Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-011

SCHAUFF ROAD

11.2 MW Capacity / 30 MW Energy

January, 2020

1 General

The Interconnection Customer (IC) has proposed a Storage generating facility located in Bureau County, Illinois. The installed facilities will have a total capability of 30 MW with 11.2 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 30, 2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF1-011
Project Name	SCHAUFF ROAD
State	Illinois
County	Bureau
Transmission Owner	ComEd
MFO	30
MWE	30
MWC	11.2
Fuel	Storage
Basecase Study Year	2023

1.1 Point of Interconnection

Queue Position AF1-011, a 30 MW storage facility proposes to interconnect with the ComEd transmission system by tying to TSS 977 and interconnected to TSS 187 Schauff Road).

1.2 Cost Summary

AF1-011 will be responsible for the following costs associated with the physical interconnection of the project:

Description	Total Cost
Attachment Facilities	$200,00
Direct Connection Network Upgrade	$0
Non Direct Connection Network Upgrades	$0
Total Costs	**$200,000**

In addition, the AF1-011 project may be responsible for a contribution to the following costs associated with network upgrades:

Description	Total Cost
System Upgrades	$**4,600,000**

Cost allocations for these upgrades will be provided in the System Impact Study Report.

2 Transmission Owner Scope of Work

Attachment Facilities

To accommodate interconnection of AF1-011; the relaying, SCADA, Communication and metering between TSS 977 and TSS 187 would be reviewed and upgraded if needed.

Direct Connection Network Upgrades

None

Non-Direct Connection Network Upgrades

None

3 Attachment Facilities

The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
SCADA, Communication, relays and metering	$200,000
Total Attachment Facility Costs	**$200,000**

4 Direct Connection Cost Estimate

The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Total Direct Connection Facility Costs	**$ 0**

5 Non-Direct Connection Cost Estimate

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Total Non-Direct Connection Facility Costs	**$0**

6 Schedule

ComEd would take approximately 18-months to review and possibly upgrade the relaying, SCADA, Communication and metering after the ISA / ICSA are signed.

7 Transmission Owner Analysis

See Section 3.

8 Interconnection Customer Requirements

ComEd interconnection requirements can be found at https://www.pjm.com/planning/design-engineering/to-tech-standards/private-comed.aspx

To the extent that these Applicable Technical Requirements and Standards may conflict with the terms and conditions of the Tariff, the Tariff shall control.

ComEd distribution line drops to move customer cranes and heavy equipment is not part of PJM process. The customer should directly contact ComEd New Business Group to arrange for line drops, if needed.

9 Revenue Metering and SCADA Requirements

The Interconnection Customer 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 PJM Tariff Section 8 of Attachment O.

10 Network Impacts

The Queue Project AF1-011 was evaluated as a 30.0 MW (Capacity 11.2 MW) injection at the O29 34.5 kV substation in the ComEd area. Project AF1-011 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-011 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

11 Generation Deliverability

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

None

12 Multiple Facility Contingency

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

None

13 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)

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
1233808	272285	POWERTON ;RT	CE	349600	4TOWERLINE	AMIL	1	COMED_P2-2_074_KE-138___1	bus	214.0	128.28	128.74	DC	2.19
1234150	272285	POWERTON ;RT	CE	349600	4TOWERLINE	AMIL	1	COMED_P4_074-38-L7413__	breaker	214.0	128.28	128.74	DC	2.19

14 Potential Congestion due to Local Energy Deliverability

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.

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
1234999	271835	KEWANEE ;23	CE	348962	4KEEMIN	AMIL	1	271838	operation	223.0	105.24	106.77	DC	3.42
1234659	271836	KEWANEE ;11	CE	271837	KEWANEE ;12	CE	1	COMED_P2-1_981-L98105___B	operation	246.0	76.99	78.46	DC	3.61
1235059	271836	KEWANEE ;11	CE	271018	ANNAWAN; R	CE	1	COMED_P1-2_138-L7411__R-S	operation	214.0	83.59	85.93	DC	5.0
1234841	272367	ROCK FALL; R	CE	272095	NELSON ; R	CE	1	COMED_P1-2_138-L15518GB-R-A	operation	223.0	115.02	120.77	DC	12.81
1234799	272505	SCHUAFF R;	CE	272367	ROCK FALL; R	CE	1	COMED_P2-1_187-L15508__	operation	214.0	125.89	130.63	DC	10.14

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
1233808, 1234150	1	POWERTON ;RT 138.0 kV - 4TOWERLINE 138.0 kV Ckt 1	CE_NUN_1404 (88) : ComEd 138kV L1404 (former L1352) SSTE rating is 202 MVA. The upgrade will be to re-conductor the line, replace the line trap and replace station conductor. A preliminary estimate for the upgrade is $6.4M with an estimated construction timeline of 24-30 months. Upon completion of the upgrade the ratings will be 302/332/402/482 MVA (SN/SLTE/SSTE/SLD/ALDR). Project Type : FAC Cost : $4,600,000 Time Estimate : 24-30 Months	$4,600,000
			TOTAL COST	$4,600,000

