Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request
Project ID AG1-070/AG1-071

BON AYR 69 KV Solar Project

32.7 MW Capacity/45 MW Energy – AG1-070

37.5 MW Capacity/55 MW Energy – AG1-071

Revision 2: March 2025

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 Barren County, Kentucky. The installed facilities for AG1-070 will have a total Maximum Facility Output (MFO) of 45 MW with 32.7 MW of this output being recognized by PJM as Capacity.

The Project developer has also proposed an uprate to the Project Developer's AG1-070 project, which will share the same Point of Change in Ownership.

The AG1-071 project is a 55 MW uprate (37.5 MW Capacity uprate) to the previous project. The total installed generation facilities will have a capability of 100 MW with 70.2 MW of this output being recognized by PJM as Capacity. No changes to the Bon Ayr substation expansion that will be constructed as part of AG1-070 as described in this report will be required for the AG1-071 capacity uprate.

2. POINT OF CHANGE IN OWNERSHIP

The Generating Facility will interconnect with the East Kentucky Power Cooperative ("EKPC") transmission system via a direct connection into the Bon Ayr 69 kV substation.

The Point of Change in Ownership (PCO) will be located at the Project Developer (PD) side of a 69 kV disconnect switch to be installed by EKPC at the interface between the PD-owned substation facilities and EKPC's substation facilities at the Bon Ayr 69 kV Substation. 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 Bon Ayr 69 kV substation. The PD will install the necessary 69 kV equipment (transmission line, OPGW, bus conductors, jumpers, etc.) from this 69 kV disconnect switch 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 a thirty-three (33) month implementation duration after a project kickoff meeting is held. Therefore, the requested in-service date of June 1, 2024, will need to be adjusted as part of the Generator Interconnection Agreement (GIA) development.

4. PROJECT DEVELOPER SCHEDULE

The Project Developer's in service date is dependent on the TO construction schedule.

5. SCOPE OF PROJECT DEVELOPER FACILITIES

The developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the Point of Change in Ownership (PCO). This includes, but is not limited to:

- Main Power Transformer (MPT)
- Circuit breakers and associated equipment located between the high side of the GSU and the Point of Change in Ownership
- Generator lead line from the Generating Facility to the Point of Change in 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 East Kentucky Power Cooperative ("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)

Bon Ayr Substation Upgrade

The existing substation, Bon Ayr, will be expanded to interconnect the project with the EKPC transmission system.

To accommodate the interconnection of the new generation facility within required codes and clearances, EKPC will construct an expansion to the existing Bon Ayr substation with an additional 69 kV box structure to terminate the existing lines in the area and to incorporate the PD's line equipment. The switch station expansion will be constructed with five 69 kV circuit breakers, associated switches, bus conductors, supports, insulators, and other miscellaneous equipment. The new line structure will be constructed on the northwest side of the existing substation outside the Bon Ayr substation fence. This arrangement and placement of the attachment facilities connection to the PCO switch structure will allow future expansion of the 69 kV bus in a manner that minimizes future conflicts. To accommodate this new connection, EKPC will install new relay panels, metering, fiber optic communications, and associated equipment.The major equipment and material associated with the expanded station is listed below:

QTY	Unit	DESCRIPTION
1	Each	69 kV Substation Box Structure (Single Bay)

5	Each	69 kV, 2000A Circuit Breakers
4	Each	69 kV GOAB Switches
1	Each	69 kV Fused Disconnect
1	Each	Station Service Transformer, 100 KVA
3	Each	Bus PT's, 69 kV
3	Each	Metering PT's, 69 kV
3	Each	Metering CT's, 69 kV
6	Each	Arrester, Station Class, 60 kV, 48 kV MCOV
12	Each	Foundations (Breaker / Box Structure / PT / CT / Switch structure)
1	Lot	Lot of Substation Electrical Material (Insulators, terminals, etc.)

The PD is responsible for construction of all the facilities on its side of the PCO, as shown in the attached one-line diagram.

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.

Control House: EKPC shall procure and install a drop-in style control building fully furnished and complete with the relay panels described below, along with auxiliary AC, and two 125V DC battery banks, and all required operating equipment.

