Generation Interconnection

Feasibility Study Report

for

Queue Project AE2-261

KINCAID-PANA

179.4 MW Capacity / 299 MW Energy

July, 2019

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1 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 Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

PJM utilizes manufacturer models to ensure the performance of turbines and inverters is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines or inverters and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a $10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

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.

2 General

The Interconnection Customer (IC), has proposed a Solar generating facility located in Christian County, Illinois. The installed facilities will have a total capability of 299 MW with 179.4 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is June 1, 2022. This study does not imply a TO commitment to this in-service date.

Queue Number	**AE2-261**
Project Name	KINCAID-PANA
State	Illinois
County	Christian
Transmission Owner	ComEd
MFO	299
MWE	299
MWC	179.4
Fuel	Solar
Basecase Study Year	2022

2.1 Primary Point of Interconnection

Queue Position AE2-261, a 299 MW solar facility, proposes to interconnect with the ComEd transmission system by tying into the Kincaid-Pana (Ameren) 345kV line 2105, approximately 1.8 miles from Kincaid.

2.2 Cost Summary

The AE2-261 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,000,000
Direct Connection Network Upgrade	$23,000,000
Non Direct Connection Network Upgrades	$1,000,000
Total Costs	$25,000,000

In addition, the AE2-261 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	$498,660,000

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

3 Transmission Owner Scope of Work

4 Attachment Facilities

The AE2-261 generator lead would interconnect to a new 345kV Interconnection Substation. The required Attachment Facilities are one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

Scope of Work	Cost Estimate
Installation of one 345kV line MOD, one dead-end structure and one set of revenue metering (see notes below on cost estimate)	$1,000,000

5 Direct Connection Cost Estimate

In order to accommodate interconnection of AE2-261, a new 345kV Interconnection Substation would need to be built close to the Kincaid-Pana (Ameren) 345kV line 2105, approximately 1.8 miles from Kincaid.

The scope of work includes the installation of three 345kV circuit breakers in a "breaker-and-a-half" bus configuration and cutting in the Interconnection Substation to the Kincaid-Pana (Ameren) 345kV line 2105, as shown in the one-line diagram below.

The Interconnection Customer ("IC") is responsible for constructing all of the facilities on the IC side of the Point of Interconnection ("POI") outside of the substation. It is assumed for the purposes of this report that the IC will obtain the site for the Interconnection Substation and right-of-way between the Interconnection Substation and the 345kV transmission line.

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

ComEd would design, engineer and construct the tie-in of the Interconnection Substation to the Kincaid-Pana (Ameren) 345kV line 2105.

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

For Option to Build Direct Connection cost estimates:

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

For ComEd building the interconnecting substation cost estimates:

Scope of Work	Cost Estimate
Installation of a new 345kV substation as described above	$20,000,000
Transmission line tie in work (foundations, structures, conductors)	$3,000,000
Total Cost Estimate (see notes below on cost estimate)	$23,000,000

6 Non-Direct Connection Cost Estimate

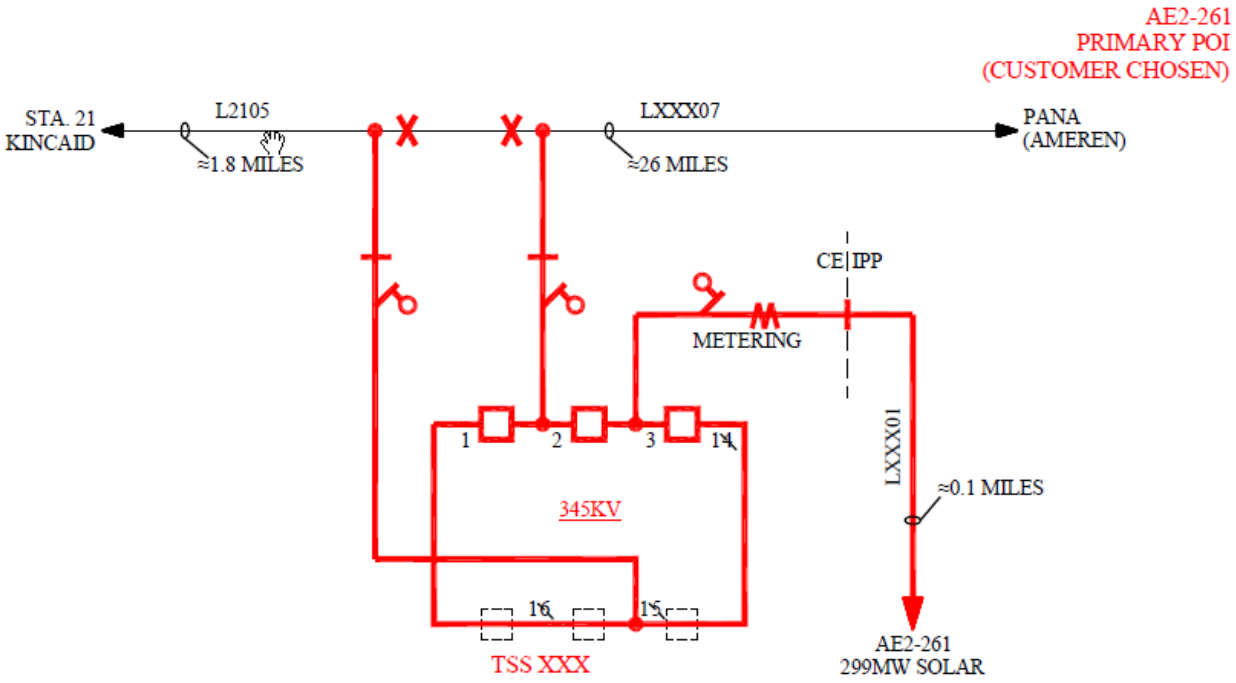
The integration of the new 345kV Interconnection Substation would require relay/communications/SCADA upgrades at Kincaid Station 21 and Ameren's Pana substation. The ComEd cost is given below:

Scope of Work	Cost Estimate
Relay/communications/SCADA upgrades at the Kincaid Station 21 substation	$1,000,000
Relay/communications/SCADA upgrades at E D Edwards Substation (Ameren to provide cost estimate in later phase)	$0
Total Cost Estimate (see notes below on cost estimate)	$1,000,000

7 Schedule

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

8 Transmission Owner Analysis



Notes on Cost Estimate:

1) These estimates are Order-of-Magnitude estimates of the costs that ComEd would bill to the customer for this interconnection. These estimates are based on a one-line electrical diagram of the project and the information provided by the IC.

2) There were no site visits performed for these estimates. There may be costs related to specific site related issues that are not identified in these estimates. The site reviews will be performed during the Facilities Study or during detailed engineering.

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

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

5) These cost estimates do not include cost of acquiring right-of-way for the transmission line and purchasing any additional land, if needed, for the line terminations. The need and cost of acquiring property and associated legal costs will be investigated during Facilities Study for this project.

9 Interconnection Customer Requirements

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

ComEd 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.