16 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

16.1 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
1234150	272285	POWERTON ;RT	CE	349600	4TOWERLINE	AMIL	1	COMED_P4_074-38-L7413__	breaker	214.0	128.28	128.74	DC	2.19

Bus #	Bus	MW Impact
274848	CAMPGROVE;RU	1.86
274877	BISHOP HL;1U	0.97
274878	BISHOP HL;2U	0.97
293516	O-009 E1	5.98
293517	O-009 E2	3.04
293518	O-009 E3	3.35
293715	O-029 E	6.39
293716	O-029 E	3.51
293717	O-029 E	3.22
293771	O-035 E	4.04

Bus #	Bus	MW Impact
294401	BSHIL;1U E	27.68
294410	BSHIL;2U E	27.68
919621	AA2-039 C	6.75
919622	AA2-039 E	45.16
926821	AC1-168 C O1	0.84
926822	AC1-168 E O1	5.63
926841	AC1-171 C O1	8.4
926842	AC1-171 E O1	56.14
927201	AC1-214 C O1	1.3
927202	AC1-214 E O1	4.12
934051	AD1-031 C O1	9.19
934052	AD1-031 E O1	15.0
943391	AF1-010 C	1.31
943392	AF1-010 E	0.87
943401	AF1-011 C	0.82
943402	AF1-011 E	1.37
946541	AF1-318 C O1	3.6
946542	AF1-318 E O1	16.86
953201	J715 C	1.05
953202	J715 E	5.66
990901	L-005 E	53.4
BLUEG	BLUEG	0.26
CALDERWOOD	CALDERWOOD	0.06
CATAWBA	CATAWBA	0.04
CBM-W1	CBM-W1	4.33
CHEOAH	CHEOAH	0.06
COFFEEN	COFFEEN	0.28
DUCKCREEK	DUCKCREEK	1.68
EDWARDS	EDWARDS	1.07
G-007	G-007	0.1
GIBSON	GIBSON	0.11
MADISON	MADISON	0.8
MEC	MEC	0.7
NEWTON	NEWTON	0.37
NY	NY	0.05
O-066	O-066	0.62
PRAIRIE	PRAIRIE	0.73
TILTON	TILTON	0.25
TRIMBLE	TRIMBLE	0.08
WEC	WEC	0.22

Affected Systems

17 Affected Systems

17.1 LG&E

LG&E Impacts to be determined during later study phases (as applicable).

17.2 MISO

MISO Impacts to be determined during later study phases (as applicable).

17.3 TVA

TVA Impacts to be determined during later study phases (as applicable).

17.4 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

17.5 NYISO

NYISO Impacts to be determined during later study phases (as applicable).

Contingency Name	Contingency Definition
COMED_P2-2_001_LA-138B__1	CONTINGENCY 'COMED_P2-2_001_LA-138B__1' DISCONNECT BUS 271908 / LASCO STA; B 138 END
COMED_P4_074-38-L7413__	CONTINGENCY 'COMED_P4_074-38-L7413__' TRIP BRANCH FROM BUS 271836 TO BUS 271241 CKT 1 / KEWAN; 1 138 CRESC; R 138 DISCONNECT BUS 271836 / KEWAN; 1 138 DISCONNECT BUS 271837 / KEWAN; 5 138 DISCONNECT BUS 271838 / KEWAN; 4 138 END
COMED_P2-1_187-L15508__	CONTINGENCY 'COMED_P2-1_187-L15508__' TRIP BRANCH FROM BUS 272505 TO BUS 272097 CKT 1 / SCHAUFF ; 138 NELSO;RT 138 END
COMED_P1-2_138-L15518GB-R-A	CONTINGENCY 'COMED_P1-2_138-L15518GB-R-A' TRIP BRANCH FROM BUS 272094 TO BUS 272366 CKT 1 / NELSO; B 138 R FAL; B 138 TRIP BRANCH FROM BUS 272366 TO BUS 272512 CKT 1 / R FAL; B 138 H71 ;BT 138 TRIP BRANCH FROM BUS 272512 TO BUS 937530 CKT 1 / H71 ;BT 138 AD2-214 TAP 138 TRIP BRANCH FROM BUS 272512 TO BUS 272514 CKT 1 / H71 ;BT 138 H71 ; B 138 MOVE 100 PERCENT LOAD FROM BUS 272514 TO BUS 272515 / H71 ; B 138 H71 ; R 138 CLOSE LINE FROM BUS 272366 TO BUS 272367 CKT 1 / R FAL; B 138 R FAL; R 138 END
271838	CONTINGENCY '271838' OPEN BRANCH FROM BUS 271838 TO BUS 271845 CKT 1 END

Contingency Name	Contingency Definition
COMED_P2-2_074_KE-138___1	CONTINGENCY 'COMED_P2-2_074_KE-138___1' DISCONNECT BUS 271836 / KEWAN; 1 138 DISCONNECT BUS 271837 / KEWAN; 5 138 DISCONNECT BUS 271838 / KEWAN; 4 138 END
Base Case	

Short Circuit

18 Short Circuit

The following Breakers are overdutied:

None