Generation Interconnection

Feasibility Study Report

for

Queue Project AF1-030

SANDWICH - PLANO 138 KV

66.9 MW Capacity / 100 MW Energy

January, 2020

1 General

The Interconnection Customer (IC) has proposed a solar generating facility located in Kendall County, Illinois. The installed facilities will have a total capability of 100 MW with 66.9 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is December 1, 2022. This study does not imply a TO commitment to this in-service date. The IC has requested that queue project AF1-090 be studied at both a Primary and Secondary Point of Interconnection.

Queue Number	AF1-030
Project Name	SANDWICH - PLANO 138 KV
State	Illinois
County	Kendall
Transmission Owner	ComEd
MFO	100
MWE	100
MWC	66.9
Fuel	Solar
Basecase Study Year	2023

2.1 Primary Point of interconnection

Queue Position AF1-030, a 100 MW solar facility, proposes to interconnect with the ComEd transmission system by tying into 138kV Line 14609, 6.3 miles from TSS 146 Sandwich. Under an earlier queue AE2-341, a new Interconnection Substation would be built tying into 138kV line 14609, 6.3 miles from TSS 146 Sandwich. ComEd proposes to interconnect AF1-030 to the proposed Interconnection Substation, to be built by PJM queue position AE2-341.

1.2 Cost Summary

AF1-030 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	$2,000,000
Non Direct Connection Network Upgrades	$0
Total Costs	**$3,000,000**

In addition, the AF1-030 project may be responsible for a contribution to the following costs associated with network upgrades (See Section 16):

Description	Total Cost

Description	Total Cost
System Upgrades	**$17,000,000**

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

2 Transmission Owner Scope of Work

Attachment Facilities

AF1-030 generator lead will interconnect to 138kV Interconnection Substation (see details in Direct Connection section below). The required Attachment Facilities are one 138kV line MOD, one dead-end structure and one revenue-metering.

Direct Connection Network Upgrades

Prior to AF1-030 queue position, a new 138kV Interconnection Substation, would be built, approximately 6.3 miles from TSS 146 Sandwich, under an earlier queue position AE2-341 by looping in the 'Sandwich-Plano' 138kV line 14609.

In order to accommodate interconnection of AF1-030, the interconnection substation to be built by AE2-341, would need to be expanded to create a bus position.

The scope of work includes installation of one 138kV circuit breaker, to create a line position for AF1-030 generator lead, as shown in the one-line diagram below. It should be noted that if the AE2-341 project drops out, then scope of AF1-030 would change.

The Interconnection Customer (IC") is responsible for constructing all the facilities on the Interconnection Customer side of the Point of Interconnection (POI).

Non-Direct Connection Network Upgrades

None

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 Interconnection Customer.

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 Interconnection Customer and the actual costs of ComEd's work may differ significantly from these estimates.

Interconnection Customer 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 Interconnection Customer is responsible for all engineering, procurement, testing and construction of all equipment on the Interconnection Customer'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 for acquiring property and associated legal costs will be investigation during Facilities Study for this project.

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 138kV 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.

Description	Total Cost
Installation of one 138 kV circuit breaker at proposed future 138 kV substation	$2,000,000
Total Direct Connection Facility Costs	**$2,000,000**

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
None	$0
Total Non-Direct Connection Facility Costs	$0

6 Schedule

Normally it takes about 24-months to engineer, design, procure material and construct 138 kV facilities after ISA/ICSA are signed.

7 Transmission Owner Analysis

See Section 3

8 Interconnection Customer Requirements

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

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

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

9 Revenue Metering and SCADA Requirements

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 Network Impacts

The Queue Project AF1-030 was evaluated as a 100.0 MW (Capacity 66.9 MW) injection tapping the Sandwich to Plano West 138 kV line in the ComEd area. Project AF1-030 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-030 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

11 Generation Deliverability

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

None

12 Multiple Facility Contingency

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

None

13 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

ID	FROM BUS#	FROM BUS	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
43372130	255113	17STILLWELL	345.0	NIPS	243219	05DUMONT	345.0	AEP	1	AEP_P4_#2978_05DUMONT_NON_FSA	breaker	1409.0	133.29	133.32	DC	14.49
43372131	255113	17STILLWELL	345.0	NIPS	243219	05DUMONT	345.0	AEP	1	AEP_P4_#2978_05DUMONT_FSA	breaker	1409.0	133.28	133.32	DC	14.49
44099405	270926	WILTON ; B	345.0	CE	275232	WILTON ;3M	345.0	CE	1	COMED_P4_112-65-BT5-6__	breaker	1379.0	117.57	117.62	DC	15.45
44099380	270927	WILTON ; R	345.0	CE	275233	WILTON ;4M	345.0	CE	1	COMED_P4_112-65-BT2-3__	breaker	1379.0	120.03	120.08	DC	15.78
44099404	275232	WILTON ;3M	345.0	CE	270644	WILTON ;	765.0	CE	1	COMED_P4_112-65-BT5-6__	breaker	1379.0	117.57	117.62	DC	15.45
44099381	275233	WILTON ;4M	345.0	CE	270644	WILTON ;	765.0	CE	1	COMED_P4_112-65-BT2-3__	breaker	1379.0	120.03	120.08	DC	15.78
44099399	943120	AE2-341 TAP	138.0	CE	272803	W PLANO ; R	138.0	CE	1	COMED_P4_083-38-BT3-4__	breaker	498.0	100.34	118.01	DC	88.03

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
43372474	255113	17STILLWELL	345.0	NIPS	243219	05DUMONT	345.0	AEP	1	COMED_P1-2_695_B2	operation	1409.0	131.33	131.36	DC	14.89

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
45416574	272728	WATERMAN ; B	138.0	CE	271560	GLIDDEN ;BT	138.0	CE	1	272803 W PLANO ; R 138 943120 AE2-341 TAP 138 1	operation	321.0	117.46	134.53	DC	54.8
43372620	274804	UNIV PK N;RP	345.0	CE	243229	05OLIVE	345.0	AEP	1	COMED_P1-2_695_B2	operation	971.0	102.75	102.81	DC	10.39
44100130	943120	AE2-341 TAP	138.0	CE	272803	W PLANO ; R	138.0	CE	1	COMED_P1-2_138-L11106_B-R	operation	449.0	84.21	102.61	DC	82.59
44100131	943120	AE2-341 TAP	138.0	CE	272803	W PLANO ; R	138.0	CE	1	Base Case	operation	351.0	79.94	102.46	DC	79.04

