PJM Generator Interconnection Request
Facilities Study Report

for

Queue Project AB1-091
575 MW Energy / 550 MW Capacity
"Davis Creek 345 kV"

Revision 1

February 2022

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A. FACILITIES STUDY INTRODUCTION

1. PROJECT DESCRIPTION

Invenergy Thermal Development LLC, the Interconnection Customer (IC), has proposed the construction and interconnection of a new natural gas fueled combined cycle generating facility consisting of a single 575 MW turbine generator arranged in a 1x1 configuration. The proposed facility will be located in Kankakee County, Illinois.

The generating facility will be interconnected to Davis Creek via IC constructed, owned, and maintained 345kV transmission line L.97301, to be landed at newly constructed bay at TSS 86 Davis Creek. Davis Creek will expand to include the addition of three (3) 345kV circuit breakers positioned in a breaker-and-a-half configuration. This facility study also includes line protection relaying upgrades for 345kV L2002.

The proposed generation interconnection is shown on the Planning Diagram in Attachment #1.

2. AMENDMENTS TO THE IMPACT STUDY DATA OR IMPACT STUDY RESULTS

2.1 Facility Name and In-Service Date

The Customer's facility name is Kankakee County Thermal. The proposed in-service date is 1280 days after the Interconnection Services Agreement (ISA) and Interconnection Construction Services Agreement (ICSA) are fully executed. ComEd will work with the IC in good faith to meet this date.

3. INTERCONNECTION CUSTOMER SCHEDULE

The following are estimated days for a schedule which is based upon the assumption that a CPCN (Certificate of Public Convenience and Necessity, from the ICC (Illinois Commerce Commission) will not be required:

Description	Schedule
Notice to Proceed (ISA and CSA signed with security deposit)	Day 1
Construction complete and ready for testing	Day 1215
Testing Complete and Back feed Power Available	Day 1280
Facility Commercial Operation Date	Day 1280

4. SCOPE OF WORK BY INTERCONNECTION CUSTOMER (IC)

4.1 The IC is responsible for construction of the 575 MW of combined cycle natural gas turbine generators facility, which includes the generator step-up transformers (GSU's), the interconnection facility consisting of a collection system, two (2) main transformers 25kV to 345kV (grounded wye high side), three (3) 345kV circuit breaker, four (4) 345kV motor operated disconnect switches, two (2) 25kV circuit breakers, two (2) 25kV disconnect switches and a 345kV transmission line (distance to be determined) terminating at TSS 86 Davis Creek.

4.2 The IC will be responsible to purchase real estate or obtain the necessary right-of-way easement to install the 345kV transmission line to TSS 86 Davis Creek substation.

4.3 The IC will be responsible to request and bear the cost of any outages required on existing transmission or distribution lines that may be required for the transport of any large equipment, i.e. turbines, rotors, turbine structures, etc.

4.4 IC will be responsible for installation and ownership of fiber between TSS 86 Davis Creek and TSS 973. Ownership will terminate at the control building. Fiber connection between stations should include two physically diverse routes.

5. DESCRIPTION OF FACILITIES INCLUDED IN THE FACILITIES STUDY

5.1 TSS 86 Davis Creek (RMT1) – PJM Network Upgrade Number N6949

5.1.1 ComEd will be responsible for performing the design, procurement, and construction to expand 345kV TSS 86 Davis Creek substation with three (3) 345kV circuit breaker on the blue bus.

5.1.2 ComEd will be responsible for performing the design, procurement, and construction to install line protection, bus protection, breaker protection and communication systems.

5.1.3 ComEd will be responsible to relocate existing tower and associated facilities.

5.1.4 ComEd will be responsible for upgrading the existing station battery to an EC-13M and charger to two A12B-130V-35-BD3 chargers, based on scope identified by the preliminary DC calculation.

5.2 STA20 Braidwood (Rxxx) – PJM Network Upgrade Number N7870

5.2.1 ComEd will be responsible for performing the design, procurement and construction to replace line protection relaying for L2002.

5.3 TSS 179 Bloom (Rxxx) – PJM Network Upgrade Number N7871

5.3.1 ComEd will be responsible for performing the design, procurement and construction to revise line protection relaying for relocated L17907.

5.4 New Transmission Line 345kV L97301

5.4.1 The IC will be responsible for performing the design, procurement, and construction to install new line facilities required to connect TSS 973 to TSS 86 Davis Creek substation via the new line number listed above. ComEd will be responsible for all work inside of TSS 86 Davis Creek up to and including the 345kV terminal structure at TSS 86 Davis Creek substation.

