Generation Interconnection

Feasibility Study Report

for

Queue Project AF2-394

“NELSON-DIXON 138 KV”

July 2020

1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is ComEd.

2 Preface

The intent of the Feasibility Study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

3 General

The Interconnection Customer (IC) has proposed a storage generating facility to be located in Lee County, Illinois. The installed facilities will have a total capability of 40 MW with 40 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 01, 2024. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-394
Project Name	NELSON-DIXON 138 KV
State	Illinois
County	Lee
Transmission Owner	ComEd
MFO	40
MWE	40
MWC	40
Fuel	Storage
Basecase Study Year	2023

A new service customer with a generating facility that could be commercially operable prior to June 1st of the basecase study year is required to request an interim deliverability analysis from PJM.

4 Point of Interconnection

Queue Position AF2-394 proposes to add 40 MW battery storage to prior queue project built under PJM queue AF2-392 and AF2-393. The proposed addition will increase output of AF2-393 from 260 MW to 300 MW. The proposed addition is behind the Point-of-Interconnection between ComEd and AF2-393.

5 Cost Summary

The AF2-394 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	$200,000
Total System Network Upgrade Costs	$15,100,000
Total Costs	**$15,300,000**

This cost excludes a Federal Income Tax Gross Up charges. This tax may or may not be charged based on whether this project meets the eligibility requirements of IRS Notice 88-129. If at a future date it is determined that the Federal Income Tax Gross charge is required, the Transmission Owner shall be reimbursed by the Interconnection Customer for such taxes.

6 Transmission Owner Scope of Work

Attachment Facilities

To accommodate interconnection of AF2-394; the relaying, SCADA, communication, and metering between AF2-394 and ComEd Interconnection Substation would be reviewed and upgraded if needed.

The total physical interconnection costs is given in the table below:

Description	Total Cost
The relaying, SCADA, communication, and metering between AF2-394 and ComEd Interconnection Substation would be reviewed and upgraded if needed.	$200,000
Total Physical Interconnection Costs	**$200,000**

7 Schedule

ComEd would take approximately 18-months to review and possibly upgrade the relaying, SCADA, Communication and metering after the ISA / ICSA are signed. See Section 11.5 for System Upgrades schedule.

8 Transmission Owner Analysis

See Section 6.

9 Interconnection Customer Requirements

The Interconnection Customer is responsible for all design and construction related activities on the Interconnection Customer's side of the Point of Interconnection.

10 Revenue Metering and SCADA Requirements

10.1 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.

10.2 Interconnected Transmission Owner Requirements

The IC will be required to comply with all Interconnected Transmission Owner's revenue metering requirements for generation interconnection customers located at the following link:

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.

11 Summer Peak - Load Flow Analysis - Primary POI

The Queue Project AF2-394 was evaluated as a 40.0 MW (Capacity 40.0 MW) injection tapping the Nelson to Dixon 138 kV line in the ComEd area. Project AF2-394 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-394 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 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
9670980 1	27133 1	DIXON ;8R	138. 0	CE	27133 3	DIXO N ; R	138. 0	CE	1	COMED_P4_155 -38-TR81___	breake r	421.0	109.63	114.9	DC	22.18
9670981 2	27209 7	NELSO N ;RT	138. 0	CE	27133 1	DIXO N ;8R	138. 0	CE	1	COMED_P4_155 -38-TR81___	breake r	440.0	109.17	114.21	DC	22.18

11.4 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
96710094	272365	ESS H440 ;RT	138.0	CE	272363	ESS H440 ; R	138.0	CE	1	COMED_P2-1_186-L16914__	operation	197.0	156.65	157.27	DC	2.68

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
96709812	2	**NELSON ;RT 138.0 kV - DIXON ;8R 138.0 kV Ckt 1**	**ComEd** **CE_NUN_L15508 (843) : ComEd 138kV L15508 ALDR rating is 319 MVA. The upgrade will be to re-conductor the line. A preliminary estimate for the upgrade is $15.1M with an estimated construction timeline of 30 months. Upon completion of the upgrade the ratings will be 351/449/459/498/573 MVA (SN/SLTE/SSTE/SLD/ALDR).** **Project Type : FAC** **Cost : $15,100,000** **Time Estimate : 30.0 Months**	$15,100,000
96709801	1	**DIXON ;8R 138.0 kV - DIXON ; R 138.0 kV Ckt 1**		
			TOTAL COST	**$15,100,000**

