingent Facility Analysis Results

This study included the effect of all earlier queued LG&E and KU GI requests. This study also included the effect of all confirmed Transmission Service Requests (TSRs). There are no planned transmission improvements associated with any earlier queued LG&E and KU GI request. Thus no study to determine whether or not those facilities would be contingent facilities for this request was performed.

## 1.4 Short Circuit Analysis Results

The Short Circuit Analysis results indicate that the transmission system has adequate interrupting capabilities to accommodate the addition of the new solar generator.

## 1.5 Stability Analysis Results

For all tested disturbances, all monitored voltages and angles were found to be within acceptable limits with the addition of the 100.0 MW generation at the point of interconnection with assumed coordination to eliminate islanding of the GI-2019-008 request and the Princeton load after a P6 disturbance. The need for coordination to prevent islanding is documented in Section 5.7.1 of the full report.

The study also relied on the following all of which are discussed in detail in Section 5 of the full report:

- MISO's determination that the oscillations emanating from J753 were not considered constraints to the GI-2019-003 request, as the GI-2019-003 request did not cause instability. Thus the J753 generation was modeled as Gnetted in the GI-2019-008 models.
- For simulation with no fault, slight drift in bus angles for some solar generation buses were ignored as discussed in Section 5.7.3 of the full report.

## 1.6 Stiffness Verification due to Inverter Based Resource Interconnection

The GI-2019-008 Short circuit ratio (SCR) was found to exceed the minimum requirement of 2.0. Due to the location of the GI-2019-008 POI, the Weighted SCR (WSCR) did not apply. There are no Grid Stiffness constraints to granting the GI-2019-008 GI request.

## 1.7 Conclusion

This report does not consider any issues related to the proposed routing of the generator lead-line to connect to the Transmission Owners Transmission System. If it is later determined that there are line clearance issues related to the generator's proposed lead-line, the customer must provide an alternate route that avoids such issues. In the event an alternate route is not available, the Transmission Owner may need to modify its transmission facilities to maintain adequate clearances. The Customer will be responsible for the costs and any schedule delay as a result.

The customer must work with the TO and ITO during the Facilities Study (FS) to assure that coordination will be in place to prevent islanding of the Princeton load with the GI-2019-008 generation during applicable P6 disturbances. If the assumption of the GI-2019-008 generation tripping 10 cycles after the creation of the island is determined to be invalid, additional study maybe required.

No third party constraints were identified in this study, but TVA and MISO Affected System Studies are required as indicated in Table E-3.

The customer must work with TVA and MISO to initiate the TVA Affected System Impact Study and keep the ITO and TO informed of the status of the studies.

Since no network upgrades have been identified as the responsibility of the GI-2019-008 customer, LG&E and KU has not provided a cost estimate for network upgrades. LG&E and KU has provided a good faith estimate of interconnection costs.

A summary of LG&E and KU's non-binding planning level cost estimate is given below:

- Generator Owner Facilities: Customer to determine.
- Transmission Interconnection Facilities: **$1,472,508 USD**.
- Network Facilities: **$1,809,323 USD**.
- Distribution Facilities: **$0 USD**.

LG&E and KU's good faith estimate of the total cost for all facilities is **$3,281,831 USD**. A detailed non-binding planning level cost estimate is given in Section 8 of the Full Report and will be further refined in the Facilities Study.

LG&E and KU has indicated that the interconnection facilities can be completed within 24 months after the LGIA is signed.

The full report is available on the LG&E and KU Critical Energy Infrastructure Information (CEII) File Transfer Protocol (FTP) site. See study report title posting on OASIS for instructions for accessing LG&E and KU CEII FTP site. The LG&E and KU secure CEII FTP site URL is: https://eftws.lge-ku.com/EFTClient/Account/Login.htm.

PPL companies

# FS-LGE-GIS-2019-008
# Facilities Study Report

**January 22, 2021**

Study & Preliminary Report Completed By:
LG&E/KU Transmission

Report Prepared By:
TranServ International, Inc. (ITO)

**TranServ International, Inc.**
3660 Technology Drive NE
Minneapolis, MN 55418
Phone: 763.205.7080

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# 1. Executive Summary

A Facilities Study was performed by LG&E/KU for the following request:

**Table 1-1**
**Request Details**

| Queue Position | Queue Date | County | State | Max Output (MW) S/W | Point of Inter-connection | In-Service Date | Inter-connection Service Type | Generator Type |
|---|---|---|---|---|---|---|---|---|
| LGE-GIS-2019-008 | 03/22/2019 | Caldwell | KY | 100 | North Princeton 161 kV Substation | 12/31/2021 | NRIS/ERIS | Solar |

TranServ as Independent Transmission Organization (ITO) completed a Generator Interconnection (GI) System Impact Study (SIS). The GI SIS analyzed the impact of this Generator Interconnection, located near Louisville, Kentucky, in accordance with the LG&E and KU Large GI Study Criteria document as posted on the LG&E and KU Open Access Same-Time Information System (OASIS). Customer executed a Facility Study Agreement with the ITO and LG&E and KU to complete a Facilities Study. LG&E and KU Services Company (LG&E-KU) contracted Black & Veatch (BV) to complete a +/-20% cost estimate study for the Generation Interconnect Request GI-2019-008 facility study. The request requires interconnecting to the existing 161 kV North Princeton substation in Caldwell County, Kentucky.

The LG&E/KU Open Access Transmission Tariff (OATT) states that the Facilities Study will include a good faith estimate of (i) the cost of Direct Assignment Facilities to be charged to the Eligible Customer, (ii) the Eligible Customer's appropriate share of the cost of any Network Upgrades, and (iii) the time required to complete such construction and initiate the requested service.

TranServ has reviewed the Facilities Study results from LG&E and KU and prepared this report in accordance with the LG&E and KU OATT.

# 2. Constraint Identified in the SIS

## 2.1 Steady State Constraints

No constraints were found in the SIS report.

## 2.2 Contingent Facility Analysis Results

There are no planned transmission improvements associated with any earlier queued LG&E and KU GI request. Thus, no study to determine whether or not those facilities would be contingent facilities for this request was performed. There were no GI-2019-008 contingent facilities identified in the SIS report.

## 2.3 Short Circuit Analysis Results

The Short Circuit Analysis results from the SIS indicate the transmission system has adequate interrupting capabilities to accommodate the addition of the new solar generator.

## 2.4 Stability Analysis Results in the SIS

For all tested disturbances in the SIS study, all monitored voltages and angles were found to be within acceptable limits with the addition of the 100 MW generation at the point of interconnection with assumed coordination to eliminate islanding of the GI-2019-008 request and the Princeton load after a P6 disturbance. The need for coordination to prevent islanding is documented in Section 5.7.1 of the full SIS report.

The study also relied on the following all of which are discussed in detail in Section 5 of the full SIS report:

- MISO's determination that the oscillations emanating from J753 were not considered constraints to the GI-2019-003 request, as the GI-2019-003 request did not cause instability. Thus, the J753 generation was modeled as Gnetted in the GI-2019-008 models.
- For simulation with no fault, slight drift in bus angles for some solar generation buses were ignored as discussed in Section 5.7.3 of the full SIS report.

