Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-012

ELECTRIC JUNCTION-NELSON

105 MW Capacity / 175 MW Energy

January, 2020

1 General

The Interconnection Customer (IC) has proposed a solar generating facility located in Lee County, Illinois. The installed facilities will have a total capability of 175 MW with 105 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 30, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AF1-012**
Project Name	ELECTRIC JUNC-NELSON
State	Illinois
County	Lee
Transmission Owner	ComEd
MFO	175
MWE	175
MWC	105
Fuel	Solar
Basecase Study Year	2023

1.1 Point of Interconnection

Queue Position AF1-012, a 175 MW solar facility, proposes to interconnect with the ComEd transmission system by tying into the Nelson- Electric Junction 345kV Line 15502, approximately 10 miles from Nelson TSS 155.

1.2 Cost Summary

AF1-012 will be responsible for the following costs associated with the physical interconnection of the project:

Description	Total Cost
Attachment Facilities	$1,000,000
Direct Connection Network Upgrade	$23,000,000
Non Direct Connection Network Upgrades	$2,000,000
Total Costs	$26,000,000

In addition, the AF1-012 project may be responsible for a contribution to the following costs associated with network upgrades (See Section 16):

Description	Total Cost
System Upgrades	**$58,640,000**

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

2 Transmission Owner Scope of Work

Attachment Facilities

The AF1-012 generator lead would interconnect to a new 345kV Interconnection Substation (see details in Direct Connection section below). The required Attachment Facilities are one 345kV line MOD, a dead-end structure and revenue metering.

Direct Connection Network Upgrades

To accommodate interconnection of AF1-012, a new 345kV Interconnection Substation would need to be built close to the Nelson- Electric Junction 345kV Line 15502, approximately 10 miles from Nelson TSS 155.

The scope of work includes the installation of three 345kV circuit breakers in a "breaker-and-a-half" bus configuration and cutting in the Interconnection Substation to Nelson- Electric Junction 345kV Line 15502, as shown in the one-line diagram below.

The Interconnection Customer ("IC") is responsible for constructing all of the facilities on the IC side of the Point of Interconnection ("POI"). It is assumed for the purposes of this report that the IC will obtain the site for the Interconnection Substation and right-of-way between the Interconnection Substation and the 138kV transmission line.

In the event that the IC exercises the option to build the Interconnecting Substation, the IC will be required to construct all interconnection facilities that will be turned over to ComEd in accordance with ComEd published standards and the PJM Tariff.

ComEd would design, engineer and construct the tie in of the Interconnection Substation to the Nelson-Electric Junction 345kV Line 15502.

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

Non-Direct Connection Network Upgrades

The integration of the new 345kV Interconnection Substation would require relay, communications and SCADA upgrades at the Nelson TSS 155 and Electric Junction TSS 111. The ComEd cost is given below:

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
Installation of one 345kV line MOD, one dead-end structure and one set of revenue metering (see notes below on cost estimate)	$1,000,000
Total Attachment Facility Costs	**$1,000,000**

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.

For Option to Build Direct Connection cost estimates:

Description	Total Cost
Installation of a new 345kV substation as described above	N/A
Transmission line tie in work (foundations, structures, conductors)	$ 3,000,000
ComEd oversight and testing	$ 1,500,000
Total Direct Connection Facility Costs (see notes below on cost estimate)	**$ 4,500,000**

For ComEd building the Interconnecting Substation cost estimates:

Description	Total Cost
Installation of a new 345kV substation as described above	$ 20,000,000
Transmission line tie in work (foundations, structures, conductors)	$ 3,000,000
Total Direct Connection Facility Costs (see notes below on cost estimate)	**$ 23,000,000**

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
Relay/communications/SCADA upgrades at Nelson TSS 155	$ 1,000,000
Relay/communications/SCADA upgrades at Electric Junction TSS 111	$ 1,000,000
Total Non-Direct Connection Facility Costs (see notes below on cost estimate)	**$ 2,000,000**

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 IC.

2) 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.

3) These estimates are not a guarantee of the maximum amount payable by the IC and the actual costs of ComEd's work may differ significantly from these estimates. IC will be responsible for paying actual costs of ComEd's work in accordance with Sections 212.1 and 217 of the PJM Open Access Transmission Tariff.