15 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
44099404	4	**WILTON ;3M 345.0 kV - WILTON ; 765.0 kV Ckt 1**	**CE** **n5145 (1825) : PJM Network Upgrade (n5145): Reconfigure Wilton 765kV bus thereby allowing for 765kV L11216 (currently on Bus 6) to be relocated to Bus 8. Along with this line relocation, installation of 2-765kV BT CBs (6-8 & 8-2).** **Project Type : CON** **Cost : $11,000,000** **Time Estimate : 36-40 Months**	$11,000,000
44099405	2	**WILTON ; B 345.0 kV - WILTON ;3M 345.0 kV Ckt 1**	**CE** **n5145 (1825) : PJM Network Upgrade (n5145): Reconfigure Wilton 765kV bus thereby allowing for 765kV L11216 (currently on Bus 6) to be relocated to Bus 8. Along with this line relocation, installation of 2-765kV BT CBs (6-8 & 8-2).** **Project Type : CON** **Cost : $11,000,000** **Time Estimate : 36-40 Months**	$11,000,000
44099380	3	**WILTON ; R 345.0 kV - WILTON ;4M 345.0 kV Ckt 1**	**CE** **n5145 (1825) : PJM Network Upgrade (n5145): Reconfigure Wilton 765kV bus thereby allowing for 765kV L11216 (currently on Bus 6) to be relocated to Bus 8. Along with this line relocation, installation of 2-765kV BT CBs (6-8 & 8-2).** **Project Type : CON** **Cost : $11,000,000** **Time Estimate : 36-40 Months**	$11,000,000

ID	Index	Facility	Upgrade Description	Cost
44099381	5	WILTON ;4M 345.0 kV - WILTON ; 765.0 kV Ckt 1	CE n5145 (1825) : PJM Network Upgrade (n5145): Reconfigure Wilton 765kV bus thereby allowing for 765kV L11216 (currently on Bus 6) to be relocated to Bus 8. Along with this line relocation, installation of 2-765kV BT CBs (6-8 & 8-2). Project Type : CON Cost : $11,000,000 Time Estimate : 36-40 Months	$11,000,000
44099399	6	AE2-341 TAP 138.0 kV - W PLANO ; R 138.0 kV Ckt 1	CE CE_NUN_L14609 (1892) : ComEd 138kV l14609 LSD & ALDR ratings are 498 MVA & 573 MVA. The upgrade will be to re-conductor a portion of the line. A preliminary estimate for the upgrade is $3.5M with an estimated construction timeline of 24 months. Upon completion of the upgrade the ratings will be 487/534/612/574/722 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $3,500,000 Time Estimate : 24.0 Months	$3,500,000
43372131,43372130	1	17STILLWELL 345.0 kV - 05DUMONT 345.0 kV Ckt 1	AEP n4790 (245) : PJM Network Upgrade n4790. Replace Dumont substation 2500A wavetrap. Project Type : FAC Cost : $200,000 Time Estimate : 12-18 Months n5769.1 (246) : PJM Network Upgrade n5769.1. Perform engineering study for CT limits, and relay compliance trip limits at Dumont substation. Project Type : FAC Cost : $25,000 Time Estimate : 12-18 Months n5769.2 (247) : PJM Network Upgrade n5769.2. Replace two Dumont 3000A Non-Oil breakers. Project Type : FAC Cost : $2,000,000 Time Estimate : 12-18 Months n5769.3 (248) : PJM Network Upgrade n5769.3. Replace 11 jumpers/risers at Dumont substation. Project Type : FAC Cost : $275,000 Time Estimate : 12-18 Months NIPS NonPJMArea (446) : The external (i.e. Non-PJM) Transmission Owner, NIPS, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : 0.0 Months	$2,500,000
			TOTAL COST	$17,000,000

16 Primary Point of Interconnection 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.

16.2 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
4337213 1	25511 3	17STILLWEL L	NIPS	24321 9	05DUMON T	AEP	1	AEP_P4_#2978_05DUMONT_FSA	breake r	1409. 0	133.28	133.32	DC	14.49

Bus #	Bus	MW Impact
274724	RIVER EC ;11	4.3131
274788	**SE CHICAG;5U (Deativation : 06/01/20)**	**7.2749**
274789	**SE CHICAG;6U (Deativation : 06/01/20)**	**7.2941**
274790	**SE CHICAG;7U (Deativation : 06/01/20)**	**7.3901**
274791	**SE CHICAG;8U (Deativation : 06/01/20)**	**7.3901**
274792	**SE CHICAG;9U (Deativation : 06/01/20)**	**6.2047**
274793	**SE CHICAG;0U (Deativation : 06/01/20)**	**6.2047**
274794	**SE CHICAG;1U (Deativation : 06/01/20)**	**7.2996**
274795	**SE CHICAG;2U (Deativation : 06/01/20)**	**7.2996**
274830	U3-021 1	5.9351
274831	U3-021 2	5.9351
274881	PILOT HIL;1E	18.8591
275149	KELLYCK ;1E	18.8591
276161	W4-086	0.2359
276167	Z1-106 E2	1.2273
276168	Z1-106 E1	1.2272
276169	Z1-107 E	2.5648
276170	Z1-108 E	2.4191
290021	O50 E	18.8333
290051	GSG-6; E	3.3074
290108	LEEDK;1U E	23.6810
293061	N-015 E	14.8492
293644	O22 E1	10.1030
293645	O22 E2	19.6117
294392	P-010 E	18.8584
910542	X3-005 E	0.8451
914321	**Y2-103 (Withdrawn : 12/24/2019)**	**43.7243**
915011	Y3-013 1	3.6437
915021	Y3-013 2	3.6437

Bus #	Bus	MW Impact
915031	Y3-013 3	3.6437
918052	AA1-018 E OP	15.8157
920272	AA2-123 E	2.3780
924471	AB2-096	41.2156
926311	AC1-109 1	1.8513
926321	AC1-109 2	1.8513
926331	AC1-110 1	1.8457
926341	AC1-110 2	1.8457
926351	AC1-111 1	0.7409
926361	AC1-111 2	0.7409
926371	AC1-111 3	0.7409
926381	AC1-111 4	0.7409
926391	AC1-111 5	0.7409
926401	AC1-111 6	0.7409
927091	AC1-204 1	70.3798
927101	AC1-204 2	70.3561
927451	AC1-142A 1	4.0890
927461	AC1-142A 2	4.0892
930501	AB1-091 O1	74.6224
930741	AB1-122 1O1	69.6078
930751	AB1-122 2O1	71.8071
933411	AC2-154 C	2.5595
933412	AC2-154 E	4.1759
933431	AC2-156 C O1	0.9283
933432	AC2-156 E O1	1.5146
933911	AD1-013 C	1.8083
933912	AD1-013 E	2.8885
933931	AD1-016 C	0.9036
933932	AD1-016 E	1.4743
934101	AD1-039 1	6.8216
934111	AD1-039 2	7.0371
934431	AD1-067 C	0.1286
934432	AD1-067 E	0.5407
934721	AD1-100 C	18.9656
934722	AD1-100 E	88.5063
934871	AD1-116 C	0.9211
934872	AD1-116 E	1.5028
934971	AD1-129 C	0.8798
934972	AD1-129 E	0.5865
936371	AD2-047 C O1	4.5801
936372	AD2-047 E O1	22.3615
936461	AD2-060	1.4279
936511	AD2-066 C O1	8.1954
936512	AD2-066 E O1	5.4636
937001	AD2-134 C	2.6772
937002	AD2-134 E	11.0596
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**16.6862**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**11.1241**
937401	AD2-194 1	7.5684
937411	AD2-194 2	7.5659
938511	AE1-070 1	8.8929
938521	AE1-070 2	8.1333