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

11.6 Flow Gate Details - Primary POI

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

11.6.1 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
96709801	271331	DIXON ;8R	CE	271333	DIXON ; R	CE	1	COMED_P4_155-38-TR81___	breaker	421.0	109.63	114.9	DC	22.18

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
276156	O-029 C	0.3192	50/50	0.3192
276157	O-029 C	0.3451	50/50	0.3451
276158	O-029 C	0.6297	50/50	0.6297
293513	O-009 C1	0.5895	50/50	0.5895
293514	O-009 C2	0.2990	50/50	0.2990
293515	O-009 C3	0.3307	50/50	0.3307
293516	O-009 E1	13.6761	50/50	13.6761
293517	O-009 E2	6.9464	50/50	6.9464
293518	O-009 E3	7.6499	50/50	7.6499
293715	O-029 E	14.6213	50/50	14.6213
293716	O-029 E	8.0166	50/50	8.0166
293717	O-029 E	7.3681	50/50	7.3681
294401	BSHIL;1U E	4.5247	Adder	5.32
294410	BSHIL;2U E	4.5247	Adder	5.32
925581	AC1-033 C	0.7411	Adder	0.87
925582	AC1-033 E	4.9617	Adder	5.84
934051	AD1-031 C O1	1.5063	Adder	1.77
934052	AD1-031 E O1	2.4576	Adder	2.89
937531	AD2-214 C	4.2306	50/50	4.2306
937532	AD2-214 E	2.8204	50/50	2.8204
943383	AF1-009 BAT	6.8187	50/50	6.8187
943401	AF1-011 C	1.8670	50/50	1.8670
943402	AF1-011 E	3.1340	50/50	3.1340
943922	AF1-060 BAT	2.0096	50/50	2.0096
946321	AF1-296 C O1	2.3738	Adder	2.79
946322	AF1-296 E O1	11.1134	Adder	13.07
961022	AF2-393 BAT	33.2718	50/50	33.2718
961032	AF2-394 BAT	22.1812	50/50	22.1812
LGEE	LGEE	0.0593	Confirmed LTF	0.0593
CPLE	CPLE	0.0926	Confirmed LTF	0.0926
G-007A	G-007A	0.0863	Confirmed LTF	0.0863
VFT	VFT	0.2322	Confirmed LTF	0.2322
CBM-W2	CBM-W2	4.2179	Confirmed LTF	4.2179
CBM-W1	CBM-W1	2.5020	Confirmed LTF	2.5020
TVA	TVA	0.5026	Confirmed LTF	0.5026
CBM-S2	CBM-S2	0.9942	Confirmed LTF	0.9942
CBM-S1	CBM-S1	2.6582	Confirmed LTF	2.6582
MADISON	MADISON	1.3810	Confirmed LTF	1.3810
MEC	MEC	2.5742	Confirmed LTF	2.5742

11.6.2 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
96709812	272097	NELSON ;RT	CE	271331	DIXON ;8R	CE	1	COMED_P4_155-38-TR81___	breaker	440.0	109.17	114.21	DC	22.18

