Generation Interconnection
System Impact Study Report

For

PJM Generation Interconnection Request Queue
Position AB1-091

Davis Creek 345kV

Revision 1: February 2022
Revision 0: September 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

Invenergy Thermal Development LLC (Interconnection Customer or IC) is proposing to install a 1x1 combined cycle combustion unit in Kankakee County. This is a request for an MFO of 575 MWs, 550 MWs to be considered as a Capacity resource. The IC has proposed an in service date of June 1, 2019 and is currently under review. The study year for the AB1 queue is 2019.

Revision History:

Revision 1: This report updates the previously issued report to include re-tooled load flow results. The 17 STILLWELL-05DUMONT 345 kV line overload is no longer valid for AB1-091. The violation and associated reinforcement have been deleted from the report.

Point of Interconnection

The Interconnection Customer (IC) AB1-091 proposes to interconnect to the 345kV bus at TSS 86 Davis Creek. It should be noted that the configuration of Davis Creek will be substantially different than that shown in this report due to the construction of a supplemental project S1444 as submitted in the PJM RTEP. Since the queue date of this request predates the TEAC date for S1444, all analysis is based on the pre-S1444 configuration.

Attachment Facilities

The IC AB1-091 generator lead will interconnect to the 345kV bus at TSS 86 Davis Creek. This interconnection would require one 345kV line circuit breaker, a dead-end structure and revenue metering as shown in the simplified one line diagram.

The cost for the attachment facilities is estimated at $4M.

Scope of Work	Cost Estimate
Installation of one 345kV line circuit breaker, one dead-end structures and one set of revenue metering (see notes below on cost estimate)	$4.0M

Direct Connection Network Upgrades

Presently, TSS 86 Davis Creek is laid out in straight-bus configuration with three circuit breakers and four bus sections. On each of bus 1, 2 and 4, there is a line and a transformer. Only bus-3 has one line L17907.

In order to interconnect generator lead to a straight bus section, each element needs to have a circuit breaker. Interconnecting the generator lead to bus-3 (blue- Primary POI) would require line breaker at generator lead as well as a line breaker on L17907. However, this configuration

would overload TR83 on bus-4 for loss of L17907, because when line L17907 trips both Braidwood and AB1-091 are connected to TR83.

The next best option is to interconnect AB1-091 to bus-1 (red – Option 2). This interconnection would require installation of three circuit breakers one each on generator lead, TR82 and L17704, as shown in the simplified one line diagram.

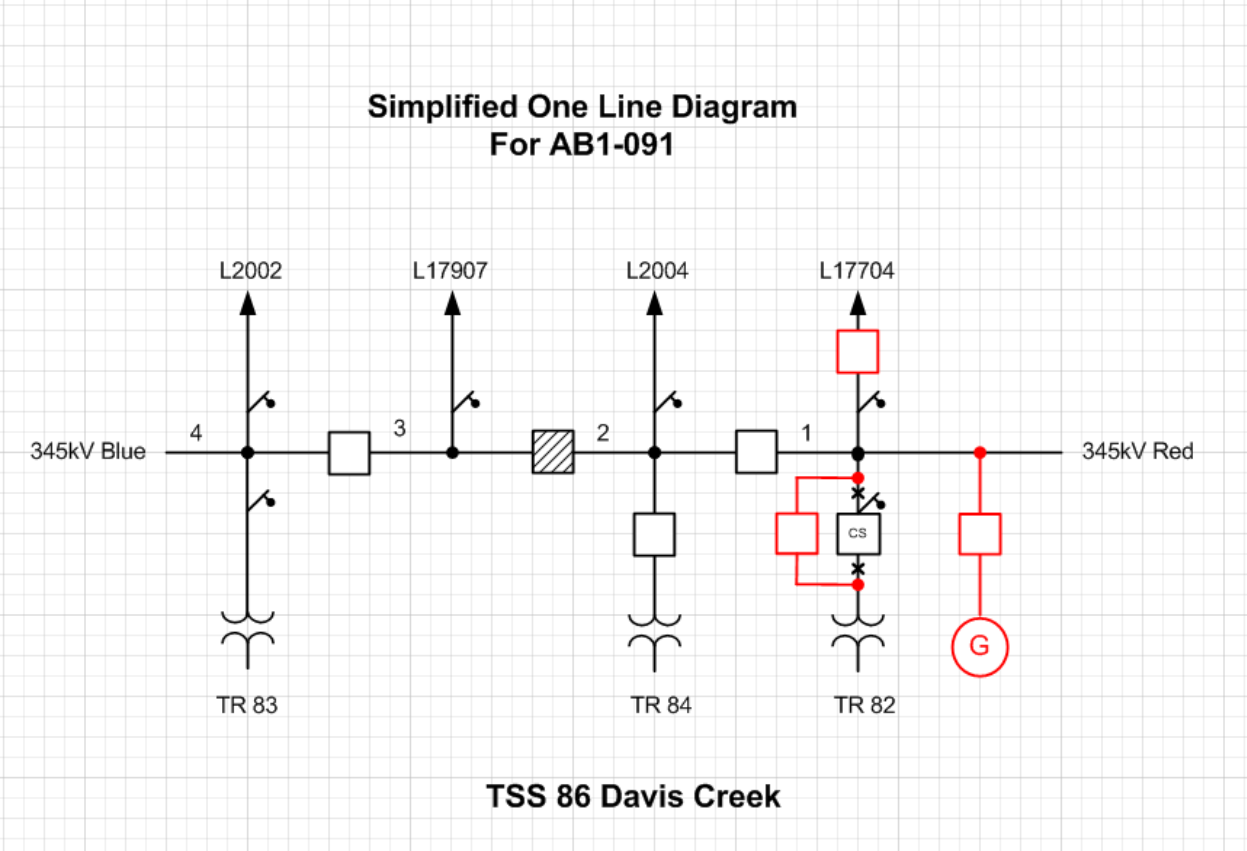
The new circuit breakers would be laid out to facilitate a breaker-and-a-half configuration in future.

