Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request Project ID AG1-320

Glendale Tap – Stephensburg 69kV Solar Project

(82 MW/ 54.8 MW Capacity)

Revision 1: June 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 Glendale, Hardin County, Kentucky. The installed facilities for AG1-320 will have a total Maximum Facility Output (MFO) of 82 MW with 54.8 MW of this output being recognized by PJM as Capacity.

2. POINT OF CHANGE IN OWNERSHIP

The Generating Facility will interconnect with the East Kentucky Power Cooperative ("EKPC") transmission system via a newly constructed 69 kV switching station, South Hardin, tapping the Hodgenville - Stephensburg 69 kV line, approximately 3.38 miles from the Glendale Tap, 5.62 miles from Stephensburg Substation, and 11.08 miles from Hodgenville Substation.

The Point of Change in Ownership will be located at the Project Developer (PD) side of a 69kV disconnect switch to be installed by EKPC at the interface between the PD-owned substation facilities and EKPC's substation facilities at the new South Hardin 69 kV Substation.

The construction of the new interconnection substation will result in the splitting of the existing Hodgenville – Stephensburg 69kV line into two lines on the transmission system west of the Glendale 69kV Tap. The new line connection additions will connect South Hardin substation to Stephensburg and Glendale substations.

The switch serving as the Point of Change in Ownership (PCO) will be located on a steel structure immediately outside of the new South Hardin Substation. EKPC will install, own, operate, and maintain the switch structure/switch. The PD substation will be constructed in the vicinity of the new EKPC South Hardin 69 kV substation. The PD will install the necessary 69 kV equipment (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 PD will acquire enough property that is suitable for EKPC's new South Hardin 69 kV substation and will grant ownership of this property to EKPC at no cost. Prior to taking ownership, EKPC will perform all necessary engineering and environmental reviews to ensure that the site is suitable. EKPC will have the right to request modifications to the site or to reject the site if it is not suitable for EKPC's needs. EKPC also assumes that the PD will provide all necessary easements for a permanent road to provide substation access. This substation access shall be from an existing county or state road. The PD will convey these rights to EKPC if they own the property on which the substation access road will be located.

The proposed generation interconnection is shown on the single line 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

Commented [TS1]: This is inconsistent with 30 months listed below in the Milestone table. I have reacehd out to EKPC but assumed 30 months at this time (as the other section is more prominent).

duration after a project kickoff meeting is held. Therefore, the requested in-service date of October 1, 2023, will not be possible.

4. PROJECT DEVELOPER SCHEDULE

Project Developer's requested in-service date for the generation facility is October 1, 2023

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:

- Generation step-up (GSU) transformer(s)
- 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 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

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

Reference section 5.9 for inverter-based generating facilities.

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.

1A. INTERCONNECTION SUBSTATION (NEW) (Stand Alone Network Upgrade)

South Hardin Interconnection Substation

A new 69kV switching station, South Hardin, will be constructed along the Glendale Tap-Stephensburg 69kV transmission line to interconnect the project with the EKPC transmission system.

The major equipment and material associated with the new switching station is listed below:

QTY	Unit	DESCRIPTION
1	Each	69 kV High Profile Substation Structure
4	Each	69 kV, 2000A Circuit Breakers
15	Each	69 kV GOAB Switches
1	Lot	Electrical Material (insulators, terminals, etc.)
1	Each	Station Service Transformer, 100 KVA (39.9 kV-120/240V)

3	Each	PT's, 69 kV
3	Each	Metering CT's, 69 kV
9	Each	Arrester, Station Class, 60 kV, 48 kV MCOV

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 one bus differential panel, one PD line panel, two transmission line panels, one line transfer panel, one SCADA panel, 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 of 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 the Hodgenville 69 kV Line Exit (12.08 miles) – EKPC shall install a standard line panel with P1 & P2 SEL-411L relays. The P1 relay shall utilize a high-speed com-assisted tripping scheme over fiber. The P2 relays shall utilize Line Distance protection. SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

Line panel for the Stephensburg 69 kV Line Exit (5.62 miles) – EKPC shall install a standard line panel with P1 & P2 SEL-411L relays. The P1 & P2 relays shall utilize a high-speed com-assisted scheme over fiber. SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

SCADA Panel – EKPC shall install standard SCADA panel with an Orion LX+ and dual metering for the PD. P1 Meter to be an ION8650A and P2 Meter to be a 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 P D substation as required based on the protection schemes utilized. All protection system designs shall be reviewed by EKPC System Protection 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. Each of the remote line ends (Hodgenville and Stephensburg substations) shall be commissioned using end-to-end testing prior to energizing the POTT scheme to the South Hardin Substation.