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
276156	O-029 C	0.3192	50/50	0.3192
276157	O-029 C	0.3451	50/50	0.3451
276158	O-029 C	0.6297	50/50	0.6297
293513	O-009 C1	0.5895	50/50	0.5895
293514	O-009 C2	0.2990	50/50	0.2990
293515	O-009 C3	0.3307	50/50	0.3307
293516	O-009 E1	13.6761	50/50	13.6761
293517	O-009 E2	6.9464	50/50	6.9464
293518	O-009 E3	7.6499	50/50	7.6499
293715	O-029 E	14.6213	50/50	14.6213
293716	O-029 E	8.0166	50/50	8.0166
293717	O-029 E	7.3681	50/50	7.3681
294401	BSHIL;1U E	4.5247	Adder	5.32
294410	BSHIL;2U E	4.5247	Adder	5.32
925581	AC1-033 C	0.7411	Adder	0.87
925582	AC1-033 E	4.9617	Adder	5.84
934051	AD1-031 C O1	1.5063	Adder	1.77
934052	AD1-031 E O1	2.4576	Adder	2.89
937531	AD2-214 C	4.2306	50/50	4.2306
937532	AD2-214 E	2.8204	50/50	2.8204
943383	AF1-009 BAT	6.8187	50/50	6.8187
943401	AF1-011 C	1.8670	50/50	1.8670
943402	AF1-011 E	3.1340	50/50	3.1340
943922	AF1-060 BAT	2.0096	50/50	2.0096
946321	AF1-296 C O1	2.3738	Adder	2.79
946322	AF1-296 E O1	11.1134	Adder	13.07
961022	AF2-393 BAT	33.2718	50/50	33.2718
961032	AF2-394 BAT	22.1812	50/50	22.1812
LGEE	LGEE	0.0593	Confirmed LTF	0.0593
CPLE	CPLE	0.0926	Confirmed LTF	0.0926
G-007A	G-007A	0.0863	Confirmed LTF	0.0863
VFT	VFT	0.2322	Confirmed LTF	0.2322
CBM-W2	CBM-W2	4.2179	Confirmed LTF	4.2179
CBM-W1	CBM-W1	2.5020	Confirmed LTF	2.5020
TVA	TVA	0.5026	Confirmed LTF	0.5026
CBM-S2	CBM-S2	0.9942	Confirmed LTF	0.9942
CBM-S1	CBM-S1	2.6582	Confirmed LTF	2.6582
MADISON	MADISON	1.3810	Confirmed LTF	1.3810
MEC	MEC	2.5742	Confirmed LTF	2.5742

11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

Queue Number	Project Name	Status
AC1-033	Kewanee	Active

Queue Number	Project Name	Status
AD1-031	Kewanee 138 kV	Active
AD2-214	Rock Falls-Garden Plains	Active
AF1-009	Dixon-McGirr	Active
AF1-011	Schauff Road	Active
AF1-060	Lena 138 kV	Active
AF1-296	Garden Plain 138 kV	Active
AF2-393	Nelson-Dixon 138 kV	Active
AF2-394	Nelson-Dixon 138 kV	Active

11.8 Contingency Descriptions - Primary POI

Contingency Name	Contingency Definition
COMED_P4_155-38-TR81___	CONTINGENCY 'COMED_P4_155-38-TR81___' TRIP BRANCH FROM BUS 270828 TO BUS 272094 TO BUS 275341 CKT 1 / NELSO; B 345 NELSO; B 138 NELSO;1C 34.5 TRIP BRANCH FROM BUS 272094 TO BUS 961010 CKT 1 / NELSO; B 138 DIXON;7B 138 TRIP BRANCH FROM BUS 272094 TO BUS 272366 CKT 1 / NELSO; B 138 R FAL; B 138 TRIP BRANCH FROM BUS 272094 TO BUS 275204 CKT 1 / NELSO; B 138 NELSO;4M 138 END
COMED_P2-1_186-L16914__	CONTINGENCY 'COMED_P2-1_186-L16914__' TRIP BRANCH FROM BUS 272365 TO BUS 272516 CKT 1 / H440 ;RT 138 STEWA; B 138 END

12 Short Circuit Analysis - Primary POI

The following breakers are overdutied:

None

12.1 System Reinforcements - Short Circuit

None

13 Summer Peak - Load Flow Analysis - Secondary POI

The Queue Project AF2-394 was evaluated as a 40.0 MW (Capacity 40.0 MW) injection at the Nelson 138 kV substation in the ComEd area. Project AF2-394 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-394 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

13.1 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
96710144	957470	AF2-041 TAP	345.0	CE	270730	ELECT JCT; B	345.0	CE	1	COMED_P1-2_345-L0626__B-R-A	single	1656.0	99.99	100.5	DC	8.56

