Generation Interconnection Facility Study Report

for

PJM Generation Interconnection Request Queue Positions AD2-103/AD2-104

AD2-103 "Crane CT1 115 kV" AD2-104 "Crane CT2-3-4 115kV"

144.6 MW Capacity / 144.6 MW Energy

April 2021

General

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff §207, as well as the Facilities Study Agreement between **C.P. Crane LLC** as the Interconnection Customer (IC) and PJM Interconnection, LLC as the Transmission Provider (TP). The Interconnected Transmission Owner (TO) is Baltimore Gas & Electric (BGE).

Under AD2-103, **C.P. Crane LLC,** the Interconnection Customer (IC), has proposed to repurpose the existing Crane GT1 oil-fired combustion turbine generating facility located at 1001 Carroll Island Road, Baltimore, Maryland 21220 and claim the unit's Capacity rights. The installed facilities will have a total capability of **14 MW** with **14 MW** of this output being recognized by PJM as capacity.

Under AD2-104, **C.P. Crane LLC,** the Interconnection Customer (IC), has proposed to claim the rights of the old Crane Unit 2 and install a new gas-fired combustion turbine generating facility located at 1001 Carroll Island Road, Baltimore, Maryland 21220. The installed facilities will have a total capability of **144.6 MW** with **144.6 MW** of this output being recognized by PJM as Capacity.

The total installed capability of AD2-103/ AD2-104 is **158.6 MW** with **158.6 MW** of this output recognized by PJM as Capacity.

The proposed in-service date for these projects as stated in the Attachment N is June 1, 2020. The revised in-service date to account for BGE's 18 month construction schedule is **February 28, 2023**. This study does not imply a BGE commitment to this in-service date.

Point of Interconnection

AD2-103 "Crane CT1 115 kV" and **AD2-104 "Crane CT2-3-4 115 kV**" will utilize the existing Crane Unit 1/Crane CT and Crane Unit 2 connections to the 115 kV transmission system. AD2-103/AD2-104 will connect via the Northeast - C.P. Crane 115 kV line No. 110631. The physical Point of Interconnection will be on the IC side of the newly installed BGE owned and Operated Switch.

Cost Summary

AD2-103/104 will be responsible for the following estimated costs:

Description	Total Cost
Attachment Facilities	$84,253
Direct Connection Network Upgrades	$674,022
Non-Direct Connection Network Upgrades	$84,252
Allocation for New System Upgrades	$0
Contribution to Previously Identified Upgrades	$0
Total Cost	$842,527

A. Transmission Owner Facilities Study Summary

1. Description of Project

C.P. Crane LLC, the Interconnection Customer (IC), has proposed a **158.6 MWE/MWC** oil/gas-powered generating facility to be located in Baltimore, MD. PJM studied AD2-103 and AD2-104 as a 158.6 MW injection into the Baltimore Gas & Electric Company's (BGE) system at the Northeast 115kV substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date was originally 06/01/2020**.** See Section 3 below for further details.

2. Amendments to the System Impact Study data or System Impact Study Results

The scope of the project as stated in the Impact Study, submitted on Impact Study published date, has remained relatively unchanged, however the estimates provided herein were performed in greater detail than those provided in the Impact Study.

3. Interconnection Customer's Submitted Milestone Schedule

The planned in-service date, as requested by the IC during the project kick-off call, was 06/01/2020. This in-service date is not attainable and was revised to February 28, 2023 in order to better reflect the BGE estimated permitting, design and construction completion time of 12-18 months.

4. Scope of Customer's Work

The IC proposes the construction of a **158.6 MWE/MWC** oil/gas-powered generating facility to be located in Baltimore, Maryland. This facility will be constructed on the existing C.P. Crane facility property.

The IC assumes full responsibility for the design, permitting, and construction of all facilities associated with the AD2-103/AD2-104 generating station on their side of the Point of Interconnection (POI). AD2-103/AD2-104 will interconnect with the BGE transmission system at the new POI disconnect switch, which will be located immediately outside of the IC's substation fence.

The IC is responsible for all design and construction related activities on its side of the POI. Site preparation, including grading and access roads, is assumed to be by the IC. Route selection, line design, right-of-way acquisition, and construction of the direct connect facilities is not included in this report and is the responsibility of the IC. The IC is required to construct and own a 115kV singular interface breaker. The IC will provide two sets of current transformers and associated relays for line differential relay protection. The singular interface breaker will be tripped by these line differential relays located in the Customer substation. In addition, the IC's breaker is required to have stuck breaker protection, which will provide a trip contact to the BGE substation. The costs outlined in this study do not include construction of the 115kV line between the Customer facility and the POI.