4) The IC is responsible for all engineering, procurement, testing and construction of all equipment on the IC's side of the POI.

5) 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.

6 Schedule

ComEd would take approximately 24-months to construct the substation and transmission line work after the ISA / ICSA are signed.

7 Transmission Owner Analysis

See Section 3 above.

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 AF1-012 was evaluated as a 175.0 MW (Capacity 105.0 MW) injection tapping the Elect Jct. to Nelson 345 kV line in the ComEd area. Project AF1-012 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-012 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)

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
43356930	956820	J1180 TAP	345.0	AMIL	247712	05SULLIVAN	345.0	AEP	1	Base Case	single	1334.0	99.97	100.43	DC	6.37
43356931	956820	J1180 TAP	345.0	AMIL	247712	05SULLIVAN	345.0	AEP	1	AEP_P1-1_#4839	single	1466.0	99.78	100.19	DC	6.26

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	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
44074206	270678	BYRON; B	345.0	CE	270694	CHERRY VA; B	345.0	CE	1	COMED_P4_006-45-BT7-8__	breaker	1441.0	113.73	114.62	DC	28.08
44074166	270694	CHERRY VA; B	345.0	CE	270759	GARDEN PR; R	345.0	CE	1	COMED_P4_144-45-BT6-8__	breaker	1479.0	113.82	114.41	DC	18.79
44074058	943410	AF1-012 TAP	345.0	CE	270730	ELECT JCT; B	345.0	CE	1	COMED_P4_155-45-BT6-7__	breaker	1656.0	133.27	134.51	DC	75.88

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	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
4407475 0	270694	CHERRY VA; B	345.0	CE	270759	GARDEN PR; R	345.0	CE	1	COMED_P1-2_345-L0626__B-R-B	operation	1479.0	113.55	114.13	DC	18.3
4407467 2	270759	GARDEN PR; R	345.0	CE	270883	SILVER LK; R	345.0	CE	1	COMED_P1-2_345-L0626__B-R-B	operation	1479.0	119.24	119.79	DC	18.3
4407467 5	270759	GARDEN PR; R	345.0	CE	270883	SILVER LK; R	345.0	CE	1	Base Case	operation	1201.0	109.92	110.41	DC	13.1
4407489 4	274768	LEE CO EC;BP	345.0	CE	270678	BYRON ; B	345.0	CE	1	COMED_P1-2_345-L15502_B-R-B	operation	1726.0	98.3	100.08	DC	68.02
4407468 2	943410	AF1-012 TAP	345.0	CE	270730	ELECT JCT; B	345.0	CE	1	COMED_P1-2_345-L15501_B-R-A	operation	1656.0	129.97	131.2	DC	75.17
4407468 4	943410	AF1-012 TAP	345.0	CE	270730	ELECT JCT; B	345.0	CE	1	Base Case	operation	1334.0	111.07	115.41	DC	60.42

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
43356931,43356930	1	**J1180 TAP 345.0 kV - 05SULLIVAN 345.0 kV Ckt 1**	**AEPI0010a : Reconductor/rebuild 0.82 miles of ACAR ~ 1024.5 ~ 30/7 ~ RAIL1 conductor section 5** **Project Type : FAC** **Cost : $1,640,000** **Time Estimate : 24 -36 Months**	$1,640,000
44074206	2	**BYRON ; B 345.0 kV - CHERRY VA; B 345.0 kV Ckt 1**	**CE_NUN_L0621 (71) : ComEd 345kV l0621 SSTE rating is 1585 MVA. The upgrade will be to mitigate sag on the line and replace a 345kV circuit breaker at Cherry Valley. A preliminary estimate for the upgrade is $12.2 M with a estimated construction timeline of 24 months subject to outage coordination with Station 6 Byron Nuclerar Station. Upon completion of the upgrade the ratings will be 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD).** **Project Type : FAC** **Cost : $12,200,000** **Time Estimate : 24.0 Months**	$12,200,000

