Generation Interconnection
System Impact Study Report
For

PJM Generation Interconnection Request Queue Position AA2-030

Nelson

August 2018

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

For Local and Network Upgrades which are required due to overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost less than $5,000,000, the cost of the Local and Network Upgrades will be shared by all proposed projects which have been assigned a Queue Position in the New Services Queue in which the need for the Local and Network Upgrades was identified. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects. •

For Local and Network Upgrades which are required due to the overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost of $5,000,000 or greater, the cost of the Local and Network Upgrades will be allocated according to the order of the New Service Requests in the New Services Queue and the MW contribution of each individual Interconnection Request for those projects which cause or contribute to the need for the Local or Network Upgrades. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects.

Cost allocation rules can be found in PJM Manual 14A, Attachment B.

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.

An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

General

The Interconnection Customer (IC), Invenergy Nelson, LLC, is proposing to install one 190 MW natural gas fired simple cycle generator to be located in Lee County, Illinois and has requested to be studied as a 190 MW Energy (157MW Capacity) resource interconnecting into the Commonwealth Edison (Transmission Owner or "TO") area. The IC has proposed in-service date is for June 1, 2018 and is under review. This is the second new generation request for this facility (see AA1-146).

Impacts on the MISO member transmission systems are not included in this analysis.

The intent of the System Impact Study is to determine system reinforcements and associated costs and construction time estimates required to facilitate the addition of the new generating plant to the transmission system. The reinforcements include the direct connection of the generator to the system and any network upgrades necessary to maintain the reliability of the transmission system.

Point of Interconnection

AA2-030 will be interconnected with the ComEd transmission system as follows:

The new generator is proposed to be connected to the ComEd transmission system at TSS 155 Nelson by way of 94201 Line to the TSS942 Nelson Energy Center.

Attachment Facilities

No new Transmission Owner Attachment Facilities. This is an addition to an existing facility and only relay setting changes are anticipated.

A one line diagram can be found below in **Figure 1**.

The IC is required to construct all connection facilities in accordance with the TO published standards. ComEd would review and approve all customer relay protection design drawings and relay settings.

The estimated cost for ComEd oversight is $100,000.

Direct Connection Network Upgrades

None

Non-Direct Connection Network Upgrades

None

Revenue Metering and SCADA Requirements

For PJM: IC 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 Section 8 of Attachment O to the PJM Open Access Transmission Tariff.

For ComEd:

The Interconnection Customer will be required to comply with all ComEd Revenue Metering Requirements for Generation Interconnection Customers.

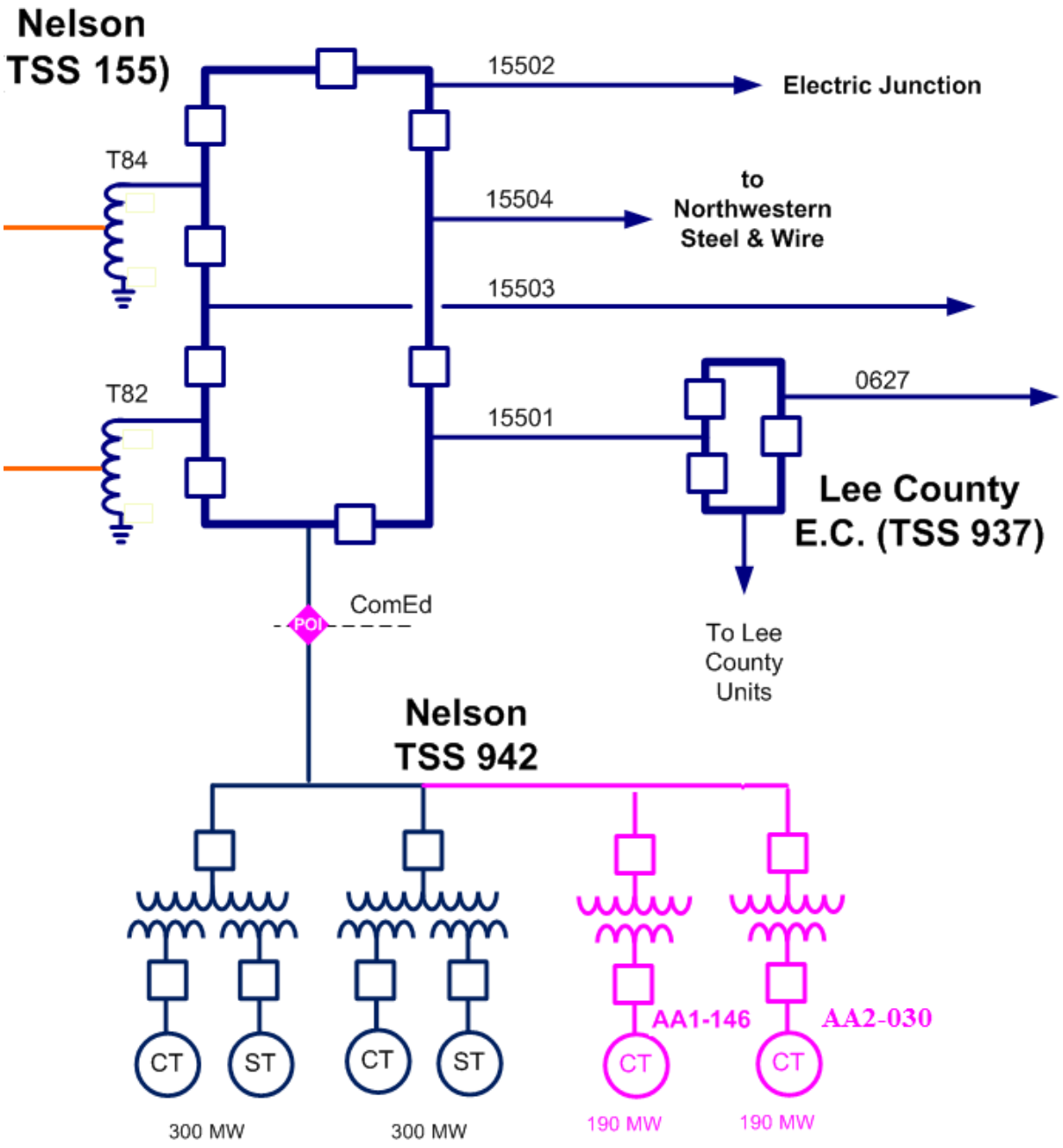

Figure 1. Single Line Diagram

Network Impacts

The Queue Project AA2-030 was evaluated as a 157.0 MW (Capacity 157.0 MW) into the R33 345 kV substation in the ComEd area. Project AA2-030 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AA2-030 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2019

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

None

Multiple Facility Contingency
(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None.

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)

None.

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

None

Short Circuit
(Summary of impacted circuit breakers)

If AA1-146 were to drop out of the queue prior to signing their ISA, this queue position would be re-evaluated to see whether the Line 15507 CB would need to be re-assigned to AA2-030

Affected System Analysis & Mitigation

MISO Impacts:

No issues identified. See MISO Affected SIS PJM April 2016 Report for more information

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.
Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

Not Applicable

Light Load Analysis - 2019

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

System Reinforcements

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

Should AA1-146 withdraw (prior to signing an ISA), then AA2-030 will be financially responsible for the replacement of the 15507 line (138kv) breaker at Nelson which becomes overdutied with the first of AA1-146 or AA2-030 projects. For more information see the AA1-146 System Impact Study.

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

No issues identified.

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused 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. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None.

Light Load Load Flow Analysis Reinforcements

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused 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. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None.