



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-252
“BLUE MOUND 345 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 located in McLean County, Illinois. The installed facilities will have a total capability of 50 MW with 20 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is October 31, 2023. This study does not imply a TO commitment to this in-service date.

Queue Number	AF2-252
Project Name	BLUE MOUND 345 KV
State	Illinois
County	McLean
Transmission Owner	ComEd
MFO	50
MWE	50
MWC	20
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 AF2-252 proposes to add 50 MW of battery storage to TSS 989 built under PJM queue S27.

5 Cost Summary

The AF2-252 project will be responsible for the following costs:

Description	Total Cost
Total Physical Interconnection Costs	\$200,000
Total System Network Upgrade Costs	\$70,500,000
Total Costs	\$70,700,000

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 AF2-252; the relaying, SCADA, communication, and metering will 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 will 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.

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

The Queue Project AF2-252 was evaluated as a 50.0 MW (Capacity 20.0 MW) injection at the Twin Groves 345 kV substation in the ComEd area. Project AF2-252 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-252 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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
9645884 2	27070 4	LORETT O ; B	345. 0	CE	93940 0	AE1-172 TAP	345. 0	CE	1	COMED_P4_01 2-45-BT12-14	break er	1528. 0	211.12	212.37	DC	19.12
9645885 7	27085 2	PONTIA C ; B	345. 0	CE	27070 4	LORETT O ; B	345. 0	CE	1	COMED_P4_01 2-45-BT12-14	break er	1528. 0	199.23	200.49	DC	19.14
9645883 7	93940 0	AE1-172 TAP	345. 0	CE	93472 0	AD1-100 TAP	345. 0	CE	1	COMED_P4_01 2-45-BT12-14	break er	1528. 0	228.61	229.87	DC	19.12

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	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJEC T LOADIN G %	POST PROJEC T LOADIN G %	AC D C	MW IMPAC T
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ID	FROM BUS#	FROM BUS	kV	FRO M BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Ratin g MVA	PRE PROJEC T LOADIN G %	POST PROJEC T LOADIN G %	AC D C	MW IMPAC T
96459386	270668	BLUEMOUN D; B	345.0	CE	270852	PONTIAC ; B	345.0	CE	1	COMED_P1-2_345-L8001__-S	operatio n	1528.0	158.59	160.26	DC	25.6
96459388	270668	BLUEMOUN D; B	345.0	CE	270852	PONTIAC ; B	345.0	CE	1	Base Case	operatio n	1334.0	112.47	114.5	DC	27.12
96459305	270704	LORETTO ; B	345.0	CE	939400	AE1-172 TAP	345.0	CE	1	COMED_P1-2_345-L8014__-S-B	operatio n	1528.0	208.01	209.25	DC	19.03
96459393	270796	KINCAID ; B	345.0	CE	347955	7AUSTIN	345.0	AMIL	1	COMED_P1-2_345-L2105__-S-D	operatio n	956.0	155.37	156.43	DC	10.12
96459323	270852	PONTIAC ; B	345.0	CE	270704	LORETTO ; B	345.0	CE	1	COMED_P1-2_345-L8014__-S-B	operatio n	1528.0	196.13	197.37	DC	19.04
96459333	270853	PONTIAC ; R	345.0	CE	935000	AD1-133 TAP	345.0	CE	1	COMED_P1-2_345-L11212_B-S-B	operatio n	1528.0	190.61	191.75	DC	17.39
96459369	270912	CHESTNUT ;	345.0	CE	270668	BLUEMOUN D; B	345.0	CE	1	COMED_P1-2_345-L8001__-S	operatio n	1334.0	165.13	166.96	DC	24.38
96459376	270912	CHESTNUT ;	345.0	CE	270668	BLUEMOUN D; B	345.0	CE	1	Base Case	operatio n	1248.0	101.72	103.55	DC	22.86
96459472	347955	7AUSTIN	345.0	AMIL	270796	KINCAID ; B	345.0	CE	1	COMED_P1-2_SPS-2105&U1__A	operatio n	956.0	134.51	135.57	DC	10.12
96459569	348856	7LATHAM	345.0	AMIL	270912	CHESTNUT ;	345.0	CE	1	COMED_P1-2_345-L8001__-S	operatio n	1707.0	115.94	117.36	DC	24.37
96459315	935000	AD1-133 TAP	345.0	CE	270717	DRESDEN ; R	345.0	CE	1	COMED_P1-2_345-L11212_B-S-B	operatio n	1528.0	203.44	204.57	DC	17.39
96459291	939400	AE1-172 TAP	345.0	CE	934720	AD1-100 TAP	345.0	CE	1	COMED_P1-2_345-L8014__-S-B	operatio n	1528.0	224.58	225.83	DC	19.03