13.2 Multiple Facility Contingency

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

None

13.3 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
96709801	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P4_155-38-TR81___	breaker	421.0	121.43	123.98	DC	10.74
96709802	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P4_155-38-TR84___	breaker	421.0	106.89	109.9	DC	12.66
105019683	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P4_006-45-BT3-4__	breaker	421.0	105.42	109.07	DC	15.36
147727630	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P4_155-45-BT9-10_	breaker	421.0	104.94	110.42	DC	23.04
147727631	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P4_155-45-BT8-9__	breaker	421.0	104.53	109.99	DC	22.99
96709812	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	COMED_P4_155-38-TR81___	breaker	440.0	120.48	122.92	DC	10.74
96709814	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	COMED_P4_155-38-TR84___	breaker	440.0	106.55	109.42	DC	12.66
147727656	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	COMED_P4_155-45-BT9-10_	breaker	440.0	104.68	109.92	DC	23.04
147727657	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	COMED_P4_155-45-BT8-9__	breaker	440.0	104.29	109.51	DC	22.99

13.4 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
14810772 5	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	COMED_P1-3_TR82_NELSO_B-R	operation	421.0	103.45	108.92	DC	23.04
14810772 6	271331	DIXON ;8R	138.0	CE	271333	DIXON ; R	138.0	CE	1	Base Case	operation	351.0	98.61	102.83	DC	14.79
96709998	271836	KEWANEE ;11	138.0	CE	271837	KEWANEE ;12	138.0	CE	1	Base Case	operation	190.0	101.23	101.72	DC	2.05
14810771 5	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	Base Case	operation	343.0	106.39	110.71	DC	14.79
14810771 6	272097	NELSON ;RT	138.0	CE	271331	DIXON ;8R	138.0	CE	1	COMED_P1-3_TR82_NELSO_B-R	operation	440.0	103.28	108.51	DC	23.04
96710094	272365	ESS H440 ;RT	138.0	CE	272363	ESS H440 ; R	138.0	CE	1	COMED_P2-1_186-L16914__	operation	197.0	156.55	157.15	DC	2.61
96710246	272505	SCHUAF R;	138.0	CE	272367	ROCK FALL; R	138.0	CE	1	COMED_P2-1_187-L15508__	operation	214.0	123.83	126.04	DC	4.72

13.5 Flow Gate Details - Secondary POI

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators. It should be noted the project/generator MW contributions presented in the body of the report are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

13.5.1 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
96710144	957470	AF2-041 TAP	CE	270730	ELECT JCT; B	CE	1	COMED_P1-2_345-L0626__B-R-A	single	1656.0	99.99	100.5	DC	8.56