10 Revenue Metering and SCADA Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

11 Network Impacts for Primary Point of Interconnection

The Queue Project AE2-261 was evaluated as a 299.0 MW (Capacity 179.4 MW) injection tapping the Kincaid ;R to Pana 345 kV line in the ComEd area. Project AE2-261 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-261 was studied with a commercial probability of 0.53. Potential network impacts were as follows:

Summer Peak Load Flow

12 Generation Deliverability

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

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
8909463	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-C-B	single	1528.0	99.55	101.65	DC	32.16
8909586	348847	7BROKAW	AMIL	937160	AD2-153 TAP	CE	1	COMED_P1-2_345-L17802__-S	single	1528.0	99.84	102.09	DC	34.33

13 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	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
8909353	925770	AC1-053 TAP	CE	924260	AB2-070 TAP	CE	1	COMED_P4_021-45-BT5-7__	breaker	1243.0	93.29	100.66	DC	91.63

14 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	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
7305087	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	152.36	152.83	DC	24.64
8909431	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	111.56	113.91	DC	35.83
8909432	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	106.56	108.91	DC	35.83
8909210	270717	DRESDEN ; R	CE	270697	COLLINS ; R	CE	1	COMED_P4_111-45-L1223T_	breaker	1528.0	113.56	114.09	DC	17.49
8909034	270796	KINCAID ; B	CE	347955	7AUSTIN	AMIL	1	COMED_P4_080-45-BT7-8_FSA	breaker	956.0	129.89	141.2	DC	108.06
8909035	270796	KINCAID ; B	CE	347955	7AUSTIN	AMIL	1	COMED_P4_080-45-BT4-5__	breaker	956.0	128.23	139.87	DC	111.06
8909454	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	108.89	111.24	DC	35.89
8909455	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	103.01	105.36	DC	35.89
8909462	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-C-A	single	1528.0	102.47	104.58	DC	32.16
7305185	346809	7CASEY	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGENE 345_A2	breaker	1466.0	136.31	139.88	DC	52.16
8909585	348847	7BROKAW	AMIL	937160	AD2-153 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	102.28	104.52	DC	34.29

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
8909478	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	107.87	110.11	DC	34.26
8909479	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L17802__-S	single	1528.0	105.18	107.43	DC	34.3
8909521	924040	AB2-047 TAP	CE	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	107.51	109.75	DC	34.29
8909522	924040	AB2-047 TAP	CE	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L17802__-S	single	1528.0	105.08	107.32	DC	34.33
8909232	924260	AB2-070 TAP	CE	270673	BROKAW ; T	CE	1	COMED_P4_021-45-BT5-7__	breaker	1243.0	104.56	111.92	DC	91.63
8909994	934720	AD1-100 TAP	CE	937030	AD2-137 TAP	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B	tower	1846.0	151.72	152.28	DC	22.85
8909995	934720	AD1-100 TAP	CE	937030	AD2-137 TAP	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-A	tower	1846.0	150.36	150.92	DC	22.93
8909440	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-C-A	single	1528.0	110.24	112.35	DC	32.16
8909441	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-C-B	single	1528.0	105.91	108.02	DC	32.16
8909989	937030	AD2-137 TAP	CE	270926	WILTON ; B	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B	tower	1846.0	159.67	160.23	DC	22.85
8909990	937030	AD2-137 TAP	CE	270926	WILTON ; B	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-A	tower	1846.0	157.9	158.46	DC	22.93
8909560	937160	AD2-153 TAP	CE	924040	AB2-047 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	103.99	106.24	DC	34.29
8909561	937160	AD2-153 TAP	CE	924040	AB2-047 TAP	CE	1	COMED_P1-2_345-L17802__-S	single	1528.0	101.56	103.81	DC	34.33
8909424	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	117.25	119.59	DC	35.83
8909425	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-A	single	1528.0	111.37	113.71	DC	35.83

15 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	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
7306022	247712	05SULLIVAN	AEP	254529	16PETE	IPL	1	AEP_P1-2_#363	operation	1409.0	144.21	144.75	DC	16.75
8909619	270668	BLUEMOUND; B	CE	270852	PONTIAC ; B	CE	1	COMED_P1-2_345-L8001___-S_1_FSA	operation	1528.0	129.97	133.24	DC	49.93

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
8909426	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	operation	1528.0	206.56	210.47	DC	59.72
8909428	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	Base Case	operation	1364.0	155.59	158.66	DC	41.92
8909781	270717	DRESDEN ; R	CE	270697	COLLINS ; R	CE	1	COMED_P1-2_345-L1223_TR-S	operation	1528.0	113.43	113.96	DC	17.46
8909573	270796	KINCAID ; B	CE	347955	7AUSTIN	AMIL	1	COMED_P1-2_SPS-2105&U1___-A	operation	956.0	123.67	138.75	DC	144.2
8909578	270796	KINCAID ; B	CE	347955	7AUSTIN	AMIL	1	Base Case	operation	956.0	99.86	110.46	DC	101.17
8909650	270804	LATHAM ; T	CE	348856	7LATHAM	AMIL	1	COMED_P1-2_345-L8002___-S	operation	908.0	124.31	130.39	DC	55.17
8909766	270804	LATHAM ; T	CE	905080	W4-005 TAP	CE	1	COMED_P1-2_345-L8001___-S_1_FSA	operation	1334.0	111.29	115.05	DC	50.13
8909449	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-B	operation	1528.0	194.7	198.62	DC	59.82
8909451	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	Base Case	operation	1364.0	142.93	146.01	DC	42.02
8909456	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-C-A	operation	1528.0	191.78	195.29	DC	53.6
8909461	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	Base Case	operation	1334.0	128.06	130.39	DC	31.13
8909507	324114	7TRIMBLE CO	LGEE	248000	06CLIFTY	OVEC	1	AEP_P1-2_#363	operation	1451.0	157.57	158.03	DC	15.11
7306114	346809	7CASEY	AMIL	247712	05SULLIVAN	AEP	1	AEP_P1-2_#286	operation	1466.0	131.04	134.56	DC	51.44
7306115	346809	7CASEY	AMIL	247712	05SULLIVAN	AEP	1	Base Case	operation	1334.0	114.54	117.72	DC	42.31
8909579	348847	7BROKAW	AMIL	937160	AD2-153 TAP	CE	1	COMED_P1-2_345-L8002___-S	operation	1528.0	134.77	138.51	DC	57.14
8909584	348847	7BROKAW	AMIL	937160	AD2-153 TAP	CE	1	Base Case	operation	1334.0	104.65	107.55	DC	38.74
8909608	905080	W4-005 TAP	CE	270668	BLUEMOUND; B	CE	1	COMED_P1-2_345-L8001___-S_1_FSA	operation	1334.0	129.96	133.71	DC	50.06
8909473	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L8002___-S	operation	1528.0	171.08	174.82	DC	57.1
8909477	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	Base Case	operation	1334.0	145.23	148.14	DC	38.7
8909516	924040	AB2-047 TAP	CE	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L8002___-S	operation	1528.0	157.0	160.74	DC	57.14
8909520	924040	AB2-047 TAP	CE	917500	Z2-087 TAP	CE	1	Base Case	operation	1334.0	130.12	133.03	DC	38.74
8909831	924260	AB2-070 TAP	CE	270673	BROKAW ; T	CE	1	COMED_P1-2_345-L2102___-S_W4-005-FSA-A	operation	1243.0	104.91	110.14	DC	64.91
8909941	925770	AC1-053 TAP	CE	924260	AB2-070 TAP	CE	1	COMED_P1-2_345-L2102___-S_W4-005-FSA-A	operation	1243.0	94.88	100.1	DC	64.91
8909483	934720	AD1-100 TAP	CE	937030	AD2-137 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	operation	1528.0	170.3	171.15	DC	28.69
8909487	934720	AD1-100 TAP	CE	937030	AD2-137 TAP	CE	1	Base Case	operation	1364.0	153.94	154.64	DC	21.1
8909849	934730	AD1-100 TAP	CE	270670	BRAIDWOOD; B	CE	1	COMED_P1-2_345-L11212_B-S-A	operation	1528.0	107.5	108.26	DC	25.97