The IC may incorporate BGE's scope of work into the IC's Certificate of Public Convenience and Necessity ("CPCN") application for filing as a single project. BGE is ultimately responsible for CPCN approval of their assets, however BGE may coordinate with the IC to prepare, develop, and file the required documentation for the CPCN.

The IC shall supply adequate unobstructed access roads for the installation, maintenance, and 24/7 access of the BGE facilities at no cost to BGE. All applicable permitting, zoning, and land use approvals for the IC's facilities will be obtained by the IC. BGE will be responsible for the permitting of its transmission line and for the facilities within its switchyard fence.

The IC is responsible for obtaining all rights necessary for its facilities, up to and including any usage of property in which BGE may have real property interests. As part of this process, the IC shall provide, for BGE review, surveyed site plans that delineate their intended facilities and clearly define the facilities relationship to existing right of ways and the electrical facilities contained therein. BGE will provide the IC with the appropriate legal instrument affording the IC the right to use BGE real property, if necessary, upon review and subsequent approval.

The IC will be required to make provisions for a fiber termination inside its substation to facilitate remote interrogation/communication and data collection. Fiber (OPGW) will be provided to the BGE Switchyard and Customer shall provide OPGW extension from BGE Switchyard to Customer site.

Customer Substation Requirements

The customer substation shall be configured per the following criteria:

1. Provide one (1) singular interface circuit breaker between Customer site and BGE system.
2. Communicate with BGE communication networks via incoming OPGW fiber from 115kV Line 110631.
3. Provide metering CT's and equipment to transmit revenue data to BGE

5. Description of Facilities Included in the Facilities Study (BGE's Scope of Work)

This report describes the electrical interconnection facilities and upgrades to existing BGE facilities necessary to support the IC's generation. The IC's interconnection circuit construction and the IC's generation facilities are not included in this study.

The BGE scope of work is summarized below:

- Design and construct a new 115kV switching yard including one (1) manually-operated disconnect switch. The switching yard will be built to BGE's specifications for a

transmission substation and be owned and operated by BGE. BGE will obtain the necessary permitting for all work within new switchyard fence.

- Re-route existing line 110631 and OPGW into new BGE switchyard.

- Upgrade remote-end relaying at Northeast Substation for new IC equipment.

BGE must review the electrical protection design and relay settings for interconnecting customer facilities to ensure that the protective relaying equipment will be compatible with that installed at the remote substations. BGE personnel must be present at the time of commissioning to witness proper function of the protection scheme and related coordination.

A three phase 115kV revenue metering point needs to be established on the IC side of the POI disconnect switch inside the Customer Substation. See Section B.5 of this report for a detailed scope of work.

6. Total Costs of Transmission Owner Facilities included in Facilities Study

Work Description	Total Cost
Attachment Facilities (N6975) Re-route 115 kV line 110631 and OPGW into the BGE switchyard	$84,253
Total Attachment Facilities Cost	$84,253
Direct Network Upgrade New BGE Switchyard **(N6976)**	$674,022
Total Direct Network Upgrade Costs	$674,022
Non-Direct Network Upgrade Final tie-in of Attachment Facilities **(N6977)**	$42,126
Non-Direct Network Upgrade Relay Modification Work at the Northeast Substation **(N6978)**	$42,126
Total Non-Direct Network Upgrade Costs	$84,252
Total Project Costs	$842,527

7. Summary of Milestone Schedules for Completion of Work Included in Facilities Study:

The overall estimated timeline for this project, including upgrades, is approximately 12-18 months from the date of the PJM release for design/construction. This timeline may be able to be improved with preferred system outages, but may be delayed if any regulatory or permitting issues are realized.

Activity	Duration
Substation Design, Procurement, and Construction	12 – 18 months
Transmission Engineering, Procurement, and Construction	6 – 8 months
Environmental Permitting	6 – 8 months
Metering	2 – 3 months

B. Transmission Owner Facilities Study Results

This section describes facilities identified to be installed (attachment facilities), replaced, and/or upgraded (upgrade facilities) by BGE to accommodate the project. During detailed design and analysis other components may be identified for installation or replacement due to this interconnection.

1. Transmission Lines – New

Attachment Facilities

PJM Network Upgrade Number N6975

- Re-route existing line 110631 and OPGW into new BGE switchyard.

2. Transmission Line – Upgrades

PJM Network Upgrade Number N6977

- Perform final tie in of the new BGE switchyard to the existing Northeast to C.P. Crane line 110631.