## 2.5 Stiffness Verification due to Inverter Based Resource Interconnection

The GI-2019-008 Short circuit ratio (SCR) was found to exceed the minimum requirement of 2.0. Due to the location of the GI-2019-008 POI, the Weighted SCR (WSCR) did not apply. There are no Grid Stiffness constraints to granting the GI-2019-008 GI request.

# 3. Affected System Impacts from SIS

An Ad Hoc Study Group was involved in the study process. Table E-2 documents the Ad Hoc Study Group Comments which relate to independent testing performed by the Ad Hoc Study Group members consistent with the allowance for such testing in the LG&E and KU GI Criteria document.

**Table E-2**
**Ad Hoc Study Group Independent Study Comments**

| Ad Hoc Group Member | Date Received | Ad Hoc Group Member Comment provided within the 03/30/2020 Deadline |
|---|---|---|
| PJM | 07/13/2020 | PJM does not see any impacts due to this project. |
| No other Ad Hoc Member chose to provide independent testing results for this request by the 07/30/2020 deadline. | | |

In addition to the Table E-2 Ad Hoc Study Group responses received prior to the 07/30/2020 deadline, Table E-3 documents additional responses received.

**Table E-3**
**Additional Ad Hoc Study Group Comments**

| Ad Hoc Group Member | Date Received | Ad Hoc Group Member Comment provided after the 07/30/2020 Deadline |
|---|---|---|
| TVA | 08/24/2020 | Our planning engineers have indicated that that PTDF values on TVA facilities associated with the GI-2019-008 generator require that TVA perform an Affected System Impact Study on this project. |
| MISO | 09/18/2020 | MISO will perform Affected System Studies for LKE-GI-2019-008 as impacts on MISO facilities are greater than screening threshold. |
| No other Ad Hoc Member chose to provide a response between 07/31/2020 and issuance of this report. | | |

# 4. Facilities Study Results from LG&E and KU

## 4.1 Methodology

The following terms are defined in this facilities study report

- **New Network Facilities (NNF)** - additions, modifications, and upgrades to the Transmission Owner's system required at or beyond the Point of Interconnection (POI) to accommodate the interconnection of the Generating Facility to the Transmission System. It is possible for system network power to flow through NNF equipment, along with generation facility power.
- **Transmission Interconnection Facilities (TIF)** - all facilities and equipment owned by the Transmission Owner from the Point of Interconnection (POI) to the Point of Change of Ownership (PCO); including any modifications, additions, or upgrades to such facilities and equipment. Transmission Interconnection Facilities are sole use facilities and shall not include Distribution Upgrades, Generator Upgrades, Stand Alone Network Upgrades, or Network Upgrades. Only generation facility power can flow through TIF equipment.
- **Generation Owner Facilities –** all facilities and equipment owned by the Interconnection Customer starting at the Point of Change of Ownership (PCO).
- **Point of Interconnection (POI) –** the point where the transmission interconnection facilities connect to the new network upgrades.
- **Point of Change of Ownership (PCO) –** the point where the Interconnection Customer's facilities connect to the transmission interconnection facilities.
- **Distribution Upgrades (Distribution Facilities)**
- **Interconnection Customer (IC) -** The Generator Owner.

Article 11 of the LGIA specifies which party (Transmission or Generator Owner) has a construction obligation and who bears the expense of that obligation. Based on the requirements within the LGIA:

- **Generator Owner Facilities:** The Generator Owner is responsible for building, owning, and maintaining the assets. The Generator Owner bears the expense for these assets.
- **Transmission Interconnection Facilities (TIF):** LG&E and KU Transmission is responsible for building, owning, and maintaining the assets. The Generator Owner bears the non-refundable expense for these assets (Generation contribution to Transmission).
- **Network Facilities (NF) (include NNF):** LG&E and KU Transmission is responsible for building, owning, and maintaining the assets. However, the Generator Owner funds the initial expense for the Network Facilities unless LG&E and KU Transmission chooses to fund

them. Any funds received from the Generator will be refunded to the Generator, plus interest, as the Generator takes transmission service, or repayment can be set up over a defined period. The Terms of payment for the Network Facilities will be determined in the negotiation period (identified in the LG&E and KU OATT: Attachment M Section 11) of the LGIA.

- **Distribution Facilities:** LG&E and KU Transmission does not own any Distribution Assets. So, Distribution Asset Costs identified would be reviewed and determined with the local distribution utility.

The LGE-GIS-2019-008 Solar Transmission Estimate was created following the below steps:

- Engineering and Project Management costs were estimated. LG&E and KU project Management & Engineering labor were estimated at 20% of the contracted project Management & Engineering labor cost.
- Construction Management labor costs were estimated. LG&E and KU Construction Management were estimated at 50% of the contracted Construction Management labor costs.
- The Generator Owner facilities are not included in the estimates.
- The Transmission Owner's Telecommunications Department provided an estimate for telecom facilities.
- Cost estimates were broken down between Company labor, contracted labor, materials, and contingency.
- Pricing provided by the vendor was combined with Transmission Owner's burdens and contingency cost
- Pricing provided by the Transmission Owner's Telecommunications Department was aggregated in the cost summary table.
- The responsibility for costs was determined per the Transmission Owner's Allocation of Costs for Generator Interconnections document, effective January 1, 2018, for connecting to an existing substation ring bus configuration. As such, costs associated with this estimate are categorized as Transmission Interconnect Facilities (TIF) and New Network Facilities (NNF). All costs associated with Transmission Interconnect Facilities (TIF) will be the sole responsibility of the Interconnection Customer. Transmission Interconnect Facilities (TIF) cost estimate and summary are shown on Section 4.5.2. New Network Facilities (NNF) cost estimate and summary are shown on Section 4.5.4.

## 4.2 Major Project Assumptions, Constraints, and Risks

### 4.2.1 Assumptions and Clarifications

The cost estimates prepared for this interconnect request are based on the following assumptions.

- The IC's interconnection circuit construction and the IC's generation facilities are not included in this study.
- Estimate accuracy is +/- 20%.
- Internal LG&E-KU costs for Project Management & Engineering labor were estimated at 20% of the contracted Project Management & Engineering labor costs.
- Internal LG&E-KU costs for Construction Management were estimated at 50% of the contracted Construction Management labor costs.
- Telecom labor and material costs were provided by LG&E-KU and are assumed to be 100% LG&E-KU costs.
- LG&E-KU burdens and contingency were estimated internally by LG&E-KU.
- All contracted costs presented within this report include 6% escalation on cost, contractor burdens, and markups.
- Union Labor rates were utilized for construction labor.
- Materials are assumed to be tax exempt. No sales taxes are included in the estimate.
- Insurance is included for contracted costs.

#### 4.2.1.1 Construction

- Temporary construction power is assumed to be provided by LG&E-KU.
- Costs for subcontracted site security are included for non-work hours, holidays, and weekends for the duration of construction.
- Costs are included for a part-time onsite Construction Safety manger.
- Temporary laydown, matting, or other improvements are not included.

#### 4.2.1.2 Civil-Site Development

- No site development is included in the estimate. All work will occur within the existing station fence.
- Surfacing stone for the disturbed areas within the station fence is included.

