Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-252

KINCAID-PANA

62.4 MW Capacity / 62.4 MW Energy

January, 2020

1 General

The Interconnection Customer (IC) has proposed a storage generating facility located in Christian County, Illinois. The installed facilities will have a capability of 62.4 MW with 62.4 of new request MW of this output being recognized by PJM as capacity. Note that this project is an increase to the Interconnection Customer's prior queue project which will share the same property and connection point. The conduct of light load analysis as required under the PJM planning process is not performed during the Generation Interconnection Feasibility Study phase of the PJM study process. Additional reinforcement requirements for this Interconnection Request may be defined during the conduct of the light load analysis which shall be performed following execution of the System Impact Study Agreement. The IC requested a both a Primary and Secondary Point of Interconnection be evaluated for the AF1-252 project.

Queue Number	AF1-252
Project Name	KINCAID-PANA
State	Illinois
County	Christian
Transmission Owner	ComEd
MFO	262.4
MWE	62.4
MWC	62.4
Fuel	Storage
Basecase Study Year	2023

1.1 Primary Point of Interconnection

Queue Position AF1-252, a 64.2 MW storage facility, proposes to interconnect with the ComEd transmission system by utilizing the same attachment facilities and Point of Interconnection as the IC's prior queue which is a tap of the Kincaid to Pana 345 kV line (20.80 miles from Kincaid).

1.2 Cost Summary

AF1-252 will be responsible for the following costs associated with the physical interconnection of the project:

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

In addition, the AF1-252 project may be responsible for a contribution to the following costs associated with network upgrades (See Section 16):

Description	Total Cost

Description	Total Cost
System Upgrades	$0

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

Transmission Owner Scope of Work

Attachment Facilities

Addition of a 64.2 MW storage facility will require review and possible upgrade of SCADA, Communication, relays and metering.

Direct Connection Network Upgrades

None.

Non-Direct Connection Network Upgrades

None

2 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
Addition of a 64.2 MW storage facility will require review and possible upgrade of SCADA, Communication, relays and metering.	$200,000
Total Attachment Facility Costs	**$200,000**

3 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**

4 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**

5 Schedule

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

6 Transmission Owner Analysis

See Section 3

7 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.

8 Revenue Metering and SCADA Requirements

PJM 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.

9 Network Impacts

The Queue Project AF1-252 was evaluated as a 62.4 MW (Capacity 62.4 MW) injection tapping the Kincaid to Pana 345 kV line (20.80 miles from Kincaid) in the ComEd area. Project AF1-252 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-252 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

10 Generation Deliverability

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

None

11 Multiple Facility Contingency

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

None

12 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

13 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	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
75671505	270796	KINCAID ; B	345.0	CE	347955	7AUSTIN	345.0	AMIL	1	COMED_P1-2_SPS-2105&U1___D	operation	956.0	140.47	143.62	DC	30.09
75671462	347955	7AUSTIN	345.0	AMIL	270796	KINCAID ; B	345.0	CE	1	COMED_P1-2_SPS-2105&U1___A	operation	956.0	158.62	159.99	DC	13.09

14 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
None			TOTAL COST	$0

15 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.

15.1 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
75670825	347955	7AUSTIN	AMIL	270796	KINCAID ; B	CE	1	COMED_P4_021-45-BT6-8__	breaker	956.0	158.68	160.05	DC	13.09

Bus #	Bus	MW Impact
276153	W2-048 E	-3.1287
909052	X2-022 E	-45.2458
936771	AD2-100 C	26.4373
936772	AD2-100 E	17.6249
936971	AD2-131 C	1.7415
936972	AD2-131 E	8.7495
941732	AE2-173 BAT	6.6460
942481	AE2-261 C	37.6417
942482	AE2-261 E	25.0945
944221	AF1-090 C O1	7.3857
944222	AF1-090 E O1	34.5783
945871	AF1-252 O1	13.0928
945881	AF1-253 O1	9.0642
951631	J456 C	1.8184
951632	J456 E	9.8381
951821	J541 C	3.7009
951822	J541 E	20.0231
952231	J598 C	2.7757
952232	J598 E	15.0173
952251	J641	22.6828
952271	J644	24.5036
952871	J757 C	12.8999
952872	J757 E	69.7917