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

ID	Idx	Facility	Upgrade Description	Cost
96458842	1	LORETTO ; B 345.0 kV - AE1- 172 TAP 345.0 kV Ckt 1	<p>CE_NUN_Sta. 12 Dresden (816) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to confirm this proposal in study. Assuming this proposal is acceptable in solution, a preliminary estimate is \$4M with a 24 month estimated construction contingent upon outage scheduling with Station 12 Dresden. The ratings for L11212 will not change rather the contingency as stated above will be revised.</p> <p>Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months</p> <p>CE_NUN_L11212_2 (838) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to replace-2-345kV circuit breakers, upgrade a line relay scheme, station conductor upgrades at both terminals and re-conductor the line. A preliminary estimate for the upgrades is \$41M with an estimated construction timeline of 24-30 months. Upon completion the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD).</p> <p>Project Type : FAC Cost : \$41,000,000 Time Estimate : 24-30 Months</p>	\$45,000,000

ID	Idx	Facility	Upgrade Description	Cost
96458857	2	PONTIAC ; B 345.0 kV - LORETTO ; B 345.0 kV Ckt 1	<p>CE_NUN_8012 (814) : ComEd 345kV L8012 SN rating is 1364 MVA. The upgrade will be to replace a 345kV bus tie circuit breaker at TSS 80 Pontiac. A preliminary estimate for the upgrade is \$3M with an estimated construction timeline of 24 months. Upon completion of the upgrade the ratings will be 1461/1656/1909/1912 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : \$3,000,000 Time Estimate : 24.0 Months</p> <p>CE_NUN_Sta. 12 Dresden (816) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to confirm this proposal in study. Assuming this proposal is acceptable in solution, a preliminary estimate is \$4M with a 24 month estimated construction contingent upon outage scheduling with Station 12 Dresden. The ratings for L11212 will not change rather the contingency as stated above will be revised. Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months</p> <p>CE_NUN_L8012_1 (824) : ComEd 345kV L8012 SSTE rating is 1846 MVA. The upgrade will be to replace 1-345kV bus tie circuit breaker at TSS 80 Pontiac along with all associated disconnect switches. Also required is a upgraded 1-345kV line motor operated disconnect switch and line re-conductoring along with station conductor work. A preliminary estimate for this upgrade is \$18.5M with an estimated construction timeline of 30 months. Upon completion of the upgrade the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : \$18,500,000 Time Estimate : 30.0 Months</p>	\$25,500,000

ID	Idx	Facility	Upgrade Description	Cost
96458837	3	AE1-172 TAP 345.0 kV - AD1- 100 TAP 345.0 kV Ckt 1	<p>CE_NUN_Sta. 12 Dresden (816) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to install a new 345kV bus tie circuit breaker at Station 12 Dresden. The new 345kV breaker will be installed as BT CB 12-13. Initial review of this proposal is that the existing contingency will be reduced and potentially reducing the post contingency flow. PJM to confirm this proposal in study. Assuming this proposal is acceptable in solution, a preliminary estimate is \$4M with a 24 month estimated construction contingent upon outage scheduling with Station 12 Dresden. The ratings for L11212 will not change rather the contingency as stated above will be revised.</p> <p>Project Type : CON Cost : \$4,000,000 Time Estimate : 24.0 Months</p> <p>CE_NUN_L11212_2 (838) : ComEd 345kV L11212 SSTE rating is 1846 MVA. The upgrade will be to replace-2-345kV circuit breakers, upgrade a line relay scheme, station conductor upgrades at both terminals and re-conductor the line. A preliminary estimate for the upgrades is \$41M with an estimated construction timeline of 24-30 months. Upon completion the ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD).</p> <p>Project Type : FAC Cost : \$41,000,000 Time Estimate : 24-30 Months</p>	\$45,000,000
			TOTAL COST	\$70,500,000

