Generation Interconnection Facilities Study Report

For

PJM Generation Interconnection Request Queue Position AC1-204

Elwood 345 kV

June 2019

Transmission Provider Facilities Study Summary

Description of Project

Queue AC1-204 project is a Jackson Generation, LLC ("Interconnection Customer" or "IC") proposal to connect a 1200.9 MW Winter Energy (1115.9 MW Summer Energy and Capacity combined cycle to be located in Will County, IL, consisting of two 1x1 CCGT (single shaft). The IC will be calling the facility "Jackson Generation".

The IC has proposed a service date for this project of June 1, 2022.

Total Costs of Transmission Owner Facilities included in Facilities Study

Upgrade #	Direct Material	Indirect Material	Direct Labor	Indirect Labor	Total
6065			$ 130,156	$ 47,343	$ 177,499
6025	$ 4,744,289	$ 199,231	$14,502,035	$ 5,274,926	$ 24,720,481
5915	$ 9,098,426	$ 382,078	$21,904,108	$ 7,967,335	$ 39,351,947
5916	$9,098,426	$ 382,078	$21,904,108	$ 7,967,335	$ 39,351,947
6058	$ 1,023,258	$ 42,970	$ 2,237,929	$ 814,017	$ 4,118,174
5144	$ 8,961,000	$ 606,381	$20,406,207	$ 8,098,001	$ 38,071,589
5918	$ 14,452,898	$ 376,804	$16,175,107	$ 5,188,313	$ 36,193,122
ComEd	$ 47,378,297	$ 1,989,542	$97,259,650	$ 35,357,270	$ 181,984,759
4058	$ 254,947		$ 1,330,620	$ 27,441	$ 1,613,008
+25%	$ 63,736.75		$ 332,655	$ 6,860.25	$ 403,252
AEP	$ 318,683.75		$ 1,663,275	$ 34,301.25	$ 2,016,260
Total	$ 47,696,980.75	$ 1,989,542	$98,922,925	$ 35,391,571.25	$ 184,001,019

See attached Commonwealth Edison Facilities Study.

For the AEP portion of this report, PJM utilized a previous Facilities Study report for a prior queued request, Z1-070, and applied a 25% escalation/uncertainty factor.

ComEd
An Exelon Company

PJM Generator Interconnection
#AC1-204 TSS 900 Elwood
ComEd Facilities Study Report
TSS 929 Jackson Generation

Revision 3

May 9, 2019

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A. FACILITIES STUDY INTRODUCTION

1. PROJECT DESCRIPTION

The developer, Jackson Generation, LLC, (Interconnection Customer- IC) has proposed the construction and interconnection of TSS 929 Jackson Generation consisting of 1200.9 MW of combined cycle natural gas turbine generators (CCGT). This proposed CCGT generation will be located near the village of Elwood, Will County, Illinois, will interconnect with ComEd transmission system and consist of two (2) single shaft 1x1 CCGT.

The CCGT generation facility will be interconnected to TSS 900 Elwood 345kV substation's blue and red buses via construction of a new IC owned station (TSS 929 Jackson Generation) having two (2) 345kV circuit breakers positioned in a radial configuration with two (2) 345kV line MODs.

The construction of TSS 929 Jackson Generation will result in the expansion of TSS 900 Elwood by adding one (1) 345kV Circuit Breaker on the blue bus. 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 TSS 929 Jackson Generation 345kV. The proposed in-service date is May 1, 2022. The IC has requested an advanced back feed date of May of 2021.ComEd will work with the IC in good faith to accelerate the schedule in an attempt to meet this date.

3. INTERCONNECTION CUSTOMER SCHEDULE TSS 929 JACKSON GENERATION

The below schedule provides estimated days, 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) by	Day 1
Construction complete and ready for testing	Day 1000
Testing complete and Back feed Power available for CCGT (Combined Cycle Gas Turbine) facility	Day 1065
Facility Commercial Operation Date	Day 1065

4. SCOPE OF WORK BY INTERCONNECTION CUSTOMER (IC)

4.1 The IC is responsible for construction of the 1200.9 MW CCGT (Combined Cycle Gas Turbine) facility, which includes the following:

4.1.1 Two (2) Step-up transformers 345kV-23kV (grounded wye/delta).

4.1.2 Two (2) 345kV circuit breakers

4.1.3 Two (2) 345kV 655 MW combined cycle natural gas turbine generators.

4.1.4 Two (2) 345kV lines (L92917 and L92915) terminating at TSS 900 Elwood (distance to be determined).

4.2 The IC will be responsible for cost to purchase real estate and obtain the necessary right-of-way/easements for this project, including for TSS 900 Elwood 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.

5. DESCRIPTION OF FACILITIES INCLUDED IN THE FACILITIES STUDY AT CUSTOMER EXPENSE

5.1 TSS 900 Elwood Substation (N6025)

5.1.1 ComEd will be responsible for performing the design, procurement, and construction to expand 345kV TSS 900 Elwood switchyard and install one 345kV, 3000A circuit breaker, generator attachment facilities and associated equipment.