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
8909435	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-C-A	operation	1528.0	204.8	208.31	DC	53.6
8909438	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	Base Case	operation	1334.0	140.85	143.18	DC	31.13
8909467	937030	AD2-137 TAP	CE	270926	WILTON ; B	CE	1	COMED_P1-2_345-L8014___-S-B	operation	1528.0	176.73	177.58	DC	28.69
8909471	937030	AD2-137 TAP	CE	270926	WILTON ; B	CE	1	Base Case	operation	1364.0	163.84	164.54	DC	21.1
8909555	937160	AD2-153 TAP	CE	924040	AB2-047 TAP	CE	1	COMED_P1-2_345-L8002___-S	operation	1528.0	145.09	148.83	DC	57.14
8909559	937160	AD2-153 TAP	CE	924040	AB2-047 TAP	CE	1	Base Case	operation	1334.0	116.5	119.4	DC	38.74
8909419	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	operation	1528.0	223.1	227.01	DC	59.72
8909421	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	Base Case	operation	1364.0	171.19	174.26	DC	41.92

16 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
8909478,8909479	10	Z2-087 TAP 345.0 kV - PONTIAC ; R 345.0 kV Ckt 1	COMED No upgrade is required. L8014 SSTE rating is 1797 MVA.	$0
8909521,8909522	11	AB2-047 TAP 345.0 kV - Z2-087 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L8001 SSTE rating is 1837 MVA.	$0
8909034,8909035	7	KINCAID ; B 345.0 kV - 7AUSTIN 345.0 kV Ckt 1	COMED No upgrade is required. ComEd 345kV L2106 SSTE rating is 1667 MVA. AMIL NonPJMArea (197) : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : N/A Months	$0
8909210	6	DRESDEN ; R 345.0 kV - COLLINS ; R 345.0 kV Ckt 1	COMED No upgrade is required. ComEd 345kV L2311 SSTE rating is 1837 MVA.	$0
8909990,8909989	15	AD2-137 TAP 345.0 kV - WILTON ; B 345.0 kV Ckt 1	COMED ce-019 (369) : L11212 SLD & ALDR ratings are 2221 MVA & 2554MVA respectively. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to re-conductor the line, upgrade station conductor at both terminals, upgrade 2-345kV circuit breakers at Wilton Center. A preliminary estimate for the upgrades is $ 43.2 M with a estimated construction timeline of 36 months. Upon completion of the upgrades the rating swill be 1912/1912/1912/2390/2749 MVA (SN/SLTE/SSTE/SLD/ALDR). Project Type : FAC Cost : $43,200,000 Time Estimate : 36.0 Months	$43,200,000
8909995,8909994	13	AD1-100 TAP 345.0 kV - AD2-137 TAP 345.0 kV Ckt 1		
8909586,8909585	2	7BROKAW 345.0 kV - AD2-153 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L8001 SSTE rating is 1837 MVA. AMIL NonPJMArea (197) : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : N/A Months	$0
8909454,8909455	8	PONTIAC ; B 345.0 kV - LORETTO ; B 345.0 kV Ckt 1	COMED No upgrade is required. L8012 SSTE rating is 1846 MVA.	$0

ID	Index	Facility	Upgrade Description	Cost
8909232	12	AB2-070 TAP 345.0 kV - BROKAW ; T 345.0 kV Ckt 1	COMED ce-030 (386) : ComEd 345kV L18806 SSTE rating is 13346 MVA. The post contingency flow for this event exceeds the rating therefore an upgarde is required. The upgrade will be to mitigate sag on the line. A preliminary estimate for this upgrade is $11.8M with an estiamted construction timeline of 30 months. Upon completion of the upgrade the ratings will be 1679/2058/2107/2280 MVA SN/SLTE/SSTE/SLD. Project Type : FAC Cost : $11,800,000 Time Estimate : 30.0 Months	$11,800,000
8909353	3	AC1-053 TAP 345.0 kV - AB2-070 TAP 345.0 kV Ckt 1	COMED No upgrade required. L18806 SSTE rating is 1346 MVA.	$0
7305185	9	7CASEY 345.0 kV - 05SULLIVAN 345.0 kV Ckt 1	AEP n5034 (196) : Rebuilding a new Sullivan - Reynolds 765kV line which is driven by X3-028 MTX project will mitigate the identified overloads. Project Type : FAC Cost : $441,700,000 Time Estimate : N/A Months AMIL NonPJMArea (197) : The external (i.e. Non-PJM) Transmission Owner, AMIL, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : $0 Time Estimate : N/A Months OVEC n4106 (824) : PJM Network Upgrade n4106. Perform a sag study on the 345 kV line between Jefferson and Clifty Creek. Project Type : FAC Cost : $1,960,000 Time Estimate : N/A Months	$443,660,000
7305087	4	05JEFRSO 345.0 kV - 06CLIFTY 345.0 kV Ckt Z1		
8909425,8909424	17	AE1-172 TAP 345.0 kV - AD1-100 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L11212 SSTE rating is 1846 MVA.	$0
8909463,8909462	1	PONTIAC ; R 345.0 kV - AD1-133 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L8014 SSTE rating is 1797 MVA.	$0
8909560,8909561	16	AD2-153 TAP 345.0 kV - AB2-047 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L8001 SSTE rating is 1837 MVA.	$0
8909432,8909431	5	LORETTO ; B 345.0 kV - AE1-172 TAP 345.0 kV Ckt 1	COMED No upgrade is required. L11212 SSTE rating is 1846 MVA.	$0
8909441,8909440	14	AD1-133 TAP 345.0 kV - DRESDEN ; R 345.0 kV Ckt 1	COMED No upgrade is required. L8014 SSTE rating is 1797 MVA.	$0
			TOTAL COST	$498,660,000