#### 4.2.1.3 Civil-Structural

- A-frame structures will be comprised of bent plate and will be detail-designed by a steel fabricator, with loads provided by the substation engineer.
- All remaining steel will consist of standard AISC shapes to be detail-designed by the substation engineer.
- Geotechnical soil information was not available at the time of the estimate completion. BV completed a geotechnical desktop review of the site location to generate foundation design assumptions for the estimate. Costs for procurement of soil borings, soil resistivity testing, ground penetrating radar, and completion of a geotechnical report are included in the estimate.
- The soil conditions are assumed to be conducive for the installation of drilled pier foundations terminating in soil based on the existing foundation details for the site. Soil conditions will require verification during drilling operations.
- Based on the proposed location of the site, it is expected that the site will fall under Seismic Design Category D. Liquefaction was not considered for foundation design estimates.
- Based on Hazard Maps there is a low to moderate risk of Karst. Based on existing substation foundations, it has been assumed that no voids or other karst features exist below substation.

#### 4.2.1.4 Electrical Installation, Relaying & Communications

- The IC will supply the fiber communication (OPGW) channel between the IC collector substation and the LG&E-KU station.
- The estimate includes costs for the fiber connection from the new LG&E-KU Control House to the dead end structure.
- The IC will supply a line protection relay panel in the IC-owned collector substation to interface with the LG&E-KU-owned line protection relay panel in the interconnection station for coordinated protection of the IC line segment.
- The existing AC/DC system is assumed to be adequate for the new GI Line connection. Cost for new station service are not included.
- New DFR and RTU panels are not included in the estimate.

### 4.2.2 Project Risks and Constraints

- Geotechnical soil information was not available at the time of the estimate completion. BV completed a geotechnical desktop review of the site location to generate foundation design assumptions for the estimate. Costs for procurement of soil borings and completion of a geotechnical report are included in the estimate. Site soil conditions that differ from anticipated conditions could have significant impact on foundation design and below grade construction.
- Material and labor availability at the time of project execution could have significant cost impacts.

## 4.3 Interconnection Facilities Needs

Figure 1 shows the division of responsibility for an existing substation ring bus configuration, per the Transmission Owner's *Allocation of Costs for Generator Interconnections* document, effective 01/01/2018.

The IC will be responsible for the design, construction, and permitting of the 161 kV transmission line from their facilities to the Point of Change of Ownership (PCO) at the existing North Princeton station.

**Figure 1: Point of Interconnection**

Details of the Transmission Interconnection Facilities and New Network Facilities required for the generation interconnection are provided in Section 4.5.

## 4.4 Description of Upgrades

The next section describes facilities identified to be installed, replaced, and/or upgraded by LG&E-KU to accommodate the project. During detailed design other components may be identified for installation or replacement due to this interconnection.

The conceptual station arrangement developed for this estimate is included as Appendix A. The station and transmission line structure locations are shown below in Figure 2. The approximate latitude and longitude of the POI is 37.167839°N, 87.973511°W.

**Figure 2. Project Location Map**


## 4.5 Total Conceptual Cost Estimate: (Total Estimated Cost $2,756,709 USD)

The cost estimates are based on existing substation ring bus interconnection configuration as shown in Figure 1 of Section 4.3 and the assumptions provided in the Section 4.2. The estimated total project cost is estimated with +/- 20% accuracy.

### 4.5.1 Generator Owner Facilities

The generator owner is responsible for the installation and costs for the generator, step up transformer, generator lead line and customer protective devices up to the Transmission Owner (TO) metering equipment at the Point of Change of Ownership. The customer is responsible for determining the generator owner costs for the facilities owned and operated by the customer.

### 4.5.2 Transmission Interconnection Facilities: (Total Estimated Cost $1,033,341)

The transmission interconnection facilities will include all equipment and materials at the interconnection facility between the Point of Ownership Change and the Point of Interconnection. The required equipment and materials are identified below, and a summary of the interconnection facilities costs are provided in Table 4-1.

#### 4.5.2.1 Station

The transmission interconnection facilities will include the following:

##### 4.5.2.1.1 High Voltage

- One (1) 161kV Motor-Operated Disconnect Switch (mounted on A-Frame)
- Three (3) 161kV Surge Arresters (mounted on A-Frame)
- Three (3) 161kV Metering CT/PT Combo Units (mounted on A-Frame)

##### 4.5.2.1.2 Civil/Structural

- One (1) Steel A-Frame Structure & Foundation
- Two (2) 1-Phase Low Bus Supports & Foundations

##### 4.5.2.1.3 Protection & Control

- One (1) Line protection panel for GI
- One (1) Retrofit Metering panel for GI

### 4.5.3 Transmission Lines

- Not applicable.

#### 4.5.3.1 Telecommunication Facilities

- Not applicable.

**Table 4-1**

**Transmission Interconnection Facility Cost Estimate**

| Description | Cost |
|---|---|
| Company Labor | $99,927 |
| Contract Labor | $427,109 |
| Materials | $412,365 |
| Contingency | $93,940 |
| **Total** | $1,033,341 |

### 4.5.4 Network Facilities: (Total Estimated Cost $1,723,368 USD)

The network facilities include a new 161 kV circuit breaker and two (2) disconnect switches that will be added to the existing ring bus for the new GI line. Other Network Facility requirements include telecom infrastructure and rerouting of existing OPGW static wire on transmission structures outside of the North Princeton station to allow room for the new GI Line. The required equipment for each component of the network facilities is identified below and a summary of the network facilities costs are provided in Table 4-2.

#### 4.5.4.1 Network Interconnection Facilities: (Total Estimated Cost $1,723,368)

LG&E/KU and the vendor combined cost estimate for network interconnection facilities is shown in Table 4-2 and includes the following:

##### 4.5.4.1.1 High Voltage

- One (1) 161kV Circuit Breaker
- Two (2) 161kV Manually Operated Disconnect Switches

##### 4.5.4.1.2 Civil/Structural

- One (1) 161kV Circuit Breaker Slab Foundation
- Two (2) Low Switch Structures and Foundations to replace existing steel bus supports and foundations

##### 4.5.4.1.3 Protection & Control

- Not applicable.

#### 4.5.4.2 Transmission Lines

- OPGW Static wire to loop through station structures from existing Livingston Co. line dead end structure to existing Earlington North line dead end structure.

#### 4.5.4.3 Telecommunication Facilities

- Data Network Systems
  - Ethernet Switch, Router / Firewall
  - Fiber Distribution Panel / Wire Management

- 90H" x 24W" Hybrid Rack

- Telecom Systems
  - ICON Mux Access Modules for SCADA and Telemetering
- PGW Termination and ADSS End Section
  - 48-SMF ADSS for dielectric end section
  - Slack Drum and attachment hardware at each end
  - Splicing Materials & Fiber Termination Panel

**Table 4-2**
**Network Interconnection Facility Cost Estimate**

| Description | Cost |
|---|---|
| Company Labor | $313,816 |
| Contract Labor | $962,666 |
| Contracted Materials | $290,217 |
| Contingency | $156,670 |
| **Total** | $1,723,368 |

### 4.5.5 Distribution Facilities: (Total Estimated Cost $0 USD)

No distribution facility upgrades have been identified.