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

11.6 Flow Gate Details

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
96458842	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P4_012-45-BT12-14	breaker	1528.0	211.12	212.37	DC	19.12

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274650	KINCAID ;1U	19.9198	50/50	19.9198
274651	KINCAID ;2U	19.9140	50/50	19.9140
274853	TWINGROVE;U1	2.6121	50/50	2.6121
274854	TWINGROVE;U2	2.6121	50/50	2.6121
274863	CAYUGA RI;1U	3.1059	50/50	3.1059
274864	CAYUGA RI;2U	3.1059	50/50	3.1059
274880	GENERATOR;	2.3938	50/50	2.3938
274882	W4-005 E	92.9332	50/50	92.9332
274890	CAYUG;1U E	72.0240	50/50	72.0240
274891	CAYUG;2U E	72.0240	50/50	72.0240
276153	W2-048 E	17.1581	50/50	17.1581
290261	S-027 E	60.5722	50/50	60.5722
290265	S-028 E	60.5722	50/50	60.5722
909052	X2-022 E	51.6116	50/50	51.6116
917501	Z2-087 C	2.1907	50/50	2.1907
917502	Z2-087 E	84.9920	50/50	84.9920
924041	AB2-047 C O1	15.8750	50/50	15.8750
924042	AB2-047 E O1	106.2401	50/50	106.2401
924261	AB2-070 C O1	7.5652	50/50	7.5652
924262	AB2-070 E O1	47.9519	50/50	47.9519
925771	AC1-053 C	7.4285	50/50	7.4285
925772	AC1-053 E	49.7135	50/50	49.7135
935001	AD1-133 C O1	88.1514	50/50	88.1514
935002	AD1-133 E O1	58.7676	50/50	58.7676
935141	AD1-148	13.4520	50/50	13.4520
936771	AD2-100 C	25.0186	50/50	25.0186
936772	AD2-100 E	16.6790	50/50	16.6790
936971	AD2-131 C	1.6480	50/50	1.6480
936972	AD2-131 E	8.2800	50/50	8.2800
937211	AD2-159 C	10.0429	50/50	10.0429
937212	AD2-159 E	47.0190	50/50	47.0190
939741	AE1-205 C O1	41.0306	50/50	41.0306
939742	AE1-205 E O1	56.6614	50/50	56.6614
941731	AE2-173 O1	24.4230	50/50	24.4230
942111	AE2-223 C	9.5250	50/50	9.5250
942112	AE2-223 E	63.7440	50/50	63.7440
942481	AE2-261 C	36.8201	50/50	36.8201
942482	AE2-261 E	24.5467	50/50	24.5467
944221	AF1-090 C O1	6.3008	50/50	6.3008
944222	AF1-090 E O1	29.4992	50/50	29.4992
945871	AF1-252 O1	11.1696	50/50	11.1696