ID	Index	Facility	Upgrade Description	Cost
2134522,2134523,2134520,2134521	7	E FRANKFO; B 345.0 kV - CRETE EC ;BP 345.0 kV Ckt 1	**COMED** ce-014 (301) : L6607 SSTE rating is 1483 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to reconductor the line. A preliminary estimate is $10.3 M with an estimated construction timeline of 30 months. Upon completion of the upgrades the rating swill be 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $10,300,000 Time Estimate : 30.0 Months	$10,300,000
2134353	15	WILTON ;3M 345.0 kV - WILTON ; 765.0 kV Ckt 1	**COMED** n5145 (292) : 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
2134355	11	WILTON ; B 345.0 kV - WILTON ;3M 345.0 kV Ckt 1		
2134357	12	WILTON ; R 345.0 kV - WILTON ;4M 345.0 kV Ckt 1		
2134359	16	WILTON ;4M 345.0 kV - WILTON ; 765.0 kV Ckt 1		
2134622	6	BURNHAM ;0R 345.0 kV - 17MUNSTER 345.0 kV Ckt 1	**COMED** ce-015 (302) : L17703 SSTE rating is 1251 MVA. The post contingency flow for this event exceeds the rating thererfore an upgrade is required. The upgrade will be to mitigate the sag on the line. A preliminary estimate for the upgrade is $2.7 M with a estimated construction timeline of 30 months. The new line rating upon completion of the upgrade will be 1201/1479/1568/1768 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $2,700,000 Time Estimate : 30.0 Months **NIPS** NonPJMArea (759) : 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 : N/A Months	$2,700,000
1347433,1347432	5	WILTON ; 765.0 kV - 05DUMONT 765.0 kV Ckt 1	**AEP** AEPI0001a (80) : Replace Dumont Circuit Breaker B1 [Breaker (3000A) Non oil - Dumont] Project Type : FAC Cost : $3,000,000 Time Estimate : 12-18 Months **COMED** No upgrade is required. Line L11215. Line sag SLD= 4802 MVA, ALDR = 5522 MVA.	$3,000,000

ID	Index	Facility	Upgrade Description	Cost
1345956,1345954,1345955,1345952,1345953	14	UNIV PK N;RP 345.0 kV - 05OLIVE 345.0 kV Ckt 1	**AEP** **AEP_AE1_REF_r0001 (120) : A Sag Study will be required on the 40.64 miles of ACSR/PE 1414 62/19 conductor to mitigate the overload. The new ratings after sag study will be: S/N: 971 MVA, S/E: 1419 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between $162,560 (no remediation required, just sag study) and $81.28 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement.** **Project Type : FAC** **Cost : $162,560** **Time Estimate : 6-12 Months** **AEP_AE1_REF_r0002 (121) : Replace 5 Jumpers (Sub cond 2156 ACSR 84/19 STD at Olive station, estimated cost : $175,000** **Project Type : FAC** **Cost : $175,000** **Time Estimate : 6-12 Months** **COMED** **ce-001 (278) : AEP owns limit on L97008. CE has a sag limit on 2 types of conductors as well. CE would need to address sag limit of 2 types of conductors to reach required rating. A preliminary estimate for sag mitigation is $21.4M with an estimated construction timeline of 30 months. Upon completion of the sag mitigation the new ratings will become 1091/1399/1483/1674 MVA SN/SLTE/SSTE/SLD.** **Project Type : FAC** **Cost : $21,400,000** **Time Estimate : 30.0 Months**	$21,737,560
2135024,2135026	18	AD2-137 TAP 345.0 kV - WILTON ; B 345.0 kV Ckt 1	**COMED** **ce-019 (308) : L11212 SLD & ALDR ratings are 2221 MVA & 2554MVA respectively. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to re-conductor the line, upgrade station conductor at both terminals, upgrade 2-345kV circuit breakers at Wilton Center. A preliminary estimate for the upgrades is $ 43.2 M with a estimated construction timeline of 36 months. Upon completion of the upgrades the rating swill be 1912/1912/1912/2390/2749 MVA (SN/SLTE/SSTE/SLD/ALDR).** **Project Type : FAC** **Cost : $43,200,000** **Time Estimate : 36.0 Months**	$43,200,000
2135029,2135031	17	AD1-100 TAP 345.0 kV - AD2-137 TAP 345.0 kV Ckt 1		

ID	Index	Facility	Upgrade Description	Cost
2134373,2134376,2134375,2134374	13	CRETE EC ;BP 345.0 kV - 17STJOHN 345.0 kV Ckt 1	**COMED** **ce-009 (293)** : L94507 SSTE rating is 1483 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to reconductor the line, upgrade station conductor and upgrade a relay package. A preliminary cost estimate is $14.9 M with an estimated construction timeline of 30 months. Upon complation of this upgrade the new ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). **Project Type** : FAC **Cost** : $14,900,000 **Time Estimate** : 30.0 Months **NIPS** **NonPJMArea (759)** : 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** : N/A Months	$14,900,000
1346086	9	GREENACRE; T 345.0 kV - 05OLIVE 345.0 kV Ckt 1	**AEP** **AEP_AE1_REF_r0005 (123)** : Replace ACSR/PE 1414 62/19 - Conductor Section 1. A Sag Study will be required on the 40.64 miles of conductor to mitigate the overload. The new ratings after sag study will be: S/N: 971 MVA, S/E: 1419 MVA, Depending on the sag study results, the cost for this upgrade is expected to be between $162,560 (no remediation required, just sag study) and $81.28 million (complete line Reconductor/rebuild). Time Estimate: a) Sag Study: 6-12 months b) Rebuild: The standard time required for construction differs from state to state. An approximate construction time would be 24 to 36 months after signing an interconnection agreement. **Project Type** : FAC **Cost** : $162,560 **Time Estimate** : 6-12 Months **COMED** **ce-002 (279)** : AEP owns limit on L6615. CE and NIPSCO have a sag limit as well that would need to be addressed. CE SSTE rating is 1134 MVA.A preliminary estimate for sag mitigation is $13.9M with an estimated construction timeline of 30 months. Upon completion of the sag mitigation the new ratings will become 1091/1399/1483/1674 MVA SN/SLTE/SSTE/SLD. **Project Type** : FAC **Cost** : $13,900,000 **Time Estimate** : 30.0 Months	$14,062,560
2134601	8	E FRANKFO; B 345.0 kV - GOODINGS ;3B 345.0 kV Ckt 1	**COMED** No upgrade is required. ComEd 345kV L11601 SSTE rating is 1837 MVA.	$0