Bus #	Bus	MW Impact
953371	J808	5.8727
953401	J811	10.8217
953641	J813	14.6100
953651	J815	55.0500
953671	J817	9.5743
953881	J848 C	7.3289
953882	J848 E	39.6511
953951	J859	20.2209
954411	J912	16.1920
954821	J955	415.3344
954831	J956	15.7400
954921	J966 C	4.4204
954922	J966 E	23.9156
955001	J976	20.9040
955031	J979 C	5.8631
955032	J979 E	31.7209
955041	J980 C	5.8631
955042	J980 E	31.7209
955101	J987	6.8060
955161	J994	6.3120
955171	J995	22.2760
955431	J1025 C	3.8105
955432	J1025 E	20.6155
955441	J1026 C	5.3265
955442	J1026 E	28.8175
955551	J1039	3.4840
956071	J1094	9.0120
956341	J1123 C	1.8416
956342	J1123 E	9.9634
956431	J1135	2.8105
956501	J1145	15.8975
956791	J1177 C	2.7757
956792	J1177 E	15.0173
956841	J1182	17.7100
LGEE	LGEE	0.7747
CPLE	CPLE	1.1226
G-007A	G-007A	1.7765
VFT	VFT	4.7665
CBM-W2	CBM-W2	36.1425
CBM-W1	CBM-W1	14.4115
TVA	TVA	5.2990
CBM-S2	CBM-S2	11.4733
EDWARDS	EDWARDS	0.0032
CBM-S1	CBM-S1	28.4057
TILTON	TILTON	2.0065
MADISON	MADISON	5.4815
MEC	MEC	7.6653

Affected Systems

16 Affected Systems

16.1 LG&E

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

16.2 MISO

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

16.3 TVA

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

16.4 Duke Energy Progress

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

16.5 NYISO

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

Contingency Name	Contingency Definition
COMED_P1-2_SPS-2105&U1___A	CONTINGENCY 'COMED_P1-2_SPS-2105&U1___A' TRIP BRANCH FROM BUS 270797 TO BUS 942480 CKT 1 / KINCA; R 345 AE2-261 TAP 345 REMOVE UNIT 1 FROM BUS 274650 / KINCA;1U 20 END
COMED_P1-2_SPS-2105&U1___D	CONTINGENCY 'COMED_P1-2_SPS-2105&U1___D' TRIP BRANCH FROM BUS 944220 TO BUS 347945 CKT 1 / AF1-090 TAP 345 7PANA 345 TRIP BRANCH FROM BUS 347945 TO BUS 346895 CKT 1 / 7PANA 345 7COFFEEN 345 END
COMED_P4_021-45-BT6-8__	CONTINGENCY 'COMED_P4_021-45-BT6-8__' TRIP BRANCH FROM BUS 270797 TO BUS 942480 CKT 1 / KINCAID ; R 345 AE2-261 TAP 345 REMOVE UNIT 2 FROM BUS 274651 / KINCAID ;2U 20 END

Short Circuit

17 Short Circuit

The following Breakers are overdutied:

None

18 Secondary Point of Interconnection

19 Network Impacts

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7567150 5	270796	KINCAID ; B	345.0	CE	347955	7AUSTIN	345.0	AMIL	1	COMED_P1-2_SPS-2105&U1___D	operation	956.0	140.47	143.62	DC	30.09
7567146 2	347955	7AUSTIN	345.0	AMIL	270796	KINCAID ; B	345.0	CE	1	COMED_P1-2_SPS-2105&U1___A	operation	956.0	158.62	159.99	DC	13.09