Facilities Study Report

For

Physical Interconnection of

PJM Generation Interconnection Request

Project ID AH1-664

Goddard - Plumville 138 kV

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff, as well as the Application and Studies Agreement between the Project Developer and PJM Interconnection, LLC (PJM or Transmission Provider (TP)). The Transmission Owner (TO) is East Kentucky Power Cooperative (EKPC).

This Facility Study was performed to satisfy the Phase 2 Facility Study requirement of the PJM Tariff. The Facility Study is intended to provide scope, cost and schedule estimates for the project as currently defined and approved for Phase 2 study. In the event project changes are made during DP2 that impact this report, updates will be provided as part of the Phase 3 report. Following execution of the project's final agreement, this report will not be updated to account for other changes made as part of the agreements modification clause and instead the scope change process will be followed.

A. Transmission Owner Facilities Study Summary

1. PROJECT DESCRIPTION

The Project Developer (PD) has proposed a Solar Generating Facility located in Fleming County, Kentucky with a designated PJM Project ID of AH1-664.The installed facilities will have a total Maximum Facility Output (MFO) of 100 MW with 66.8 MW of this output being recognized by PJM as Capacity.

2. POINT OF INTERCONNECTION (POI)

The Generating Facility will interconnect with the EKPC transmission system via a newly constructed 138 kV Breaker-and-a-Half (BAAH) substation, Mt. Carmel Road 138 kV Switching Station, tapping the Plumville – Goddard 138 kV line, approximately 9.3 miles from Plumville and 7.6 miles from Goddard.

The construction of the new interconnection substation will split the existing Plumville – Goddard 138 kV line into two lines on the transmission system. These new lines will connect the new Mt. Carmel Road 138 kV Switching Station to the Plumville and Goddard Substations.

The proposed generation interconnection is shown on the single line diagram in Attachment #1.

3. POINT OF CHANGE IN OWNERSHIP

The Point of Change in Ownership (PCO) will be located at the PD side of a 138 kV disconnect switch to be installed by EKPC at the interface between the PD-owned substation facilities and EKPC's substation facilities at Mt. Carmel Road 138 kV Switching Station. The switch shall be installed on a steel transmission line monopole structure on a drilled shaft foundation located outside the substation fence. The exact location will be determined during project detailed design and EKPC will install, own, operate, and maintain the switch.

4. SCOPE OF PROJECT DEVELOPER INTERCONNECTION FACILITIES

Project Developer will design, build, own, operate and maintain the Project Developer Interconnection Facilities on Project Developer's side of the PCO. This includes, but is not limited to:

- Circuit breakers and associated equipment located between the high side of the Main Power Transformer(s) or Generation Step-Up Transformer(s) 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, telecommunications equipment, and Supervisory Control and Data Acquisition (SCADA) 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 5.2.3 for inverter-based generating facilities.

B. Transmission Owner Facilities Study Results

The following is a description of the planned Transmission Owner facilities for the physical interconnection of the proposed AH1-664 project to the EKPC transmission system. These facilities shall be designed according to EKPC Applicable Technical Requirements and Standards. Once built, EKPC will own, operate, and maintain these Facilities.

1. TRANSMISSION OWNER INTERCONNECTION FACILITIES:

A 138 kV transmission line monopole structure and foundation outside the fence of the Interconnection Substation to terminate the Project Developer's generator lead line will be considered Transmission Owner Interconnection Facilities (TOIF). A 138 kV disconnect switch will also be mounted to this monopole dead-end structure serving as the PCO.

The TOIF will also include the line conductor from the dead-end structure to the bus position in the switchyard of the Mt. Carmel Road 138 kV Switching Station, one 138 kV circuit breaker, and 138 kV metering equipment.

QTY	Unit	DESCRIPTION
1	Each	138 kV, 2000 Amp Circuit Breakers
2	Each	138 kV GOAB Switches
3	Each	CT's, 138 kV

Installation of fiber cable circuits

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

Two 48-strand fiber optic cables will be installed between the EKPC substation control house at the new Mt. Carmel Road 138 kV Switching 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.

2. STAND ALONE NETWORK UPGRADES

Mt. Carmel Road 138 kV Interconnection Switching Station

A new 138 kV Breaker-and-a-Half (BAAH) substation, Mt. Carmel Road 138 kV Switching Station, will be constructed along the Plumville - Goddard 138 kV transmission line to interconnect the project with the EKPC transmission system.

Scope of Work

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

QTY	Unit	DESCRIPTION
1	Each	138 kV BAAH Steel Structure
4	Each	138 kV, 2000 Amp Circuit Breakers
10	Each	138 kV GOAB Switches
1	Lot	Electrical Material (insulators, terminals, etc.)
2	Each	Station Service Transformer, 138 kV, 1 PH
9	Each	Arresters, Lightning 138 kV Station 115 kV MCOV Polymer
11	Each	Line/Bus CCVTs, 138 kV

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 the following protection and control panels.