Bus #	Bus	MW Impact
938851	AE1-113 C	7.7687
938852	AE1-113 E	27.5437
939351	AE1-166 C O1	5.2839
939352	AE1-166 E O1	4.8774
939631	AE1-193 C	8.6820
939632	AE1-193 E	58.1025
939641	AE1-194 C	8.6820
939642	AE1-194 E	58.1025
939651	AE1-195 C	8.6820
939652	AE1-195 E	58.1025
939681	AE1-198 C	25.7788
939682	AE1-198 E	21.9053
939732	**AE1-204 E (Withdrawn : 11/18/2019)**	**0.5371**
940621	AE2-049 C O1	4.8871
940622	AE2-049 E O1	3.2581
940631	AE2-050 C O1	6.1122
940632	AE2-050 E O1	4.0748
940752	AE2-062 E	0.0687
940762	**AE2-063 E (Withdrawn : 01/14/2020)**	**0.0687**
941131	AE2-107 C	3.7742
941132	AE2-107 E	2.5161
941551	AE2-152 C O1	6.0968
941552	AE2-152 E O1	4.0645
941561	AE2-153 C O1	4.5912
941562	AE2-153 E O1	21.4953
942421	AE2-255 C O1	2.9427
942422	AE2-255 E O1	8.8281
942881	AE2-307 C O1	11.2056
942882	AE2-307 E O1	4.0748
942911	AE2-310 C O1	4.7454
942912	AE2-310 E O1	1.2749
942991	AE2-321 C	7.9553
942992	AE2-321 E	3.9183
943121	AE2-341 C	12.3870
943122	AE2-341 E	6.0827
943591	AF1-030 C O1	4.3789
943592	AF1-030 E O1	2.1470
943801	AF1-048 C	1.9710
943802	AF1-048 E	1.3140
944041	AF1-072	1.1094
944911	AF1-156 C	6.2216
944912	AF1-156 E	4.1478
945351	AF1-200 FTIR	158.8704
946521	AF1-316 C O1	3.4628
946522	AF1-316 E O1	5.1942
946661	AF1-330 C	1.0335
946662	AF1-330 E	0.2269
946671	AF1-331	1.2446
951721	J643	25.9805
953871	J847	13.2318
954751	J351	435.5561
955741	J1058	36.5370

Bus #	Bus	MW Impact
WEC	WEC	4.3038
CBM-W2	CBM-W2	29.4185
NY	NY	1.3477
CBM-W1	CBM-W1	73.8716
TVA	TVA	2.3114
O-066	O-066	15.9264
CBM-S1	CBM-S1	11.3231
G-007	G-007	2.4606
MADISON	MADISON	22.0167
MEC	MEC	15.3609
BLUEG	BLUEG	0.0972
TRIMBLE	TRIMBLE	0.0723
CATAWBA	CATAWBA	0.2034

16.3 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
44099405	270926	WILTON ; B	CE	275232	WILTON ;3M	CE	1	COMED_P4_112-65-BT5-6__	breaker	1379.0	117.57	117.62	DC	15.45

Bus #	Bus	MW Impact
274771	LINCOLN ;2U	3.0480
274772	LINCOLN ;3U	3.0480
274773	LINCOLN ;4U	3.0480
274774	LINCOLN ;5U	3.0480
274775	LINCOLN ;6U	3.0480
274776	LINCOLN ;7U	3.0480
274777	LINCOLN ;8U	3.0480
274830	U3-021 1	6.3043
274831	U3-021 2	6.3043
274881	PILOT HIL;1E	19.9420
274890	CAYUG;1U E	17.0075
274891	CAYUG;2U E	17.0075
275149	KELLYCK ;1E	19.9420
276161	W4-086	0.2521
276167	Z1-106 E2	1.3064
276168	Z1-106 E1	1.3064
276169	Z1-107 E	2.6741
276170	Z1-108 E	2.5706
290021	O50 E	20.0287
290051	GSG-6; E	10.8928
290108	LEEDK;1U E	25.1957
293061	N-015 E	16.4444
293644	O22 E1	10.5927
293645	O22 E2	20.5622
294392	P-010 E	20.8844
910542	X3-005 E	0.7563

Bus #	Bus	MW Impact
914321	Y2-103 (Withdrawn : 12/24/2019)	46.3651
915011	Y3-013 1	3.8638
915021	Y3-013 2	3.8638
915031	Y3-013 3	3.8638
918052	AA1-018 E OP	16.9848
920272	AA2-123 E	2.5264
924041	AB2-047 C O1	0.5855
924042	AB2-047 E O1	3.9182
924471	AB2-096	43.7801
926311	AC1-109 1	1.9768
926321	AC1-109 2	1.9768
926331	AC1-110 1	1.9636
926341	AC1-110 2	1.9636
926351	AC1-111 1	0.7895
926361	AC1-111 2	0.7895
926371	AC1-111 3	0.7895
926381	AC1-111 4	0.7895
926391	AC1-111 5	0.7895
926401	AC1-111 6	0.7895
927091	AC1-204 1	75.0465
927101	AC1-204 2	75.0465
927451	AC1-142A 1	4.3262
927461	AC1-142A 2	4.3259
930501	AB1-091 O1	79.3488
930741	AB1-122 1O1	75.3115
930751	AB1-122 2O1	76.2401
933411	AC2-154 C	2.7064
933412	AC2-154 E	4.4157
933431	AC2-156 C O1	0.9894
933432	AC2-156 E O1	1.6143
933911	AD1-013 C	1.9234
933912	AD1-013 E	3.0725
933931	AD1-016 C	0.9600
933932	AD1-016 E	1.5663
934101	AD1-039 1	7.3805
934111	AD1-039 2	7.4715
934431	AD1-067 C	0.1368
934432	AD1-067 E	0.5751
934701	AD1-098 C O1	7.1671
934702	AD1-098 E O1	5.2327
934721	AD1-100 C	24.8549
934722	AD1-100 E	115.9893
934871	AD1-116 C	0.9892
934872	AD1-116 E	1.6139
934971	AD1-129 C	0.9346
934972	AD1-129 E	0.6230
935001	AD1-133 C O1	23.0265
935002	AD1-133 E O1	15.3510
936291	AD2-038 C O1	2.4304
936292	AD2-038 E O1	16.2649
936371	AD2-047 C O1	4.8431
936372	AD2-047 E O1	23.6455