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
945881	AF1-253 O1	7.7328	50/50	7.7328
951741	J474 C	5.3123	PJM External (MISO)	5.3123
951742	J474 E	28.7408	PJM External (MISO)	28.7408
952251	J641	14.3304	PJM External (MISO)	14.3304
952271	J644	14.1460	PJM External (MISO)	14.1460
952651	J756 C	4.7153	PJM External (MISO)	4.7153
952652	J756 E	25.5111	PJM External (MISO)	25.5111
952871	J757 C	6.0528	PJM External (MISO)	6.0528
952872	J757 E	32.7473	PJM External (MISO)	32.7473
953401	J811	10.9009	PJM External (MISO)	10.9009
953651	J815	38.2450	PJM External (MISO)	38.2450
953741	J826 C	3.1365	PJM External (MISO)	3.1365
953742	J826 E	16.9695	PJM External (MISO)	16.9695
953851	J845 C	3.0456	PJM External (MISO)	3.0456
953852	J845 E	16.4772	PJM External (MISO)	16.4772
953881	J848 C	5.8531	PJM External (MISO)	5.8531
953882	J848 E	31.6669	PJM External (MISO)	31.6669
954411	J912	14.4300	PJM External (MISO)	14.4300
954721	J750 C	3.7864	PJM External (MISO)	3.7864
954722	J750 E	20.4851	PJM External (MISO)	20.4851
954761	J468 C	3.0439	PJM External (MISO)	3.0439
954762	J468 E	17.2490	PJM External (MISO)	17.2490
954821	J955	182.0312	PJM External (MISO)	182.0312
955031	J979 C	4.6825	PJM External (MISO)	4.6825
955032	J979 E	25.3335	PJM External (MISO)	25.3335
955401	J1022 C	4.7048	PJM External (MISO)	4.7048
955402	J1022 E	25.4542	PJM External (MISO)	25.4542
955711	J1055 C	2.3506	PJM External (MISO)	2.3506
955712	J1055 E	12.7175	PJM External (MISO)	12.7175
956151	J1102	11.7649	PJM External (MISO)	11.7649
956281	J1115 C	7.7975	PJM External (MISO)	7.7975
956282	J1115 E	42.1865	PJM External (MISO)	42.1865
956451	J1139	17.7690	PJM External (MISO)	17.7690
957381	AF2-032 C	2.8247	50/50	2.8247
957382	AF2-032 E	1.3293	50/50	1.3293
958013	AF2-095 BAT	4.6200	50/50	4.6200
958023	AF2-096 BAT	8.9907	50/50	8.9907
959341	AF2-225 C	30.7730	50/50	30.7730
959342	AF2-225 E	42.4960	50/50	42.4960
959611	AF2-252 C	7.6480	50/50	7.6480
959612	AF2-252 E	11.4720	50/50	11.4720
960141	AF2-305	2.6769	50/50	2.6769
960261	AF2-317	4.3046	50/50	4.3046
960603	AF2-351 BAT	2.3100	50/50	2.3100
960611	AF2-352 C	7.6480	50/50	7.6480
960612	AF2-352 E	11.4720	50/50	11.4720
LGEE	LGEE	1.5500	Confirmed LTF	1.5500
CPL	CPL	1.2549	Confirmed LTF	1.2549
G-007A	G-007A	2.0738	Confirmed LTF	2.0738
VFT	VFT	5.5664	Confirmed LTF	5.5664
CBM-W2	CBM-W2	48.5831	Confirmed LTF	48.5831
TVA	TVA	5.5440	Confirmed LTF	5.5440

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
CBM-S2	CBM-S2	12.6582	Confirmed LTF	12.6582
CBM-S1	CBM-S1	31.7711	Confirmed LTF	31.7711
MADISON	MADISON	2.9857	Confirmed LTF	2.9857
MEC	MEC	3.9169	Confirmed LTF	3.9169

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
96458857	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P4_012-45-BT12-14	breaker	1528.0	199.23	200.49	DC	19.14