ID	Index	Facility	Upgrade Description	Cost
1345815	4	17STILLWELL 345.0 kV - 05DUMONT 345.0 kV Ckt 1	**AEP** **n4790 (150) : PJM Network Upgrade n4790. Replace Dumont substation 2500A wavetrap. The network project had a projected in-service date of 06/01/2019 and an estimated cost of $200,000.** **Cost : $0** **n5769.1 (151) : PJM Network Upgrade n5769.1. Perform engineering study for CT limits, and relay compliance trip limits at Dumont substation. The network project has a projected in-service date of 06/01/2021 and an estimated cost of $25,000.** **Cost : $0** **n5769.2 (152) : PJM Network Upgrade n5769.2. Replace two Dumont 3000A Non-Oil breakers. The network project has a projected in-service date of 06/01/2021 and an estimated cost of $2,000,000.** **Cost : $0** **n5769.3 (153) : PJM Network Upgrade n5769.3. Replace 11 jumpers/risers at Dumont substation. The network project has a projected in-service date of 06/01/2021 and an estimated cost of $275,000.** **Cost : $0** **AEP_AD2_REF_r0001 (154) : Replace 4 Dumont switches (3000 A). Estimated cost is $2,400,000.** **Cost : $0** **AEP_AD2_REF_r0002 (155) : An engineering study will need to be conducted to determine if the Dumont Relay Compliance Trip limit settings can be adjusted. Estimated Cost to perform setting changes: $25,000. New relay packages will be required if the settings cannot be adjusted, Estimated Cost for relay package: $600,000.** **Cost : $0** **For all AEP reinforcements on the Stillwell-Dumont 345 kV line:** **Cost allocation will be performed in the Impact Study phase. Queue Project AE2-049 presently does not receive cost allocation for this upgrade.** **Note 1: As changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE2-049 could receive cost allocation.** **Note 2: Although Queue Project AE2-049 may not have cost responsibility for this upgrade, Queue Project AE2-049 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE2-049 comes into service prior to completion of the upgrade, Queue Project AE2-049 will need an interim study.** **NIPS** **NonPJMArea (759) : The external (i.e. Non-PJM) Transmission Owner, NIPS, will not evaluate this violation until the impact study phase.** **Cost : $0**	$0

ID	Index	Facility	Upgrade Description	Cost
2134417,2134420,2134418,2134419	3	17STJOHN 345.0 kV - ST JOHN ; T 345.0 kV Ckt 1	**COMED** ce-011 (297) : L6617 SSTE is 1134 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade is sag mitgation of the line. A preliminary estimate is $3.1 M with a estimated construction timeline of 30 months. Upon completion of this upgrade the new ratings will be 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : $3,100,000 Time Estimate : 30.0 Months **NIPS** NonPJMArea (759) : 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 : N/A Months	$3,100,000
2134425,2134424,2134423,2134422	10	ST JOHN ; T 345.0 kV - 17GREEN_ACRE 345.0 kV Ckt 1		
2134549	2	17GREEN_ACRE 345.0 kV - GREENACRE; T 345.0 kV Ckt 1		
2134629	1	BRAIDWOOD; B 345.0 kV - BRAIDWOOD; R 345.0 kV Ckt 1	**COMED** No violation. Post queue loading less than 100%.	$0
			TOTAL COST	**$124,000,120**

If "No Reinforcement Needed. Not a valid violation" was provided as the Upgrade Description for a facility in the System Reinforcements table then that facility met one of the following conditions:

a. The loading on the facility at your queue position was less than 100%; therefore, the facility is not yet overloaded, but may be overloaded by end of the AE2 queue.

b. The TO reviewed their ratings on the facility and determined that the current rating was greater than the rating in PJM's model. This new rating was greater than the loading at your queue position making the violation invalid.

c. The TO reviewed the contingency and determined that contingency was not valid; therefore the violation is invalid. Any contingency corrections will be assessed and corrected in the AE2 impact study phase.

17 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, 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.

17.1 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
8909462	270853	PONTIAC ; R	CE	935000	AD1-133 TAP	CE	1	COMED_P1-2_345-L11212_B-S-C-A	single	1528.0	102.47	104.58	DC	32.16

Bus #	Bus	MW Impact
274650	KINCAID ;1U	12.31
274651	KINCAID ;2U	12.33
274853	TWINGROVE;U1	1.83
274854	TWINGROVE;U2	1.83
274863	CAYUGA RI;1U	1.7
274864	CAYUGA RI;2U	1.7
900404	X3-028 C	78.44
905081	W4-005 C	1.74
917501	Z2-087 C	1.47
924041	AB2-047 C O1	14.84
924261	AB2-070 C O1	6.98
925771	AC1-053 C	6.83
926841	AC1-171 C O1	0.75
930461	AB1-087	28.76
930471	AB1-088	28.76
933441	AC2-157 C	3.97
935141	AD1-148	12.3
936771	AD2-100 C O1	25.49
937161	AD2-153 C O1	9.91
937171	AD2-154 C O1	9.91
937211	AD2-159 C	10.33
939401	AE1-172 C O1	24.59
939741	AE1-205 C O1	39.12
940101	AE1-252 C O1	41.91
941731	AE2-173	22.87
942111	AE2-223 C	9.07
942481	AE2-261 C	32.16
942601	AE2-276	2.62
942913	AE2-310 BAT	2.96
950701	J196 C	1.11
951001	J339	12.11
951741	J474 C	4.81
952271	J644	12.24
952321	J734	10.17
952651	J756 C	4.36
952871	J757 C	5.19
953401	J811	10.29
953651	J815	34.82
953741	J826 C	3.01
953801	J835 C	3.42

Bus #	Bus	MW Impact
953851	J845 C	2.96
953881	J848 C	5.38
954181	J884	24.97
954411	J912	13.29
954721	J750 C	3.3
954761	J468 C	3.94
AD2-098	AD2-098	0.45
CBM-N	CBM-N	0.66
CBM-S1	CBM-S1	9.88
CBM-S2	CBM-S2	3.14
CBM-W2	CBM-W2	112.92
CIN	CIN	10.83
CPLE	CPLE	1.12
EDWARDS	EDWARDS	0.05
G-007A	G-007A	2.19
IPL	IPL	5.91
LGEE	LGEE	1.65
MEC	MEC	2.68
NYISO	NYISO	2.87
TATANKA	TATANKA	0.42
VFT	VFT	5.88

17.2 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
8909585	348847	7BROKAW	AMIL	937160	AD2-153 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	102.28	104.52	DC	34.29

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.11
274651	KINCAID ;2U	13.12
274853	TWINGROVE;U1	1.09
274854	TWINGROVE;U2	1.09
900404	X3-028 C	87.56
905081	W4-005 C	1.25
924261	AB2-070 C O1	8.98
925771	AC1-053 C	8.73
926841	AC1-171 C O1	1.03
930461	AB1-087	32.1
930471	AB1-088	32.1
933441	AC2-157 C	4.44
935141	AD1-148	15.45
936771	AD2-100 C O1	25.63
937211	AD2-159 C	7.45
942481	AE2-261 C	34.29
942601	AE2-276	2.92
942913	AE2-310 BAT	3.84
950291	J291	4.04
950701	J196 C	1.28
951001	J339	15.22
951741	J474 C	5.73
952251	J641	12.82
952271	J644	13.06
952321	J734	12.78
952651	J756 C	4.6
952871	J757 C	5.52
953401	J811	10.84
953651	J815	36.64
953741	J826 C	3.74
953801	J835 C	3.63
953851	J845 C	3.66
953881	J848 C	5.65
954181	J884	32.6
954411	J912	13.99
954681	J949	19.05
954721	J750 C	3.58
954761	J468 C	4.33
AD2-098	AD2-098	0.43
CBM-N	CBM-N	0.7
CBM-S1	CBM-S1	11.11