5.2 ComEd 345kV L11620 Upgrade and TSS 116 Goodings Grove (N5915)

5.2.1 ComEd will be responsible for performing design, procurement and construction to reconductor L11620 from TSS 900 Elwood to TSS 116 Goodings Grove to meet or exceed the required minimum thermal capability of 1205/1479/1628/1768 MVA SN/SLTE/SSTE/ALDR.

5.3 ComEd 345kV L11622 and TSS 116 Goodings Grove (N5916)

5.3.1 ComEd will be responsible for performing design, procurement and construction to reconductor L11622 from TSS 900 Elwood to TSS 116 Goodings Grove to meet or exceed the required minimum thermal capability of 1241/1479/1646/1768 MVA SN/SLTE/SSTE/ALDR.

5.4 ComEd TSS 116 Goodings Grove 345kV BT3-4 Upgrade (N6058)

5.4.1 ComEd will be responsible for performing the design, procurement, and construction to replace the 345kV, 3000A BT3-4 circuit breaker and associated equipment.

5.5 ComEd 345kV L10805 (N5144 and N5918)

5.5.1 ComEd will be responsible for performing design, procurement and construction to reconductor and/or rebuild L10805 from TSS 935 Kendall CO to TSS 108 Lockport to meet or exceed the required minimum thermal capability of 1201/1605/2089.3 SN/SSTE/ALDR. Upgrade (N5144)

5.5.2 ComEd will be responsible for performing design, procurement and construction to increase L10805 from TSS 935 Kendall CO to TSS 108 Lockport post N5144 capabilities to meet or exceed the required minimum thermal capability of 1386/1713/2089.3 SN/SSTE/ALDR. Upgrade (N5918)

5.6 New Transmission Line 345kV L92917 and 345kV L92915 (N6065)

5.6.1 The IC will be responsible for performing the design, and construction to install new line facilities required to connect TSS 929 Jackson Generation to TSS 900 Elwood substation via the new line numbers listed above. ComEd will be responsible for all work up to and including the 345kV dead-ends at TSS 900 Elwood substation.

5.6.2 The 345kV A frame termination structures for AC1-204 Jackson Generation leads are to be positioned such that the locations do not conflict with the future 345kV Red and Blue bus extension at TSS 900 Elwood.

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

NETWORK #	SITE LOCATION	TOTAL PROJECT COST	STUDY SECTION
N6065	**Oversight & Review of Relaying at TSS929 Jackson**	**$177,499**	**A4.1, A5.6, B1.1**
N6025	**TSS900 Elwood Expansion and Attachment Facilities**	**$24,720,481**	**A5.1, B2.1**
N5915	**TSS116 Goodings Grove L11620 Upgrade**	**$39,351,947**	**A5.2, B4.1**
N5916	**TSS116 Goodings Grove L11622 Upgrade**	**$39,351,947**	**A5.3, B4.1**
N6058	**TSS116 Goodings Grove BT3-4 Replacement**	**$4,118,174**	**A5.4, B2.4**
N5144	**345kV L10805 Transmission Upgrade**	**$38,671,589**	**A5.5**
N5918	**345kV L10805 Transmission Additional Upgrades**	**$35,593,122**	**A5.5, B4.2**
	TOTAL COST	**$181,984,759**	

7. SUMMARY OF MILESTONE SCHEDULES FOR COMPLETION OF WORK INCLUDED IN FACILITIES STUDY

Description	Start	Finish
Prepare Project Diagram & Specifications	Day 1	Day 1
Project Design	Day 90	Day 350
Material Procurement	Day 250	Day 810
Construction of Facilities Upgrades	Day 600	Day 1065

The above Milestone Schedule is based on the Interconnection Services Agreement and the Construction Services Agreement (if applicable) to be executed. The schedules are based upon the assumption that the CPCN from the ICC will not be required. The exact Milestone Schedule will be negotiated and determined upon the execution of Construction Services Agreement. The Milestone schedule dates are dependent on the IC design deliverables and are subject to change.

B. TRANSMISSION OWNER (COMED) FACILITIES STUDY RESULTS

1. NEW SUBSTATION / SWITCHYARD FACILITIES

1.1 TSS 929 Jackson Generation (N6065)

IC will design, construct, and test the new substation TSS 929 Jackson Generation having the following equipment (per ComEd Interconnection Guideline):

1.1.1 ComEd Protection and Control Engineering will review all customer relay protection design drawings and relay settings.

1.1.2 Customer equipment impedance and test data must be provided to ComEd Protection and Control Engineering for all lines, transformers, and generators.

1.1.3 A SCADA interface over fiber must be included to provide ComEd with customer BES (Bulk Electric System) equipment status. This will be done through serial protocol between TSS 929 Jackson Generation and TSS 900 Elwood.

1.1.4 The System 1 and System 2 communication system shall be designed per ComEd fiber requirements. The System 1 and System 2 fiber connections from TSS 929 Jackson Generation to TSS 900 Elwood are two different single mode fiber cables that are routed in physically diverse paths. At a minimum, 48 single mode fibers will be required for each cable.