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274650	KINCAID ;1U	19.9495	50/50	19.9495
274651	KINCAID ;2U	19.9437	50/50	19.9437
274853	TWINGROVE;U1	2.6142	50/50	2.6142
274854	TWINGROVE;U2	2.6142	50/50	2.6142
274880	GENERATOR;	2.3962	50/50	2.3962
274882	W4-005 E	93.0279	50/50	93.0279
276153	W2-048 E	17.1775	50/50	17.1775
290261	S-027 E	60.6213	50/50	60.6213
290265	S-028 E	60.6213	50/50	60.6213
909052	X2-022 E	51.6699	50/50	51.6699
917501	Z2-087 C	2.1921	50/50	2.1921
917502	Z2-087 E	85.0460	50/50	85.0460
924041	AB2-047 C O1	15.8850	50/50	15.8850
924042	AB2-047 E O1	106.3075	50/50	106.3075
924261	AB2-070 C O1	7.5733	50/50	7.5733
924262	AB2-070 E O1	48.0029	50/50	48.0029
925771	AC1-053 C	7.4365	50/50	7.4365
925772	AC1-053 E	49.7675	50/50	49.7675
935001	AD1-133 C O1	88.2072	50/50	88.2072
935002	AD1-133 E O1	58.8048	50/50	58.8048
935141	AD1-148	13.4672	50/50	13.4672
936771	AD2-100 C	25.0576	50/50	25.0576
936772	AD2-100 E	16.7051	50/50	16.7051
936971	AD2-131 C	1.6506	50/50	1.6506
936972	AD2-131 E	8.2929	50/50	8.2929
937211	AD2-159 C	10.0531	50/50	10.0531
937212	AD2-159 E	47.0669	50/50	47.0669
939741	AE1-205 C O1	41.0567	50/50	41.0567
939742	AE1-205 E O1	56.6973	50/50	56.6973
941731	AE2-173 O1	24.4385	50/50	24.4385
942111	AE2-223 C	9.5310	50/50	9.5310
942112	AE2-223 E	63.7845	50/50	63.7845
942481	AE2-261 C	36.8757	50/50	36.8757
942482	AE2-261 E	24.5838	50/50	24.5838
944221	AF1-090 C O1	6.3117	50/50	6.3117
944222	AF1-090 E O1	29.5503	50/50	29.5503
945871	AF1-252 O1	11.1889	50/50	11.1889
945881	AF1-253 O1	7.7462	50/50	7.7462
951741	J474 C	5.3123	PJM External (MISO)	5.3123
951742	J474 E	28.7408	PJM External (MISO)	28.7408
952251	J641	14.3304	PJM External (MISO)	14.3304
952271	J644	14.1460	PJM External (MISO)	14.1460

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
952651	J756 C	4.7153	PJM External (MISO)	4.7153
952652	J756 E	25.5111	PJM External (MISO)	25.5111
952871	J757 C	6.0528	PJM External (MISO)	6.0528
952872	J757 E	32.7473	PJM External (MISO)	32.7473
953401	J811	10.9009	PJM External (MISO)	10.9009
953651	J815	38.2450	PJM External (MISO)	38.2450
953741	J826 C	3.1365	PJM External (MISO)	3.1365
953742	J826 E	16.9695	PJM External (MISO)	16.9695
953851	J845 C	3.0456	PJM External (MISO)	3.0456
953852	J845 E	16.4772	PJM External (MISO)	16.4772
953881	J848 C	5.8531	PJM External (MISO)	5.8531
953882	J848 E	31.6669	PJM External (MISO)	31.6669
954411	J912	14.4300	PJM External (MISO)	14.4300
954681	J949 C	15.3782	PJM External (MISO)	15.3782
954721	J750 C	3.7864	PJM External (MISO)	3.7864
954722	J750 E	20.4851	PJM External (MISO)	20.4851
954761	J468 C	3.0439	PJM External (MISO)	3.0439
954762	J468 E	17.2490	PJM External (MISO)	17.2490
954821	J955	182.0312	PJM External (MISO)	182.0312
955031	J979 C	4.6825	PJM External (MISO)	4.6825
955032	J979 E	25.3335	PJM External (MISO)	25.3335
955401	J1022 C	4.7048	PJM External (MISO)	4.7048
955402	J1022 E	25.4542	PJM External (MISO)	25.4542
955711	J1055 C	2.3506	PJM External (MISO)	2.3506
955712	J1055 E	12.7175	PJM External (MISO)	12.7175
956151	J1102	11.7649	PJM External (MISO)	11.7649
956281	J1115 C	7.7975	PJM External (MISO)	7.7975
956282	J1115 E	42.1865	PJM External (MISO)	42.1865
956451	J1139	17.7690	PJM External (MISO)	17.7690
957381	AF2-032 C	2.8289	50/50	2.8289
957382	AF2-032 E	1.3313	50/50	1.3313
958013	AF2-095 BAT	4.6076	50/50	4.6076
958023	AF2-096 BAT	8.9687	50/50	8.9687
959341	AF2-225 C	30.7925	50/50	30.7925
959342	AF2-225 E	42.5230	50/50	42.5230
959611	AF2-252 C	7.6542	50/50	7.6542
959612	AF2-252 E	11.4813	50/50	11.4813
960141	AF2-305	2.6798	50/50	2.6798
960261	AF2-317	4.3095	50/50	4.3095
960603	AF2-351 BAT	2.3038	50/50	2.3038
960611	AF2-352 C	7.6542	50/50	7.6542
960612	AF2-352 E	11.4813	50/50	11.4813
LGEE	LGEE	1.5677	Confirmed LTF	1.5677
CPL	CPL	1.2754	Confirmed LTF	1.2754
G-007A	G-007A	2.1482	Confirmed LTF	2.1482
VFT	VFT	5.7663	Confirmed LTF	5.7663
CBM-W2	CBM-W2	48.8370	Confirmed LTF	48.8370
TVA	TVA	5.5874	Confirmed LTF	5.5874
CBM-S2	CBM-S2	12.8374	Confirmed LTF	12.8374
CBM-S1	CBM-S1	32.0352	Confirmed LTF	32.0352
MADISON	MADISON	2.9857	Confirmed LTF	2.9857
MEC	MEC	3.9661	Confirmed LTF	3.9661

