Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request Project ID AG1-341

"Summer Shade 161kV Solar"

63.6 MW Capacity / 106 MW Energy

Revision 1: July 2024

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff. The Transmission Owner (TO) is East Kentucky Power Cooperative ("EKPC").

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project developer has proposed a solar generating facility located in Metcalfe County, Kentucky The installed facilities for AG1-341 will have a total Maximum Facility Output (MFO) of 106 MW with 63.6 MW of this output being recognized by PJM as Capacity.

2. POINT OF CHANGE OF OWNERSHIP

The Generating Facility will interconnect with the EKPC transmission system via a direct connection into the Summer Shade 161 kV substation.

The Point of Change of Ownership will be located at the Project Developer (PD) side of a 161kV disconnect switch to be installed by EKPC outside of the Summer Shade Substation fence, mounted to a transmission pole. The exact location of this switch will be determined during project detail design and EKPC will install, own, operate, and maintain it. The PD substation will be constructed in the vicinity of the Summer Shade 161 kV substation. The PD will install the necessary 161 kV equipment (transmission line & structures, OPGW, bus conductors, jumpers, etc.) from this 161kV disconnect switch structure to its substation equipment. The PD will be responsible for acquiring all rights-of-way, easements, and environmental approvals and permits for its facilities. The PD will be responsible for constructing, owning, operating, and maintaining its facilities, and EKPC will have no responsibility for any of these activities.

The proposed generation interconnection is shown on the High-Level Planning Diagram in Attachment #1.

3. AMENDMENTS TO THE IMPACT STUDY DATA OR IMPACT STUDY RESULTS

The project costs and construction schedule have been refined in this report for increased accuracy and thereby differ from that information which was presented in the Feasibility and System Impact Study reports. All estimates have been created based on meeting the earliest in-service date possible at the request of the PD. EKPC estimates 28-month implementation duration after a project kickoff meeting is held. Therefore, the requested in-service date of June 15, 2023 as stated in the Feasibility Study is not possible based on the expected schedule for implementation of the necessary transmission projects

4. PROJECT DEVELOPER SCHEDULE

Project Developer's requested in-service date for the generation facility is June 15, 2023.

5. SCOPE OF PROJECT DEVELOPER FACILITIES

The PD will design, build, own, operate and maintain all Interconnection Facilities on PD side of the Point of Change of Ownership (PCO). This includes, but is not limited to:

- Generation step-up (GSU) transformer(s)
- Circuit breakers and associated equipment located between the high side of the GSU and the Point of Change of Ownership
- Generator lead line from the Generating Facility to the Point of Change of Ownership
- Relay and protective equipment, and Supervisory Control and Data Acquisition (SCADA) and telecommunications equipment to comply with the TO's Applicable Technical Requirements and Standards

PJM will provide the reactive power requirements for the generation facility based on results of its steady-state and dynamic voltage studies.

The proposed facility must meet EKPC's published facility connection requirements. The latest version of these requirements can be accessed via the following link:

https://www.pjm.com/planning/design-engineering/to-tech-standards/ekpc.aspx

B. Transmission Owner Facilities Study Results

The following is a description of Transmission Owner facilities for physical interconnection of project to the EKPC transmission system. These facilities shall be designed according to EKPC standards. Once built, EKPC will own, operate, and maintain these Facilities.

1B. INTERCONNECTION SUBSTATION (EXISTING)

Summer Shade Substation Upgrade

The existing 161 kV substation, Summer Shade, will be expanded to interconnect the project with the EKPC transmission system.

The existing substation will be expanded westward by approximately one acre and cross an existing property line. The footprint of the expansion will accommodate the addition of a new circuit breaker for the termination of the PD generator lead line and allow for the installation of a future breaker position. The existing 161 kV main and transfer buses will be extended to the west beyond the existing transfer breaker which will allow for the installation of a 161kV breaker position, breaker disconnect switches, and a transfer bus disconnect switch. The PD generator lead line will terminate on a new A-frame structure on the north side of the yard. EKPC will also install a new relay panel, metering, fiber optic communications, and associated equipment to accommodate the connection of the PD generator lead line.

The major equipment and materials associated with the expanded substation are listed below.

QTY	Unit	DESCRIPTION
1	Each	161 kV A-Frame Substation Structure
1	Each	161 kV, 2000 Amp Circuit Breaker
4	Each	161 kV 2000A Disconnect Switches including PCO Switch
1	Lot	Electrical Material (bus, insulators, terminals, conductors etc.)
3	Each	CT's, 161 kV (for revenue metering)
3	Each	Surge Arrester, 108 kV Station Class

System Protection

The following system protection scope of work applies for this project. All system protection equipment described in this section will be owned, operated, and maintained by EKPC.

Relay Panels: EKPC shall install the following relay panels in the existing control house.