Relay Panels: EKPC shall install a standard bus panel complete with P1 SEL-587Z and P2 SEL-487B relays tripping P1 & P2 lock out relays.

Line Transfer Panel – EKPC shall install a standard line transfer panel with P1 & P2 SEL-411L relays. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing. The line panel shall have the capability to transfer the other circuit breaker terminals.

Line panel for the Project Developer (PD) facility connection– EKPC shall install a standard line panel with P1 & P2 SEL-411L relays. Line option relays shall utilize line current differential. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing.

Line Panel for Fox Hollow 69 kV Line via the Beckton Exit (10.9 miles) – EKPC shall install standard line panel with P1 & P2 SEL-411L relays for the line exit. The P1 & P2 relays shall utilize a communication assisted protection scheme over fiber. SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

Line Panel for Barren County 69kV Line via the Cave City Jct. Exit (14.3 miles) – EKPC shall install standard line panel with P1 & P2 SEL-411L relays for the line exit. The P1 & P2 relays shall utilize a communication assisted protection scheme over fiber. SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

Transformer Panel for Bon Ayr Distribution Substation Line – EKPC shall install a Distribution Transformer Relay Panel with a P1 SEL-787 relay and P2 SEL-451 relay for protection of the distribution transformer. A SEL-451 relay shall be utilized for breaker control and breaker failure.

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, SCADA alarms, and end-to-end testing where required.

2. TRANSMISSION LINE TIE-IN

No new EKPC Transmission lines were determined to be needed for interconnection of the PD's solar facility to the EKPC System.

The modification of 69 kV transmission line facilities to re-terminate the existing Bon Ayr – Cave City 69kV line section to connect to the expanded Bon Ayr Switch Station is required. Two (2) replacement structures will need to be located near the Bon Ayr station.

3. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

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

- A 69 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 69kV 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 69kV Circuit breaker and associated line side 69kV disconnect switch.
- Relay panel installed by EKPC for the line to the PD substation.

4. UPGRADE TO NEIGHBORING SUBSTATIONS

4.1 Fox Hollow Substation

Relay settings associated with the line protection for Bon Ayr – Fox Hollow 69kV line shall be reviewed for the Fox Hollow 69kV Substation to accommodate the construction of the Bon Ayr Switch Station expansion, and relay files will be updated accordingly. If acceptable relay setting adjustments are not possible due to older model relays, and new modern SEL line relays are required, the cost will be higher. This is to be determined during detailed design.

4.2 Barren County Substation

Relay settings associated with the line protection for Bon Ayr – Barren County 69kV line shall be reviewed for the Barren County 69kV Substation to accommodate the construction of the Bon Ayr Switch Station expansion, and relay files will be updated accordingly. If acceptable relay setting adjustments are not possible due to older model relays, and new modern SEL line relays are required, the cost will be higher. This is to be determined during detailed design.

5. INSTALLATION OF FIBER CABLE CIRCUITS

Transmission Owner Interconnection Facilities

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

A 48-strand fiber optic cable will be installed between the EKPC substation control house at Bon Ayr Switch Station and the PD facility for relaying, metering, and SCADA circuit requirements. The exact details and installation plans for this fiber will be developed during project scoping.

The cost for installation of the telecommunications facilities contained in the EKPC Bon Ayr switching station are included in the substation costs provided in Section 6 below.

Network Upgrades

Overhead Optical Ground Wire (OPGW) infrastructure on the Bon Ayr – Beckton – West Glasgow – Parkway 69kV line section (8.3 miles) will need to be installed for the new Bon Ayr 69 kV switching substation expansion.

OPGW infrastructure on the Bon Ayr – Cave City – Cav City Jct. – Barren County 69kV line section (14.6 miles) will also need to be installed for a redundant fiber path to the Bon Ayr 69kV switching substation expansion.

