PJM Generation Interconnection
Queue X4-034
Greenville 12kV
Feasibility/System Impact Study

700118v4
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Preface

The intent of this System Impact Study is to determine a plan, with cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

The PJM Reliability Planning Process utilizes PJM planning criteria, NERC Planning Standards, NERC Regional Council planning criteria, and the individual Transmission Owner FERC filed planning criteria. In all cases, PJM applies the most conservative of all applicable planning criteria when identifying reliability problems and determining the need for system upgrades on the PJM system. The application of the NERC Planning Standards is adapted to the specific needs of the PJM system.

In some instances an interconnection customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. All facilities required for interconnection of a generation interconnection project must be designed in compliance with the technical specifications (on PJM web site) for the appropriate Transmission Owner.

After the System Impact Study Agreement is executed and prior to execution of the Interconnection Service Agreement, an Interconnection Customer may modify its project to reduce the electrical output (MW) (in the case of a Generation Interconnection Request) of the proposed project by up to the larger of 20 percent of the capability considered in the System Impact Study or 50 MW.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

The Interconnection Customer (IC) is proposing a 5MW Energy-only hydro facility located at Braddock Lock & Dam in Braddock, PA to be interconnected to the Duquesne Light Company (DLCO) transmission system. The proposed in-service date for this project is August 31, 2013 and is currently under review.

Attachment Facilities

The Interconnection Customer is proposing to construct a 5MW Energy-only hydro facility to be connected to the Dravosburg – Rankin No. 2 23kV line in the vicinity of the Kennywood substation in Duquesne (See **Figure #1** below). To accommodate this interconnection, a 23kV breaker and associated protection work a the Dravosburg substation, two 23kV disconnects, three lightning arrestors and associated metering equipment will have to be installed, along with approximately 6,000 feet of new subtransmission line. The cost breakdown is shown in Table 1 below:

The preliminary total cost estimate is **$1,520,097** in 2012 dollars (with **$628,575** tax gross-up for a total of **$2,148,672** if applicable), which includes Direct Connection costs and tax gross-up. The costs to acquire the four (4) railroad crossings and permits to install 1,000 feet of overhead conductor that will be paralleled with railroad tracks is included. These prices may be greater than estimated when negotiated with the railroad company. The price will be adjusted for labor rate and material cost changes based on the actual project schedule.

	PJM Network Upgrade Number	Description	Total	Tax (@41.351%)	Total with Tax
	N**3329**	Install new 23kV breaker and associated protection work	$66,075	$27,323	$93,398
	N**3330**	Install two 23kV disconnects, three lightning arrestors, metering equipment, and 6,000 feet of new 23kV subtransmission line	$1,454,022	$601,252	$2,055,274
Total Cost			**$1,520,097**	**$628,575**	**$2,148,672**

Table 1. Cost Estimate Breakdown

The following assumptions were used in the preparation of this high-level cost estimate:

- DLCO will construct approximately 6,000 feet of new 23kV line.
- An area of 30'-0" x 30'-0" will be supplied for the interconnection substation. This area will have a flat grade and the top level of material will be type 2B slag.
- The developer will be responsible for providing any cable tray required within the control house.
- The developer will be responsible for the engineering, purchasing and construction of the customer substation.
- The developer must meet all National, State, Local, and DLCO requirements.
- The developer is responsible for providing, installing, and maintaining the steel, foundations, conduit, grounding, fencing, and control house per DLCO specifications.
- The control house will be provided two separate AC sources and will be temperature controlled to protect the relays from the outside environment.
- The developer is responsible for obtaining land for the interconnection substation per DLCO specification including but not limited to size, grading, and location.
- All developer substation equipment beyond the DLCO metering point must be coordinated and meet DLCO specification.
- All costs assume 2012 pricing.

After the receipt of an executed Interconnection Service Agreement (ISA), the developer must obtain the necessary land and fully develop their Point of Interconnection. Following this work, DLCO will require approximately four (4) months to complete their work. This time estimate does not include an estimated six (6) months to one (1) year to acquire railroad right-of-way. This estimate is a conservative high-level estimate for the lead-time of the proposed interconnection. Delays could occur based on weather, equipment lead-time, procurement of right of ways, site preparation, and availability of outages to perform the work.

The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer's side of the Point of Interconnection.