ID	Index	Facility	Upgrade Description	Cost
44074166	3	CHERRY VA; B 345.0 kV - GARDEN PR; R 345.0 kV Ckt 1	ce-017 (792) : L15616 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to re-conductor a portion of the line, perform sag mitigation on another portion of the line and station conductor upgrade at a line terminal. A preliminary estimate for the upgrades is $19.4M with a estimated construction time of 30 months. Upon completion the rating swill be 1248/1441/1667/1982 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $19,400,000 Time Estimate : 30.0 Months	$19,400,000
44074058	4	AF1-012 TAP 345.0 kV - ELECT JCT; B 345.0 kV Ckt 1	CE_NUN_15502 (56) : ComEd 345kV L15502 SSTE rating is 1837 MVA. The upgrade will be to re-conductor a portion of the line, 1-345kV circuit breaker and associated switches and upgrade of station conductor. A preliminary estimate for the upgrade is $25.4M with an estimated construction timeline od 30 months. Upon completion of the upgrade the ratings will be 2293/2293/2293/2436 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $25,400,000 Time Estimate : 30.0 Months	$25,400,000
			TOTAL COST	$58,640,000

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
43356931	956820	J1180 TAP	AMIL	247712	05SULLIVAN	AEP	1	AEP_P1-1_#4839	single	1466.0	99.78	100.19	DC	6.26

Bus #	Bus	MW Impact
274650	KINCAID ;1U	10.6820
274651	KINCAID ;2U	10.6773
274662	QUAD CITI;1U	8.9078
274663	QUAD CITI;2U	8.8960

Bus #	Bus	MW Impact
274677	POWERTON ;5U	6.8493
274678	POWERTON ;6U	6.8600
274699	CORDOVA ;1C	1.5609
274700	CORDOVA ;2C	1.5609
274701	CORDOVA ;1S	1.7560
274715	NELSON EC;1C	1.4560
274716	NELSON EC;1S	1.0624
274717	NELSON EC;2C	1.4673
274718	NELSON EC;2S	1.0719
274764	LEE CO EC;5U	0.6545
274765	LEE CO EC;6U	0.6545
274830	U3-021 1	2.2444
274831	U3-021 2	2.2444
274848	CAMPGROVE;RU	0.3027
274849	CRESCENT ;1U	0.0939
274851	PROVIDENC;RU	0.1432
274853	TWINGROVE;U1	0.5352
274854	TWINGROVE;U2	0.5352
274863	CAYUGA RI;1U	0.2770
274864	CAYUGA RI;2U	0.2770
274877	BISHOP HL;1U	0.1960
274878	BISHOP HL;2U	0.1960
274880	GENERATOR;	0.7089
276156	O-029 C	0.0990
276157	O-029 C	0.1070
276158	O-029 C	0.1953
276160	W4-084	0.2233
293513	O-009 C1	0.1828
293514	O-009 C2	0.0927
293515	O-009 C3	0.1026
917501	Z2-087 C	0.2788
919221	AA1-146	1.3583
919581	AA2-030	9.7309
919621	AA2-039 C	1.3691
924041	AB2-047 C O1	2.4967
924261	AB2-070 C O1	2.8350
924471	AB2-096	15.5860
925161	**AB2-173 (Withdrawn : 12/24/2019)**	**1.7354**
925581	AC1-033 C	0.9196
925771	AC1-053 C	2.8777
926431	AC1-114	0.9255
926821	AC1-168 C O1	0.6599
926841	AC1-171 C O1	0.8245
927201	AC1-214 C O1	1.3173
927511	AC1-113 1	0.4627
927521	AC1-113 2	0.4627
930481	AB1-089	25.1889
932881	AC2-115 1	0.9255
932891	AC2-115 2	0.9255
932921	AC2-116	0.3239
933341	AC2-147 C	0.3818
933911	AD1-013 C	0.6906