2. TRANSMISSION LINE TIE-IN

EKPC Glendale Tap-Stephensburg 69kV line

The Glendale Tap-Stephensburg 69kV line will be cut and looped into the new interconnection substation.

The new transmission line loop-in facilities will be owned, operated, and maintained by EKPC. The tap from the existing transmission line into the new switching station will consist of two steel monopole self-supporting 90-degree transmission structures on drilled pier foundations. Both circuits (toward Glendale and toward Stephensburg) will deadend on the new structures and then span directly into the substation onto the two frames on the north side of the substation. The tap will allow for the connection of the existing transmission line to the new switching station. The loop from the Glendale Tap - Stephensburg 69 kV line to the new substation is expected to extend approximately 200 feet.

3. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

The TO 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.

4. UPGRADE TO NEIGHBORING SUBSTATIONS

4.1 Hodgenville Substation

Relay settings shall be reviewed for the Hodgenville – Stephensburg 69 kV line to accommodate the new South Hardin substation, and relay files will be updated accordingly. New modern SEL-411L relays shall be installed for communication with South Hardin substation. New SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

4.2 Stephensburg Substation

Relay settings shall be reviewed for the Hodgenville – Stephensburg 69 kV line to accommodate the new South Hardin substation, and relay files will be updated accordingly. New modern SEL-411L relays shall be installed for communication with South Hardin substation. New SEL-451 relays shall be utilized for breaker control, breaker failure, and reclosing.

5. INSTALLATION OF FIBER CABLE CIRCUITS

Transmission Owner Interconnection Facilities

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

Two 48-count ADSS fibers 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.

Network Upgrades

Overhead optical ground wire ("OPGW") installation will be required to meet communications requirements for the new EKPC South Hardin substation. EKPC will need to establish a fiber-optic

communications path to its nearest microwave tower site. There is currently OPGW installed on the Glendale Tap – Stephensburg line section. Therefore, new OPGW will be required on the tie-ins from South Hardin – Stephensburg 69 kV line section and from the South Hardin – Glendale Tap line section to allow for redundant communication paths to the South Hardin Substation. The existing OPGW will need to be dissected and routed into the new South Hardin substation location. The OPGW will be terminated overhead within the substation fence. Additionally, OPGW installation will also be required on the Summersville – Green County (4.16 miles) line section to complete the communication requirements.

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 a Federal Income Tax Gross Up charges 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 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
		Labor	Material	Labor	Material	
Transmission Owner Interconnection Facilities	TOIF	$1,271,000	$776,000	$351,000	$39,000	$2,437,000
New Interconnection Substation	Stand Alone Network Upgrade	$3,077,000	$3,270,000	$1,090,000	$121,000	$7,558,000
Interconnection Substation tie-in	Network Upgrade	$493,000	$361,000	$147,000	$16,000	$1,017,000
Remote relay at Glendale substation	Network Upgrade	$56,000	$1,000	$10,000	$1,000	$68,000
Remote relay at Stephensburg substation	Network Upgrade	$56,000	$1,000	$10,000	$1,000	$68,000
Fiber Installation in Existing ROW Summersville – Green County Line	Network Upgrade	$732,000	$158,000	$154,000	$17,000	$1,061,000
Total Project Costs		**$5,685,000**	**$4,567,000**	**$1,762,000**	**$195,000**	**$12,209,000**

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**	$245,000	$45,000	$49,000	$49,000	$388,000
New Interconnection Substation (Oversight)	**Stand Alone Network Upgrade**	$735,000	$162,000	$153,000	$153,000	$1,203,000
Interconnection Substation tie-in	**Network Upgrade**	$493,000	$361,000	$147,000	$16,000	$1,017,000
Remote relay at Glendale substation	**Network Upgrade**	$56,000	$1,000	$10,000	$1,000	$68,000
Remote relay at Stephensburg substation	**Network Upgrade**	$56,000	$1,000	$10,000	$1,000	$68,000

Fiber Installation in Existing ROW Summersville – Green County Line	**Network Upgrade**	$732,000	$158,000	$154,000	$17,000	$1,061,000
Total Project Costs		**$2,317,000**	**$728,000**	**$523,000**	**$237,000**	**$3,805,000**

7. MILESTONE SCHEDULE FOR COMPLETION OF TO 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	14
Procurement	2	23
Construction	19	30

8. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Transmission Line Assumption:

1. The new substation will be constructed on the south side of EKPC's line right-of-way. This estimate will need to be re-evaluated if it is located on the north side of the right-of-way.
2. The PD is responsible for either providing deeded property or obtaining any new ROW/easements on behalf of EKPC for routing the looped-in transmission line to the new substation.
3. Any required tree / vegetation clearing for the new substation and the transmission line loop-in work will be the responsibility of the PD.
4. It is assumed that standard drilled piers can be used. If geotechnical assessment reveals poor soil conditions or contamination, additional measures may be required.
5. 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.
6. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
7. No significant sub-surface rock encountered during construction, and soil conditions are suitable for standard foundation installations.