# 5. Conclusion and Project Completion Timeframes

This report does not consider any issues related to the proposed routing of the generator lead-line to connect to the Transmission Owners Transmission System. If it is later determined that there are line clearance issues related to the generator's proposed lead-line, the customer must provide an alternate route that avoids such issues. In the event an alternate route is not available, the Transmission Owner may need to modify its transmission facilities to maintain adequate clearances. The Customer will be responsible for the costs and any schedule delay as a result.

The customer must have adequate protection in place to prevent islanding of the Princeton load during applicable P6 disturbances. The customer must coordinate and verify this protection scheme with the TO and ITO prior to commissioning the unit. If the assumption of the GI-2019-008 generation tripping 10 cycles after the creation of the island is determined to be invalid, additional study maybe required.

The study determined that the inverters' 0.95 PF capability along with the customer indicated inclusion of four 8 MVAR switched capacitors is expected to provide at least +/- 0.95 power factor at the high side of the customer main transformer.

No third-party constraints were identified in this study, but TVA and MISO Affected System Studies are required as indicated in Table E-3. The customer must work with TVA and MISO to initiate the TVA and MISO Affected System Impact Studies and keep the ITO and TO informed of the status of the studies.

The engineering, design, and construction of the interconnection facilities and network upgrades is estimated to take twenty-four (24) months from receipt of the Interconnection Customer's execution of the LGIA or notice to proceed in the event of a suspension. Additionally, this estimate assumes that the project schedule would not be impacted by storm damage and restoration, time of year limitations, permitting issues, outage scheduling, system emergencies, and contractor and equipment availability, or other unforeseen circumstances.

Interconnection to LG&E and KU system is contingent on steady state, short circuit and dynamic model, assumptions and settings used in the SIS and Facilities Study.

# 6. References

[1]https://www.oasis.oati.com/woa/docs/LGEE/LGEEdocs/Allocation_of_Costs_for_Generator_Interconnections_effective_1-1-2018.pdf

# Appendix A. Conceptual Substation Layout

The appendix A of this report is available on the LG&E and KU Critical Energy Infrastructure Information (CEII) File Transfer Protocol (FTP) site. The LG&E and KU secure CEII FTP site URL is: https://eftws.lge-ku.com/EFTClient/Account/Login.htm.

# Golden Solar Facility Economic Impact Analysis

Kentucky State Board on Electric Generation and Transmission Application

Case No. 2020-00243

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# Tables

# 1 Overview and Context

Golden Solar, LLC (Golden Solar), a subsidiary of National Grid Renewables, is proposing the Golden Solar Facility (Project) in Caldwell County, Kentucky, which will be a photovoltaic power generation facility with a capacity of up to 100-megawatt alternating current ($MW_{AC}$). and 130-megawatt direct current ($MW_{DC}$). The Project is associated with high levels of both upfront and ongoing capital investment to construct and operate the facility. These investments will generate positive economic and fiscal impacts in the socioeconomic areas of interest (SAOIs): The Commonwealth SAOI and the Regional SAOI. The Commonwealth SAOI is defined as the entirety of Kentucky, while the Regional SAOI is defined as the combined area of Caldwell, Crittenden, Hopkins, and Lyon counties. These counties are all in Kentucky and are all within a ten-mile radius from the Project boundary. For both SAOIs, positive impacts arise both from short-term effects during the construction phase and from long-term recurring annual impacts during the operational phase.

Initial construction includes the creation of greater than 100 jobs, increased annual tax revenue, and increased economic activity in adjacent businesses. The operational life of the Project is anticipated to be approximately 30 years. Operational phase impacts include: the creation of a smaller set of ongoing jobs; annual contributions to the local tax base, primarily through property taxes; the long-term presence of a responsible corporate citizen with a commitment to the regional economy through charitable giving to a local organization(s); and the provision of green, renewable electricity, which is potentially attractive to many businesses in their siting locations.

Table 1 presents select socioeconomic data for the regions of interest. For the counties that comprise the Regional SAOI, per capita income is generally similar to Kentucky as a whole, while population density is lower than Kentucky and percent of the population in poverty is generally higher.

**Table 1. Socioeconomic Metrics for National and SAOI Populations**

| | Population (2021) [a] | Population per sq. mile, (2010) [a] | Per capita income (2016-2020) [a] | Population in poverty [a] (2020) | Gross Domestic Product (GDP) for year 2020 ('000s) [b] |
|---|---|---|---|---|---|
| USA | 331,893,745 | 87 | $35,384 | 11.4% | $18,384,687,000 |
| Kentucky (KY) | 4,509,394 | 110 | $29,123 | 14.9% | $185,535,131 |
| Caldwell County, KY | 12,624 | 38 | $32,439 | 15.3% | $364,540 |
| Crittenden County, KY | 8,947 | 26 | $24,732 | 16.8% | $177,541 |
| Hopkins County, KY | 45,138 | 87 | $24,883 | 18.1% | $1,658,687 |
| Lyon County, KY | 8,803 | 39 | $26,993 | 14.4% | $197,733 |

[a] USCB2022

[b] USBEA2021

# 2 Methodology for Quantifying Economic Impacts

Total Project spending during construction is estimated to exceed $150 million. A portion of the labor hired for this Project will come from within Kentucky, and efforts will be made to hire local labor for construction-related activities, when feasible. Project-related spending on materials and wages suffuses new money into the Commonwealth and regional economies.

In order to quantify economic impacts within the SAOIs, Golden Solar conducted an analysis using the solar-power specific version of the Jobs and Economic Development Impact (JEDI) tool. The JEDI tool, developed by National Renewable Energy Laboratory, is a widely used and recognized model for determining economic impacts of various utility scale power generation projects. The results below are based on the proposed 130-$MW_{DC}$ facility.

The JEDI model estimates results at the Commonwealth/State level. Therefore, economic impacts for the Commonwealth SAOI reported here are those outputs estimated directly by the JEDI model. Economic impacts for the Regional SAOI are determined through a scaling approach by adjusting Kentucky results downward by the ratio of their respective 2020 Gross Domestic Products (GDPs). The 2020 GDP of the combined Regional SAOI was divided by the 2020 GDP of Kentucky, resulting in a scaling factor of 1.29%. Therefore, economic impacts reported for the Regional SAOI are equal to the Kentucky estimates multiplied by 0.0129.

# 3 Economic Impacts: Kentucky

Economic impacts of the construction phase are estimated at approximately 79.2 direct full-time equivalent (FTE) jobs filled by skilled and contract workers from within Kentucky, as displayed in Table 2. Another 98.2 FTE jobs in Kentucky will be supported through indirect impacts of construction. In total, these 177.4 FTE jobs represent an estimated injection of $10.94 million in wages into the Kentucky economy, which are expected to drive an additional $12.60 million in increased economic activity. The total construction phase economic impact of the Project (excluding tax revenues) is estimated to be approximately $23.56 million.