Line panel for the Project Developer (PD) facility connection—EKPC shall install a standard line panel with P1 and P2 SEL-411L relays. The P1 and P2 relays shall utilize line current differential. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing. Dual metering for the PD shall also be installed in the panel. The P1 Meter shall be an ION8650A, and the P2 Meter shall be an SEL-735.

EKPC requires the PD to utilize all Schweitzer Engineering Laboratories (SEL) relays and related protective equipment for facilities that will be interconnecting or communicating with EKPC relaying. EKPC reserves the right to specify relays or other protective equipment utilized in the PD substation as required based on the protection schemes utilized. All protection system designs shall be reviewed by EKPC System Protection or its designer during the design phase to ensure proper clearing times, coordination, and compliance with applicable NERC regulations.

Control cables shall be pulled from new breakers and other required equipment to the control house.

Commissioning: Each relay panel shall be fully commissioned prior to being placed in service. Commissioning shall include AC current and potential circuits, DC functional, relay testing, and end-to-end testing where required.

2. TRANSMISSION LINE TIE-IN

No EKPC Transmission Lines will be needed to allow for the interconnection of the Project Developer's solar facility into the EKPC system.

3. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The TO Interconnection Facilities will include, but not be limited to, the following:

- A 161 kV transmission line monopole dead-end structure and foundation outside the fence of the Interconnection Substation to terminate the Project Developer's generator lead line.
- A 161 kV 3-pole disconnect switch mounted to the monopole structure.

- Line conductor from the dead-end structure to the bus position in the switchyard of the Interconnection Substation.
- Interconnection metering and telecommunications facilities.
- A 161 kV Circuit breaker and associated 161 kV disconnect switches.
- Relay panel installed by EKPC for the line to the PD substation.

4. UPGRADE TO NEIGHBORING SUBSTATIONS

No physical interconnection upgrades to neighboring substations were identified as a result of the Project Developer Solar facility.

5. INSTALLATION OF FIBER CABLE CIRCUITS

EKPC shall use telecommunications equipment that matches its current network and equipment requirements.

Two 48-count fiber-optic cables will be installed between the EKPC substation control house and the Project Developer (PD) facility for relaying, metering, and SCADA circuit requirements. Separate paths shall be used to ensure both fibers are not damaged during a single incident. The exact details and installation plans for this fiber will be developed during project scoping.

6. COST ESTIMATE OF EKPC FACILITIES FOR PHYSICAL INTERCONNECTION

The following table summarizes the total estimated costs according to FERC criteria. The estimated costs are in 2024 dollars. **This cost excludes Federal Income Tax Gross Upcharges on Contributions in Aid of Construction (CIAC)**. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, EKPC shall be reimbursed by the Project Developer for such taxes. The estimated reimbursement amount is noted in the table below.

6.1 COST ESTIMATE FOR TRANSMISSION OWNER-BUILD OPTION

Work Description	Type of Upgrade	Direct		Indirect		Total Cost	Tax
		Labor	Material	Labor	Material		
Transmission Owner Interconnection Facilities	TOIF	$708,000	$745,000	$207,000	$23,000	$1,683,000	
New Interconnection Substation	Stand Alone Network Upgrade	$2,400,000	$2,782,000	$738,000	$82,000	$6,002,000	
Total Project Costs		**$3,108,000**	**$3,527,000**	**$945,000**	**$105,000**	**$7,685,000**	

7. MILESTONE SCHEDULE FOR COMPLETION OF EKPC WORK

Facilities outlined in this report are estimated to take 28 months to construct, from the time the Generation Interconnection Agreement is fully executed. This schedule is based on the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Detailed Design	1	12
Procurement	2	26
Construction	25	28

8. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Substation & System Protection Assumptions:

The following general assumptions have been included for the substation information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, property/easement acquisitions, extreme weather, or similar events.
2. No significant sub-surface rock encountered during construction, and soil conditions suitable for standard ground-grid and foundation installations.

The following engineering assumptions have been included for the substation information provided:

1. Neither foundation nor structural analyses have been performed. Information provided assumes that no significant foundation or structural issues are present.
2. Material and equipment-related costs are based on current pricing.
3. Environmental permits and reviews will be completed by EKPC and can be completed in a timely manner.
4. Existing bus is in good condition and can be expanded to accommodate the new breaker.

Metering Assumptions:

The following assumptions have been included for the metering information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
2. Fiber-optic cable and associated equipment installation is completed as scheduled. Material and equipment-related costs are based on current pricing.
3. Once fiber-optic cable installation is complete the fiber will not be damaged.

Communications Assumptions:

The following assumptions have been included for the telecommunications information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
2. Material and equipment-related costs are based on current pricing.
3. Once fiber-optic cable installation is complete the fiber will not be damaged.