11.6.3 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
96458837	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P4_012-45-BT12-14	breaker	1528.0	228.61	229.87	DC	19.12

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
274650	KINCAID ;1U	19.9198	50/50	19.9198
274651	KINCAID ;2U	19.9140	50/50	19.9140
274853	TWINGROVE;U1	2.6121	50/50	2.6121
274854	TWINGROVE;U2	2.6121	50/50	2.6121
274863	CAYUGA RI;1U	3.1059	50/50	3.1059
274864	CAYUGA RI;2U	3.1059	50/50	3.1059
274880	GENERATOR;	2.3938	50/50	2.3938
274882	W4-005 E	92.9332	50/50	92.9332
274890	CAYUG;1U E	72.0240	50/50	72.0240
274891	CAYUG;2U E	72.0240	50/50	72.0240
276153	W2-048 E	17.1581	50/50	17.1581
290261	S-027 E	60.5722	50/50	60.5722
290265	S-028 E	60.5722	50/50	60.5722
909052	X2-022 E	51.6116	50/50	51.6116
917501	Z2-087 C	2.1907	50/50	2.1907
917502	Z2-087 E	84.9920	50/50	84.9920
924041	AB2-047 C O1	15.8750	50/50	15.8750
924042	AB2-047 E O1	106.2401	50/50	106.2401
924261	AB2-070 C O1	7.5652	50/50	7.5652
924262	AB2-070 E O1	47.9519	50/50	47.9519
925771	AC1-053 C	7.4285	50/50	7.4285
925772	AC1-053 E	49.7135	50/50	49.7135
935001	AD1-133 C O1	88.1514	50/50	88.1514
935002	AD1-133 E O1	58.7676	50/50	58.7676
935141	AD1-148	13.4520	50/50	13.4520
936771	AD2-100 C	25.0186	50/50	25.0186
936772	AD2-100 E	16.6790	50/50	16.6790
936971	AD2-131 C	1.6480	50/50	1.6480
936972	AD2-131 E	8.2800	50/50	8.2800
937211	AD2-159 C	10.0429	50/50	10.0429
937212	AD2-159 E	47.0190	50/50	47.0190
939401	AE1-172 C O1	29.6684	50/50	29.6684
939402	AE1-172 E O1	139.2029	50/50	139.2029
939741	AE1-205 C O1	41.0306	50/50	41.0306
939742	AE1-205 E O1	56.6614	50/50	56.6614
940101	AE1-252 C O1	59.6016	50/50	59.6016
940102	AE1-252 E O1	39.7344	50/50	39.7344
941731	AE2-173 O1	24.4230	50/50	24.4230
942111	AE2-223 C	9.5250	50/50	9.5250
942112	AE2-223 E	63.7440	50/50	63.7440
942481	AE2-261 C	36.8201	50/50	36.8201