Economic impacts of the operation phase are anticipated to create approximately 4.0 direct FTE jobs within Kentucky for the duration of operations, as displayed in Table 2. Another 2.3 FTE jobs in Kentucky will be supported through indirect impacts of Project operations. In total, these 6.8 FTE jobs represent an estimated $450,000 in annual wages, which will drive increased economic activity of an additional $350,000. The total operational phase economic impact of the Project is estimated to be approximately $0.80 million annually.

**Table 2. Estimated Economic Impacts: Kentucky**

| | Construction Phase | | | Operation Phase (Annual) | | |
|---|---|---|---|---|---|---|
| | Number of Jobs [a] | Value of Earnings | Total Economic Output | Number of Jobs [a] | Value of Earnings | Total Economic Output |
| Direct | 79.2 | $5,568,700 | $8,762,000 | 4.0 | $280,000 | $280,000 |
| Indirect & Induced | 98.2 | $5,367,600 | $14,800,400 | 2.8 | $172,700 | $524,800 |
| Total | 177.4 | $10,936,300 | $23,562,400 | 6.8 | $452,700 | $804,800 |

Note: May not sum to total due to independent rounding.

Note: An estimate of anticipated direct employment for the operational phase of this Project was revised based on the Applicant's recent experience from similar projects. Estimates of direct employment wages, induced economic impacts and total economic impacts for the operational phase, have been revised downward from JEDI output to account for these experience-based estimates of direct employment during operations.

[a] Jobs are listed in full-time equivalent (FTE) units.

# 4 Economic Impacts: Regional SAOI

Regional economic impacts of the construction phase are estimated to create one direct FTE job filled by a craft/contract worker from the Regional SAOI, as displayed in Table 3. Another FTE job will be supported through indirect and induced impacts of Project construction. In total, these approximately 2.3 FTE jobs represent an estimated $141,400 in new wages into the regional economy annually, which will drive increased economic activity of an additional $163,200 annually. The total construction phase economic impact of the Project is estimated to be approximately $304,600 annually.

Annual economic impacts of the operation phase in the regional SAOI will be relatively modest as shown in Table 3. These estimates, which are scaled down from Kentucky impacts, likely underestimate regional impacts because the four long-term direct jobs that are anticipated during operation are likely to be preferentially filled by individuals who live nearby (or will obtain resident status nearby) the Project.

**Table 3. Estimated Economic Impacts: Regional SAOI**

| | Construction Phase | | | Operation Phase (Annual) | | |
|---|---|---|---|---|---|---|
| | Number of Jobs [a] | Value of Earnings | Total Economic Output | Number of Jobs [a] | Value of Earnings | Total Economic Output |
| Direct | 1.02 | $72,000 | $113,300 | 0.1 | $3,600 | $3,600 |
| Indirect & Induced | 1.27 | $69,400 | $191,300 | 0.0 | $2,200 | $6,800 |
| Total | 2.29 | $141,400 | $304,600 | 0.1 | $5,900 | $10,400 |

Note: Values in this table are scaled from the Commonwealth SAOI estimates by applying an adjustment factor of 0.0129. May not sum to total due to independent rounding.

Note: An estimate of anticipated direct employment for the operational phase of this Project was revised based on the Applicant's recent experience from similar projects. Estimates of direct employment wages induced economic impacts and total economic impacts for the operational phase have been revised downward from JEDI output to account for these experience-based estimates of direct employment during operations.

[a] Jobs are listed in full-time equivalent (FTE) units.

# 5 Government Revenue Impacts

In addition to the economic impacts listed above, This Project will have a positive tax impact on governments within the SAOIs. Golden Solar will pay new Kentucky sales and property taxes over the life of the Project, which will support local schools, infrastructure and/or other public services. This Project would create valuable new tax revenue sources, as solar energy facilities do not result in large increases in public expenditure services such as schools, roads, water, or sewer relative to the taxes they generate. More than $3.3 million is estimated to be paid in taxes to Kentucky and local governments over the Project life.

# 6 Additional Investments in Community and Ancillary Benefits

In addition to increased economic activity and tax payments, Golden Solar is committed to charitable donations to local organizations exceeding $400,000 over the life of the Project.

The Project will also make an important contribution to the diversification of the economy in the SAOIs, particularly at the regional level through renewable energy job and spending growth.

Finally, large businesses consider availability and proximity to renewable electricity resources when siting prospective facility locations. Corporate commitments to renewable electricity support local jobs and allow corporations to leverage positive marketing opportunities to enhance brand image and recruiting efforts. A more attractive business setting may provide additional positive economic impacts to the SAOIs.

# 7 Summary

The construction and operation of the Project would have a positive economic impact on the SAOIs, including increases in employment and income, elevated tax revenues, and a variety of other ancillary benefits. The total economic impact for Kentucky is estimated at approximately $23.6 million during construction and approximately $800,000 annually during operation. The total economic impact for the Regional SAOI is estimated at approximately $300,000 during construction and less than $100,000[1] annually during operation. Detailed economic impacts are provided in Table 2 and Table 3. Government tax revenues paid by Golden Solar are estimated at approximately $3.3 million over the life of the Project, as described in Section 6. Cumulatively, these positive economic impacts are likely to have relatively large beneficial effects compared to the far smaller level of increased public expenditures solar energy facilities generally require, as described in Section 5.

[1] As described in Section 4 (Economic Impacts: Regional SAOI) economic impacts for the Regional SAOI are estimated by scaling down Kentucky impacts by a factor determined by the relative GDP of the Regional SAOI in aggregate to the GDP of Kentucky. For operational phase impacts in particular, this scaling methodology is likely to yield an estimate that under-predicts actual economic impacts.

# 8 References

United States Bureau of Economic Analysis (USBEA). 2021. Local Area Gross Domestic Product, 2020. Available at: https://www.bea.gov/news/2021/gross-domestic-product-county-2020. Accessed June 2022.

United States Census Bureau (USCB). 2022. QuickFacts. Available at: https://www.census.gov/quickfacts/fact/table/lyoncountykentucky,crittendencountykentucky,caldwellcountykentucky,KY,US/PST045221. Accessed June 2022.