5.5 Existing Transmission Line 345kV L17907 PJM Network Upgrade Number N7872

5.5.1 ComEd will be responsible for performing the design, procurement, and construction to install new line conductor and shield wire required to reroute 345kV line 17907 to the new dead end at TSS 86 Davis Creek substation.

6. TOTAL COSTS OF TRANSMISSION OWNER FACILITIES INCLUDE IN FACILITY STUDY

NETWORK #	SITE LOCATION	TOTAL PROJECT COST	STUDY SECTION
None	**TSS 86 Davis Creek Attachment**	**$2,257,235**	**A.5.1, B.4.1**
N6949	**TSS 86 Davis Creek**	**$26,216,116**	
N7870	**STA20 Braidwood**	**$512,439**	**A.5.2, B.4.2**
N7871	**TSS 179 Bloom**	**$437,410**	**A.5.3, B.4.3**
N7872	**L19707 Reroute**	**$286,311**	**A.5.5, B.2.1**
	Subtotal	**29,709,511**[1]	
	Gross Up Tax	**$3,943,780**	

[1]This cost excludes Gross Up Tax charges. If at a future date it is determined that the Federal Income Tax Gross Up charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

	Total Cost of ComEd Work	**$33,653,292**	

SUMMARY OF MILESTONE SCHEDULES FOR COMPLETION OF WORK INCLUDED IN FACILITY STUDY

Description	Schedule
Notice to Proceed (ISA and CSA signed with security deposit)	Day 1
Construction complete and ready for testing	Day 1215
Testing Complete and Back feed Power Available	Day 1280
Facility Commercial Operation Date	Day 1280

B. TRANSMISSION OWNER (COMED) FACILITIES STUDY RESULTS

1. TRANMISSION LINES -NEW

1.1 IC will be performing the design, procurement, and construction of 345kV L97301. For the purpose of coordination, the IC will provide design drawings of their proposed line to ComEd for review prior to construction.

2. TRANSMISSION LINES – UPGRADES

2.1 345 kV L17907 (N7872)

2.1.1 ComEd will be performing the design, procurement, and construction to reroute L17907 to the new deadend at TSS86 Davis Creek.

2.1.2 Existing conductor will be replaced with new TP 1113 kcmil ACSR (45/7) Bluejay. Approximately 0.03 circuit miles are to be replaced.

2.1.3 Existing shield wire will be replaced with new 7#8 Alumoweld. Approximately 0.03 circuit miles are to be replaced.

3. NEW SUBSTATION / SWITCHYARD FACILITIES

3.1 Not applicable.

4. UPGRADES TO EXISTING SUBSTATION / SWITCHYARD FACILITIES

4.1 STA 86 Davis Creek Facility (RMT1 – N6949)

4.1.1 Eight (8) 345kV motor operated disconnect switches (both sides of new circuit breakers BT 5-12, BT 7-12, & BT 7-10, one for L.17907 and one for new L.97301).

4.1.2 Six (6) 345kV CCVTs (345kV Bus 5 and 345kV Bus 7).

4.1.3 Three (3) 345kV, 3000A, 63kA SF6 gas circuit breakers (BT 5-12, BT 7-12, & BT 7-10).

4.1.4 Foundations and structures for all new equipment. Expand below grade ground grid and stormwater system.

4.1.5 For IC Line protection: Protective relaying for 345kV L.97301:

System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber.

System 2 Protection: Install SEL-311L relay for Current Differential Scheme over direct fiber.

IC to install System 1 and System 2 fiber cables in separate static wires from TSS 973 substation to TSS 86 Davis Creek. The fiber optic cables will be owned by the IC and ownership will terminate at the FDP panel in the TSS 86 Davis Creek control building.

4.1.6 For ComEd Line protection: Protective relaying for 345kV L.2002:

System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber.

System 2 Protection: Install SEL-311L relay for Current Differential Scheme on NX64 over mux.

Remove System 1 relay P544.

4.1.7 New dual SEL-487B protection for 345kV Bus 12.

4.1.8 For each 345kV circuit breaker:

Breaker Failure Protection: Install one SEL-451 relay for each breaker for breaker failure protection, manual close supervision, and auto reclose function.

Breaker Monitoring: Install one SEL-2411 for each breaker for breaker monitoring. Install local FDP and fiber to the building.

4.1.9 For BT 7-10 circuit breakers add a SEL-351A reclosing relay.

4.1.10 Relocate L.17907 to 345KV Bus 7.

System 1 Protection: Utilize existing SEL-411L relay for Current Differential Scheme on NX64 over mux.