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274656	BYRON ;1U	28.4057	80/20	28.4057
274657	BYRON ;2U	27.6588	80/20	27.6588
274662	QUAD CITI;1U	30.7349	80/20	30.7349
274663	QUAD CITI;2U	30.7924	80/20	30.7924
274699	CORDOVA ;1C	5.4014	80/20	5.4014
274700	CORDOVA ;2C	5.4014	80/20	5.4014
274701	CORDOVA ;1S	6.0766	80/20	6.0766
274715	NELSON EC;1C	7.6911	80/20	7.6911
274716	NELSON EC;1S	5.6118	80/20	5.6118
274717	NELSON EC;2C	7.7505	80/20	7.7505
274718	NELSON EC;2S	5.6621	80/20	5.6621
274760	LEE CO EC;1U	2.9366	80/20	2.9366
274761	LEE CO EC;2U	2.9366	80/20	2.9366
274762	LEE CO EC;3U	2.8956	80/20	2.8956
274763	LEE CO EC;4U	2.9068	80/20	2.9068
274764	LEE CO EC;5U	2.9440	80/20	2.9440
274765	LEE CO EC;6U	2.9440	80/20	2.9440
274766	LEE CO EC;7U	2.8994	80/20	2.8994
274767	LEE CO EC;8U	2.8994	80/20	2.8994
274857	BIG SKY ;U1	0.8933	80/20	0.8933
274858	BIG SKY ;U2	0.8933	80/20	0.8933
276156	O-029 C	0.3794	80/20	0.3794
276157	O-029 C	0.4102	80/20	0.4102
276158	O-029 C	0.7485	80/20	0.7485
276160	W4-084	0.1271	80/20	0.1271
293513	O-009 C1	0.7007	80/20	0.7007
293514	O-009 C2	0.3555	80/20	0.3555
293515	O-009 C3	0.3931	80/20	0.3931
919221	AA1-146	7.1747	80/20	7.1747
919581	AA2-030	41.5940	80/20	41.5940
925581	AC1-033 C	1.0444	Adder	1.23
926431	AC1-114	1.7971	Adder	2.11
927201	AC1-214 C O1	1.2402	Adder	1.46
927511	AC1-113 1	0.8985	Adder	1.06
927521	AC1-113 2	0.8985	Adder	1.06
927531	AC1-185 1	0.2233	80/20	0.2233
927541	AC1-185 2	0.2233	80/20	0.2233
927551	AC1-185 3	0.2233	80/20	0.2233
927561	AC1-185 4	0.2233	80/20	0.2233
927571	AC1-185 5	0.2233	80/20	0.2233
927581	AC1-185 6	0.2233	80/20	0.2233
927591	AC1-185 7	0.2233	80/20	0.2233
927601	AC1-185 8	0.2233	80/20	0.2233
932881	AC2-115 1	1.7969	Adder	2.11
932891	AC2-115 2	1.7969	Adder	2.11
932921	AC2-116	0.6290	Adder	0.74
934051	AD1-031 C O1	2.1213	Adder	2.5
934431	AD1-067 C	0.0771	Adder	0.09
934651	AD1-096 C	0.8887	Adder	1.05
934701	AD1-098 C O1	4.3662	Adder	5.14
934971	AD1-129 C	0.4901	Adder	0.58
936791	AD2-102 C	11.4393	Adder	13.46

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
937001	AD2-134 C	1.6049	Adder	1.89
937311	AD2-172 C	2.4165	Adder	2.84
937531	AD2-214 C	8.5239	80/20	8.5239
938861	AE1-114 C O1	5.6035	80/20	5.6035
939051	AE1-134 1	3.2321	80/20	3.2321
939061	AE1-134 2	3.2321	80/20	3.2321
940501	AE2-035 C	2.4165	Adder	2.84
943381	AF1-009 C	0.3777	Adder	0.44
943401	AF1-011 C	2.2193	80/20	2.2193
943411	AF1-012 C	38.1066	80/20	38.1066
943921	AF1-060	1.1899	Adder	1.4
946151	AF1-280 C O1	31.5963	80/20	31.5963
946161	AF1-281 C	0.6919	80/20	0.6919
946321	AF1-296 C O1	7.2346	80/20	7.2346
946501	AF1-314 C	4.2936	Adder	5.05
946531	AF1-317 C O1	7.2584	80/20	7.2584
950471	J438 C	2.5873	PJM External (MISO)	2.5873
951381	J504	4.5635	PJM External (MISO)	4.5635
951421	J514	2.6967	PJM External (MISO)	2.6967
951511	J530 C	4.1655	PJM External (MISO)	4.1655
954091	J873 C	2.7041	PJM External (MISO)	2.7041
954861	J959 C	1.9722	PJM External (MISO)	1.9722
954901	J963	1.0689	PJM External (MISO)	1.0689
955051	J981 C	2.8885	PJM External (MISO)	2.8885
955221	J1000	4.2385	PJM External (MISO)	4.2385
955971	J1084	23.6535	PJM External (MISO)	23.6535
956411	J1131	12.6670	PJM External (MISO)	12.6670
956831	J1181 C	2.5565	PJM External (MISO)	2.5565
957471	AF2-041 C	99.3492	80/20	99.3492
957751	AF2-069 C	0.0761	Adder	0.17
957761	AF2-070 C	0.1072	Adder	0.24
958911	AF2-182	41.5134	80/20	41.5134
958921	AF2-183 C	7.3802	80/20	7.3802
959081	AF2-199 C O2	33.1164	80/20	33.1164
959091	AF2-200 C O2	66.2328	80/20	66.2328
959101	AF2-201 C O2	3.1348	Adder	6.96
959761	AF2-267 C O2	2.2651	Adder	5.03
960551	AF2-346 C	16.3314	80/20	16.3314
961011	AF2-392 C O2	7.5296	80/20	7.5296
961021	AF2-393 O2	12.8346	80/20	12.8346
961031	AF2-394 O2	8.5564	80/20	8.5564
WEC	WEC	0.7859	Confirmed LTF	0.7859
CPLE	CPLE	0.1230	Confirmed LTF	0.1230
CBM-W2	CBM-W2	17.1826	Confirmed LTF	17.1826
NY	NY	0.2323	Confirmed LTF	0.2323
CBM-W1	CBM-W1	52.5170	Confirmed LTF	52.5170
TVA	TVA	1.9782	Confirmed LTF	1.9782
CBM-S2	CBM-S2	2.1097	Confirmed LTF	2.1097
CBM-S1	CBM-S1	9.6361	Confirmed LTF	9.6361
MADISON	MADISON	15.0958	Confirmed LTF	15.0958
MEC	MEC	15.7089	Confirmed LTF	15.7089
BLUEG	BLUEG	0.2726	Confirmed LTF	0.2726