Bus #	Bus	MW Impact
CBM-S2	CBM-S2	3.48
CBM-W2	CBM-W2	129.36
CIN	CIN	12.16
CPLE	CPLE	1.24
G-007A	G-007A	2.31
IPL	IPL	6.59
LGEE	LGEE	1.82
MEC	MEC	6.14
NYISO	NYISO	3.02
VFT	VFT	6.22

17.3 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
8909353	925770	AC1-053 TAP	CE	924260	AB2-070 TAP	CE	1	COMED_P4_021-45-BT5-7__	breaker	1243.0	93.29	100.66	DC	91.63

Bus #	Bus	MW Impact
274650	KINCAID ;1U	21.61
274651	KINCAID ;2U	21.65
276150	W2-048 E	8.35
909052	X2-022 E	115.96
925771	AC1-053 C	17.53
925772	AC1-053 E	117.31
935141	AD1-148	30.3
940103	AE1-252 EBAT	2.59
941732	AE2-173 BAT	2.56
942481	AE2-261 C	54.98
942482	AE2-261 E	36.65
950291	J291	2.97
952251	J641	9.41
952271	J644	9.35
952871	J757 C	3.63
952872	J757 E	19.67
953401	J811	7.6
953651	J815	27.3
953801	J835 C	2.39
953802	J835 E	12.96
953881	J848 C	5.01
953882	J848 E	27.12
954411	J912	10.88
954721	J750 C	3.36
954722	J750 E	18.15
CBM-N	CBM-N	0.08
CBM-S1	CBM-S1	4.98
CBM-S2	CBM-S2	1.33
CBM-W2	CBM-W2	55.53
CIN	CIN	1.76
CPLE	CPLE	0.43
EDWARDS	EDWARDS	0.14
G-007A	G-007A	0.32
IPL	IPL	1.18
LGEE	LGEE	0.38
MEC	MEC	7.26
NYISO	NYISO	0.36
TILTON	TILTON	1.17
VFT	VFT	0.84

17.4 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC|DC	MW IMPACT
7305087	242865	05JEFRSO	AEP	248000	06CLIFTY	OVEC	Z1	AEP_P4_#1760_05JEFRSO 765_A	breaker	2354.0	152.36	152.83	DC	24.64

Bus #	Bus	MW Impact
243442	05RKG1	79.73
243443	05RKG2	76.44
247900	05FR-11G E	6.14
247901	05FR-12G E	6.04
247902	05FR-21G E	6.46
247903	05FR-22G E	6.18
247904	05FR-3G E	12.52
247905	05FR-4G E	9.42
247906	05MDL-1G E	10.71
247907	05MDL-2G E	5.31
247912	05MDL-3G E	5.56
247913	05MDL-4G E	5.37
247943	T-127 E	5.37
276150	W2-048 E	1.04
290261	S-027 E	10.96
290265	S-028 E	10.96
296125	R-030 C3	2.11
296128	R-030 E3	8.46
296271	R-030 C2	2.09
296272	R-030 E2	8.36
296308	R-030 C1	2.09
296309	R-030 E1	8.36
900404	X3-028 C	353.7
900405	X3-028 E	471.6
905082	W4-005 E	22.57
909052	X2-022 E	14.48
915662	Y3-099 E	0.13
915672	Y3-100 E	0.13
917502	Z2-087 E	10.96
924041	AB2-047 C O1	2.07
924042	AB2-047 E O1	13.83
924261	AB2-070 C O1	1.98
924262	AB2-070 E O1	13.26
925242	AB2-178 E	1.34
925771	AC1-053 C	1.99
925772	AC1-053 E	13.32
926841	AC1-171 C O1	0.66
926842	AC1-171 E O1	4.42
930042	AB1-006 E	11.67
930461	AB1-087	129.69
930471	AB1-088	129.69
933441	AC2-157 C	17.92

Bus #	Bus	MW Impact
933442	AC2-157 E	29.24
935141	AD1-148	3.78
935271	AD1-137 C	5.1
935272	AD1-137 E	34.13
936771	AD2-100 C O1	10.19
936772	AD2-100 E O1	6.79
936972	AD2-131 E O1	2.14
937161	AD2-153 C O1	1.83
937162	AD2-153 E O1	8.55
937171	AD2-154 C O1	1.83
937172	AD2-154 E O1	8.55
937211	AD2-159 C	2.44
937212	AD2-159 E	11.42
939741	AE1-205 C O1	5.28
939742	AE1-205 E O1	7.3
940581	AE2-045 C O1	7.27
940582	AE2-045 E O1	9.98
941341	AE2-130 C	231.63
941342	AE2-130 E	154.42
941571	AE2-154 C	2.18
941572	AE2-154 E	14.59
941731	AE2-173	3.19
942111	AE2-223 C	1.23
942112	AE2-223 E	8.22
942481	AE2-261 C	14.78
942482	AE2-261 E	9.86
942601	AE2-276	11.81
954681	J949	13.19
BLUEG	BLUEG	54.31
CALDERWOOD	CALDERWOOD	0.29
CANNELTON	CANNELTON	0.33
CARR	CARR	0.59
CATAWBA	CATAWBA	0.36
CBM-W1	CBM-W1	20.16
CBM-W2	CBM-W2	92.88
CHEOAH	CHEOAH	0.27
CHILHOWEE	CHILHOWEE	0.09
CIN	CIN	11.99
ELMERSMITH	ELMERSMITH	0.5
G-007	G-007	1.7
HAMLET	HAMLET	0.63
IPL	IPL	8.51
MEC	MEC	24.25
MECS	MECS	4.46
O-066	O-066	10.91
RENSSELAER	RENSSELAER	0.47
SANTEETLA	SANTEETLA	0.08
TRIMBLE	TRIMBLE	6.67
WEC	WEC	3.29
Z1-043	Z1-043	14.61

17.5 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
8909431	270704	LORETTO ; B	CE	939400	AE1-172 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	111.56	113.91	DC	35.83