3. New Substation/Switchyard Facilities

PJM Network Upgrade Number N6976

- Install new BGE switchyard consisting of the following:
    - One (1) 115kV, 3000A, 100kA three-phase manually-operated disconnect switch with grounds
    - One (1) 65-ft H-Frame structure (steel)

- One (1) Lot lighting equipment
- One (1) Lot 2167kcmil ACSR transmission conductor
- One (1) Lot Steel Shield Wire
- One (1) Lot Optical Ground Wire (OPGW)
- One (1) OPGW Splice Box
    - Additional Splice Box may be required for OPGW run into Customer site
- One (1) Lot fencing, gates and E-Key locks
- One (1) Lot crushed stone and foundations (drilled piers)
- One (1) Lot grounding materials and below-grade conduit

The work required for the substation construction also includes the following:

- Engineering design and drafting, preparation of all plans, layouts, details, schematic and wiring diagrams, with equipment purchasing and installation specifications
- Field construction management and all other field construction resources
- Design of storm water management and erosion and sediment control facilities (if needed), with reports and drawings to be used by the Customer for permitting the site
    - It is assumed that existing stormwater management and erosion controls on-site are sufficient.
- Clearing/grading of site with installation of roadway, fence, stoning, and storm water and erosion and sediment control facilities (Customer responsibility)
    - Roadway and access to BGE Switchyard shall be designed per BGE standard EPB-11111
- Testing and commissioning for all new equipment and systems

4. Upgrades to Substation / Switchyard Facilities

Non-Direct Connection Network Upgrade

PJM Network Upgrade Number N6978

- Upgrade line relays and necessary communications infrastructure at Northeast Substation for Line #110631 to Crane facility

5. Metering & Communications

BGE Requirements

Metering

A three phase 115kV revenue metering point will need to be established within the IC facility between the POI disconnect switch and the IC singular interface circuit breaker.

The metering instrument transformers will be specified by BGE but all equipment and labor will be supplied by the IC.

Telemetry

It is the IC's responsibility to send the data that both PJM and BGE require directly to PJM. The IC will grant permission for PJM to send BGE the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, interval MWH and MVARH, and generator breaker position.

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

6. Environmental, Real Estate and Permitting Issues

Environmental

It can be assumed that this project in its entirety will need at least one (1) CPCN license. BGE and IC are each responsible for obtaining CPCN license for their assets, and BGE will provide inputs to Customer if a single CPCN license for all work is desired. If a single CPCN license is desired, CPCN process will be Customer's responsibility. Any necessary environmental studies outside of the substation will be the responsibility of the IC. BGE Environmental Planning will be responsible for the environmental permitting covering the work inside the BGE substation.

Permitting and Real Estate

All work to accommodate the interconnection of PJM AD2-103/AD2-104 is dependent upon the IC and BGE obtaining all necessary permits for their respective assets. Moreover, the IC shall be responsible for acquiring all necessary real property rights and acquisitions, including but not limited to: rights of way, easements, and fee simple, in a form approved by BGE. Any setbacks in obtaining the necessary real property rights, acquisitions and permits required for this interconnection may delay the construction schedule.

7. Summary of Results of Study

Description	Total Cost
Attachment Facilities	$84,253
Direct Connection Network Upgrades	$674,022
Non-Direct Connection Network Upgrades	$84,252
Allocation for New System Upgrades	$0
Contribution to Previously Identified Upgrades	$0
Total Cost	$ 842,527

Description	Direct Labor
Direct Labor	$208,391
Direct Material	$226,502
Indirect Labor	$254,899
Indirect Material	$152,735
Total Cost	$842,527

Generation projects meeting IRS "Safe Harbor" provisions generally do not incur "CIAC"(Contribution in Aid to Construction), a tax collected by the utility for the state or federal government. BGE does not expect to collect CIAC for this project. If for any reason, "CIAC" would be required for this project, it would be the responsibility of the party owning the generator to pay this cost.

BGE reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities.

8. Schedules and Assumption

The BGE schedule is based on an 12-18 month lead-time from start of engineering to in-service date, including the assumption that it would not be impacted by storm damage and restoration, time of year limitations, permitting issues, outage scheduling, system emergencies, and contractor and equipment availability.

It is important to note that this project will be incorporated into the existing project work load at BGE at the time of contract execution. If the workload of existing projects is extensive, resource constraints may cause this project to be delayed beyond the projected in-service date.

8. Stability Analysis Results

The AD2-103 project did not meet the 0.90 lagging and 0.95 leading power factor requirement at the generator terminals. An additional 3.30 Mvar would be required for the plant to meet the 0.90 lagging power factor requirement, and an additional 2.08 Mvar would be required for the plant to meet the 0.95 leading power factor requirement.

The AD2-104 queue project met both the 0.90 lagging and 0.95 leading power factor requirements.

However, with the AD2-104 queue project on, the surplus reactive power would allow the AD2-103 and AD2-104 queue projects to meet both the 0.90 lagging and 0.95 leading power factor requirements.

Attachment 1

Single Line Diagram