Bus #	Bus	MW Impact
936461	AD2-060	1.5099
936511	AD2-066 C O1	8.7651
936512	AD2-066 E O1	5.8434
937001	AD2-134 C	2.8475
937002	AD2-134 E	11.7632
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**17.7568**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**11.8378**
937401	AD2-194 1	8.0702
937411	AD2-194 2	8.0702
938511	AE1-070 1	9.4825
938521	AE1-070 2	8.6755
938851	AE1-113 C	8.2618
938852	AE1-113 E	29.2920
939321	AE1-163 C O1	6.1071
939322	AE1-163 E O1	37.5153
939351	AE1-166 C O1	6.4997
939352	AE1-166 E O1	5.9997
939401	AE1-172 C O1	6.7954
939402	AE1-172 E O1	31.8837
939732	**AE1-204 E (Withdrawn : 11/18/2019)**	**0.5696**
939741	AE1-205 C O1	10.4001
939742	AE1-205 E O1	14.3621
940101	AE1-252 C O1	13.6514
940102	AE1-252 E O1	9.1010
940621	AE2-049 C O1	5.1697
940622	AE2-049 E O1	3.4464
940631	AE2-050 C O1	6.8967
940632	AE2-050 E O1	4.5978
940752	AE2-062 E	0.0716
940762	**AE2-063 E (Withdrawn : 01/14/2020)**	**0.0716**
941131	AE2-107 C	4.0158
941132	AE2-107 E	2.6772
941551	AE2-152 C O1	7.4996
941552	AE2-152 E O1	4.9997
941561	AE2-153 C O1	5.1253
941562	AE2-153 E O1	23.9957
941731	AE2-173 O1	6.1905
942111	AE2-223 C	2.4143
942112	AE2-223 E	16.1573
942421	AE2-255 C O1	3.1295
942422	AE2-255 E O1	9.3885
942651	AE2-281 C O1	0.8724
942652	AE2-281 E O1	5.3593
942881	AE2-307 C O1	12.6440
942882	AE2-307 E O1	4.5978
942911	AE2-310 C O1	5.0198
942912	AE2-310 E O1	1.3486
942991	AE2-321 C	8.4519
942992	AE2-321 E	4.1629
943121	AE2-341 C	13.2096
943122	AE2-341 E	6.4866
943381	AF1-009 C	0.3286

Bus #	Bus	MW Impact
943382	AF1-009 E	1.3144
943422	AF1-013 E	1.6430
943591	AF1-030 C O1	4.6697
943592	AF1-030 E O1	2.2896
943801	AF1-048 C	2.0940
943802	AF1-048 E	1.3960
944041	AF1-072	1.1799
944911	AF1-156 C	6.9454
944912	AF1-156 E	4.6302
945351	AF1-200 FTIR	171.0257
946521	AF1-316 C O1	3.8348
946522	AF1-316 E O1	5.7523
946661	AF1-330 C	1.0980
946662	AF1-330 E	0.2410
946671	AF1-331	1.3239
WEC	WEC	4.5593
CBM-W2	CBM-W2	25.8886
NY	NY	1.4400
CBM-W1	CBM-W1	77.6746
TVA	TVA	1.6184
O-066	O-066	17.0957
CHEOAH	CHEOAH	0.0776
CBM-S1	CBM-S1	6.0492
G-007	G-007	2.6426
MADISON	MADISON	24.2726
MEC	MEC	16.0219
CALDERWOOD	CALDERWOOD	0.0636
BLUEG	BLUEG	2.3054
TRIMBLE	TRIMBLE	0.7964
CATAWBA	CATAWBA	0.3626

16.4 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
44099380	270927	WILTON ; R	CE	275233	WILTON ;4M	CE	1	COMED_P4_112-65-BT2-3__	breaker	1379.0	120.03	120.08	DC	15.78

Bus #	Bus	MW Impact
274771	LINCOLN ;2U	3.1304
274772	LINCOLN ;3U	3.1304
274773	LINCOLN ;4U	3.1304
274774	LINCOLN ;5U	3.1304
274775	LINCOLN ;6U	3.1304
274776	LINCOLN ;7U	3.1304
274777	LINCOLN ;8U	3.1304
274830	U3-021 1	6.4384
274831	U3-021 2	6.4384

Bus #	Bus	MW Impact
274881	PILOT HIL;1E	20.3585
274890	CAYUG;1U E	17.3471
274891	CAYUG;2U E	17.3471
275149	KELLYCK ;1E	20.3585
276161	W4-086	0.2575
276167	Z1-106 E2	1.3343
276168	Z1-106 E1	1.3342
276169	Z1-107 E	2.7312
276170	Z1-108 E	2.6255
290021	O50 E	20.4558
290051	GSG-6; E	11.1243
290108	LEEDK;1U E	25.7329
293061	N-015 E	16.7882
293644	O22 E1	10.8167
293645	O22 E2	20.9971
294392	P-010 E	21.3210
910542	X3-005 E	0.7728
914321	**Y2-103 (Withdrawn : 12/24/2019)**	**47.3566**
915011	Y3-013 1	3.9464
915021	Y3-013 2	3.9464
915031	Y3-013 3	3.9464
918052	AA1-018 E OP	17.3564
920272	AA2-123 E	2.5803
924041	AB2-047 C O1	0.5973
924042	AB2-047 E O1	3.9976
924471	AB2-096	44.7113
926311	AC1-109 1	2.0188
926321	AC1-109 2	2.0188
926331	AC1-110 1	2.0054
926341	AC1-110 2	2.0054
926351	AC1-111 1	0.8064
926361	AC1-111 2	0.8064
926371	AC1-111 3	0.8064
926381	AC1-111 4	0.8064
926391	AC1-111 5	0.8064
926401	AC1-111 6	0.8064
927091	AC1-204 1	76.6590
927101	AC1-204 2	76.6542
927451	AC1-142A 1	4.4192
927461	AC1-142A 2	4.4192
930501	AB1-091 O1	80.9991
930741	AB1-122 1O1	76.9097
930751	AB1-122 2O1	77.8676
933411	AC2-154 C	2.7629
933412	AC2-154 E	4.5080
933431	AC2-156 C O1	1.0105
933432	AC2-156 E O1	1.6487
933911	AD1-013 C	1.9643
933912	AD1-013 E	3.1378
933931	AD1-016 C	0.9805
933932	AD1-016 E	1.5998
934101	AD1-039 1	7.5372

Bus #	Bus	MW Impact
934111	AD1-039 2	7.6310
934431	AD1-067 C	0.1397
934432	AD1-067 E	0.5873
934701	AD1-098 C O1	7.3194
934702	AD1-098 E O1	5.3439
934721	AD1-100 C	25.3483
934722	AD1-100 E	118.2919
934871	AD1-116 C	1.0108
934872	AD1-116 E	1.6492
934971	AD1-129 C	0.9545
934972	AD1-129 E	0.6363
935001	AD1-133 C O1	23.5039
935002	AD1-133 E O1	15.6692
936291	AD2-038 C O1	2.4828
936292	AD2-038 E O1	16.6155
936371	AD2-047 C O1	4.9442
936372	AD2-047 E O1	24.1394
936461	AD2-060	1.5414
936511	AD2-066 C O1	8.9509
936512	AD2-066 E O1	5.9673
937001	AD2-134 C	2.9081
937002	AD2-134 E	12.0133
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**18.1248**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**12.0832**
937401	AD2-194 1	8.2436
937411	AD2-194 2	8.2431
938511	AE1-070 1	9.6863
938521	AE1-070 2	8.8614
938851	AE1-113 C	8.4380
938852	AE1-113 E	29.9165
939321	AE1-163 C O1	6.2388
939322	AE1-163 E O1	38.3238
939351	AE1-166 C O1	6.6307
939352	AE1-166 E O1	6.1207
939401	AE1-172 C O1	6.9298
939402	AE1-172 E O1	32.5144
939732	**AE1-204 E (Withdrawn : 11/18/2019)**	**0.5818**
939741	AE1-205 C O1	10.6108
939742	AE1-205 E O1	14.6529
940101	AE1-252 C O1	13.9215
940102	AE1-252 E O1	9.2810
940621	AE2-049 C O1	5.2778
940622	AE2-049 E O1	3.5186
940631	AE2-050 C O1	7.0386
940632	AE2-050 E O1	4.6924
940752	AE2-062 E	0.0731
940762	**AE2-063 E (Withdrawn : 01/14/2020)**	**0.0731**
941131	AE2-107 C	4.1013
941132	AE2-107 E	2.7342
941551	AE2-152 C O1	7.6508
941552	AE2-152 E O1	5.1006
941561	AE2-153 C O1	5.2309