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 2025 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, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

6.1 COST ESTIMATE FOR TRANSMISSION OWNER-BUILD OPTION

Work Description	Type of Upgrade	Direct		Indirect		Total Cost
		Labor	Material	Labor	Material	
Transmission Owner Interconnection Facilities	TOIF	$994,000	$593,000	$288,000	$32,000	$1,907,000
Expansion of Existing Substation	Stand Alone Network Upgrade	$3,180,000	$2,717,000	$1,128,000	$125,000	$7,150,000
Interconnection Substation tie-in	Network Upgrade	$487,000	$223,000	$105,000	$12,000	$827,000
Remote relay at Barren County Substation	Network Upgrade	$55,000	$4,000	$6,000	$1,000	$66,000
Remote relay at Fox Hollow Substation	Network Upgrade	$55,000	$4,000	$6,000	$1,000	$66,000
Fiber Installation in Existing ROW Bon Ayr – Beckton – West Glasgow - Parkway	Network Upgrade	$1,444,000	$336,000	$151,000	$15,000	$1,946,000
Fiber Installation in Existing ROW Bon Ayr – Cave City – Cave City Jct-Barren CO	Network Upgrade	$1,700,000	$410,000	$191,000	$23,000	$2,324,000
Total Project Costs		$7,915,000	$4,287,000	$1,875,000	$209,000	$14,286,000

6.2 COST ESTIMATE FOR DEVELOPER-BUILD OPTION

Work Description	Type of Upgrade	Direct		Indirect		Total Cost
		Labor	Material	Labor	Material	
Transmission Owner Interconnection Facilities (Oversight)	TOIF	$194,000	$21,000	$36,000	$4,000	$255,000
Expansion of Existing Substation	Stand Alone Network Upgrade	$3,180,000	$2,717,000	$1,128,000	$125,000	$7,150,000
Interconnection Substation tie-in	Network Upgrade	$487,000	$223,000	$105,000	$12,000	$827,000
Remote relay at Barren County Substation	Network Upgrade	$55,000	$4,000	$6,000	$1,000	$66,000
Remote relay at Fox Hollow Substation	Network Upgrade	$55,000	$4,000	$6,000	$1,000	$66,000
Fiber Installation in Existing ROW Bon Ayr – Beckton – West Glasgow - Parkway	Network Upgrade	$1,444,000	$336,000	$151,000	$15,000	$1,946,000
Fiber Installation in Existing ROW Bon Ayr – Cave City – Cave City Jct-Barren CO	Network Upgrade	$1,700,000	$410,000	$191,000	$23,000	$2,324,000
Total Project Costs		$7,115,000	$3,715,000	$1,623,000	$181,000	$12,634,000

7. MILESTONE SCHEDULE FOR COMPLETION OF WORK

Facilities outlined in this report are estimated to take 30 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	8
Procurement	2	23
Construction	20	30

8. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Transmission Line Assumptions:

The following general assumptions have been included for the transmission line information. provided:

1. Required transmission line outages can be scheduled as planned. Transmission line outages are:
    a. typically, not taken in the summer (June-August) or winter (December-February),
    b. cancelled during extreme weather conditions, and
    c. in some cases, required to be scheduled twelve (12) or more months in advance.
2. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
3. No significant sub-surface rock will be encountered during construction, and soil conditions are suitable for standard foundation installations.

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.

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.
3. Material and equipment-related costs are based on current pricing at the time of this study.
4. 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 at the time of this study.
3. Once fiber-optic cable installation is complete, the fiber will not be damaged.

Environmental Assumptions:

The following general assumptions have been included for environmental permitting requirements:

1. 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. No additional property will need to be acquired adjacent to the existing Bon Ayr substation to facilitate the project. Likewise, if required, expansion of the existing Bon Ayr substation to the north or northwest 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 AG1-070 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 the PJM website.

The metering will be installed on the EKPC side of the Point of Change in Ownership, and will be owned and maintained by EKPC. Metering requirements for this facility include the installation of EKPC's standard revenue quality metering package, including current transformers, remote-terminal unit, and associated SCADA equipment.

The cost for installation of the metering facilities contained in the expanded EKPC substation are included in the substation costs provided in Section 6 above.

10. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in the EKPC's Facility Connection Requirements Document posted on PJM website.