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.71
274651	KINCAID ;2U	13.73
274853	TWINGROVE;U1	1.99
274854	TWINGROVE;U2	1.99
274863	CAYUGA RI;1U	2.24
274864	CAYUGA RI;2U	2.24
900404	X3-028 C	84.7
905081	W4-005 C	1.9
917501	Z2-087 C	1.59
924041	AB2-047 C O1	16.06
924261	AB2-070 C O1	7.65
925771	AC1-053 C	7.5
926841	AC1-171 C O1	0.96
930461	AB1-087	31.06
930471	AB1-088	31.06
933441	AC2-157 C	4.29
935001	AD1-133 C O1	90.83
935141	AD1-148	13.51
936771	AD2-100 C O1	28.25
937161	AD2-153 C O1	10.77
937171	AD2-154 C O1	10.77
937211	AD2-159 C	11.3
939741	AE1-205 C O1	42.48
941731	AE2-173	24.76
942111	AE2-223 C	9.81
942481	AE2-261 C	35.83
942601	AE2-276	2.83
942913	AE2-310 BAT	4.28
950291	J291	4.24
950701	J196 C	1.14
951001	J339	12.81
951741	J474 C	5.16
952271	J644	13.58
952321	J734	10.76
952651	J756 C	4.83
952871	J757 C	5.78
953401	J811	10.87
953651	J815	37.43
953741	J826 C	3.19
953801	J835 C	3.81

Bus #	Bus	MW Impact
953851	J845 C	3.12
953881	J848 C	5.76
954181	J884	26.74
954411	J912	14.21
954721	J750 C	3.62
954761	J468 C	4.05
AD2-098	AD2-098	0.36
CBM-N	CBM-N	0.57
CBM-S1	CBM-S1	11.07
CBM-S2	CBM-S2	3.34
CBM-W2	CBM-W2	130.63
CIN	CIN	11.59
CPLE	CPLE	1.17
G-007A	G-007A	1.93
IPL	IPL	6.27
LGEE	LGEE	1.71
MEC	MEC	9.12
NYISO	NYISO	2.49
VFT	VFT	5.19

17.6 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
8909210	270717	DRESDEN ; R	CE	270697	COLLINS ; R	CE	1	COMED_P4_111-45-L1223T_	breaker	1528.0	113.56	114.09	DC	17.49

Bus #	Bus	MW Impact
274659	DRESDEN ;3U	33.59
274729	ELWOOD EC;1P	2.14
274731	ELWOOD EC;2P	2.14
274733	ELWOOD EC;3P	2.14
274735	ELWOOD EC;4P	2.14
274736	ELWOOD EC;9P	2.11
274890	CAYUG;1U E	9.66
274891	CAYUG;2U E	9.66
276150	W2-048 E	0.97
290021	O50 E	11.08
290261	S-027 E	15.14
290265	S-028 E	15.14
296125	R-030 C3	3.8
296128	R-030 E3	15.18
296271	R-030 C2	3.75
296272	R-030 E2	15.0
296308	R-030 C1	3.75
296309	R-030 E1	15.0
905082	W4-005 E	25.36
909052	X2-022 E	13.51
917502	Z2-087 E	19.61
924041	AB2-047 C O1	3.61
924042	AB2-047 E O1	24.16
924261	AB2-070 C O1	1.95
924262	AB2-070 E O1	13.06
925771	AC1-053 C	1.93
925772	AC1-053 E	12.89
926841	AC1-171 C O1	0.6
926842	AC1-171 E O1	4.0
927091	AC1-204 1	64.52
927101	AC1-204 2	65.3
930741	AB1-122 1O1	173.73
930751	AB1-122 2O1	33.84
934101	AD1-039 1	17.03
934111	AD1-039 2	3.32
935001	AD1-133 C O1	38.99
935002	AD1-133 E O1	25.99
935141	AD1-148	3.53
936291	AD2-038 C O1	1.13
936292	AD2-038 E O1	7.55
936771	AD2-100 C O1	7.91
936772	AD2-100 E O1	5.27

Bus #	Bus	MW Impact
936972	AD2-131 E O1	1.66
937161	AD2-153 C O1	2.52
937162	AD2-153 E O1	11.78
937171	AD2-154 C O1	2.52
937172	AD2-154 E O1	11.78
937211	AD2-159 C	2.74
937212	AD2-159 E	12.83
937401	AD2-194 1	6.94
937411	AD2-194 2	7.02
938511	AE1-070 1	8.15
938521	AE1-070 2	7.55
938851	AE1-113 C O1	5.02
938852	AE1-113 E O1	15.77
939321	AE1-163 C O1	2.83
939322	AE1-163 E O1	17.41
939401	AE1-172 C O1	3.3
939402	AE1-172 E O1	15.46
939741	AE1-205 C O1	9.43
939742	AE1-205 E O1	13.02
939861	AE1-222 1	191.86
939871	AE1-222 2	37.37
940101	AE1-252 C O1	5.63
940102	AE1-252 E O1	3.75
941731	AE2-173	5.56
942111	AE2-223 C	2.2
942112	AE2-223 E	14.71
942421	AE2-255 C O1	1.73
942422	AE2-255 E O1	5.2
942481	AE2-261 C	10.5
942482	AE2-261 E	7.0
942651	AE2-281 C	0.4
942652	AE2-281 E	2.49
951741	J474 C	1.23
951742	J474 E	6.63
952651	J756 C	1.67
952652	J756 E	9.04
954181	J884	6.1
CARR	CARR	0.17
CBM-S1	CBM-S1	2.65
CBM-S2	CBM-S2	0.27
CBM-W1	CBM-W1	3.39
CBM-W2	CBM-W2	44.42
CIN	CIN	2.1
CPLE	CPLE	0.02
G-007	G-007	0.46
IPL	IPL	0.96
LGEE	LGEE	0.08
MEC	MEC	12.32
O-066	O-066	2.93
RENSSELAER	RENSSELAER	0.13
Z1-043	Z1-043	11.8

17.7 Index 7

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
8909034	270796	KINCAID ; B	CE	347955	7AUSTIN	AMIL	1	COMED_P4_080-45-BT7-8_FSA	breaker	956.0	129.89	141.2	DC	108.06

Bus #	Bus	MW Impact
274650	KINCAID ;1U	26.53
274651	KINCAID ;2U	26.81
274853	TWINGROVE;U1	0.72
274854	TWINGROVE;U2	0.72
274890	CAYUG;1U E	8.38
274891	CAYUG;2U E	8.38
276150	W2-048 E	3.33
290261	S-027 E	23.55
290265	S-028 E	23.55
296125	R-030 C3	3.13
296128	R-030 E3	12.51
296271	R-030 C2	3.09
296272	R-030 E2	12.36
296308	R-030 C1	3.09
296309	R-030 E1	12.36
905081	W4-005 C	1.06
905082	W4-005 E	58.13
909052	X2-022 E	46.2
917501	Z2-087 C	0.61
917502	Z2-087 E	33.31
924041	AB2-047 C O1	6.22
924042	AB2-047 E O1	41.64
924261	AB2-070 C O1	5.83
924262	AB2-070 E O1	39.01
925771	AC1-053 C	6.01
925772	AC1-053 E	40.25
935141	AD1-148	12.07
936771	AD2-100 C O1	43.36
936772	AD2-100 E O1	28.91
936972	AD2-131 E O1	17.21
937161	AD2-153 C O1	5.05
937162	AD2-153 E O1	23.66
937171	AD2-154 C O1	5.05
937172	AD2-154 E O1	23.66
937211	AD2-159 C	6.28
937212	AD2-159 E	29.41
939401	AE1-172 C O1	2.99
939402	AE1-172 E O1	13.99
939741	AE1-205 C O1	7.82
939742	AE1-205 E O1	10.79
940101	AE1-252 C O1	5.09
940102	AE1-252 E O1	3.4