The following engineering assumptions have been included for the transmission line information.

provided:

1. Neither foundation nor transmission pole structural analyses have been performed. Information provided assumes that no significant foundation or structural issues are present.
2. Construction will be scheduled to avoid winter peak load periods (December -February).
3. The preliminary schedule assumes that transmission line outages can be obtained as necessary.
4. Material and equipment costs are based on current pricing at the time of this study.

5. Easements, if necessary, shall be acquired by EKPC.
6. Environmental permits and reviews shall be completed by EKPC and can be completed in a timely manner.

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.
3. PD shall acquire an adequate and suitable site and grant ownership to EKPC to accommodate EKPC's interconnection substation, as mentioned above.
4. The PD will provide all necessary easements for a permanent road to provide substation access. This substation access shall be from an existing county or state road. The IC will convey these rights to EKPC if they own the property on which the substation access road will be located. Otherwise, EKPC will need to acquire the access rights from the owner of the property.

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. The schedule assumes no issues related to scheduling outages of existing transmission lines to terminate into the new substation.
3. Material and equipment-related costs are based on current pricing at the time of this study.
4. Environmental permits and reviews will be completed by EKPC and can be completed in a timely manner.
5. No relay coordination issues exist outside of the remote end stations. Further coordination will be studied during detailed design.

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 Permitting 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. Substation location will remain in the currently identified location, which is approximately 0.58 miles west of the point where EKPC's Hodgenville-Stephensburg 69 kV transmission line S Beech St. (see Attachment 2). Relocation of the substation site 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 AG1-320 GIA, and in PJM Manuals M01 and M14D. The details of applicable metering requirements are given in the EKPC's Facility Connection Requirements Document posted on PJM website.

The metering will be installed on the East Kentucky Power Cooperative ("EKPC") side of the Point of Change of Ownership will be owned and maintained by EKPC. Metering requirements for this facility include the installation of EKPC's standard revenue quality metering package, including potential transformers and current transformers.

The cost for installation of the metering facilities contained in the new 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

The Project Developer (PD) is responsible for obtaining all the required property rights to provide EKPC ownership of the new switching station site, as well as any other property ownership needed for the switching station access road and the transmission tap line, if appropriate. The PD shall convey the necessary property rights to EKPC for construction of its facilities. The PD shall work directly with EKPC when acquiring these rights to ensure that they meet EKPC requirements and standards.

EKPC 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.

C. APPENDICES

Attachment #1: Conceptual Single line Diagram

Attachment #2: Substation General Arrangement

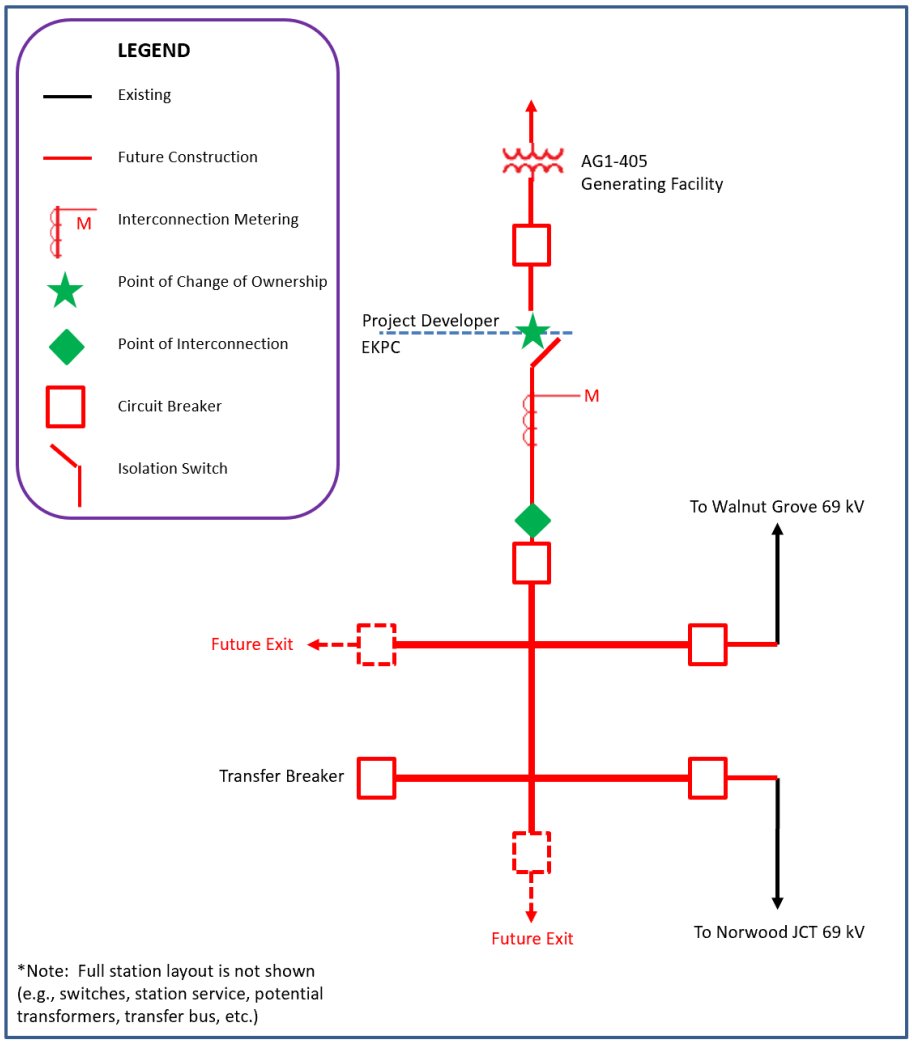
Attachment #3: Preliminary Site Layout Plan