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
TRIMBLE	TRIMBLE	0.1063	Confirmed LTF	0.1063

13.5.2 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
96709801	271331	DIXON ;8R	CE	271333	DIXON ; R	CE	1	COMED_P4_155-38-TR81___	breaker	421.0	121.43	123.98	DC	10.74

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
276156	O-029 C	0.3192	50/50	0.3192
276157	O-029 C	0.3451	50/50	0.3451
276158	O-029 C	0.6297	50/50	0.6297
293513	O-009 C1	0.5895	50/50	0.5895
293514	O-009 C2	0.2990	50/50	0.2990
293515	O-009 C3	0.3307	50/50	0.3307
293516	O-009 E1	13.6761	50/50	13.6761
293517	O-009 E2	6.9464	50/50	6.9464
293518	O-009 E3	7.6499	50/50	7.6499
293715	O-029 E	14.6213	50/50	14.6213
293716	O-029 E	8.0166	50/50	8.0166
293717	O-029 E	7.3681	50/50	7.3681
293771	O-035 E	2.8068	Adder	3.3
294401	BSHIL;1U E	4.5247	Adder	5.32
294410	BSHIL;2U E	4.5247	Adder	5.32
925581	AC1-033 C	0.7411	Adder	0.87
925582	AC1-033 E	4.9617	Adder	5.84
927201	AC1-214 C O1	0.9008	Adder	1.06
927202	AC1-214 E O1	2.8637	Adder	3.37
934051	AD1-031 C O1	1.5063	Adder	1.77
934052	AD1-031 E O1	2.4576	Adder	2.89
937531	AD2-214 C	4.2306	50/50	4.2306
937532	AD2-214 E	2.8204	50/50	2.8204
943383	AF1-009 BAT	6.8187	50/50	6.8187
943401	AF1-011 C	1.8670	50/50	1.8670
943402	AF1-011 E	3.1340	50/50	3.1340
943922	AF1-060 BAT	2.0096	50/50	2.0096
946321	AF1-296 C O1	2.3738	Adder	2.79
946322	AF1-296 E O1	11.1134	Adder	13.07
957751	AF2-069 C	0.0553	Adder	0.12
957752	AF2-069 E	0.1784	Adder	0.4
957761	AF2-070 C	0.0779	Adder	0.17
957762	AF2-070 E	0.3782	Adder	0.84
961011	AF2-392 C O2	9.4508	50/50	9.4508
961012	AF2-392 E O2	44.2472	50/50	44.2472
961021	AF2-393 O2	16.1094	50/50	16.1094
961031	AF2-394 O2	10.7396	50/50	10.7396
990901	L-005 E	5.9435	Adder	6.99