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
942482	AE2-261 E	24.5467	50/50	24.5467
944221	AF1-090 C O1	6.3008	50/50	6.3008
944222	AF1-090 E O1	29.4992	50/50	29.4992
945871	AF1-252 O1	11.1696	50/50	11.1696
945881	AF1-253 O1	7.7328	50/50	7.7328
951741	J474 C	5.3123	PJM External (MISO)	5.3123
951742	J474 E	28.7408	PJM External (MISO)	28.7408
952251	J641	14.3304	PJM External (MISO)	14.3304
952271	J644	14.1460	PJM External (MISO)	14.1460
952651	J756 C	4.7153	PJM External (MISO)	4.7153
952652	J756 E	25.5111	PJM External (MISO)	25.5111
952871	J757 C	6.0528	PJM External (MISO)	6.0528
952872	J757 E	32.7473	PJM External (MISO)	32.7473
953401	J811	10.9009	PJM External (MISO)	10.9009
953651	J815	38.2450	PJM External (MISO)	38.2450
953741	J826 C	3.1365	PJM External (MISO)	3.1365
953742	J826 E	16.9695	PJM External (MISO)	16.9695
953851	J845 C	3.0456	PJM External (MISO)	3.0456
953852	J845 E	16.4772	PJM External (MISO)	16.4772
953881	J848 C	5.8531	PJM External (MISO)	5.8531
953882	J848 E	31.6669	PJM External (MISO)	31.6669
954411	J912	14.4300	PJM External (MISO)	14.4300
954721	J750 C	3.7864	PJM External (MISO)	3.7864
954722	J750 E	20.4851	PJM External (MISO)	20.4851
954761	J468 C	3.0439	PJM External (MISO)	3.0439
954762	J468 E	17.2490	PJM External (MISO)	17.2490
954821	J955	182.0312	PJM External (MISO)	182.0312
955031	J979 C	4.6825	PJM External (MISO)	4.6825
955032	J979 E	25.3335	PJM External (MISO)	25.3335
955401	J1022 C	4.7048	PJM External (MISO)	4.7048
955402	J1022 E	25.4542	PJM External (MISO)	25.4542
955711	J1055 C	2.3506	PJM External (MISO)	2.3506
955712	J1055 E	12.7175	PJM External (MISO)	12.7175
956151	J1102	11.7649	PJM External (MISO)	11.7649
956281	J1115 C	7.7975	PJM External (MISO)	7.7975
956282	J1115 E	42.1865	PJM External (MISO)	42.1865
956451	J1139	17.7690	PJM External (MISO)	17.7690
957381	AF2-032 C	2.8247	50/50	2.8247
957382	AF2-032 E	1.3293	50/50	1.3293
958013	AF2-095 BAT	4.6200	50/50	4.6200
958023	AF2-096 BAT	8.9907	50/50	8.9907
959341	AF2-225 C	30.7730	50/50	30.7730
959342	AF2-225 E	42.4960	50/50	42.4960
959611	AF2-252 C	7.6480	50/50	7.6480
959612	AF2-252 E	11.4720	50/50	11.4720
960141	AF2-305	2.6769	50/50	2.6769
960261	AF2-317	4.3046	50/50	4.3046
960603	AF2-351 BAT	2.3100	50/50	2.3100
960611	AF2-352 C	7.6480	50/50	7.6480
960612	AF2-352 E	11.4720	50/50	11.4720
LGEE	LGEE	1.5500	Confirmed LTF	1.5500
CPL	CPL	1.2549	Confirmed LTF	1.2549