1.1.5 The IC will be responsible for the maintenance of the two single mode fiber paths between TSS 929 Jackson Generation and TSS 900 Elwood, including all terminations in the fiber distribution panels (FDP's). ComEd will own the maintenance for the fiber jumpers from the FDP to the relay panels at TSS 900 Elwood.

1.1.6 Witness testing by ComEd is required.

1.1.7 Protective relaying for 345kV L92917:

- System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber with DTT.
- System 2 Protection: Install SEL-311L relay for Current Differential Scheme over direct fiber with DTT.

1.1.8 Protective relaying for 345kV L92915:

- System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber with DTT.
- System 2 Protection: Install SEL-311L relay for Current Differential Scheme over direct fiber with DTT.

1.1.9 For each 345kV circuit breaker:

- Breaker Failure Protection: Install breaker failure protection and manual close supervision.

1.1.10 For each transformer redundant protection is required.

1.1.11 For any new equipment connected to the Bulk Electric System, rated at 100kV, or above ComEd requires the associated primary and secondary protective schemes to have a minimum redundant; connected CTs, PT secondary control circuits, auxiliary trip relays, and circuit breaker trip coils.

1.1.12 The TSS 929 Jackson Generation switchyard ground grid shall not be tied to the TSS 900 Elwood ground grid through static wire. TSS 929 Jackson Generation switchyard design shall be shared with ComEd for coordination purposes.

2. UPGRADES TO EXISTING SUBSTATION / SWITCHYARD FACILITIES AT CUSTOMER EXPENSE

2.1 TSS 900 Elwood (N6025)

2.1.1 Expand existing switchyard by approximately 1.5 Acres (value dependent on final substation design).

2.1.2 Provide grading and drainage design. Update existing grading and drainage (including cable trough) if required.

2.1.3 Install one (1) 345kV, 3000A, 63kA SF6 gas circuit breaker.

2.1.4 Install four (4) 345kV motor operated disconnect switches (one on both sides of new circuit breaker and one on each new line).

2.1.5 Install six (6) free standing CTs for 345kV L92915 and L92917.

2.1.6 Install six (6) Surge Arresters for 345kV L92915 and L92917.

2.1.7 Install nine (9) 345kV CCVTs.

2.1.8 Install one (1) lot of 345kV bus support structures with associated overhead bus work.

2.1.9 Install Two (2) 345kV dead-end A-frame structures. One for 345kV L92915 and one for L92917.

2.1.10 Install new foundations and structures for all new equipment.

2.1.11 Install new conduit, trough, and grounding for all new equipment. Update existing if required.

2.1.12 Protective relaying for 345kV L92917:

- System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber with DTT.
- System 2 Protection: Install SEL-311L relay for Current Differential Scheme over direct fiber with DTT.

2.1.13 Protective relaying for 345kV L92915:

- System 1 Protection: Install SEL-411L relay for Current Differential Scheme over direct fiber with DTT.
- System 2 Protection: Install SEL-311L relay for Current Differential Scheme over direct fiber with DTT.

2.1.14 Install PDC (Phasor Data Concentrator) cabinet for all new 400 series relays.

2.1.15 Install dual SEL-487 protection for 345kV Bus 5&12. (Bus 5 currently has a MFAC for primary and SEL-251C for secondary protection)

2.1.16 For each 345kV circuit breaker:

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

2.1.17 Modify existing relaying for 345kV L11620, BT 10-11, and BT 8-12 to account for new configuration.

2.1.18 The System 1 and System 2 communication system shall be designed per ComEd fiber requirements. It shall include diverse fiber routes between TSS 900 Elwood and TSS 929 Jackson Generation. One OPBW fiber line for L92915 and one for L92917.

2.1.19 SCADA interface must be included to provide ComEd with customer BES (Bulk Electric System) equipment status.

2.1.20 ComEd shall provide and install metering equipment including 345kV optical CT/PT and bi-directional revenue grade meter, on ComEd side of the Point-of-Interconnection at TSS 900 Elwood substation for 345kV lines L92915 and L92917.

The metering equipment shall be designed to measure both wholesale energy (high KWH and KVARH readings) and retail energy (low KWH and KVARH readings) and meet metering requirements stated in 'ComEd Interconnection Guidelines for Generators Greater than 20MW'.

ComEd will own and maintain the metering equipment. The metering equipment shall provide the following data:

- Instantaneous net KW and KVAR values TO and FROM the generator.
- Instantaneous Voltage value and circuit breaker status.
- Hourly compensated KWH and KVARH values TO and FROM the generator.

The metering equipment shall be capable to transmit the real-time data to ComEd and the PJM via a SCADA RTU. The metering equipment shall comply with PJM Manuals M-01 & M-14D, and PJM tariff.

2.1.21 The security system will need to be upgraded to meet ComEd standards.

2.2 TSS 116 Goodings Grove (N6058)

2.2.1 Replace existing 2000A BT3-4 oil circuit breaker with one (1) 345kV, 3000A, 63kA SF6 gas circuit breaker.

2.2.2 Install two (2) 345kV, motor operators on existing 3000A disconnect switches (on both sides of new circuit breaker).