System 2 Protection: Utilize existing SEL-311L relay for Current Differential Scheme on NX64 over mux.

Install new CT cables from new breaker BT7-12 and BT7-10 to System 1 and System 2 relays. Install new PT cables from new Bus 7 CCVTs to System 1 and System 2 relays. Install FO cable to existing OCEF panel for breaker alarms.

4.1.11 Demo and construct new communication tower including foundations and associated grading at location outside of station ultimate plan. New location will require permitting and study to ensure compatibility with other communication sites as well as verification that the new location does not interfere with any existing paths during construction.

4.1.12 Expand fence approximately 143'X 395' in southwest corner of yard to encompass station ultimate configuration. Reuse security fence panels removed from the fence previously in this corner. New fence poles will need to be procured. Yard expansion will require new grounding per a new grounding study.

4.1.13 Relocate three (3) lighting masts. Add four (4) new lightning masts to yard near 345KV bus. A lightning study is required.

4.1.14 Storm water evaluation for the site will need to be re-assessed for 345KV yard ultimate configuration.

4.1.15 Security technology shall be relocated or replaced along fence expansion.

4.2 STA20 Braidwood (RMXX – N7870)

4.2.1 For Line protection: Protective relaying for 345kV L.2002:

System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber.

System 2 Protection: Install SEL-311L relay for Current Differential Scheme on NX64 over mux.

Remove System 1 relay P544.

4.3 TSS 179 Bloom (RMXX – N7871)

4.3.1 Print revisions to revise line and bus changes, relay settings changes, and testing due to the relocation of the terminal at TSS 86 Davis Creek.

5. METERING

5.1 For PJM:

ComEd, at IC cost, will be required to install equipment necessary to provide Revenue Metering (kWH, kVARH) and real time data (kW, kVAR) for interconnection customer's generating resource at ComEd side of Point-of-interconnect (POI) at TSS 86 Davis Creek. See PJM Manuals M-01 & M-14D, and PJM tariff.

5.2 For IC:

The IC is required to submit new customer request 18 months prior to the project completion.

5.3 For ComEd:

ComEd, at IC cost, will be required to install equipment necessary to provide bi-directional revenue metering (kWH, kVARH) and real time data (kW, kVAR, and circuit breaker status and 345kV voltage) for IC's generating resource, at ComEd side of POI at TSS 86 Davis Creek. See ComEd applicable standards available on the PJM website (TO Standards). CT/PT combo units will be installed. Metering has the ability to record both the large outflow of power generation and the small inflow of auxiliary power requirements. It is assumed that required analog and digital communication circuits will be available and obtainable from the Local Telecommunication Provider to meet the Milestone Schedule.

ComEd will procure, install, own and maintain the AMI meter at ComEd side of POI at TSS 86 Davis Creek for retail metering. IC will reimburse ComEd for the cost.

6. SUMMARY OF RESULTS OF STUDY

6.1 Cost Estimate:

NETWORK #	SITE LOCATION	TOTAL PROJECT COST	STUDY SECTION
None	**TSS86 Davis Creek Attachment Facilities**	**$2,257,235**	**A.5.1, B.4.1**
N6949	**TSS 86 Davis Creek**	**$26,216,116**	
N7870	**STA20 Braidwood**	**$512,439**	**A.5.2, B.4.2**
N7871	**TSS 179 Bloom**	**$437,410**	**A.5.3, B.4.3**
N7872	**L19707 Reroute**	**$286,311**	**A.5.5, B.2.1**
	Subtotal	**29,709,511**	
	Gross Up Tax	**$3,943,780**	
	Total Cost of ComEd Work	**$33,653,291**	

6.2 Milestone Schedule

Description	Schedule
Notice to Proceed (ISA and CSA signed with security deposit)	Day 1
Construction complete and ready for testing	Day 1215
Testing Complete and Back feed Power Available	Day 1280
Facility Commercial Operation Date	Day 1280

7. ASSUMPTIONS IN DEVELOPING COSTS AND SCHEDULES

7.1 ComEd Cost Estimates assume that work will be performed during normal weekdays and with no overtime.

7.2 Transmission line outages have not been identified, but generally are available in spring (March to May) and fall (September to November). These outages are controlled by PJM. Braidwood is a nuclear station, so outages are dependent on plant outage schedules and may affect project schedule.

7.3 An LON from ComEd will be required for relocation of ComEd L17907.

7.4 Foundation design assumes typical soil conditions at locations and will be subject to change after soil boring tests.