Bus #	Bus	MW Impact
941562	AE2-153 E O1	24.4902
941731	AE2-173 O1	6.3159
942111	AE2-223 C	2.4632
942112	AE2-223 E	16.4846
942421	AE2-255 C O1	3.1962
942422	AE2-255 E O1	9.5886
942651	AE2-281 C O1	0.8913
942652	AE2-281 E O1	5.4748
942881	AE2-307 C O1	12.9041
942882	AE2-307 E O1	4.6924
942911	AE2-310 C O1	5.1249
942912	AE2-310 E O1	1.3768
942991	AE2-321 C	8.6325
942992	AE2-321 E	4.2518
943121	AE2-341 C	13.4901
943122	AE2-341 E	6.6243
943381	AF1-009 C	0.3356
943382	AF1-009 E	1.3423
943422	AF1-013 E	1.6779
943591	AF1-030 C O1	4.7689
943592	AF1-030 E O1	2.3382
943801	AF1-048 C	2.1387
943802	AF1-048 E	1.4258
944041	AF1-072	1.2051
944911	AF1-156 C	7.0885
944912	AF1-156 E	4.7257
945351	AF1-200 FTIR	174.6388
946521	AF1-316 C O1	3.9150
946522	AF1-316 E O1	5.8725
946661	AF1-330 C	1.1214
946662	AF1-330 E	0.2462
946671	AF1-331	1.3520
WEC	WEC	4.6566
CBM-W2	CBM-W2	26.4209
NY	NY	1.4710
CBM-W1	CBM-W1	79.3384
TVA	TVA	1.6506
O-066	O-066	17.4586
CHEOAH	CHEOAH	0.0796
CBM-S1	CBM-S1	6.1685
G-007	G-007	2.6988
MADISON	MADISON	24.7867
MEC	MEC	16.3603
CALDERWOOD	CALDERWOOD	0.0651
BLUEG	BLUEG	2.3558
TRIMBLE	TRIMBLE	0.8136
CATAWBA	CATAWBA	0.3707

16.5 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
44099404	275232	WILTON ;3M	CE	270644	WILTON ;	CE	1	COMED_P4_112-65-BT5-6__	breaker	1379.0	117.57	117.62	DC	15.45

Bus #	Bus	MW Impact
274771	LINCOLN ;2U	3.0480
274772	LINCOLN ;3U	3.0480
274773	LINCOLN ;4U	3.0480
274774	LINCOLN ;5U	3.0480
274775	LINCOLN ;6U	3.0480
274776	LINCOLN ;7U	3.0480
274777	LINCOLN ;8U	3.0480
274830	U3-021 1	6.3043
274831	U3-021 2	6.3043
274881	PILOT HIL;1E	19.9420
274890	CAYUG;1U E	17.0075
274891	CAYUG;2U E	17.0075
275149	KELLYCK ;1E	19.9420
276161	W4-086	0.2521
276167	Z1-106 E2	1.3064
276168	Z1-106 E1	1.3064
276169	Z1-107 E	2.6741
276170	Z1-108 E	2.5706
290021	O50 E	20.0287
290051	GSG-6; E	10.8928
290108	LEEDK;1U E	25.1957
293061	N-015 E	16.4444
293644	O22 E1	10.5927
293645	O22 E2	20.5622
294392	P-010 E	20.8844
910542	X3-005 E	0.7563
914321	**Y2-103 (Withdrawn : 12/24/2019)**	**46.3651**
915011	Y3-013 1	3.8638
915021	Y3-013 2	3.8638
915031	Y3-013 3	3.8638
918052	AA1-018 E OP	16.9848
920272	AA2-123 E	2.5264
924041	AB2-047 C O1	0.5855
924042	AB2-047 E O1	3.9182
924471	AB2-096	43.7801
926311	AC1-109 1	1.9768
926321	AC1-109 2	1.9768
926331	AC1-110 1	1.9636
926341	AC1-110 2	1.9636
926351	AC1-111 1	0.7895
926361	AC1-111 2	0.7895
926371	AC1-111 3	0.7895
926381	AC1-111 4	0.7895
926391	AC1-111 5	0.7895
926401	AC1-111 6	0.7895
927091	AC1-204 1	75.0465

Bus #	Bus	MW Impact
927101	AC1-204 2	75.0465
927451	AC1-142A 1	4.3262
927461	AC1-142A 2	4.3259
930501	AB1-091 O1	79.3488
930741	AB1-122 1O1	75.3115
930751	AB1-122 2O1	76.2401
933411	AC2-154 C	2.7064
933412	AC2-154 E	4.4157
933431	AC2-156 C O1	0.9894
933432	AC2-156 E O1	1.6143
933911	AD1-013 C	1.9234
933912	AD1-013 E	3.0725
933931	AD1-016 C	0.9600
933932	AD1-016 E	1.5663
934101	AD1-039 1	7.3805
934111	AD1-039 2	7.4715
934431	AD1-067 C	0.1368
934432	AD1-067 E	0.5751
934701	AD1-098 C O1	7.1671
934702	AD1-098 E O1	5.2327
934721	AD1-100 C	24.8549
934722	AD1-100 E	115.9893
934871	AD1-116 C	0.9892
934872	AD1-116 E	1.6139
934971	AD1-129 C	0.9346
934972	AD1-129 E	0.6230
935001	AD1-133 C O1	23.0265
935002	AD1-133 E O1	15.3510
936291	AD2-038 C O1	2.4304
936292	AD2-038 E O1	16.2649
936371	AD2-047 C O1	4.8431
936372	AD2-047 E O1	23.6455
936461	AD2-060	1.5099
936511	AD2-066 C O1	8.7651
936512	AD2-066 E O1	5.8434
937001	AD2-134 C	2.8475
937002	AD2-134 E	11.7632
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**17.7568**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**11.8378**
937401	AD2-194 1	8.0702
937411	AD2-194 2	8.0702
938511	AE1-070 1	9.4825
938521	AE1-070 2	8.6755
938851	AE1-113 C	8.2618
938852	AE1-113 E	29.2920
939321	AE1-163 C O1	6.1071
939322	AE1-163 E O1	37.5153
939351	AE1-166 C O1	6.4997
939352	AE1-166 E O1	5.9997
939401	AE1-172 C O1	6.7954
939402	AE1-172 E O1	31.8837
939732	**AE1-204 E (Withdrawn : 11/18/2019)**	**0.5696**