Environmental Assumptions:

1. The following general assumptions have been included for environmental permitting requirements: For the PD's project, there are no "federal actions" (i.e., federal financial

assistance or grants or federal permit, license or approval) present that would trigger NEPA compliance obligations for the EKPC facilities as a connected action.

2. If required, expansion of the existing Summer Shade substation to the west will not impact on-site waters of the U.S. Expansion of the substation property and/or impacts to waters of the U.S. would require a re-evaluation of the permitting obligations.

9. METERING REQUIREMENTS

All metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AG1-341 GIA, and in PJM Manuals M01 and M14D. The details of applicable metering requirements are given in EKPC's Facility Connection Requirements Document posted on PJM website.

The metering will be installed on the EKPC side of the Point of Change of Ownership will be owned and maintained by EKPC.

10. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in EKPC's Facility Connection Requirements Document posted on PJM website. The PD shall be responsible for acquiring necessary property for the expansion of the Summer Shade substation to accommodate the interconnection of the AG1-341 generating facility.

11. ENVIRONMENTAL AND PERMITTING

EKPC or its representative will perform all necessary environmental assessments and obtain all necessary permits/approvals associated with construction of all EKPC facilities required to facilitate the interconnection of the new generating facility. This includes the Storm-water Pollution Prevention Plan ("SWPPP"), obtaining KYR 10 storm-water permit, and conducting the necessary SWPPP inspections prior to all construction activities.

C. APPENDICES

Attachment #1: Conceptual Single line Diagram

Attachment #2: Substation General Arrangement

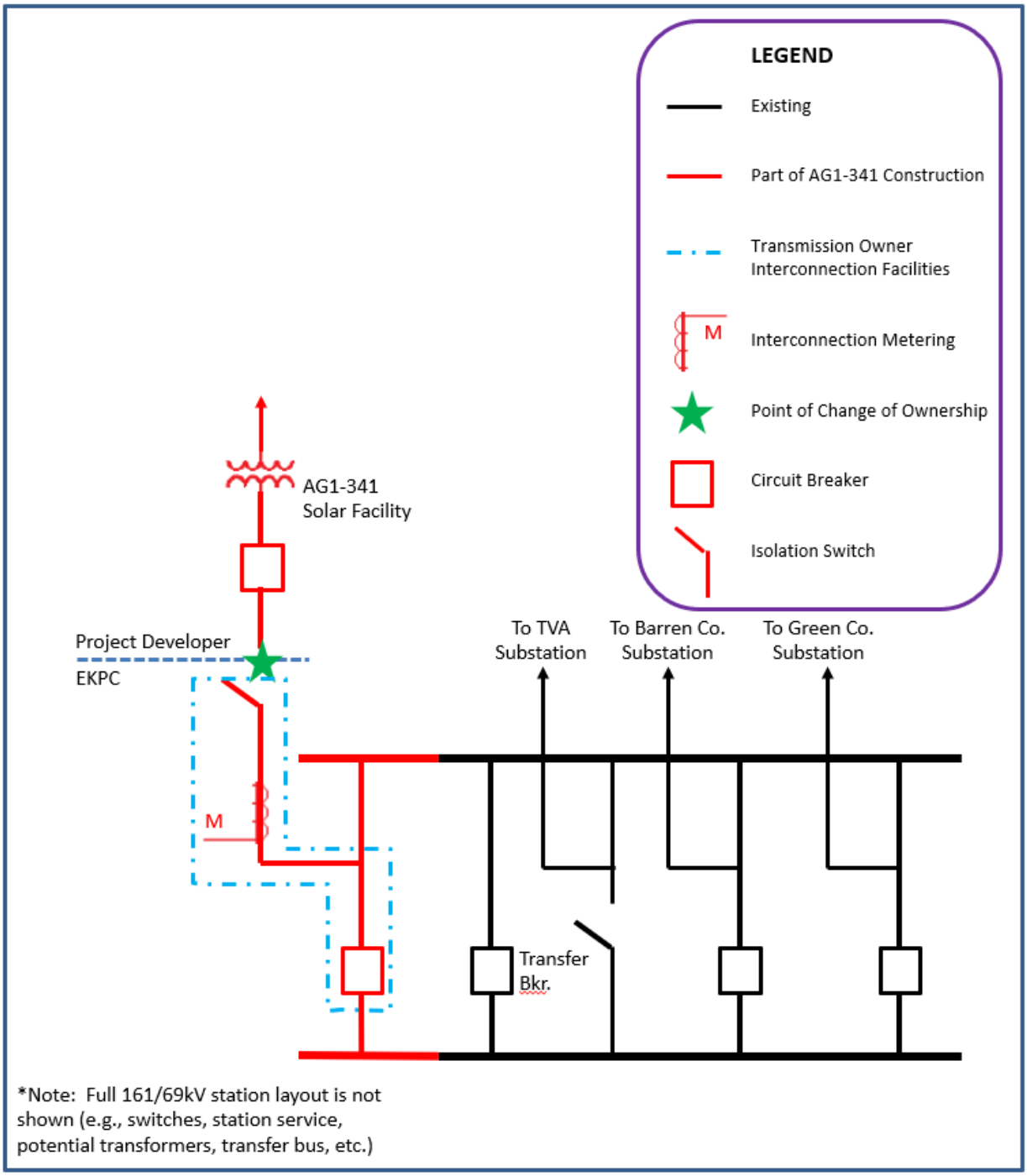
Attachment #3: Preliminary Site Layout Plan