2.2.3 Install three (3) 345kV CCVTs on 345kV Bus 4.

2.2.4 Install new foundations and structures for all new equipment.

2.2.5 Install new conduit and grounding for all new equipment.

2.2.6 Install new conduit to all 345kV circuit breakers on 345kV Bus 3 and 4.

2.2.7 Install trough, conduit, and cable as required.

2.2.8 For the 345kV circuit breaker:

- Breaker Failure Protection: Install breaker failure protection, manual close supervision, and auto reclose function in new relay panel.

2.2.9 Install dual SEL-487 protection for 345kV Bus 3 in new relay panel to meet current ComEd bus protection standard. (Bus 3 currently has a MFAC for primary and SEL-2PG10 for secondary protection). This may require replacement of CT leads as necessary.

2.2.10 Install dual SEL-487 protection for 345kV Bus 4 in new relay panel to meet current ComEd bus protection standard. (Bus 4 currently has a MFAC for primary and SEL-487 for secondary protection). This may require replacement of CT leads as necessary.

2.2.11 Upgrade relaying to include gas tripping to breaker failure relay and breaker monitoring.

2.2.12 Modify existing station schematic/wiring drawings to incorporate the circuit breaker replacement.

2.2.13 Connect new equipment to station SCADA and communications equipment.

3. TRANMISSION LINES - NEW

3.1 IC will design and construct and own 345kV L92917 and 345kV L92915 up to new dead-end structures at TSS 900 Elwood. For the purpose of coordination, the IC will provide design drawings of their proposed generator lead lines, 345kV L92915 & L92917, to ComEd for review prior to construction.

4. TRANSMISSION LINES - UPGRADES

4.1 ComEd 345kV L11620 & 11622 (N5915 & N5916)

4.1.1 ComEd will perform the design and construction to reconductor L11620 & 11622 from TSS 900 Elwood to TSS 116 Goodings Grove.

4.1.2 Reconductoring these lines on the existing structures was evaluated with various conductor types. Due to clearance issues, replacement of some existing towers is required. See 4.1.4 for a list of the new structures required.

4.1.3 The new conductor type will be 2156 kcmil ACSR (84/19) Str Bluebird. Approximately 18.1 circuit miles are to be replaced for each circuit. The existing 3#5 Alumoweld static wire will be replaced with 7#8 Alumoweld static wire.

4.1.4 Below is a list of proposed structure types, heights, and quantities required for the rebuild portion of the project.

Structure Description	Structure Height (ft)	Quantity
New Double Circuit 345 kV DE	135	1
New Double Circuit 345 kV DE	140	1
New Double Circuit 345 kV DE	145	1
New Double Circuit 345 kV DE	150	1
New Double Circuit 345 kV DE	155	2
New Double Circuit 345 kV DE	160	2
New Double Circuit 345 kV Susp	145	4
New Double Circuit 345 kV Susp	150	3
New Double Circuit 345 kV Susp	155	7
New Double Circuit 345 kV Susp	160	3
New Double Circuit 345 kV Susp	165	6
New Double Circuit 345 kV Susp	170	8
New Double Circuit 345 kV Susp	175	2
New Double Circuit 345 kV Susp	190	1
Total		**42**

4.1.5 The following structure modifications are required for the 345kV L11620 & 11622 reconductor work.

Structure #	Existing Structure Type	Comments
All	Existing AD Towers	Minor tower reinforcements anticipated on all 'AD' type towers not requiring replacement. There are 42 towers total.
113 & 114	Existing HD Towers	Minor tower reinforcements anticipated on all 'HD' type towers not requiring replacement.

4.1.6 The following structure modifications are required for the 345kV L11620 & 11622 reconductor work.

Structure #	Comments
86-87	Distribution clearance margin 10.1 feet. Distribution to be relocated.
126-127	Distribution clearance margin 7.3 feet. Distribution to be relocated.

4.2 ComEd 345 kV L10805 (N5144)

4.2.1 ComEd will perform the design and construction to reconductor L10805 from TSS 935 Kendall Co. E.C. to TSS 108 Lockport.

4.2.2 The new conductor type will be 2156 kcmil ACSR (84/19) Str Bluebird. Approximately 16.1 circuit miles are to be replaced.

4.3 ComEd 345 kV L10805 additional capability requirement (N5918)

4.3.1 The ComEd specification states the static wire shall be replaced with OPGW if the line is reconductored for this work. Per the existing loading drawings, these towers are not capable of this additional load created by ComEd's standard OPGW. This study assumes an alternate fiber route utilizing ADSS on wood poles within the existing right-of-way. ComEd will perform the design and construction to reconductor L10805 from TSS 935 Kendall Co. E.C. to TSS 108 Lockport.

4.3.2 The new conductor type will be 2x1113 kcmil ACSR (45/7) T2 Bluejay. Approximately 16.1 circuit miles are to be replaced.