Bus #	Bus	MW Impact
939741	AE1-205 C O1	10.4001
939742	AE1-205 E O1	14.3621
940101	AE1-252 C O1	13.6514
940102	AE1-252 E O1	9.1010
940621	AE2-049 C O1	5.1697
940622	AE2-049 E O1	3.4464
940631	AE2-050 C O1	6.8967
940632	AE2-050 E O1	4.5978
940752	AE2-062 E	0.0716
940762	**AE2-063 E (Withdrawn : 01/14/2020)**	**0.0716**
941131	AE2-107 C	4.0158
941132	AE2-107 E	2.6772
941551	AE2-152 C O1	7.4996
941552	AE2-152 E O1	4.9997
941561	AE2-153 C O1	5.1253
941562	AE2-153 E O1	23.9957
941731	AE2-173 O1	6.1905
942111	AE2-223 C	2.4143
942112	AE2-223 E	16.1573
942421	AE2-255 C O1	3.1295
942422	AE2-255 E O1	9.3885
942651	AE2-281 C O1	0.8724
942652	AE2-281 E O1	5.3593
942881	AE2-307 C O1	12.6440
942882	AE2-307 E O1	4.5978
942911	AE2-310 C O1	5.0198
942912	AE2-310 E O1	1.3486
942991	AE2-321 C	8.4519
942992	AE2-321 E	4.1629
943121	AE2-341 C	13.2096
943122	AE2-341 E	6.4866
943381	AF1-009 C	0.3286
943382	AF1-009 E	1.3144
943422	AF1-013 E	1.6430
943591	AF1-030 C O1	4.6697
943592	AF1-030 E O1	2.2896
943801	AF1-048 C	2.0940
943802	AF1-048 E	1.3960
944041	AF1-072	1.1799
944911	AF1-156 C	6.9454
944912	AF1-156 E	4.6302
945351	AF1-200 FTIR	171.0257
946521	AF1-316 C O1	3.8348
946522	AF1-316 E O1	5.7523
946661	AF1-330 C	1.0980
946662	AF1-330 E	0.2410
946671	AF1-331	1.3239
WEC	WEC	4.5593
CBM-W2	CBM-W2	25.8886
NY	NY	1.4400
CBM-W1	CBM-W1	77.6746
TVA	TVA	1.6184

Bus #	Bus	MW Impact
O-066	O-066	17.0957
CHEOAH	CHEOAH	0.0776
CBM-S1	CBM-S1	6.0492
G-007	G-007	2.6426
MADISON	MADISON	24.2726
MEC	MEC	16.0219
CALDERWOOD	CALDERWOOD	0.0636
BLUEG	BLUEG	2.3054
TRIMBLE	TRIMBLE	0.7964
CATAWBA	CATAWBA	0.3626

16.6 Index 5

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
44099381	275233	WILTON ;4M	CE	270644	WILTON ;	CE	1	COMED_P4_112-65-BT2-3__	breaker	1379.0	120.03	120.08	DC	15.78

Bus #	Bus	MW Impact
274771	LINCOLN ;2U	3.1304
274772	LINCOLN ;3U	3.1304
274773	LINCOLN ;4U	3.1304
274774	LINCOLN ;5U	3.1304
274775	LINCOLN ;6U	3.1304
274776	LINCOLN ;7U	3.1304
274777	LINCOLN ;8U	3.1304
274830	U3-021 1	6.4384
274831	U3-021 2	6.4384
274881	PILOT HIL;1E	20.3585
274890	CAYUG;1U E	17.3471
274891	CAYUG;2U E	17.3471
275149	KELLYCK ;1E	20.3585
276161	W4-086	0.2575
276167	Z1-106 E2	1.3343
276168	Z1-106 E1	1.3342
276169	Z1-107 E	2.7312
276170	Z1-108 E	2.6255
290021	O50 E	20.4558
290051	GSG-6; E	11.1243
290108	LEEDK;1U E	25.7329
293061	N-015 E	16.7882
293644	O22 E1	10.8167
293645	O22 E2	20.9971
294392	P-010 E	21.3210
910542	X3-005 E	0.7728
914321	**Y2-103 (Withdrawn : 12/24/2019)**	**47.3566**
915011	Y3-013 1	3.9464
915021	Y3-013 2	3.9464
915031	Y3-013 3	3.9464

Bus #	Bus	MW Impact
918052	AA1-018 E OP	17.3564
920272	AA2-123 E	2.5803
924041	AB2-047 C O1	0.5973
924042	AB2-047 E O1	3.9976
924471	AB2-096	44.7113
926311	AC1-109 1	2.0188
926321	AC1-109 2	2.0188
926331	AC1-110 1	2.0054
926341	AC1-110 2	2.0054
926351	AC1-111 1	0.8064
926361	AC1-111 2	0.8064
926371	AC1-111 3	0.8064
926381	AC1-111 4	0.8064
926391	AC1-111 5	0.8064
926401	AC1-111 6	0.8064
927091	AC1-204 1	76.6590
927101	AC1-204 2	76.6542
927451	AC1-142A 1	4.4192
927461	AC1-142A 2	4.4192
930501	AB1-091 O1	80.9991
930741	AB1-122 1O1	76.9097
930751	AB1-122 2O1	77.8676
933411	AC2-154 C	2.7629
933412	AC2-154 E	4.5080
933431	AC2-156 C O1	1.0105
933432	AC2-156 E O1	1.6487
933911	AD1-013 C	1.9643
933912	AD1-013 E	3.1378
933931	AD1-016 C	0.9805
933932	AD1-016 E	1.5998
934101	AD1-039 1	7.5372
934111	AD1-039 2	7.6310
934431	AD1-067 C	0.1397
934432	AD1-067 E	0.5873
934701	AD1-098 C O1	7.3194
934702	AD1-098 E O1	5.3439
934721	AD1-100 C	25.3483
934722	AD1-100 E	118.2919
934871	AD1-116 C	1.0108
934872	AD1-116 E	1.6492
934971	AD1-129 C	0.9545
934972	AD1-129 E	0.6363
935001	AD1-133 C O1	23.5039
935002	AD1-133 E O1	15.6692
936291	AD2-038 C O1	2.4828
936292	AD2-038 E O1	16.6155
936371	AD2-047 C O1	4.9442
936372	AD2-047 E O1	24.1394
936461	AD2-060	1.5414
936511	AD2-066 C O1	8.9509
936512	AD2-066 E O1	5.9673
937001	AD2-134 C	2.9081