Bus #	Bus	MW Impact
933931	AD1-016 C	0.3305
934051	AD1-031 C O1	1.8673
934431	AD1-067 C	0.0499
934651	AD1-096 C	0.3640
934701	AD1-098 C O1	2.6402
934871	AD1-116 C	0.3284
934971	AD1-129 C	0.3370
935001	AD1-133 C O1	11.1906
935141	AD1-148	5.5938
936291	AD2-038 C O1	0.9509
936511	AD2-066 C O1	3.2710
936771	AD2-100 C	18.2713
936791	AD2-102 C	5.6508
936971	AD2-131 C	1.2036
937001	AD2-134 C	1.0387
937211	AD2-159 C	3.6752
937311	AD2-172 C	1.0066
937531	AD2-214 C	2.6969
938851	AE1-113 C	3.1455
938861	AE1-114 C O1	1.6805
939051	AE1-134 1	0.7562
939061	AE1-134 2	0.7562
939321	AE1-163 C O1	2.3895
939401	AE1-172 C O1	2.6979
939741	AE1-205 C O1	6.4529
940101	AE1-252 C O1	5.4198
940501	AE2-035 C	0.5335
941131	AE2-107 C	1.3856
941731	AE2-173 O1	3.8410
942111	AE2-223 C	1.4980
942421	AE2-255 C O1	1.1915
942481	AE2-261 C	25.0478
942651	AE2-281 C O1	0.3414
942991	AE2-321 C	2.9232
943381	AF1-009 C	0.1210
943401	AF1-011 C	1.8656
943411	AF1-012 C	6.2601
943801	AF1-048 C	0.7242
943921	AF1-060	0.3048
944221	AF1-090 C O1	5.6598
945881	AF1-253 O1	16.9794
946161	AF1-281 C	8.4140
946321	AF1-296 C O1	2.5612
946501	AF1-314 C	1.2194
946531	AF1-317 C O1	1.1924
946541	AF1-318 C O1	3.5961
946661	AF1-330 C	0.3780
946671	AF1-331	0.4754
946681	AF1-332 C	1.1924
951741	J474 C	1.2546
952251	J641	8.1074
952271	J644	7.4657

Bus #	Bus	MW Impact
952651	J756 C	1.6147
952871	J757 C	3.1709
953371	J808	8.2655
953401	J811	16.3152
953431	J853	10.3063
953641	J813	37.3350
953651	J815	26.4900
953671	J817	9.5257
953881	J848 C	4.3442
953951	J859	7.6424
954411	J912	12.0580
954681	J949 C	26.8158
954721	J750 C	1.5837
954761	J468 C	3.2573
954821	J955	85.9248
954831	J956	11.6900
955001	J976	20.9160
955031	J979 C	3.4754
955041	J980 C	3.4754
955101	J987	6.5000
955131	J991	39.3480
955161	J994	5.9300
955171	J995	6.7870
955391	J1021 C	1.7063
955441	J1026 C	3.3896
955551	J1039	3.4860
956071	J1094	12.6825
956091	J1096	10.5765
956151	J1102	3.7996
956241	J1111	10.1520
956281	J1115 C	1.8108
956341	J1123 C	1.3677
956451	J1139	9.0105
956501	J1145	14.7300
956821	J1180	37.4888
CPLE	CPLE	0.4644
WEC	WEC	1.6868
CBM-W2	CBM-W2	59.3529
NY	NY	0.4253
CBM-W1	CBM-W1	52.5670
TVA	TVA	6.6976
CBM-S2	CBM-S2	7.0285
CBM-S1	CBM-S1	31.0128
MADISON	MADISON	22.0772
MEC	MEC	13.3778
GIBSON	GIBSON	0.5427
BLUEG	BLUEG	3.1526
TRIMBLE	TRIMBLE	1.1158

16.2 Index 2

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
44074206	270678	BYRON ; B	CE	270694	CHERRY VA; B	CE	1	COMED_P4_006-45-BT7-8__	breaker	1441.0	113.73	114.62	DC	28.08