Attachment 1:

Conceptual Single Line Diagram

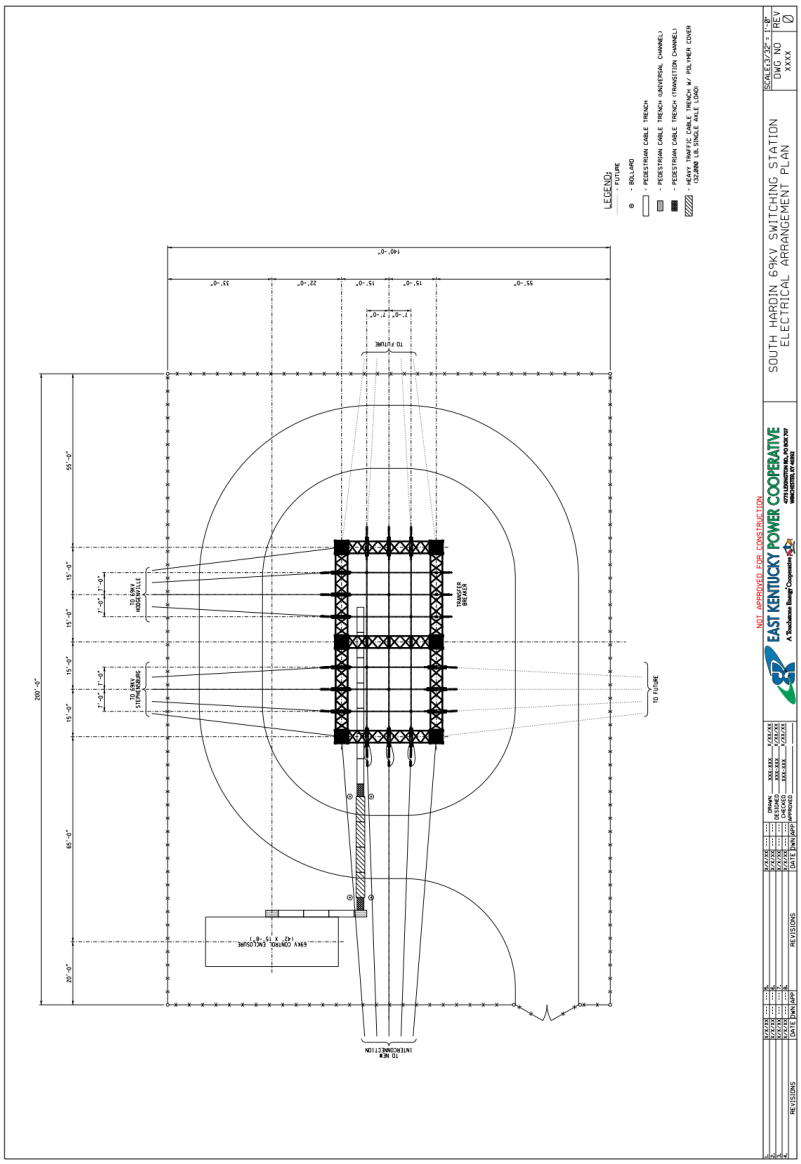
AG1-320 Conceptual One-Line Diagram of Interconnection Facilities

East Pulaski 69kV Switch Station



Attachment 2:

Substation General Arrangement



Attachment 3:

Preliminary Site Layout Plan