4.3.3 The ComEd specification states the static wire shall be replaced with OPGW. ComEd's standard OPGW will be used and terminated on the deadend structures at Kendall and Lockport.

4.3.4 The following structure replacements are required for the 345kV L10805 reconductor work.

Structure Description	Structure Height (ft)	Quantity
New Double Circuit 345kV DE	55	1
New Double Circuit 345kV DE	125	1
New Double Circuit 345kV DE	135	5
New Double Circuit 345kV DE	140	4
New Double Circuit 345kV DE	145	1
New Double Circuit 345kV DE	150	1
New Double Circuit 345kV DE	195	1
New Double Circuit 345kV DE	215	2
New Double Circuit 345kV Susp	125	1
New Double Circuit 345kV Susp	130	4
New Double Circuit 345kV Susp	135	11
New Double Circuit 345kV Susp	140	32
New Double Circuit 345kV Susp	145	13

New Double Circuit 345kV Susp	150	7
New Double Circuit 345kV Susp	160	2
New Double Circuit 345kV Susp	165	6
Total Structures:		**92**

NOTE: The Section B4.3 scope of work above replaces (and is not in addition) that in Section B4.2 and is required due to the increase loading associated with AC1-204 over the proposed mitigation of Network Upgrade No. 5144. Both scopes of work are shown to facilitate PJM allocation rules. The cost estimate in the tables reflect ONLY the additional cost of N5918 over the cost estimate of N5144.

4.4 TSS 108 Lockport (N5918)

4.4.1 Replace conductor from 345kV L10805 dead-end to line switch.

4.4.2 Installation of OPGW splice enclosure on L10805 deadend.

4.5 TSS 935 Kendall County (N5918)

4.5.1 Replace conductor from 345kV L10805 dead-end to line switch.

4.5.2 Installation of OPGW splice enclosure on L10805 deadend.

5. METERING

5.1 For PJM:

ComEd at IC expense will 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 Elwood TSS 900. See PJM Manuals M-01 & M-14D, and PJM tariff.

5.2 For ComEd:

ComEd at IC expense will install and own 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 Elwood TSS 900. See ComEd applicable standards available on the PJM website (TO Standards). Optical metering will be installed. Optical 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.

5.3 For ComEd:

ComEd at IC cost will procure, install, own and maintain two sets of AMI meter including 345kV optical CT/PT at ComEd side of POI at Elwood TSS 900 for retail metering.

6. ENVIRONMENTAL, REAL ESTATE, AND PERMITING

6.1 ComEd will be responsible to obtain all environmental approvals and permitting required for the expansion of 345kV TSS 900 Elwood. In addition, ComEd will be responsible for all environmental approvals and permitting required for L10805, L11622 & L11620 upgrades. This includes any endangered species studies and monitoring, as required. Costs associated with this permitting are at the expense of the IC.

6.2 ComEd will be responsible for site restoration required for substation and transmission upgrades. This includes, but is not limited to road restoration/improvements, wetland restoration, and farm field restoration/crop damage. Costs associated with this are at the expense of the IC.

6.3 The IC will be responsible for the cost to purchase real estate or obtain the necessary right-of-way easement for all upgrades associated with this project. These associated upgrades are not included in the costs listed in this study.

6.4 IC will be responsible for remediation costs for locations found to have environmental contaminations and remediation. This may require contaminated soil disposal as well as lead paint removal for existing structure work.

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

6.6 It is assumed that conveyance of property and rights will be obtained to support the PJM Transmission Outage Schedule.

6.7 It is assumed that the required Environmental Study will yield no impediments to the development of the site.

7. SUMMARY OF RESULTS OF STUDY

7.1 Cost Estimate

NETWORK #	SITE LOCATION	TOTAL PROJECT COST	STUDY SECTION
N6065	**Oversight & Review of Relaying at TSS929 Jackson**	**$177,499**	**A4.1, A5.6, B1.1**
N6025	**TSS900 Elwood Expansion and Attachment Facilities**	**$24,720,481**	**A5.1, B2.1**
N5915	**TSS116 Goodings Grove L11620 Upgrade**	**$39,351,947**	**A5.2, B4.1**
N5916	**TSS116 Goodings Grove L11622 Upgrade**	**$39,351,947**	**A5.3, B4.1**
N6058	**TSS116 Goodings Grove BT3-4 Replacement**	**$4,118,174**	**A5.4, B2.4**
N5144	**345kV L10805 Transmission Upgrade**	**$38,071,589**	**A5.5**
N5918	**345kV L10805 Transmission Additional Upgrades**	**$36,193,122**	**A5.5, B4.2**
	TOTAL COST	**$181,984,759**	

7.2 Milestone Schedule

Description	Start	Finish
Prepare Project Diagram & Specifications	Day 1	Day 1
Project Design	Day 90	Day 350
Material Procurement	Day 250	Day 810
Construction of Facilities Upgrades	Day 600	Day 1065

8. ASSUMPTIONS IN DEVELOPING COSTS AND SCHEDULES

8.1 ComEd estimate does not include costs of design and construction of TSS 929 Jackson Generation substation as described in IC scope of work. ComEd estimated schedule is based on ISA/CSA contract being executed by all parties.