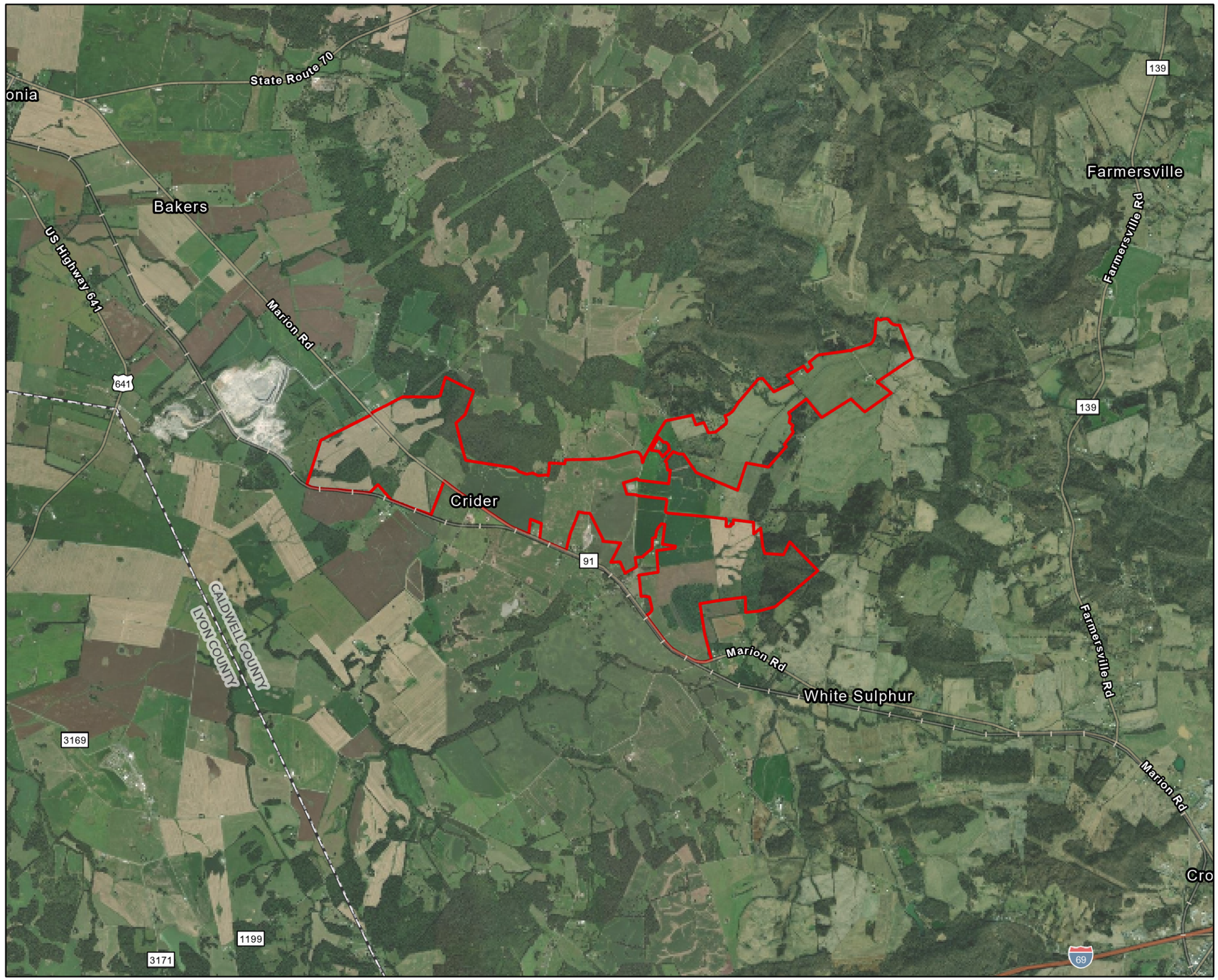



*Figure No.*
**1**

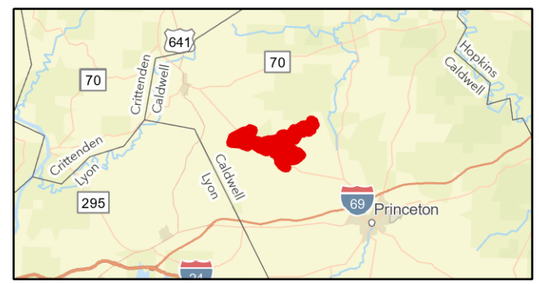
*Title*
**Project Area**

*Client/Project*
Golden Solar Project

*Project Location*
Caldwell County, Kentucky

Project Area
County Boundary

0 0.65 1.3
Miles
(At original document size of 11x17)
1:50,000




***Notes***
1. NAD 1983 2011 StatePlane Kentucky FIPS 1600 Ft US
2. Basemap Sources: Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, Maxar

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Path: K:\Project_Data\Geronimo\Golden\ProjectsMxds\Golden.aprx

# EXHIBIT G
# ENVIRONMENTAL PERMITS

## Requirement

*KRS 278.704(1): The certificate shall be conditioned upon the applicant obtaining necessary air, water and waste permits.*

*KRS 224.10-280 Cumulative environmental assessment and fee required before construction of facility for generating electricity*

## Compliance

All necessary air, water, and waste permits have been or will be obtained before construction and operation of the Project, and may include:

| Permit | Regulatory Agency | Activity | Authority |
|---|---|---|---|
| Kentucky Pollutant Discharge Elimination System (KPDES) Individual Permit | Kentucky Division of Water (DOW) | Discharge of process wastewater, non-process wastewater or stormwater from a point source. | KRS 224.10-100, 224.16-050, 224.70-110, 224.70-120, 401 KAR 5:001, and 401 KAR 5:055–5:080 |
| KPDES Construction Storm Water Discharge General Permit | DOW | Stormwater discharges from construction activities that disturb one or more acres. | KRS 224.16-050, 224.16-060, 401 KAR 5:055 and 5:060 |
| KPDES Wastewater Facility Construction Permit | DOW | If installation of sewers or pump stations is involved, a Wastewater Facility Construction Permit is required. | KRS 224.10-100, 224.16-050, 224.70-110, and 401 KAR 5:005 |
| General Permit for Floodplain Development | DOW, Caldwell County | Development in, along, or across a stream requires a floodplain permit. | KRS 151.230 |
| Water Withdrawal Permit | DOW | Withdrawal of public water. | KRS 151.140, 401 KAR 4:010 and 4:200 |
| Section 404 Clean Water Act Permit / Section 10 Rivers and Harbors Act Permit (Individual) | U.S. Army Corps of Engineers | Permit for structures and/or work in or affecting navigable Waters of the United States. | 33 CFR 322.3 |
| Section 401 Water Quality Certification | DOW | Any discharge into waters of the Commonwealth. associated with any federally licensed or permitted activity. | § 401 CWA KRS 224.16-050 401 KAR Ch. 5 |

A Cumulative Environmental Assessment, as required pursuant to KRS 224.10-280 is provided as an attachment following this exhibit. The report includes an environmental assessment of potential air, water, and waste impacts from construction and operation of the Golden Solar Project. Golden Solar is filing the Cumulative Environmental Assessment with the Kentucky Energy and Environment Cabinet concurrently with this application.

# Golden Solar Facility
# Cumulative Environmental Assessment

## Kentucky State Board on Electric Generation and Transmission Application

Case No. 2020-00243

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# Acronyms

| | |
|---|---|
| Applicant | Golden Solar, LLC |
| BMP | Best Management Practice |
| CEA | Cumulative Environmental Assessment |
| CO | Carbon Monoxide |
| KDOW | Kentucky Energy & Environment Cabinet, Department for Environmental Protection, Division of Water |
| NAAQS | National Ambient Air Quality Standards |
| $NO_2$ | Nitrogen Oxide |
| PM | Particulate Matter |
| Project | Golden Solar Facility |
| PV | Photovoltaic |
| $SO_2$ | Sulfur Dioxide |
| SWPPP | stormwater pollution prevention plan |
| Golden Solar | Golden Solar, LLC |
| USACE | United States Army Corps of Engineers |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| VOC | volatile organic compound |

# Introduction

Section KRS 224.10-280 of the Kentucky statutes for the Energy and Environment Cabinet states that an electrical facility may not be constructed until the developing party submits a cumulative environmental assessment (CEA) to the Kentucky Energy and Environment Cabinet as part of its application documents.