East Bus Differential Panel – EKPC shall install a standard bus panel complete with P1 SEL-787Z and P2 SEL-487B relays tripping P1 & P2 bus lock-out relays.

West Bus Differential Panel – EKPC shall install a standard bus panel complete with P1 SEL-787Z and P2 SEL-487B relays tripping P1 & P2 bus lock-out relays.

Bay #1 Control Panel – EKPC shall install a bay control panel with three SEL-451 relays, one for both line breakers and the tie breaker in the bay. The SEL-451 relays will be used for breaker control breaker failure, and reclosing.

Bay #2 Control Panel – EKPC shall install a bay control panel with three SEL-451 relays, one for the PD generator line breaker, a future line breaker and a tie breaker in the bay. The SEL-451 relays will be used for breaker control breaker failure, and reclosing.

Panel for protection of the PD facility connection– EKPC shall install a standard line panel with P1 & P2 SEL-411L relays. Line relays shall utilize a line current differential protection scheme.

Line Panel for the Plumville 138kV Line Exit (9.9 miles) – EKPC shall install standard line panel with P1 & P2 SEL-411L relays for each line exit. The P1 & P2 relays shall utilize a high-speed com-assisted tripping scheme over fiber. Control switches for line reclosing, breaker control, and local/supervisory control shall also be provided.

Line Panel for the Goddard 138kV Line Exit (7.6 miles) – EKPC shall install standard line panel with P1 & P2 SEL-411L relays for each line exit. The P1 & P2 relays shall utilize a high-speed com-assisted tripping scheme over fiber. Control switches for line reclosing, breaker control, and local/supervisory control shall also be provided.

SCADA Panel – EKPC shall install a standard SCADA panel with an Orion LX+ and dual metering for the PD. P1 Meter shall be an ION8650A, and P2 Meter shall be a SEL-735. A SEL-3555 RTAC unit will also be installed for PRC-028 DFR requirements.

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 (Plumville and Goddard Substations) shall be commissioned using end-to-end testing prior to energizing the comm assisted tripping scheme to the new Mt. Carmel Road 138 kV Switching Station.

3. NETWORK UPGRADES

Transmission Line Tie-in for new interconnection substation:

The Plumville - Goddard 138 kV 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 station will consist of two (2) direct embed guyed 3-pole dead-end structures. All existing wire or structures on the Plumville - Goddard 138 kV line between the two tie-in structures will be removed. Each end of the tie-in is assumed to be no longer than 300 feet.

Upgrades to neighboring facilities:

Plumville Substation

Relay settings associated with the line protection for the Plumville – Goddard 138 kV line shall be reviewed for the Plumville 138 kV Substation to accommodate the construction of the Mt. Carmel Road 138 kV Switching Station, 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.

Goddard Substation

Relay settings associated with the line protection for Plumville – Goddard 138kV line shall be reviewed for the Goddard 138 kV Substation to accommodate the construction of the Mt. Carmel Road 138 kV Switching Station, 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.

Installation of Fiber Circuits:

Overhead optical ground wire (OPGW) will be required to meet communications requirements for the new Mt. Carmel Road 138 kV Switching Station. New OPGW will need to be installed on the existing Goddard – Plumville 138 kV line sections (16.92 miles).

4. OTHER SCOPE OF WORK

No other scope has been identified for the construction of the Mt. Carmel Road 138 kV Switching Station.

5. MILESTONE SCHEDULE FOR COMPLETION OF EKPC WORK

Facilities outlined in this report are estimated to take approximately 34 months to construct from the time the Generation Interconnection Agreement is fully executed. This schedule may be impacted by the timeline for procurement and installation of long lead items and/or the ability to obtain outages to construct and test the proposed facilities.

Description	Start Month	Finish Month
Detailed Design	1	16
Procurement	2	26
Construction	22	34

Option to Build Schedule

If Option to Build is selected, the remaining facilities in this report are estimated to take approximately 21 months to complete. Start date to be determined after GIA is signed and in alignment with PD's schedule. This schedule may be impacted by the timeline for procurement and installation of long lead items and/or the ability to obtain outages to construct and test the proposed facilities.

Description	Start Month	Finish Month
Detailed Design	1	5
Procurement	3	16
Construction	16	21

6. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

Transmission Line Assumptions:

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

1. The new substation will be constructed on the west side of EKPC's transmission line right-of-way. This estimate will need to be re-evaluated if it is located on the east 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 is 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. The 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.
5. 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 is encountered during construction, and soil conditions are 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 PD will convey these rights to EKPC if they own the property on which the substation access road will be located.
5. Switchyard grading is assumed to be a balanced site. No significant cut or fill will be required to achieve EKPC standard grading specification. Detailed grading design to be completed during project execution.