Bus #	Bus	MW Impact
274656	BYRON ;1U	81.1826
274760	LEE CO EC;1U	3.4478
274761	LEE CO EC;2U	3.4478
274763	LEE CO EC;4U	3.4128
274764	LEE CO EC;5U	3.4565
274765	LEE CO EC;6U	3.4565
274766	LEE CO EC;7U	3.4041
274767	LEE CO EC;8U	3.4041
274859	EASYR;U1 E	25.5457
274860	EASYR;U2 E	25.5457
276160	W4-084	0.2851
276172	Z1-108 BAT	1.7754
293516	O-009 E1	8.6742
293517	O-009 E2	4.4058
293518	O-009 E3	4.8520
293715	O-029 E	9.2737
293716	O-029 E	5.0846
293717	O-029 E	4.6733
919581	AA2-030	25.5877
920273	AA2-123 BAT	2.9120
925161	**AB2-173 (Withdrawn : 12/24/2019)**	**4.5634**
937531	AD2-214 C	4.6322
937532	AD2-214 E	3.0881
939051	AE1-134 1	1.9883
939061	AE1-134 2	1.9883
943401	AF1-011 C	1.6363
943402	AF1-011 E	1.7260
943411	AF1-012 C	7.5906
943412	AF1-012 E	5.0604
943803	AF1-048 BAT	7.8081
943922	AF1-060 BAT	1.4410
946161	AF1-281 C	17.4313
946162	AF1-281 E	9.9607
946321	AF1-296 C O1	2.0546
946322	AF1-296 E O1	9.6189
946531	AF1-317 C O1	1.4458
946532	AF1-317 E O1	2.1688
946681	AF1-332 C	1.4458
946682	AF1-332 E	2.1688
954792	J952 E	4.1607
954901	J963	0.8428
955051	J981 C	2.4027
955052	J981 E	12.9993
955971	J1084	19.4550
956411	J1131	10.4710
CBM-W2	CBM-W2	6.8878

Bus #	Bus	MW Impact
NY	NY	0.1963
TVA	TVA	0.6748
O-066	O-066	2.2982
CBM-S2	CBM-S2	0.0289
CBM-S1	CBM-S1	3.0502
TILTON	TILTON	0.0025
G-007	G-007	0.3546
MADISON	MADISON	1.2842
MEC	MEC	6.4116
GIBSON	GIBSON	0.0339
BLUEG	BLUEG	0.3594
TRIMBLE	TRIMBLE	0.1241
CATAWBA	CATAWBA	0.0017

16.3 Index 3

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
44074166	270694	CHERRY VA; B	CE	270759	GARDEN PR; R	CE	1	COMED_P4_144-45-BT6-8__	breaker	1479.0	113.82	114.41	DC	18.79

Bus #	Bus	MW Impact
274656	BYRON ;1U	41.4378
274657	BYRON ;2U	40.5298
274822	ROCKFORD ;11	3.7754
274823	ROCKFORD ;21	3.8743
274824	ROCKFORD ;12	3.7425
274859	EASYR;U1 E	14.5428
274860	EASYR;U2 E	14.5428
276160	W4-084	0.4257
276172	Z1-108 BAT	2.0868
290051	GSG-6; E	7.4386
290108	LEEDK;1U E	14.8121
290266	R-018	0.2232
293516	O-009 E1	7.6184
293517	O-009 E2	3.8696
293518	O-009 E3	4.2615
293715	O-029 E	8.1450
293716	O-029 E	4.4658
293717	O-029 E	4.1045
294763	P-046 E	14.4357
919581	AA2-030	17.1350
925161	**AB2-173 (Withdrawn : 12/24/2019)**	**3.0559**
926431	AC1-114	4.9268
927511	AC1-113 1	2.0938
927521	AC1-113 2	2.0938
930481	AB1-089	139.7165
932881	AC2-115 1	4.9266