The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer side of the point of interconnection outside of the substation.

The preliminary cost estimate for Direct Connection Network Upgrade is given in the following tables.

Scope of Work	Cost Estimate
Install two 345kV circuit breakers at TSS 86 Davis Creek as described above	$7,000,000
Total Cost Estimate (see notes below on cost estimate)	$7,000,000

ComEd would take 24-months to construct after ISA/ICSA are signed.



Notes on Cost Estimate:

1) These estimates are Order-of-Magnitude estimates of the costs that ComEd would bill to the customer for this interconnection. These estimates are based on a one-line electrical diagram of the project and the information provided by the Interconnection Customer.

2) These cost estimates do not include cost of acquiring right-of-way for the transmission line and purchasing any additional land, if needed, for the line terminations. The need and cost of acquiring property and associated legal costs will be investigated during Facilities Study for this project.

3) There were no site visits performed for these estimates. There may be costs related to specific site related issues that are not identified in these estimates. The site reviews will be performed during the Facilities Study or during detailed engineering.

4) These estimates are not a guarantee of the maximum amount payable by the Interconnection Customer and the actual costs of ComEd's work may differ significantly from these estimates. Per the PJM Tariff, Interconnection Customer will be responsible for paying all actual costs of ComEd's work.

5) The Interconnection Customer is responsible for all engineering, procurement, testing and construction of all equipment on the Interconnection Customer's side of the Point of Interconnection (POI).

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 IC will be required to comply with all ComEd Revenue Metering Requirements. The Revenue Metering Requirements may be found on the ComEd website located at the following links:

https://www.comed.com/customer-service/rates-pricing/interconnection/Pages/distribution-under-10000kva.aspx

https://www.comed.com/customer-service/rates-pricing/interconnection/Pages/distribution-over-10000kva.aspx

http://www.pjm.com/planning/design-engineering/to-tech-standards.aspx**Network Impacts**

The Queue Project AB1-091 was evaluated as a 550.0 MW (Capacity 550.0 MW) injection into the Davis Creek 'R' 345 kV substation in the ComEd area. Project AB1-091 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB1-091 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

No issues identified.

Short Circuit
(Summary of impacted circuit breakers)

None.

Affected System Analysis & Mitigation

MISO Impacts:

None. See PJM October 2016 Queue Generation Affected System Impact Study dated March 15, 2017 available on the MISO website.

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)

None

Stability and Reactive Power Requirement

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

Stability and Reactive Power Reinforcement

None.