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.
4. It is assumed OPGW replacement is like for like with existing shield wire on the line. No

structure replacements have been assumed and will need to be confirmed during detailed design.

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. Substation location will remain in the currently identified location. Relocation of the substation site may require a re-evaluation of the permitting obligations.

7. REVENUE METERING REQUIREMENTS

All revenue metering needed for this interconnection project must meet the metering requirements stated in Appendix 2, section 8 of the AH1-664 GIA, and in PJM Manuals M01 and M14D. The details of applicable revenue metering requirements are given in EKPC's Facility Connection Requirements Document posted on the PJM website.

The revenue metering will be installed on the East Kentucky Power Cooperative side of the PCO 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 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.

8. LAND REQUIREMENTS FOR INTERCONNECTION SUBSTATION

Land requirements for the Interconnection Substation needed for this interconnection project must meet the requirements in the EKPC Facility Connection Requirements Document posted on PJM website. The PD shall be responsible for acquiring all property required for this new EKPC interconnection substation and shall deed that property to EKPC. Typically, for a new 138 kV switchyard an approximately 7.5-acre parcel is required. EKPC will have no responsibility to acquire any property associated with the substation, either initially or if it is determined later that additional property is required.

9. APPLICABLE TECHNICAL REQUIREMENTS AND STANDARDS

Applicable Technical Requirements and the EKPC Technical Standard: Facility Connection Requirements Rev 16 dated 8/15/2025 shall apply.

10. 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

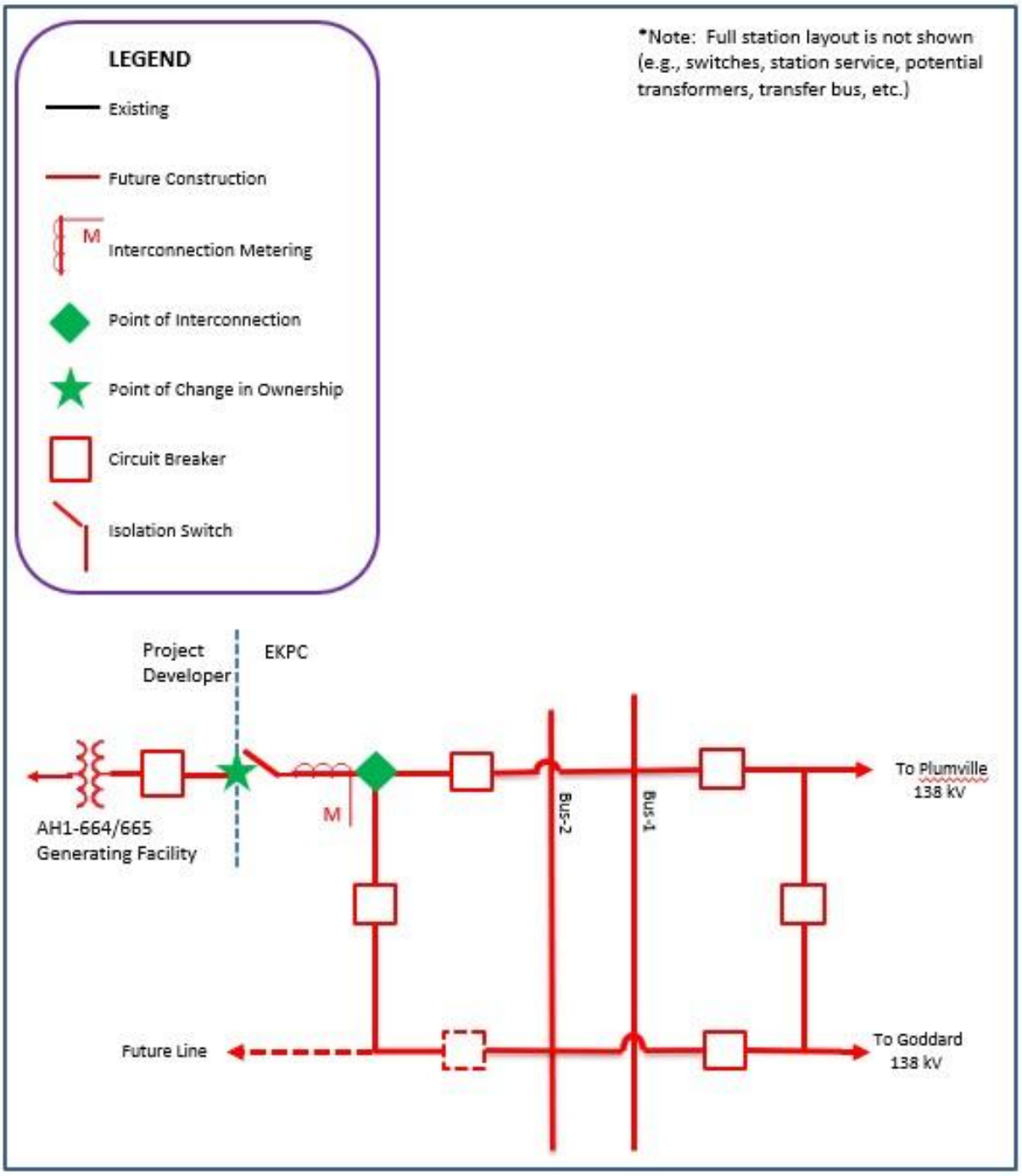
Attachment #1:	Single line Diagram for the Physical Interconnection
Attachment #2:	Substation General Arrangement
Attachment #3:	Preliminary Site Plan Layout