Bus #	Bus	MW Impact
937002	AD2-134 E	12.0133
937321	**AD2-175 C (Withdrawn : 12/10/2019)**	**18.1248**
937322	**AD2-175 E (Withdrawn : 12/10/2019)**	**12.0832**
937401	AD2-194 1	8.2436
937411	AD2-194 2	8.2431
938511	AE1-070 1	9.6863
938521	AE1-070 2	8.8614
938851	AE1-113 C	8.4380
938852	AE1-113 E	29.9165
939321	AE1-163 C O1	6.2388
939322	AE1-163 E O1	38.3238
939351	AE1-166 C O1	6.6307
939352	AE1-166 E O1	6.1207
939401	AE1-172 C O1	6.9298
939402	AE1-172 E O1	32.5144
939732	**AE1-204 E (Withdrawn : 11/18/2019)**	**0.5818**
939741	AE1-205 C O1	10.6108
939742	AE1-205 E O1	14.6529
940101	AE1-252 C O1	13.9215
940102	AE1-252 E O1	9.2810
940621	AE2-049 C O1	5.2778
940622	AE2-049 E O1	3.5186
940631	AE2-050 C O1	7.0386
940632	AE2-050 E O1	4.6924
940752	AE2-062 E	0.0731
940762	**AE2-063 E (Withdrawn : 01/14/2020)**	**0.0731**
941131	AE2-107 C	4.1013
941132	AE2-107 E	2.7342
941551	AE2-152 C O1	7.6508
941552	AE2-152 E O1	5.1006
941561	AE2-153 C O1	5.2309
941562	AE2-153 E O1	24.4902
941731	AE2-173 O1	6.3159
942111	AE2-223 C	2.4632
942112	AE2-223 E	16.4846
942421	AE2-255 C O1	3.1962
942422	AE2-255 E O1	9.5886
942651	AE2-281 C O1	0.8913
942652	AE2-281 E O1	5.4748
942881	AE2-307 C O1	12.9041
942882	AE2-307 E O1	4.6924
942911	AE2-310 C O1	5.1249
942912	AE2-310 E O1	1.3768
942991	AE2-321 C	8.6325
942992	AE2-321 E	4.2518
943121	AE2-341 C	13.4901
943122	AE2-341 E	6.6243
943381	AF1-009 C	0.3356
943382	AF1-009 E	1.3423
943422	AF1-013 E	1.6779
943591	AF1-030 C O1	4.7689
943592	AF1-030 E O1	2.3382

Bus #	Bus	MW Impact
943801	AF1-048 C	2.1387
943802	AF1-048 E	1.4258
944041	AF1-072	1.2051
944911	AF1-156 C	7.0885
944912	AF1-156 E	4.7257
945351	AF1-200 FTIR	174.6388
946521	AF1-316 C O1	3.9150
946522	AF1-316 E O1	5.8725
946661	AF1-330 C	1.1214
946662	AF1-330 E	0.2462
946671	AF1-331	1.3520
WEC	WEC	4.6566
CBM-W2	CBM-W2	26.4209
NY	NY	1.4710
CBM-W1	CBM-W1	79.3384
TVA	TVA	1.6506
O-066	O-066	17.4586
CHEOAH	CHEOAH	0.0796
CBM-S1	CBM-S1	6.1685
G-007	G-007	2.6988
MADISON	MADISON	24.7867
MEC	MEC	16.3603
CALDERWOOD	CALDERWOOD	0.0651
BLUEG	BLUEG	2.3558
TRIMBLE	TRIMBLE	0.8136
CATAWBA	CATAWBA	0.3707

16.7 Index 6

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
44099399	943120	AE2-341 TAP	CE	272803	W PLANO ; R	CE	1	COMED_P4_083-38-BT3-4__	breaker	498.0	100.34	118.01	DC	88.03

Bus #	Bus	MW Impact
272364	ESS H440N ;R	1.3041
274850	MENDOTA H;RU	0.3029
274855	GSG-6 ;RU	1.2756
274872	LEE DEKAL;1U	3.5810
276160	W4-084	0.2694
290051	GSG-6; E	36.5546
290108	LEEDK;1U E	106.8960
916221	AB2-191	0.4893
933431	AC2-156 C O1	6.1565
933432	AC2-156 E O1	10.0447
933911	AD1-013 C	6.5736
933912	AD1-013 E	10.5008

Bus #	Bus	MW Impact
934431	AD1-067 C	0.4590
934432	AD1-067 E	1.9300
934701	AD1-098 C O1	23.0651
934702	AD1-098 E O1	16.8399
937001	AD2-134 C	9.5559
937002	AD2-134 E	39.4756
941131	AE2-107 C	33.4266
941132	AE2-107 E	22.2844
943121	AE2-341 C	88.5552
943122	AE2-341 E	43.4853
943381	AF1-009 C	1.9952
943382	AF1-009 E	7.9810
943422	AF1-013 E	9.9762
943591	AF1-030 C O1	59.0661
943592	AF1-030 E O1	28.9609
946671	AF1-331	8.5372
WEC	WEC	0.1480
CBM-W2	CBM-W2	1.8837
NY	NY	0.0470
CBM-W1	CBM-W1	6.3050
TVA	TVA	0.1946
O-066	O-066	0.5443
CBM-S2	CBM-S2	0.0694
CBM-S1	CBM-S1	0.9031
TILTON	TILTON	0.0006
G-007	G-007	0.0842
MADISON	MADISON	1.8426
MEC	MEC	1.7940
GIBSON	GIBSON	0.0071
BLUEG	BLUEG	0.0833
TRIMBLE	TRIMBLE	0.0295

Affected Systems

17 Affected Systems

17.2 LG&E

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

17.3 MISO

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

17.4 TVA

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

17.5 Duke Energy Progress

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

17.6 NYISO

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

Contingency Name	Contingency Definition
AEP_P4_#2978_05DUMONT_NON_FSA	CONTINGENCY 'AEP_P4_#2978_05DUMONT_NON_FSA' OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020 OPEN BRANCH FROM BUS 243207 TO BUS 907040 CKT 1 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
AEP_P4_#2978_05DUMONT_FSA	CONTINGENCY 'AEP_P4_#2978_05DUMONT_FSA' OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
COMED_P1-2_695_B2	CONTINGENCY 'COMED_P1-2_695_B2' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1 END
COMED_P4_112-65-BT2-3__	CONTINGENCY 'COMED_P4_112-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
272803 W PLANO ; R 138 943120 AE2-341 TAP 138 1	CONTINGENCY '272803 W PLANO ; R 138 943120 AE2-341 TAP 138 1' OPEN BRANCH FROM BUS 272803 TO BUS 943120 CKT 1 END
Base Case	