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

8.3 ComEd cost estimate is valid for one (1) year after Facilities Study release by PJM.

8.4 Transmission line outages for construction have not been identified, but generally are available in spring (March to May) and fall (September to November). These outages are controlled by PJM.

8.5 A CPCN from the ICC will not be required for installation of ComEd interconnection to TSS 900 Elwood.

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

8.7 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.

8.8 Formal submittal of this request to ComEd's TSO for ultimate review by PJM can be made 7 months prior to back feed request date.

8.9 This study assumes that there will be no additional right-of-way and/or easement work required.

8.10 This Facility Study is time dependent. If the project is not into construction within one year of the issuance, the FS will be void and the project re-studied, requiring completion of a new FS.

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

8.12 Upgrades are subject to change based on detailed design development.

8.13 It is assumed that ComEd facilities included in this document will not require a sound study or flood mitigation.

8.14 ComEd will complete pre-design and post construction survey for the transmission and substation upgrades, as required. This includes, but is not limited to, the LIDAR survey and video imaging for transmission lines. Costs associated with this are at the expense of the IC.

8.15 ComEd will complete geotechnical soil borings, resistivity study, and analysis for substation and transmission upgrades. Costs associated with this are at the expense of the IC.

8.16 This study is based on the 'System Impact Study Report for PJM Generation Interconnection Request Queue Position AC1-204 Elwood' dated April 22, 2019.

8.17 It was assumed the required transmission conductor rating for 345kV L10805 is listed on page 13, section 1 of the impact study. This minimum rating is stated in this report in section A item 5.7.

9. INFORMATION REQUIRED FOR INTERCONNECTION SERVICE AGREEMENT (ISA)

9.1 The following cost estimate is a breakdown of the costs of the ComEd work for # AC1-204 project.

Network Number	Site Location	Direct Material	Indirect Material	Direct Labor	Indirect Labor	Total Project Cost
N6065	**Oversight & Review of Relaying at TSS929 Jackson**	**$0**	**$0**	**$130,156**	**$47,343**	**$177,499**
N6025	**TSS900 Elwood Expansion and Attachment Facilities**	**$4,744,289**	**$199,231**	**$14,502,035**	**$5,274,926**	**$24,720,481**
N5915	**TSS116 Goodings Grove 345kV L11620 Upgrade**	**$9,098,426**	**$382,078**	**$21,904,108**	**$7,967,335**	**$39,351,947**
N5916	**TSS116 Goodings Grove 345kV L11622 Upgrade**	**$9,098,426**	**$382,078**	**$21,904,108**	**$7,967,335**	**$39,351,947**
N6058	**TSS116 Goodings Grove BT3-4 Replacement**	**$1,023,258**	**$42,970**	**$2,237,929**	**$814,017**	**$4,118,174**
N5144	**345kV L10805 Transmission Upgrade**	**$8,961,000**	**$606,381**	**$20,406,207**	**$8,098,001**	**$38,071,589**
N5918	**345kC L10805 Transmission Additional Upgrades**	**$14,452,898**	**$376,804**	**$16,175,107**	**$5,188,313**	**$36,193,122**
	Total Cost	**$47,378,297**	**$1,989,542**	**$97,259,650**	**$35,357,270**	**$181,984,759**

Note:

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

[2] Carrying charges are anticipated to be zero.

APPENDIX

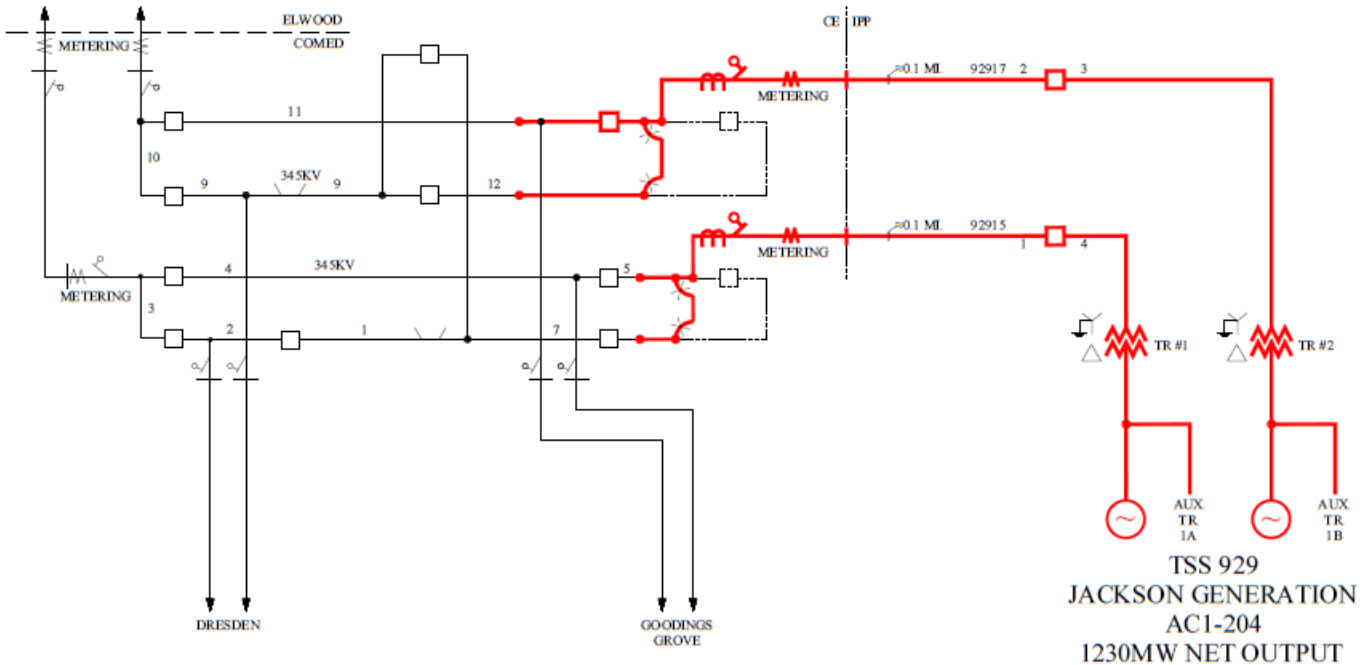
Attachment #1: High Level Planning Diagram Depicting Interconnection Facilities and Points of Ownership/Demarcation