Attachment 1:

Conceptual One Line Diagram

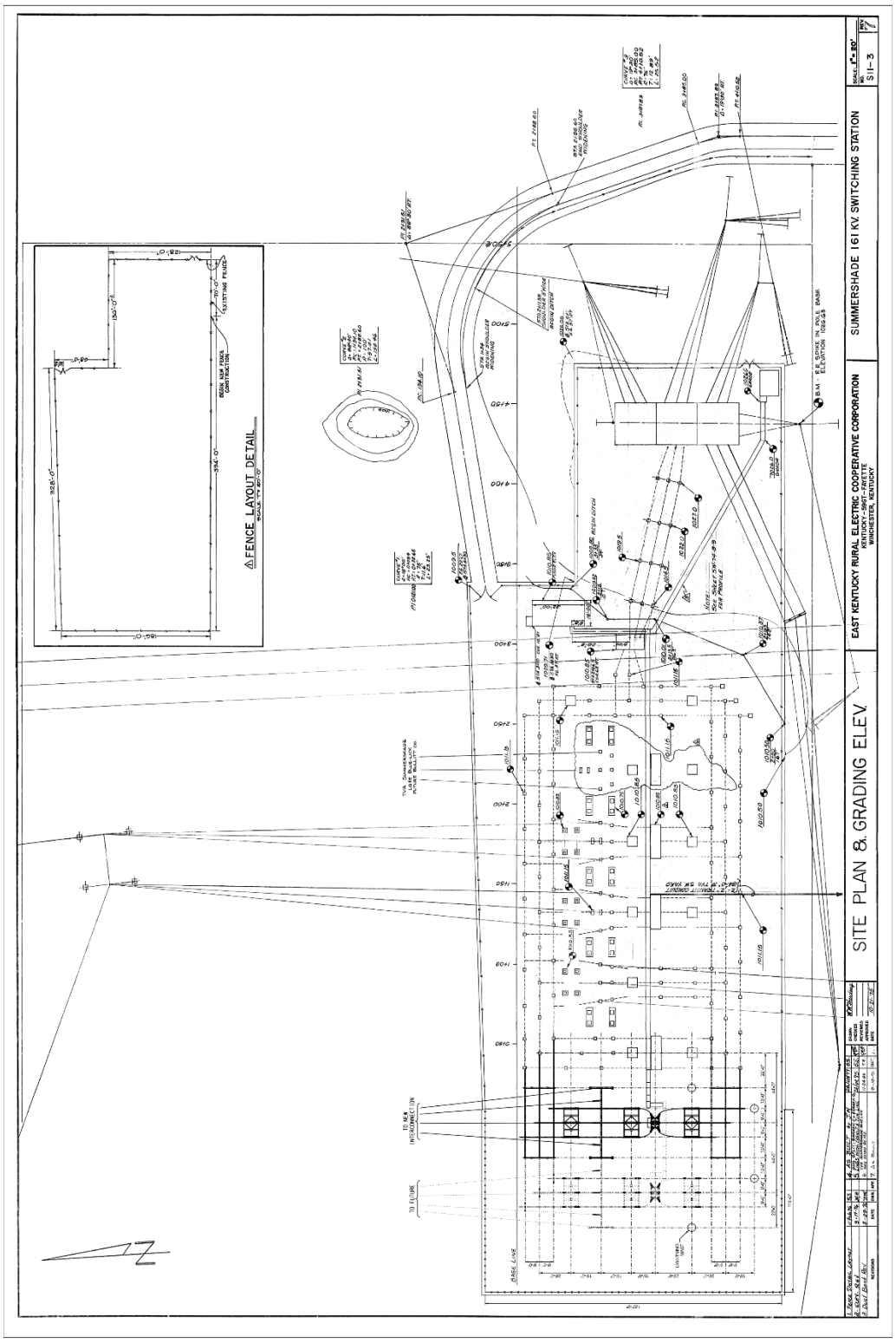
AG1-341 Conceptual One-Line Diagram of Interconnection Facilities

Summer Shade 161/69kV Substation



Attachment 2:

Substation General Arrangement



Attachment 3*:*

Preliminary Site Layout Plan