In compliance with KRS 224.10-280, this cumulative environmental assessment discusses potential impacts and impact mitigation plans for the following categories:

1. Air Pollutants
2. Water Pollutants
3. Waste
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# 1 Air Pollutants

In accordance with the Clean Air Act, the United States Environmental Protection Agency (USEPA) developed National Ambient Air Quality Standards (NAAQS). The NAAQS were set to regulate air pollutants that are deemed harmful to public health and the environment. Maximum allowed concentrations and safety margins were established for six principal pollutants, referred to as "criteria" pollutants: ozone, particulate matter (PM), carbon monoxide (CO), nitrogen oxide ($NO_2$), sulfur dioxide ($SO_2$), and lead.

Based on daily measurements of regional air quality, areas that fall below the NAAQS threshold are designated as attainment areas. Regions that exceed the NAAQS are deemed nonattainment areas. When a nonattainment area improves in air quality and meets the NAAQS, it becomes a maintenance area.

The Golden Solar Project (Project) proposed by Golden Solar, LLC (Golden Solar) will be located in Caldwell County (Figure 1), which is within an air quality control region in attainment of NAAQS (USEPA 2022). The Commonwealth of Kentucky implements further air quality protection through the Kentucky Administrative Regulations, Title 401, chapters 50 through 68.

Air quality impacts from construction would occur over the 12-18-month construction period. An estimated up to 150 construction workers are anticipated to be onsite at a time, using equipment and machinery which may include bulldozers, backhoes, flatbed semi-trucks, forklifts, tractors, bobcats, augers, pile drivers, and concrete trucks.

Construction and operation of the completed facility would produce air pollutants. Emissions will predominantly come from the construction and personnel vehicles, operating equipment, and supplies. Vehicles and equipment with internal combustion engines would produce PM, $NO_2$, CO, $SO_2$, and volatile organic compounds (VOCs). The anticipated emissions generated by construction are expected to be minor due to the scale and duration of operations. Estimating the precise quantity of emissions produced by heavy machinery will require factoring in engine horsepower, machine age, task duration, soil type (for ground-breaking equipment) and other variables tied to efficiency. Proper maintenance and use of ultralow-sulfur diesel fuel will aid in reducing air pollutants from machinery.

In addition to criteria pollutants, construction activities would generate dust and other suspended particulates (temporary fugitive air pollutant emissions). Unpaved roads, parking lots, and exposed soil at the construction site provide sources of fugitive dust. Best management practices (BMPs) will be implemented onsite, requiring measures such as covering loads and applying water for dust suppression. Dispersal of air pollutants across the Project area and offsite will be influenced by the type and intensity of construction activity, extent of control measures, and natural factors such as wind and precipitation. With the use of appropriate BMPs, ambient air quality standards would not be exceeded, and construction activities would result in temporary, negligible impacts to air quality.

Air emissions from the operation of the Project would be generated by worker vehicles and maintenance equipment. Operating solar panels does not produce any emissions, including criteria pollutants, VOCs, or hazardous air pollutants, during energy production. Therefore, facility operations would generate negligible levels of air pollutants. The Project will yield an overall benefit to air quality at both local and regional levels by reducing the use of non-renewable energy and offering an alternative, minimal- to zero-emission electricity source. The Project does not require an air quality permit.

# 2 Water Pollutants

## 2.1 Surface Water

The Project is located within Hydrologic Unit 05130205, also referred to as the Lower Cumberland Watershed. The Lower Cumberland River drains 2,084 square miles in Kentucky and ultimately connects to the Ohio River near Smithland, Kentucky, west of the Project area (Kentucky 2022). The Project area is characterized primarily by moderately well-drained to well-drained silt loam soils (USDA 2022). There are water bodies within the Project boundary; however, none inside or directly adjacent to the boundary have been designated as Kentucky Special Waters by the Kentucky Division of Water (KDOW) (KDOW 2022).

Wetlands, ponds, and streams are present within the proposed Project boundary. These waterbodies could be impacted by erosion and sedimentation generated by ground-disturbing construction activities. As with minimizing fugitive dust into the air, the Project will follow BMPs to limit surface water pollution from dust and sediment. Actions will include keeping ground-disturbing activities, such as grading and clearing, to a minimum. These actions generate conditions for erosion and sedimentation. Additionally, disturbed ground is prone to colonization by invasive species, which often require herbicide application to control.

Existing roads will be used as much as possible to minimize construction of additional access. If grading is deemed necessary and unavoidable, effort will be made to avoid drainages. Grading will follow the natural topography of the surrounding region to lower the risk of erosion. No fill above the permittable threshold is anticipated to be placed in jurisdictional waters during construction or operation of the Project.

Erosion control and sedimentation prevention measures will also apply to construction assembly areas, which could result in overland sediment migration into wetlands. Staging or laydown areas will be in place during the construction phase and located entirely within the Project boundary.

Project construction may result in stormwater discharge. To mitigate effects from these activities, Golden Solar will use BMPs to protect jurisdictional wetlands and streams from sedimentation and prevent the migration of silt and sediment offsite. Silt fences, sediment basins, and 25-foot buffer zones will be used to prevent sedimentation of wetlands. Erosion control measures in disturbed areas, including using water to prevent dust and help compact the soil, will prevent sediment from entering jurisdictional waters and from moving offsite.

In compliance with KDOW, Golden Solar will design and implement a stormwater pollution prevention plan (SWPPP). Furthermore, the Project will comply with the KDOW Construction Storm Water Discharge General Permit on actions that will influence one or more acres of land. A Notice of Intent and Notice of Completion will be submitted prior to and upon completion of construction.

Construction may generate hazardous materials such as fuel, lubricants, and hydraulic fluids that could potentially contaminate groundwater. While the use of these materials will be limited to essential use only, there remains a small risk of on-site spills. BMPs will be established to minimize spill risk and immediately address any spills that occur. Proper maintenance of machinery and vehicles will further reduce this risk. Hazardous materials will be appropriately stored, and chemicals such as herbicides and fertilizers will be used sparingly. Golden Solar does not anticipate further sources of groundwater pollution from facility operations. The completed photovoltaic (PV) panels will not include a runoff collection system, allowing rain to filter through vegetated soils into the groundwater table. In addition, disposal of these materials shall be in compliance with all applicable federal, Commonwealth, and local regulations.

Once construction is complete, vegetation cover will be planted using industry best practices to ensure stabilization of disturbed soils as quickly as possible to reach final stabilization. Seed mixes will be purchased from ~~local,~~ reputable sources. The vegetation will consist of low-growing, herbaceous plants

and grasses from certified weed-free seed mixes. As soils stabilize, herbicide application in conjunction with mowing may be necessary to prevent the establishment of invasive species. In these instances, herbicides will be applied by certified commercial pesticide applicators who are licensed within Kentucky. Applicators will use USEPA-registered and approved herbicides and strictly follow the herbicides' application instructions. Chemical application near wetlands would be restricted to prevent aquatic impacts. Stormwater BMPs shall be left in place until final stabilization per construction stormwater permit regulations has been achieved.