Attachment #2 TSS 900 Elwood general arrangement

Attachment #3: Real Estate Requirements

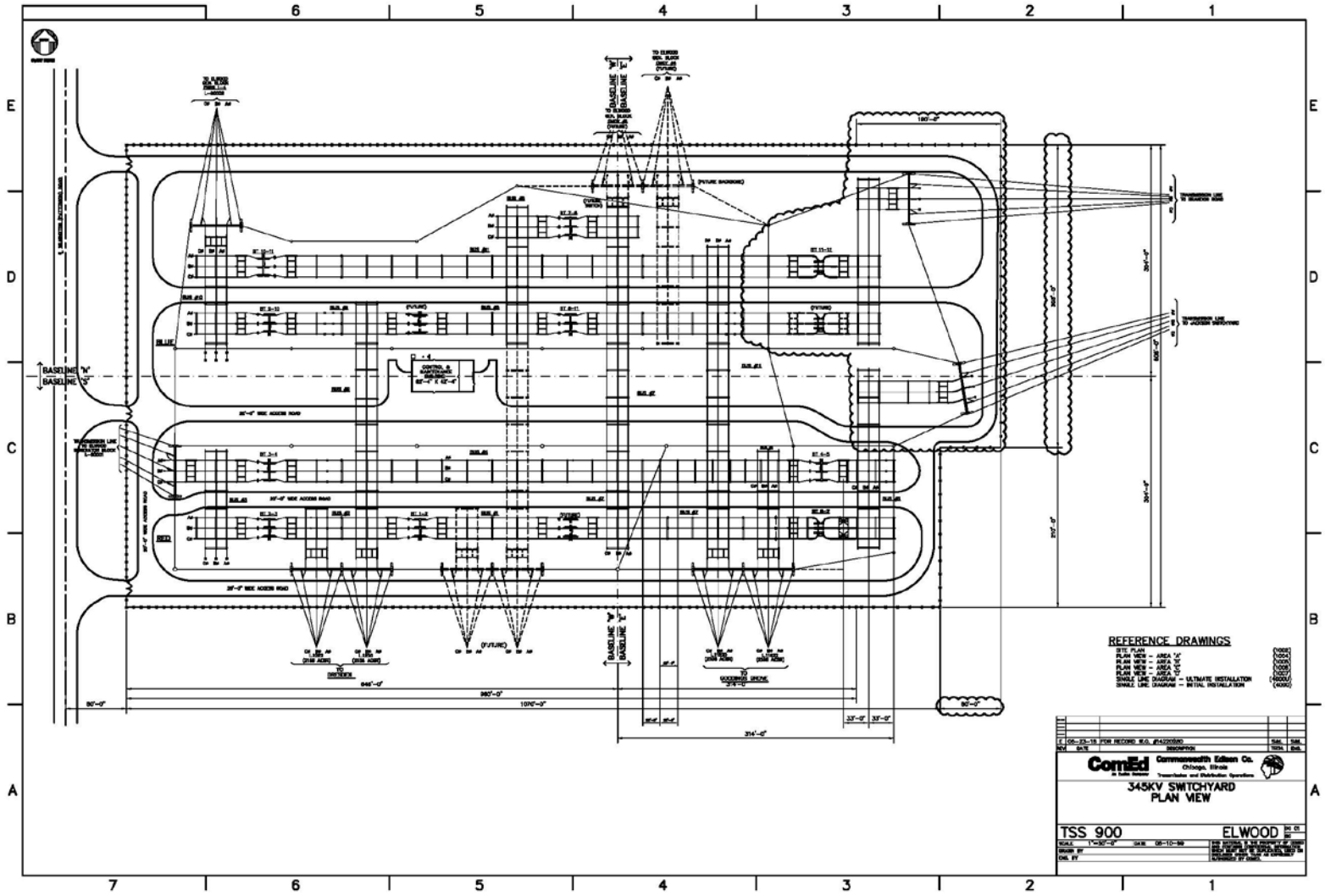
Attachment #1

TSS 900
ELWOOD ENERGY
CENTER



TSS 929
JACKSON GENERATION
AC1-204
1230MW NET OUTPUT

Attachment #2 TSS 900 Elwood General Arrangement



Attachment #3 Real Estate Requirements (IC)