7.5 The IC will be responsible to request and bear the cost for relocation of existing transmission or distribution lines (including structures) that may be required for transmission line crossings, the transport of any large equipment, such as turbines, rotors, turbine structures, cranes, etc.

7.5.1 The terminal structure for the IC's 345 kV L97301 is located between ComEd's 345 kV L17907 and L17704. The route of L97301 will cross one of these lines, and an additional single-circuit dead-end structure will be required to raise the ComEd lines to provide clearance over L97301 as it crosses underneath. The cost and installation of this new structure is not included as part of the L17907 reroute.

7.5.2 The route of the IC's L97301 may cross additional ComEd transmission lines. ComEd's costs for the modification of any other transmission lines is outside the scope of this study and will need to be addressed separately by the IC as the route of L97301 is finalized.

7.6 It is assumed that all necessary permits will be obtained in a timely manner so as to allow engineering and construction to proceed according to the Milestone Schedule.

7.7 This study assumes a two-year schedule for the scope associated with communication tower relocation.

7.8 ComEd cost estimate and this report is valid for one (1) year after Facility Study release by ComEd to PJM.

7.9 All facilities upgrades included in this document will be required to meet the latest ComEd standards.

7.10 Upgrades included in this document are subject to change based on detailed design scope development.

7.11 This study assumes that the existing stormwater system and detention pond is sized to support the ultimate site configuration. This study does not include provisions for modifying the existing stormwater system or detention pond.

7.12 It is assumed an upgraded battery system will fit in the existing battery location should an upgrade be required based on studies. If the battery footprint needs to be expanded, additional costs may be incurred.

8. INFORMATION REQUIRED FOR INTERCONNECTION SERVICE AGREEMENT (ISA)

The following cost estimate is a breakdown of the costs of the ComEd work for # AB1-091 project.

NETWORK #	SITE LOCATION	Direct Material	Indirect Material	Direct Labor	Indirect Labor	TOTAL PROJECT COST
None	**TSS 86 Davis Creek Attachment Facilities**	**$558,998.60**	**$235,475.28**	**$1,106,175.26**	**$356,586.24**	**$2,257,235**
N6949	**TSS 86 Davis Creek**	**$3,734,444.12**	**$1,869,720.42**	**$15,644,946.34**	**$4,967,005.53**	**$26,216,116**
N7870	**STA20 Braidwood**	**$29,000.00**	**$9,943.64**	**$332,514.50**	**$140,980.50**	**$512,439**
N7871	**TSS 179 Bloom**	**$13,340.00**	**$4,574.08**	**$292,303.25**	**$127,192.70**	**$437,410**
N7872	**L19707 Reroute**	**$16,147.05**	**$5,536.57**	**$188,321.13**	**$76,306.51**	**$286,311**
	Subtotal	**$4,351,930**	**$2,125,250**	**$17,564,260**	**$5,668,071**	**$29,709,511**
	Gross Up Tax					**$3,943,780**
	Total Cost					**$33,653,292**

Note:

[1] IL sales taxes not reflected in this cost estimate.

[2] Carrying charges are anticipated to be zero.

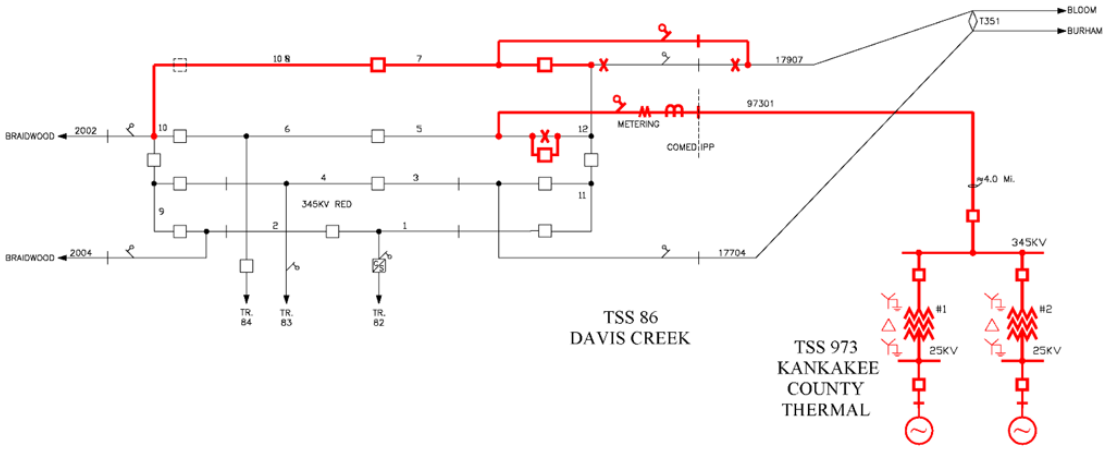
C. APPENDIX

Attachment #1: Reduced Planning Diagram Depicting Interconnection Facilities and Points of Ownership/Demarcation