Bus #	Bus	MW Impact
932891	AC2-115 2	4.9266
932921	AC2-116	1.7244
933341	AC2-147 C	1.0521
933342	AC2-147 E	1.7166
933911	AD1-013 C	1.2962
933912	AD1-013 E	2.0705
934431	AD1-067 C	0.0934
934432	AD1-067 E	0.3927
934651	AD1-096 C	1.3790
934652	AD1-096 E	2.2499
934701	AD1-098 C O1	5.0039
934702	AD1-098 E O1	3.6534
934971	AD1-129 C	1.0959
934972	AD1-129 E	0.7306
936791	AD2-102 C	24.0832
936792	AD2-102 E	16.0555
937001	AD2-134 C	1.9446
937002	AD2-134 E	8.0330
937311	AD2-172 C	3.7894
937312	AD2-172 E	5.2329
937531	AD2-214 C	3.8724
937532	AD2-214 E	2.5816
938861	AE1-114 C O1	5.2043
938862	AE1-114 E O1	17.7559
939051	AE1-134 1	1.3315
939061	AE1-134 2	1.3315
940501	AE2-035 C	2.0084
940502	AE2-035 E	2.7735
941131	AE2-107 C	2.2884
941132	AE2-107 E	1.5256
943381	AF1-009 C	0.2294
943382	AF1-009 E	0.9177
943401	AF1-011 C	1.4371
943402	AF1-011 E	1.5159
943411	AF1-012 C	5.0798
943412	AF1-012 E	3.3865
943422	AF1-013 E	1.1471
943921	AF1-060	1.1476
946161	AF1-281 C	10.2905
946162	AF1-281 E	5.8803
946321	AF1-296 C O1	1.7370
946322	AF1-296 E O1	8.1324
946501	AF1-314 C	4.5906
946502	AF1-314 E	21.4896
946531	AF1-317 C O1	0.9676
946532	AF1-317 E O1	1.4514
946671	AF1-331	0.8922
946681	AF1-332 C	0.9676
946682	AF1-332 E	1.4514
950101	J390	83.6714
952431	J760	5.3721
952511	J584 C	1.0645

Bus #	Bus	MW Impact
952512	J584 E	5.7593
953111	J807 C	1.2239
953112	J807 E	6.6214
953681	J818	14.1923
953691	J819 C	1.4986
953692	J819 E	8.1078
953901	J850	21.0825
954001	J864	4.4352
955221	J1000	3.7495
955971	J1084	11.1600
956371	J1127	5.6362
956391	J1129	8.5768
956581	J1154	7.1483
956901	J1188	5.8185
WEC	WEC	0.5314
CBM-W2	CBM-W2	8.5585
NY	NY	0.2688
CBM-W1	CBM-W1	39.8193
TVA	TVA	0.8932
O-066	O-066	3.1450
CBM-S2	CBM-S2	0.0058
CBM-S1	CBM-S1	3.9533
TILTON	TILTON	0.1399
G-007	G-007	0.4857
MADISON	MADISON	11.2936
MEC	MEC	9.4657
GIBSON	GIBSON	0.0988
BLUEG	BLUEG	0.5711
TRIMBLE	TRIMBLE	0.1948
CATAWBA	CATAWBA	0.0046

16.4 Index 4

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
44074058	943410	AF1-012 TAP	CE	270730	ELECT JCT; B	CE	1	COMED_P4_155-45-BT6-7__	breaker	1656.0	133.27	134.51	DC	75.88

Bus #	Bus	MW Impact
274715	NELSON EC;1C	8.1817
274716	NELSON EC;1S	5.9698
274717	NELSON EC;2C	8.2449
274718	NELSON EC;2S	6.0233
276160	W4-084	0.7032
290051	GSG-6; E	5.4296
293516	O-009 E1	16.8017
293517	O-009 E2	8.5340