Attachment 1:

Single Line Diagram for the Physical Interconnection

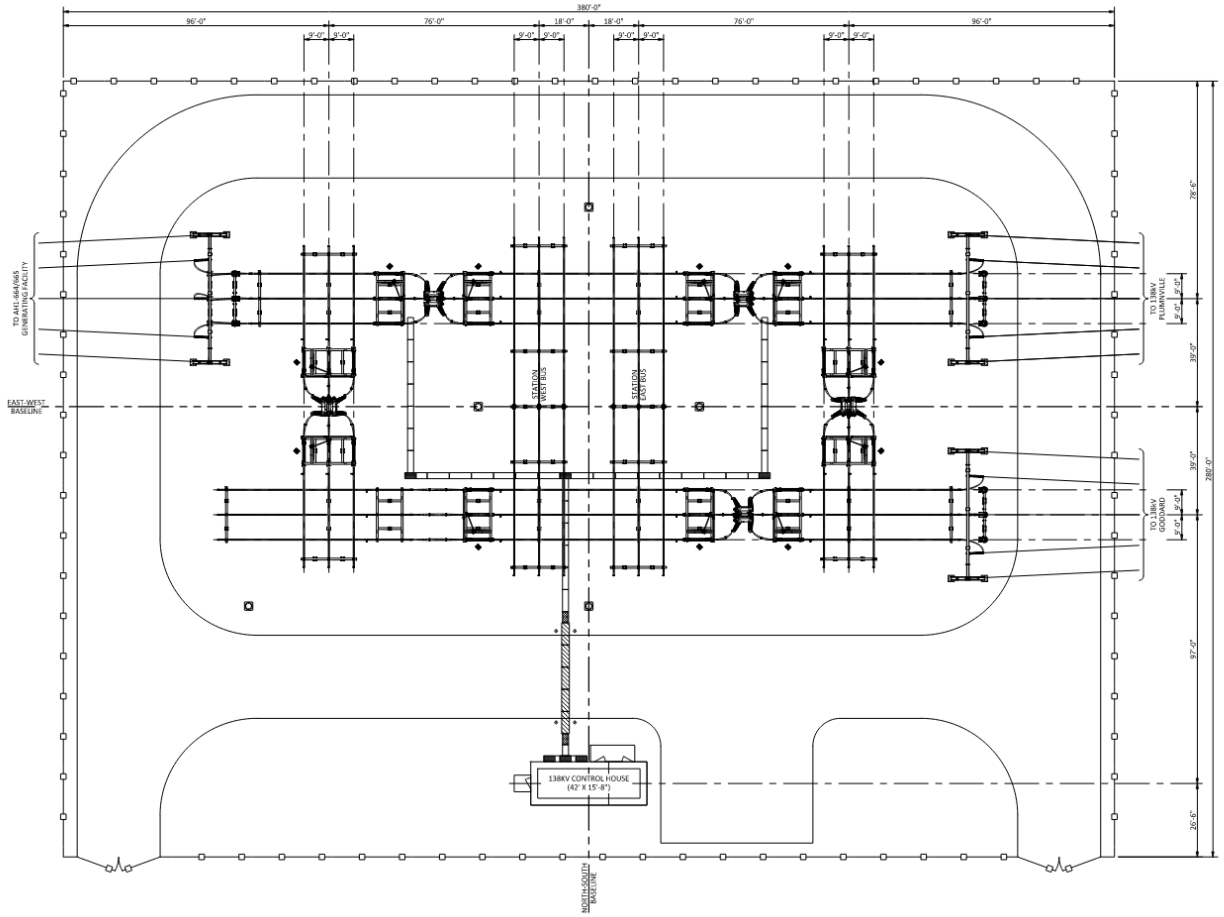
AH1-664 & AH1-665 Conceptual One-Line Diagram of Interconnection Facilities

Mt. Carmel Road 138kV Switching Station



Attachment 2:

Substation General Arrangement



Attachment 3:

Preliminary Site Layout Plan