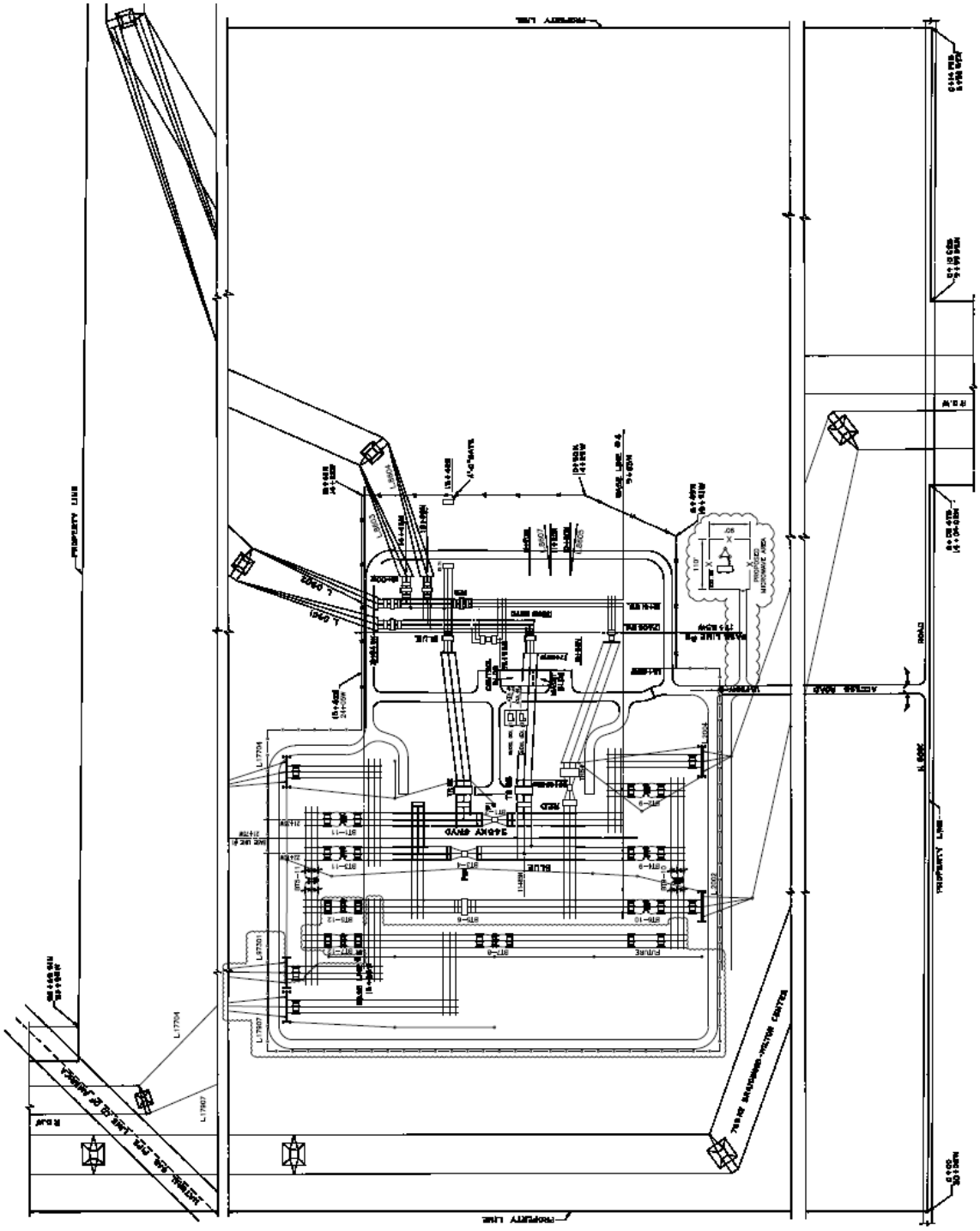
Attachment #2: General Arrangement, TSS 86 Davis Creek

Attachment #3: L17907 Plan and Profile

Attachment #1: High Level Planning Diagram Depicting Interconnection Facilities and Points of Ownership/Demarcation



Attachment #2: General Arrangement, TSS 86 Davis Creek



Attachment #3: L17907 Plan and Profile