Bus #	Bus	MW Impact
293518	O-009 E3	9.3982
293715	O-029 E	17.9629
293716	O-029 E	9.8488
293717	O-029 E	9.0521
293771	O-035 E	4.8825
294401	BSHIL;1U E	7.9846
294410	BSHIL;2U E	7.9846
294763	P-046 E	4.7546
919221	AA1-146	7.6324
919581	AA2-030	54.6800
919621	AA2-039 C	1.9462
919622	AA2-039 E	13.0248
925161	**AB2-173 (Withdrawn : 12/24/2019)**	**9.7518**
925581	AC1-033 C	1.3078
925582	AC1-033 E	8.7553
927201	AC1-214 C O1	1.5670
927202	AC1-214 E O1	4.9815
933341	AC2-147 C	1.1234
933342	AC2-147 E	1.8329
934051	AD1-031 C O1	2.6560
934052	AD1-031 E O1	4.3335
934431	AD1-067 C	0.0682
934432	AD1-067 E	0.2867
934651	AD1-096 C	0.5446
934652	AD1-096 E	0.8885
934701	AD1-098 C O1	3.9894
934702	AD1-098 E O1	2.9126
937001	AD2-134 C	1.4194
937002	AD2-134 E	5.8635
937311	AD2-172 C	1.2481
937312	AD2-172 E	1.7235
937531	AD2-214 C	10.2934
937532	AD2-214 E	6.8623
938861	AE1-114 C O1	3.9792
938862	AE1-114 E O1	13.5762
939051	AE1-134 1	4.2490
939061	AE1-134 2	4.2490
940501	AE2-035 C	0.6615
940502	AE2-035 E	0.9135
943381	AF1-009 C	0.1829
943382	AF1-009 E	0.7316
943401	AF1-011 C	3.1695
943402	AF1-011 E	3.3431
943411	AF1-012 C	45.5259
943412	AF1-012 E	30.3506
943422	AF1-013 E	0.9145
943921	AF1-060	0.3780
946321	AF1-296 C O1	3.9971
946322	AF1-296 E O1	18.7135
946501	AF1-314 C	1.5120
946502	AF1-314 E	7.0778
946531	AF1-317 C O1	8.6716

Bus #	Bus	MW Impact
946532	AF1-317 E O1	13.0074
946541	AF1-318 C O1	1.6264
946542	AF1-318 E O1	7.6155
946681	AF1-332 C	8.6716
946682	AF1-332 E	13.0074
950181	J407 C	3.0508
950182	J407 E	12.2032
950401	J041 C	1.6578
950402	J041 E	6.6312
950471	J438 C	3.3963
950472	J438 E	13.5852
950501	J449 C	3.2760
950502	J449 E	13.1041
950522	J455 E	21.7410
951031	J344 C	3.0687
951032	J344 E	9.2061
951221	J475 C	3.7524
951222	J475 E	15.0096
951301	J495 C	3.5170
951302	J495 E	10.5510
951351	J500 C	6.8720
951352	J500 E	27.4880
951381	J504	5.8275
951402	J506 E	13.1320
951421	J514	3.4842
951441	J523 C	2.2302
951442	J523 E	1.4868
951451	J524 C	4.5390
951452	J524 E	3.0260
951491	J528 C	2.6808
951492	J528 E	10.7232
951501	J529 C	3.4800
951502	J529 E	13.9200
951511	J530 C	5.5475
951512	J530 E	22.1900
951541	J534 C	3.5910
951542	J534 E	14.3640
951551	J535 C	3.0509
951552	J535 E	12.2035
951821	J541 C	4.4741
951822	J541 E	24.2059
951841	J555 C	2.0488
951842	J555 E	11.0846
952021	J614 C	0.7584
952022	J614 E	4.1032
952191	J583 C	2.1695
952192	J583 E	11.7375
952211	J590 C	1.0175
952212	J590 E	5.5048
952231	J598 C	3.3556
952232	J598 E	18.1544
952781	J748 C	2.0873

Bus #	Bus	MW Impact
952782	J748 E	11.2927
953001	J785 C	1.1096
953002	J785 E	6.0031
953011	J885 C	0.7615
953012	J885 E	4.1198
953082	J836 E	14.4840
953091	J916	0.1325
953231	J447 C	1.9691
953232	J447 E	10.6534
953571	J720 C	2.0873
953572	J720 E	11.2927
953821	J840 C	1.6286
953822	J840 E	8.8114
954091	J873 C	3.3262
954092	J873 E	17.9958
954131	J877	18.1175
954301	J898 C	1.1371
954302	J898 E	6.1519
954521	J927 C	1.1312
954522	J927 E	6.1198
954702	J844 E	14.1752
954792	J952 E	6.8467
954861	J959 C	2.3117
954862	J959 E	12.5068
954901	J963	1.4155
954931	J967 C	1.8327
954932	J967 E	9.9153
955011	J977 C	3.1389
955012	J977 E	16.9821
955051	J981 C	3.8950
955052	J981 E	21.0730
955061	J982 C	3.2573
955062	J982 E	17.6227
955201	J998	3.7420
955211	J999	12.3500
955221	J1000	4.0215
955291	J1008	3.5385
955571	J1041	1.3154
955661	J1050 C	2.7936
955662	J1050 E	15.1141
955731	J1057	8.2213
955871	J1072	11.7480
955971	J1084	31.8375
955991	J1086	7.8780
956111	J1098	2.6568
956231	J1110	7.3440
956271	J1114 C	2.0486
956272	J1114 E	11.0834
956381	J1128	11.1540
956411	J1131	17.0440
956421	J1132	3.3785
956431	J1135	4.0970