Any earth-disturbing activities which are a part of facility maintenance shall be required to implement BMPs and permit requirements as necessary to reduce impacts to surface water. Design of the solar facility will only require small, dispersed areas of impervious surfaces in the form of access roads, gravel pads, operations and maintenance buildings, the substation, and switchyard, resulting in no or negligible impacts to surface waters from runoff. Much of the current land use is dedicated to cultivated crops and pasture, which introduce fertilizers, herbicides, and pesticides to the system. Application of these chemicals will be significantly reduced by converting agricultural land to solar fields. As such, surface water conditions may improve over the life of the Project.

## 2.2 Groundwater

Aquifers are permeable bodies of rock and sediments that store and allow for underground movement of water. Rain and other precipitation permeate the ground, enters the aquifer, and can then resurface as a natural spring, be extracted through man-made wells, or discharge into waterbodies such as streams and lakes. The subterranean water is referred to as groundwater (United States Geological Survey [USGS] 2020). A Kentucky Geological Survey Kentucky Groundwater Observation Network observation well (UKREC Princeton Farm well) is located east of the Project area (south of Princeton, Kentucky). Depth to water measured in 2017 and 2018 ranged from approximately 27 feet to approximately 37 feet below ground surface (University of Kentucky 2022).

The Project is not expected to generate adverse impacts to groundwater. Hazardous materials, including fuel, lubricants, hydraulic fluids, herbicides, and fertilizers, will be limited to essential use only, properly stored, and used following proper techniques. Proper maintenance of machinery, spill prevention protocols, and readily available spill kits will be used to reduce the risk of groundwater contamination. The conversion of the Project area from agricultural land use to solar energy production will produce net reductions in fertilizer, herbicide, and pesticide use, thereby reducing chemical application to the landscape. Minor benefits to groundwater systems are anticipated as a result.

# 3 Waste

Project construction will generate very small quantities of hazardous waste. To avoid any on- and off-site impacts, all waste will be stored, handled, and disposed of in accordance with local, state, and federal regulations. Golden Solar will develop a hazardous material business plan to ensure materials are handled, used, and stored using BMPs, with resources and operating procedure guidelines in place in case of a spill. The plan will include spill prevention measures, proper training of personnel, providing appropriate personal protective equipment, keeping Material Safety Data Sheets for all hazardous chemicals, and maintaining spill kits and other cleanup materials onsite.

Materials will be properly stored in containers most appropriate for each type of waste and labeled in compliance with federal, state, and local regulations. All hazardous material storage units will include secondary containment so that in the unlikely event of primary container failure, a spill would not reach the environment.

Solid construction waste will be recycled, if possible. Non-recyclable solid materials will be removed from the Project site and disposed of at an appropriate regulated landfill. Anticipated solid waste includes construction debris, recyclables, and garbage, including packaging materials, storage boxes, wooden pallets, and building materials. Designated personnel will conduct daily inspections to ensure proper handling of wastes. This will include waste storage, labeling, cleanup, and disposal as well as recording the generated amounts of waste for Project records.

The primary sources of waste are expected to be the maintenance of equipment, vehicles and machinery and the replacement of damaged or worn-out materials. Construction machinery and vehicles will include semi-trucks, work trucks, excavators, and other equipment types that use gasoline, diesel, engine oil, and other petroleum-based products. These machines will produce hazardous liquid wastes such as used oil, diesel fuel, gasoline, hydraulic fluid, and other lubricants. Some vehicles may be refueled or undergo maintenance on-site. Spill prevention measures will consist of maintaining proper storage and material handling techniques and following procedure instructions for material use. Spill kits will be kept on all refueling vehicles and at strategic locations on-site. They will be easily accessible for any tasks that may incur a risk of spills.

Liquid supplies stored on site may include cleaning supplies, pesticides and herbicides, air conditioning fluids, machinery maintenance supplies (hydraulics fluids, degreasers), fuels (gasoline or diesel), paints, and propane. It is expected that these materials will be kept in small quantities, measuring less than 55 gallons, 500 pounds, or 200 cubic feet of each substance.

Construction will result in human waste, but no negative impacts to environmental resources are expected. To accommodate increased personnel during construction, portable chemical toilets will be provided. These portable toilets will be properly maintained and regularly pumped by a licensed sewage waste contractor. The waste will be disposed of at a regulated wastewater treatment plant. If a permanent septic system or wastewater disposal system is not already present, the addition of bathroom facilities with appropriate waste-handling procedures may be required for the standard facility operations.

Small quantities of other waste (paper, packaging, etc.) will be produced during both construction and facility operations. Appropriate disposal plans are in place for removing waste from the Project site to appropriate disposal or recycling facilities. Therefore, while facility construction and operations will generate hazardous and non-hazardous waste, due to their limited quantities and the implementation of spill prevention measures, they are not expected to negatively impact onsite or offsite resources.

# 4 Water Withdrawal

Construction and standard facility operations will require water. The Project plans to use existing wells for water supply. If there are no existing wells, or if existing wells are not sufficient for construction and operations, then a new well may be developed.

Construction activities will use water to prevent dust and sediment pollution into onsite air and wetlands. Ground-disturbing activities such as grading require water for soil compaction and dust control. Water used for any dust control measures will be properly handled using BMP protocols. Water may also be used during construction of building foundations and equipment pads, for washing equipment, and for other minor uses. The SWPPP will include regulations for both using water to clean equipment and appropriate disposal of this wastewater.

Anticipated use of water for construction is expected to be relatively minor and would not negatively impact groundwater resources. Once the facilities are complete, standard operations are expected to have low water requirements. The surrounding area receives enough rainfall throughout the year to contribute to aquifers and reduce the need to regularly wash the solar panels. Rainfall will be adequate to keep the PV panels largely free from dust and debris. Additionally, rain will contribute to ongoing vegetation management. Some water will be needed to maintain ground cover planted between the PV panels, ground-stabilization vegetation, and planted visual buffers. An irrigation system may need to be installed to sustain vegetation through periods of low rainfall.

Construction and operation of solar electricity-generating facilities are not anticipated to be water intensive. Water withdrawal for the Project is not expected to create negative effects on regional water resources.

# 5 References

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# TOGETHER we can do great things

## Community

When we say community, we don't just mean the neighborhoods that people call home. We mean everyone and everything with a stake in the work that we do—from our Stantec and industry colleagues to the clients we collaborate with and the people and places we impact.

Whether creating, sustaining, or revitalizing a community, we help diverse cultures and perspectives work together toward shared successes.

Although our work helps to create physical communities, our ultimate goal is to create something far more meaningful—a sense of community.

## Creativity

For us, creativity is driven by purpose. Knowing that transformation is truly possible inspires us to approach every situation with a fresh perspective.

Our inventive and collaborative approach to problem-solving helps bring big ideas to life through creative solutions.

Whether our contribution is a design that strikes the perfect balance between function and aesthetics, a feat of engineering that redefines what's possible, or a project management approach that delivers results, we strive for outcomes that transcend the challenges they solve and shape the communities we serve for the better.

## Client Relationships

We're better together. This belief shapes how we collaborate with our clients, our partners, and our communities.

We listen so we can deeply understand our clients' needs, communicate with purpose so we maintain alignment, and remain open and flexible so we never miss an opportunity to strengthen a project and positively transform a community.

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