Contingency Name	Contingency Definition
COMED_P1-2_138-L11106_B-R	CONTINGENCY 'COMED_P1-2_138-L11106_B-R' TRIP BRANCH FROM BUS 271390 TO BUS 271586 CKT 1 / ELECT; B 138 W541 ; B 138 TRIP BRANCH FROM BUS 271560 TO BUS 271558 CKT 1 / GLIDD;BT 138 GLIDD; B 138 TRIP BRANCH FROM BUS 271560 TO BUS 272728 CKT 1 / GLIDD;BT 138 WATER; B 138 TRIP BRANCH FROM BUS 271586 TO BUS 272114 CKT 1 / W541 ; B 138 N AUR; B 138 TRIP BRANCH FROM BUS 272114 TO BUS 272522 CKT 1 / N AUR; B 138 SUGAR; B 138 TRIP BRANCH FROM BUS 272522 TO BUS 271560 CKT 1 / SUGAR; B 138 GLIDD;BT 138 MOVE 100 PERCENT LOAD FROM BUS 271586 TO BUS 271587 / W541 ; B 138 W541 ; R 138 MOVE 100 PERCENT LOAD FROM BUS 272522 TO BUS 272523 / SUGAR; B 138 SUGAR; R 138 CLOSE LINE FROM BUS 272114 TO BUS 272115 CKT 1 / N AUR; B 138 N AUR; R 138 END
COMED_P4_083-38-BT3-4__	CONTINGENCY 'COMED_P4_083-38-BT3-4__' TRIP BRANCH FROM BUS 271390 TO BUS 271586 CKT 1 / ELECT; B 138 W541 ; B 138 TRIP BRANCH FROM BUS 271560 TO BUS 271558 CKT 1 / GLIDD;BT 138 GLIDD; B 138 TRIP BRANCH FROM BUS 271560 TO BUS 272728 CKT 1 / GLIDD;BT 138 WATER; B 138 TRIP BRANCH FROM BUS 271586 TO BUS 272114 CKT 1 / W541 ; B 138 N AUR; B 138 TRIP BRANCH FROM BUS 272114 TO BUS 272522 CKT 1 / N AUR; B 138 SUGAR; B 138 TRIP BRANCH FROM BUS 272522 TO BUS 271560 CKT 1 / SUGAR; B 138 GLIDD;BT 138 MOVE 100 PERCENT LOAD FROM BUS 271586 TO BUS 271587 / W541 ; B 138 W541 ; R 138 MOVE 100 PERCENT LOAD FROM BUS 272522 TO BUS 272523 / SUGAR; B 138 SUGAR; R 138 CLOSE LINE FROM BUS 272114 TO BUS 272115 CKT 1 / N AUR; B 138 N AUR; R 138 TRIP BRANCH FROM BUS 271558 TO BUS 272730 CKT 1 / GLIDD; B 138 WATER;3B 138 MOVE 100 PERCENT LOAD FROM BUS 272761 TO BUS 272759 / W DEK;7R 138 W DEK;4R 138 DISCONNECT BUS 271581 / B200 ; R 138 DISCONNECT BUS 272757 / W DEK;7T 138 END
COMED_P4_112-65-BT5-6__	CONTINGENCY 'COMED_P4_112-65-BT5-6__' TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END

Short Circuit

18 Short Circuit

The following Breakers are overdutied:

None

19 Secondary Point of Interconnection

The Queue Project AF1-030 was evaluated as a 100.0 MW (Capacity 66.9 MW) injection at the Plano West 138 kV substation in the ComEd area.

20 Generation Deliverability

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

None

21 Multiple Facility Contingency

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

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
4409945 8	27280 3	W PLAN O ; R	138. 0	CE	27225 1	PLANO ; R	138. 0	CE	1	COMED_P4_083 -38-BT3-4__	breake r	498.0	92.77	111.18	DC	91.7

22 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
433721 30	2551 13	17STILLW ELL	345. 0	NIPS	2432 19	05DUMO NT	345. 0	AEP	1	AEP_P4_#2978_05DUMONT_ NON_FSA	breake r	1409 .0	133.3	133.33	DC	14.55
433721 31	2551 13	17STILLW ELL	345. 0	NIPS	2432 19	05DUMO NT	345. 0	AEP	1	AEP_P4_#2978_05DUMONT_ FSA	breake r	1409 .0	133.3	133.33	DC	14.55
440994 05	2709 26	WILTON ; B	345. 0	CE	2752 32	WILTON ;3M	345. 0	CE	1	COMED_P4_112-65-BT5-6__	breake r	1379 .0	117.56	117.57	DC	15.52
440993 80	2709 27	WILTON ; R	345. 0	CE	2752 33	WILTON ;4M	345. 0	CE	1	COMED_P4_112-65-BT2-3__	breake r	1379 .0	120.01	120.02	DC	15.85
440990 16	2727 28	WATERM AN ; B	138. 0	CE	2715 60	GLIDDEN ;BT	138. 0	CE	1	COMED_P2-2_167_PL- 138R__3	bus	344. 0	103.6	119.53	DC	54.79
440993 71	2727 28	WATERM AN ; B	138. 0	CE	2715 60	GLIDDEN ;BT	138. 0	CE	1	COMED_P4_167-38-L14304_	breake r	344. 0	103.54	119.47	DC	54.79
433722 58	2748 04	UNIV PK N;RP	345. 0	CE	2432 29	05OLIVE	345. 0	AEP	1	AEP_P4_#2978_05DUMONT_ FSA	breake r	971. 0	103.76	103.79	DC	10.35
433722 59	2748 04	UNIV PK N;RP	345. 0	CE	2432 29	05OLIVE	345. 0	AEP	1	AEP_P4_#2978_05DUMONT_ NON_FSA	breake r	971. 0	103.76	103.79	DC	10.35
433722 60	2748 04	UNIV PK N;RP	345. 0	CE	2432 29	05OLIVE	345. 0	AEP	1	COMED_P4_023-65-BT2-3__	breake r	971. 0	102.75	102.78	DC	10.46
433722 61	2748 04	UNIV PK N;RP	345. 0	CE	2432 29	05OLIVE	345. 0	AEP	1	COMED_P4_112-65-BT4-5__	breake r	971. 0	102.75	102.78	DC	10.45
433722 62	2748 04	UNIV PK N;RP	345. 0	CE	2432 29	05OLIVE	345. 0	AEP	1	COMED_P4_112-65-BT3-4__	breake r	971. 0	102.75	102.78	DC	10.45
440994 04	2752 32	WILTON ;3M	345. 0	CE	2706 44	WILTON ;	765. 0	CE	1	COMED_P4_112-65-BT5-6__	breake r	1379 .0	117.56	117.57	DC	15.52
440993 81	2752 33	WILTON ;4M	345. 0	CE	2706 44	WILTON ;	765. 0	CE	1	COMED_P4_112-65-BT2-3__	breake r	1379 .0	120.01	120.02	DC	15.85

23 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
4337247 4	25511 3	17STILLWEL L	345. 0	NIPS	24321 9	05DUMON T	345. 0	AEP	1	COMED_P 1-2_695_B2	operatio n	1409. 0	131.34	131.37	DC	14.95
4409988 4	27272 8	WATERMA N ; B	138. 0	CE	27156 0	GLIDDEN ;BT	138. 0	CE	1	COMED_P 2-1_167-L14604__	operatio n	321.0	110.92	127.99	DC	54.8
4337262 0	27480 4	UNIV PK N;RP	345. 0	CE	24322 9	05OLIVE	345. 0	AEP	1	COMED_P 1-2_695_B2	operatio n	971.0	102.74	102.77	DC	10.44