Bus #	Bus	MW Impact
956761	J1174	23.2770
956771	J1175 C	3.6312
956772	J1175 E	19.6458
956781	J1176 C	1.8399
956782	J1176 E	9.9544
956791	J1177 C	3.3556
956792	J1177 E	18.1544
956831	J1181 C	3.0270
956832	J1181 E	16.3770
990901	L-005 E	10.7600
LGEE	LGEE	0.1010
CPLE	CPLE	0.3308
CBM-W2	CBM-W2	22.4979
NY	NY	0.1134
CBM-W1	CBM-W1	47.0376
TVA	TVA	2.6880
O-066	O-066	1.2230
CBM-S2	CBM-S2	4.0865
CBM-S1	CBM-S1	13.5979
G-007	G-007	0.1872
MADISON	MADISON	14.4507
MEC	MEC	18.4133

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_P1-2_345-L15502_B-R-B	CONTINGENCY 'COMED_P1-2_345-L15502_B-R-B' TRIP BRANCH FROM BUS 943410 TO BUS 270730 CKT 1 / AF1-012 TAP 345 ELEC JUNC; B 345 END
COMED_P4_155-45-BT6-7__	CONTINGENCY 'COMED_P4_155-45-BT6-7__' TRIP BRANCH FROM BUS 275204 TO BUS 270828 CKT 1 / NELSO;4M 138 NELSO; B 345 TRIP BRANCH FROM BUS 275204 TO BUS 272094 CKT 1 / NELSO;4M 138 NELSO; B 138 TRIP BRANCH FROM BUS 275204 TO BUS 275304 CKT 1 / NELSO;4M 138 NELSO;4C 34.5 TRIP BRANCH FROM BUS 270828 TO BUS 946160 CKT 1 / NELSO; B 345 AF1-281 TAP 345 END
COMED_P1-2_345-L0626__B-R-B	CONTINGENCY 'COMED_P1-2_345-L0626__B-R-B' TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345 END
AEP_P1-1_#4839	CONTINGENCY 'AEP_P1-1_#4839' OPEN BRANCH FROM BUS 243209 TO BUS 243442 CKT 1 / 243209 05ROCKPT 765 243442 05RKG1 26.0 1 REMOVE UNIT 1H FROM BUS 243442 / 243442 05RKG1 26.0 REMOVE UNIT 1L FROM BUS 243442 / 243442 05RKG1 26.0 END
COMED_P4_006-45-BT7-8__	CONTINGENCY 'COMED_P4_006-45-BT7-8__' TRIP BRANCH FROM BUS 270678 TO BUS 930480 CKT 1 / BYRON ; B 345 AB1-089 TAP 345 TRIP BRANCH FROM BUS 270678 TO BUS 270679 CKT 1 / BYRON ; B 345 BYRON ; R 345 END
Base Case	
COMED_P1-2_345-L15501_B-R-A	CONTINGENCY 'COMED_P1-2_345-L15501_B-R-A' TRIP BRANCH FROM BUS 270828 TO BUS 946160 CKT 1 / NELSO; B 345 AF1-281 TAP 345 END
COMED_P4_144-45-BT6-8__	CONTINGENCY 'COMED_P4_144-45-BT6-8__' TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / AB1-089 TAP 345 WAYNE ; B 345 TRIP BRANCH FROM BUS 270730 TO BUS 270916 CKT 1 / ELEC JUNC; B 345 WAYNE ; B 345 TRIP BRANCH FROM BUS 270916 TO BUS 270917 CKT 1 / WAYNE ; B 345 WAYNE ; R 345 END

Short Circuit

18 Short Circuit

The following Breakers are overdutied:

None