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
LGEE	LGEE	0.0593	Confirmed LTF	0.0593
CPLE	CPLE	0.0926	Confirmed LTF	0.0926
G-007A	G-007A	0.0863	Confirmed LTF	0.0863
VFT	VFT	0.2322	Confirmed LTF	0.2322
CBM-W2	CBM-W2	4.2179	Confirmed LTF	4.2179
CBM-W1	CBM-W1	2.5020	Confirmed LTF	2.5020
TVA	TVA	0.5026	Confirmed LTF	0.5026
CBM-S2	CBM-S2	0.9942	Confirmed LTF	0.9942
CBM-S1	CBM-S1	2.6582	Confirmed LTF	2.6582
MADISON	MADISON	1.3810	Confirmed LTF	1.3810
MEC	MEC	2.5742	Confirmed LTF	2.5742

13.5.3 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
96709812	272097	NELSON ;RT	CE	271331	DIXON ;8R	CE	1	COMED_P4_155-38-TR81___	breaker	440.0	120.48	122.92	DC	10.74

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
276156	O-029 C	0.3192	50/50	0.3192
276157	O-029 C	0.3451	50/50	0.3451
276158	O-029 C	0.6297	50/50	0.6297
293513	O-009 C1	0.5895	50/50	0.5895
293514	O-009 C2	0.2990	50/50	0.2990
293515	O-009 C3	0.3307	50/50	0.3307
293516	O-009 E1	13.6761	50/50	13.6761
293517	O-009 E2	6.9464	50/50	6.9464
293518	O-009 E3	7.6499	50/50	7.6499
293715	O-029 E	14.6213	50/50	14.6213
293716	O-029 E	8.0166	50/50	8.0166
293717	O-029 E	7.3681	50/50	7.3681
293771	O-035 E	2.8068	Adder	3.3
294401	BSHIL;1U E	4.5247	Adder	5.32
294410	BSHIL;2U E	4.5247	Adder	5.32
925581	AC1-033 C	0.7411	Adder	0.87
925582	AC1-033 E	4.9617	Adder	5.84
927201	AC1-214 C O1	0.9008	Adder	1.06
927202	AC1-214 E O1	2.8637	Adder	3.37
934051	AD1-031 C O1	1.5063	Adder	1.77
934052	AD1-031 E O1	2.4576	Adder	2.89
937531	AD2-214 C	4.2306	50/50	4.2306
937532	AD2-214 E	2.8204	50/50	2.8204
943383	AF1-009 BAT	6.8187	50/50	6.8187
943401	AF1-011 C	1.8670	50/50	1.8670
943402	AF1-011 E	3.1340	50/50	3.1340
943922	AF1-060 BAT	2.0096	50/50	2.0096
946321	AF1-296 C O1	2.3738	Adder	2.79

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
946322	AF1-296 E O1	11.1134	Adder	13.07
957751	AF2-069 C	0.0553	Adder	0.12
957752	AF2-069 E	0.1784	Adder	0.4
957761	AF2-070 C	0.0779	Adder	0.17
957762	AF2-070 E	0.3782	Adder	0.84
961011	AF2-392 C O2	9.4508	50/50	9.4508
961012	AF2-392 E O2	44.2472	50/50	44.2472
961021	AF2-393 O2	16.1094	50/50	16.1094
961031	AF2-394 O2	10.7396	50/50	10.7396
990901	L-005 E	5.9435	Adder	6.99
LGEE	LGEE	0.0593	Confirmed LTF	0.0593
CPLE	CPLE	0.0926	Confirmed LTF	0.0926
G-007A	G-007A	0.0863	Confirmed LTF	0.0863
VFT	VFT	0.2322	Confirmed LTF	0.2322
CBM-W2	CBM-W2	4.2179	Confirmed LTF	4.2179
CBM-W1	CBM-W1	2.5020	Confirmed LTF	2.5020
TVA	TVA	0.5026	Confirmed LTF	0.5026
CBM-S2	CBM-S2	0.9942	Confirmed LTF	0.9942
CBM-S1	CBM-S1	2.6582	Confirmed LTF	2.6582
MADISON	MADISON	1.3810	Confirmed LTF	1.3810
MEC	MEC	2.5742	Confirmed LTF	2.5742