11. ENVIRONMENTAL AND PERMITING

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: Single line Diagram for the Physical Interconnection

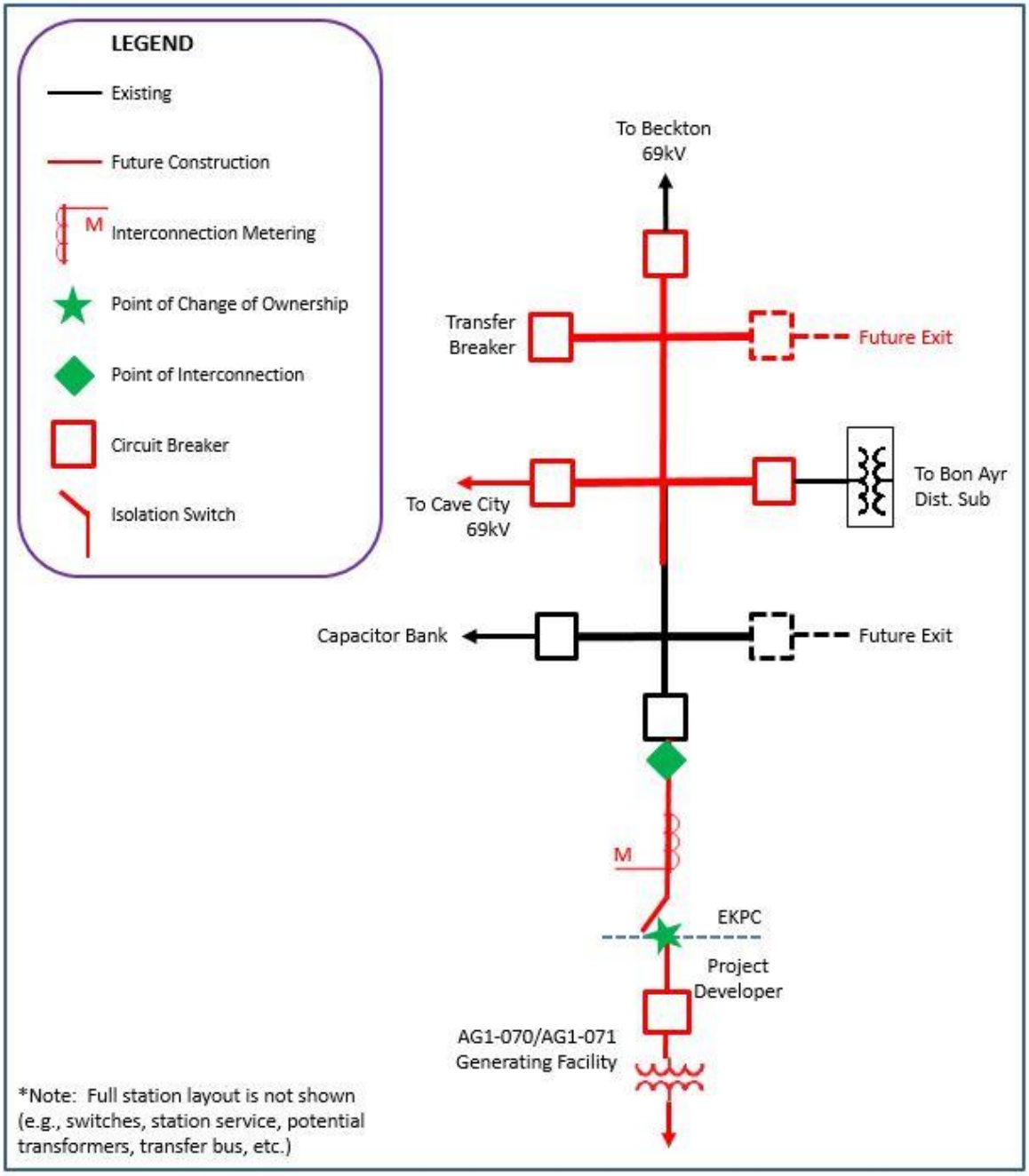
Attachment #2: Substation General Arrangement

Attachment 1:

Single Line Diagram for the Physical Interconnection

AG1-070/AG1-071 Conceptual One-Line Diagram of Interconnection Facilities

Bon Ayr 69kV Switch Station



Attachment 2:

Substation General Arrangement