It is the IC's responsibility to purchase property, acquire rights, and obtain any required permits for the transmission, distribution, and or communication lines required to interconnect its generation. In addition, the IC will grant to COMED such rights and interests as may be reasonably necessary to interconnect the generation facilities and associated network upgrades to the COMED system. Real estate transactions will be determined by the type of interconnection configuration employed, which may include:

Conveyance of fee simple ownership to COMED for a switchyard.

Conveyance of perpetual easements (exclusive and nonexclusive) associated with the switchyard including, but not limited to, access, drainage, and such overhead and underground facilities as COMED may reasonably require for the construction, use, maintenance, and operation of the switchyard.

Conveyance and or acquisition of perpetual easements (exclusive and nonexclusive) and or other property rights for all purposes of interconnecting the generation facilities and associated network upgrades with the COMED transmission, distribution and communication systems, including such overhead and underground electrical and related communications, transmission and distribution facilities.

In each of the three transaction scenarios outlined above, or any combination thereof, the IC will be responsible for executing and delivering all documentation requested by ComEd, which may include deeds, easements, purchase agreements, assignments, affidavits, certifications, statements and releases, and for providing a title policy, with the appropriate endorsements, covering the rights and interests conveyed.

ComEd will grant to the IC, subject to engineering review and approval, easement rights or consents, as applicable, for:

Perpendicular crossings of ComEd transmission / distribution right of way to accommodate facilities such as roadways and various utilities.

ComEd Scope

ComEd will provide the following:

Real estate forms of agreement, which incorporate terms and conditions that reflect ComEd's standard business practices.

Engineering review of proposed IC facilities that involve real estate and/or right of way in which ComEd has an interest.

IC Scope

It is imperative, when the IC is required by the scope of a project to provide information, that the deliverables itemized below be received by COMED as soon as possible. This will facilitate a timely review and will allow COMED to address the real estate aspects of the project in a timely manner.

The IC is responsible for providing the following:

The following current information covering all interests and rights to be conveyed to COMED:

- Title Policy/Commitment.
- Copies of all recorded documents listed in above-mentioned Title Policy/Commitment.
- ALTA/ACSM Land Title Survey, which will include adjoining Exelon property, if applicable.
- Phase I Environmental Assessment Report (Phase 2 also if there is a fee conveyance to COMED) and any other environmental reports, notifications and documents as required. IC to utilize only contractors approved by ComEd Environmental department for this work.
- Wetland Delineation reports. IC to utilize only contractors approved by ComEd Environmental department for this work
- Annexation Agreement(s), zoning changes or other governmental agreements or approvals entered into or proposed for the Project.
- All jurisdictional permits, such as special use and building permits, that have been issued for the project or copies of pending applications that relate to or affect property in which COMED has or will have a right or interest.
- Detailed civil engineering drawings showing the proposed site plan, layout, drainage, access and facilities.

Additional information may also be required, depending on specific project requirements. Requests for such information will be transmitted to the IC during project development.

Excerpts from
Facilities Study Report

For

PJM Transmission Service Request
Queue Position Z1-070

April 2016

C. AEP Facilities Study Summary

5. Description of Transmission Owner Facilities Included in the Facilities Study

Network Upgrade Work

1. To relieve the Stillwell - Dumont 345 kV line overload: A sag check will be required on the Stillwell – Dumont 345 kV line to determine if the line section can be operated above its emergency rating of 1409 MVA. The result could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 8.57 mile section of line would need to be rebuilt. This is an AEP-NIPSCO tie line therefore; PJM is going to have to coordinate this upgrade with NIPSCO.

D. AEP Facilities Study Results

2. Transmission Line – Upgrades

Description	Estimated Cost
Stillwell - Dumont 345 kV line work will include the replacement of tower 20 with a custom steel pole, replacement of tower 24 with a custom H-frame and the removal of swing angle brackets on 2 structures.	$1,613,008

6. Environmental, Real Estate and Permitting Issues

Any siting, surveying, or additional permitting required will be funded by the Interconnection Customer

7. Summary of Results of Study

Cost Estimates for AEP

	Engineering	Material	Construction	Misc.	Total
Stillwell – Dumont 345 kV	$255,963	$254,947	$1,074,657	$27,441	$1,613,008

Assumptions

System conditions allow scheduled outages to occur.