13.6 Contingency Descriptions - Secondary POI

Contingency Name	Contingency Definition
COMED_P4_006-45-BT3-4__	CONTINGENCY 'COMED_P4_006-45-BT3-4__' TRIP BRANCH FROM BUS 274768 TO BUS 270678 CKT 1 / LEECO;BP 345 BYRON; B 345 REMOVE UNIT 1 FROM BUS 274656 / BYRON;1U 25 END
COMED_P4_155-45-BT9-10_	CONTINGENCY 'COMED_P4_155-45-BT9-10_' TRIP BRANCH FROM BUS 275203 TO BUS 270828 CKT 1 / NELSO;2M 138 NELSO; B 345 TRIP BRANCH FROM BUS 275203 TO BUS 272095 CKT 1 / NELSO;2M 138 NELSO; R 138 TRIP BRANCH FROM BUS 275203 TO BUS 275303 CKT 1 / NELSO;2M 138 NELSO;2C 34.5 DISCONNECT BUS 274714 REMOVE UNIT C1 FROM BUS 274715 REMOVE UNIT S1 FROM BUS 274716 REMOVE UNIT C2 FROM BUS 274717 REMOVE UNIT S2 FROM BUS 274718 END

Contingency Name	Contingency Definition
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_P1-3_TR82_NELSO_B-R	CONTINGENCY 'COMED_P1-3_TR82_NELSO_B-R' TRIP BRANCH FROM BUS 275203 TO BUS 270828 CKT 1 / NELSO;2M 138 NELSO; B 345 TRIP BRANCH FROM BUS 275203 TO BUS 272095 CKT 1 / NELSO;2M 138 NELSO; R 138 TRIP BRANCH FROM BUS 275203 TO BUS 275303 CKT 1 / NELSO;2M 138 NELSO;2C 34.5 END
COMED_P4_155-45-BT8-9__	CONTINGENCY 'COMED_P4_155-45-BT8-9__' TRIP BRANCH FROM BUS 270828 TO BUS 270700 CKT 1 / NELSO; B 345 CORDO; B 345 TRIP BRANCH FROM BUS 275203 TO BUS 270828 CKT 1 / NELSO;2M 138 NELSO; B 345 TRIP BRANCH FROM BUS 275203 TO BUS 272095 CKT 1 / NELSO;2M 138 NELSO; R 138 TRIP BRANCH FROM BUS 275203 TO BUS 275303 CKT 1 / NELSO;2M 138 NELSO;2C 34.5 END
COMED_P2-1_186-L16914__	CONTINGENCY 'COMED_P2-1_186-L16914__' TRIP BRANCH FROM BUS 272365 TO BUS 272516 CKT 1 / H440 ;RT 138 STEWA; B 138 END
Base Case	
COMED_P4_155-38-TR84___	CONTINGENCY 'COMED_P4_155-38-TR84___' 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 272094 TO BUS 271330 CKT 1 / NELSO; B 138 DIXON;7B 138 TRIP BRANCH FROM BUS 272094 TO BUS 272366 CKT 1 / NELSO; B 138 R FAL; B 138 END

Contingency Name	Contingency Definition
COMED_P4_155-38-TR81___	CONTINGENCY 'COMED_P4_155-38-TR81___' TRIP BRANCH FROM BUS 270828 TO BUS 272094 TO BUS 275341 CKT 1 / NELSO; B 345 NELSO; B 138 NELSO;1C 34.5 TRIP BRANCH FROM BUS 272094 TO BUS 271330 CKT 1 / NELSO; B 138 DIXON;7B 138 TRIP BRANCH FROM BUS 272094 TO BUS 272366 CKT 1 / NELSO; B 138 R FAL; B 138 TRIP BRANCH FROM BUS 272094 TO BUS 275204 CKT 1 / NELSO; B 138 NELSO;4M 138 END
COMED_P1-2_345-L0626__B-R-A	CONTINGENCY 'COMED_P1-2_345-L0626__B-R-A' TRIP BRANCH FROM BUS 270678 TO BUS 930480 CKT 1 / BYRON ; B 345 AB1-089 TAP 345 END

14 Affected Systems

14.1 MISO

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