Revenue Metering and SCADA Requirements

REVENUE METERING
DLCO will install, own, and/or maintain the revenue metering.

REAL TIME METERING
The Interconnection Customer will supply and own real time metering equipment that will provide instantaneous net MW and MVAr at low side of Generator Step-Up Transformer in accordance with PJM Manuals M-01 and M-14D, and Sections 8.1 through 8.5 of Appendix 2 to this ISA.

COMMUNICATION

DLCO will take responsibility to populate the revenue metering data into PJM's eMeter.

The standards for DLCO are posted on PJM's website at: http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx. Select the Duquesne link.

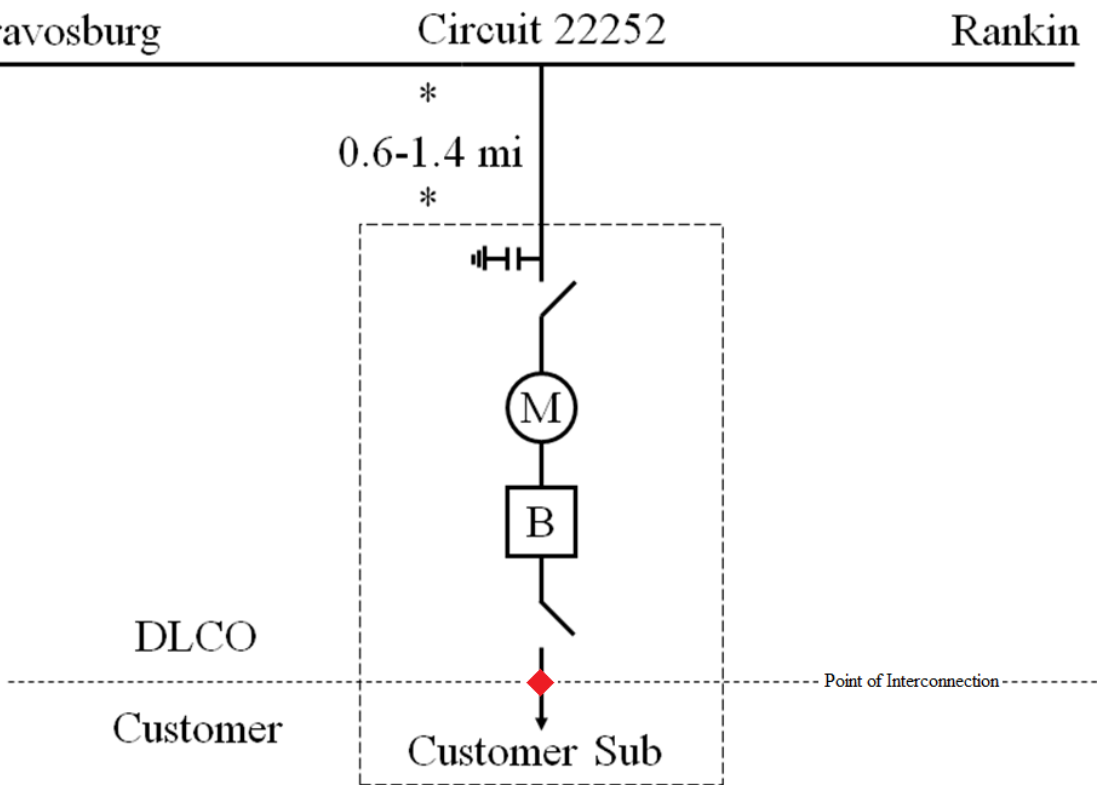

Figure 1. Single Line Diagram

Network Impacts

The Queue Project X4-034 was studied as a 5.0MW (0.0MW Capacity) injection as a tap into the Dravosburg – Rankin No. 2 138kV station in the Duquesne area. Project X4-034 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

No violations were identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

No violations were identified.

Short Circuit

(Summary of impacted circuit breakers)

No overloads were identified.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

No violations were identified.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially cause by the addition of this project generation)

None.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project.)

None.

Steady-State Voltage Requirements

(Summary of VAR requirements based upon the results of the steady-state voltage studies)

None.

Stability and Reactive Power Requirement

(Summary of VAR requirements based upon the results of the dynamic studies.)

Not required.

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

As a result of the aggregate energy resources in the area, no violations were identified.