Bus #	Bus	Gendeliv MW Impact	Type	Full MW Impact
G-007A	G-007A	2.0738	Confirmed LTF	2.0738
VFT	VFT	5.5664	Confirmed LTF	5.5664
CBM-W2	CBM-W2	48.5831	Confirmed LTF	48.5831
TVA	TVA	5.5440	Confirmed LTF	5.5440
CBM-S2	CBM-S2	12.6582	Confirmed LTF	12.6582
CBM-S1	CBM-S1	31.7711	Confirmed LTF	31.7711
MADISON	MADISON	2.9857	Confirmed LTF	2.9857
MEC	MEC	3.9169	Confirmed LTF	3.9169

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
AB2-047	Brokaw-Pontiac Midpoint	Engineering and Procurement
AB2-070	Brokaw-Lanesville	Active
AC1-053	Lanesville-Brokaw	Active
AD1-133	Pontiac MidPoint-Dresden	Active
AD1-148	Brokaw-Lanesville	Active
AD2-100	Kincaid-Pana	Active
AD2-131	Latham Kincaid	Active
AD2-159	Chestnut 345kV	Active
AE1-172	Loretto-Wilton Center	Active
AE1-205	McLean 345 kV	Active
AE1-252	Loretto-Wilton Center	Active
AE2-173	McLean 345 kV	Active
AE2-223	McLean 345 kV	Active
AE2-261	Kincaid-Pana	Active
AF1-090	Kincaid-Pana	Active
AF1-252	Kincaid-Pana	Active
AF1-253	Kincaid-Pana	Active
AF2-032	Kincaid	Active
AF2-095	Wilmington-Davis Creek	Active
AF2-096	Braidwood-East Frankfort 345 kV	Active
AF2-225	McLean 345 kV	Active
AF2-252	Blue Mound 345 kV	Active
AF2-305	Brokaw-Lanesville 345 kV	Active
AF2-317	Hill Topper 345 kV	Active
AF2-351	Kensington 138 kV	Active
AF2-352	Blue Mound 34.5 kV	Active
W2-048	Brokaw-Lanesville	In Service
W4-005	Blue Mound-Latham	Partially in Service - Under Construction
X2-022	Brokaw-Lanesville	In Service
Z2-087	Pontiac MidPoint-Brokaw 345kV	In Service
J1022	MISO	MISO
J1055	MISO	MISO
J1102	MISO	MISO
J1115	MISO	MISO
J1139	MISO	MISO
J468	MISO	MISO
J474	MISO	MISO
J641	MISO	MISO
J644	MISO	MISO

Queue Number	Project Name	Status
J750	MISO	MISO
J756	MISO	MISO
J757	MISO	MISO
J811	MISO	MISO
J815	MISO	MISO
J826	MISO	MISO
J845	MISO	MISO
J848	MISO	MISO
J912	MISO	MISO
J949	MISO	MISO
J955	MISO	MISO
J979	MISO	MISO

11.8 Contingency Descriptions

Contingency Name	Contingency Definition
COMED_P1-2_345-L11212_B-S-B	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-B' TRIP BRANCH FROM BUS 934720 TO BUS 939400 CKT 1 / AD1-100 TAP 345 AE1-172 TAP 345 END
COMED_P1-2_345-L8001___-S	CONTINGENCY 'COMED_P1-2_345-L8001___-S' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTI; R 345 Z2-087 TAP 345 END
COMED_P4_012-45-BT12-14	CONTINGENCY 'COMED_P4_012-45-BT12-14' TRIP BRANCH FROM BUS 270717 TO BUS 930740 CKT 1 / DRESDEN ; R 345 AB1-122 TAP 345 TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1 / AD1-133 TAP 345 DRESDEN ; R 345 END
COMED_P1-2_345-L2105___-S-D	CONTINGENCY 'COMED_P1-2_345-L2105___-S-D' TRIP BRANCH FROM BUS 944220 TO BUS 347945 CKT 1 / AF1-090 TAP 345 7PANA 345 END
COMED_P1-2_345-L8014___-S-B	CONTINGENCY 'COMED_P1-2_345-L8014___-S-B' TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1 / AD1-133 TAP 345 DRESDEN ; R 345 END
Base Case	
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

12 Short Circuit Analysis

The following breakers are overdutied:

None

12.1 System Reinforcements - Short Circuit

None

13 Affected Systems

13.1 MISO

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