Bus #	Bus	MW Impact
941731	AE2-173	9.59
942111	AE2-223 C	3.73
942112	AE2-223 E	24.98
942481	AE2-261 C	64.84
942482	AE2-261 E	43.22
950701	J196 C	0.82
950702	J196 E	3.28
951001	J339	9.09
951741	J474 C	3.6
951742	J474 E	19.47
952321	J734	7.63
952651	J756 C	2.54
952652	J756 E	13.75
953741	J826 C	2.24
953742	J826 E	12.1
953851	J845 C	2.23
953852	J845 E	12.08
954181	J884	18.56
954761	J468 C	2.16
954762	J468 E	8.64
CALDERWOOD	CALDERWOOD	0.71
CANNELTON	CANNELTON	0.1
CARR	CARR	0.06
CATAWBA	CATAWBA	0.3
CHEOAH	CHEOAH	0.64
CHILHOWEE	CHILHOWEE	0.23
CIN	CIN	1.79
COFFEEN	COFFEEN	2.24
COTTONWOOD	COTTONWOOD	6.35
DUCKCREEK	DUCKCREEK	11.8
EDWARDS	EDWARDS	1.72
ELMERSMITH	ELMERSMITH	0.26
FARMERCITY	FARMERCITY	1.97
G-007	G-007	0.18
HAMLET	HAMLET	0.45
IPL	IPL	0.73
MECS	MECS	1.01
NEWTON	NEWTON	1.49
O-066	O-066	1.16
PRAIRIE	PRAIRIE	11.37
RENSSELAER	RENSSELAER	0.04
SANTEETLA	SANTEETLA	0.19
SMITHLAND	SMITHLAND	0.5
TATANKA	TATANKA	2.97
TVA	TVA	3.46
UNIONPOWER	UNIONPOWER	2.11

17.8 Index 8

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
8909454	270852	PONTIAC ; B	CE	270704	LORETTO ; B	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	108.89	111.24	DC	35.89

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.73
274651	KINCAID ;2U	13.75
274853	TWINGROVE;U1	1.99
274854	TWINGROVE;U2	1.99
900404	X3-028 C	85.2
905081	W4-005 C	1.9
917501	Z2-087 C	1.6
924041	AB2-047 C O1	16.07
924261	AB2-070 C O1	7.66
925771	AC1-053 C	7.5
926841	AC1-171 C O1	0.97
930461	AB1-087	31.24
930471	AB1-088	31.24
933441	AC2-157 C	4.32
935001	AD1-133 C O1	90.89
935141	AD1-148	13.53
936771	AD2-100 C O1	28.29
937161	AD2-153 C O1	10.77
937171	AD2-154 C O1	10.77
937211	AD2-159 C	11.31
939741	AE1-205 C O1	42.51
941731	AE2-173	24.78
942111	AE2-223 C	9.82
942481	AE2-261 C	35.89
942601	AE2-276	2.85
942913	AE2-310 BAT	4.26
950291	J291	4.24
950701	J196 C	1.14
951001	J339	12.81
951741	J474 C	5.16
952251	J641	13.49
952271	J644	13.58
952321	J734	10.76
952651	J756 C	4.83
952871	J757 C	5.78
953401	J811	10.87
953651	J815	37.43
953741	J826 C	3.19
953801	J835 C	3.81
953851	J845 C	3.12

Bus #	Bus	MW Impact
953881	J848 C	5.76
954181	J884	26.74
954411	J912	14.21
954721	J750 C	3.62
954761	J468 C	4.05
AD2-098	AD2-098	0.36
CBM-N	CBM-N	0.6
CBM-S1	CBM-S1	11.17
CBM-S2	CBM-S2	3.39
CBM-W2	CBM-W2	131.41
CIN	CIN	11.67
CPLE	CPLE	1.19
G-007A	G-007A	2.01
IPL	IPL	6.32
LGEE	LGEE	1.73
MEC	MEC	9.28
NYISO	NYISO	2.59
VFT	VFT	5.4

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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
7305185	346809	7CASEY	AMIL	247712	05SULLIVAN	AEP	1	AEP_P4_#3128_05EUGENE 345_A2	breaker	1466.0	136.31	139.88	DC	52.16

Bus #	Bus	MW Impact
270859	PWR VTR EC;R	6.22
274650	KINCAID ;1U	11.68
274651	KINCAID ;2U	11.7
274832	U4-027	8.52
274853	TWINGROVE;U1	0.59
274854	TWINGROVE;U2	0.59
274859	EASYR;U1 E	6.79
274860	EASYR;U2 E	6.79
274890	CAYUG;1U E	10.12
274891	CAYUG;2U E	10.12
276150	W2-048 E	2.05
290021	O50 E	10.75
290051	GSG-6; E	5.67
290108	LEEDK;1U E	12.37
290261	S-027 E	19.34
290265	S-028 E	19.34
293516	O-009 E1	6.46
293517	O-009 E2	3.28
293518	O-009 E3	3.61
293644	O22 E1	4.89
293645	O22 E2	9.49
293715	O-029 E	6.64
293716	O-029 E	3.64
293717	O-029 E	3.35
293771	O-035 E	5.18
294401	BSHIL;1U E	7.07
294410	BSHIL;2U E	7.07
294763	P-046 E	5.37
295109	WESTBROOK E	3.03
295111	SUBLETTE E	1.65
296125	R-030 C3	3.33
296128	R-030 E3	13.32
296271	R-030 C2	3.29
296272	R-030 E2	13.16
296308	R-030 C1	3.29
296309	R-030 E1	13.16
905081	W4-005 C	0.77
905082	W4-005 E	42.58
909052	X2-022 E	28.48
916211	Z1-072 E	3.92
916221	Z1-073 E	2.92
917502	Z2-087 E	17.3

Bus #	Bus	MW Impact
918052	AA1-018 E	7.9
919221	AA1-146	11.63
919581	AA2-030	11.63
919621	AA2-039 C	1.72
919622	AA2-039 E	11.53
920272	AA2-123 E	1.22
924041	AB2-047 C O1	3.3
924042	AB2-047 E O1	22.08
924261	AB2-070 C O1	3.83
924262	AB2-070 E O1	25.66
924471	AB2-096	21.78
925161	AB2-173	2.07
925302	AB2-191 E	0.75
925581	AC1-033 C	1.16
925582	AC1-033 E	7.75
925771	AC1-053 C	3.87
925772	AC1-053 E	25.9
926431	AC1-114	1.29
926821	AC1-168 C O1	0.82
926822	AC1-168 E O1	5.53
926841	AC1-171 C O1	1.14
926842	AC1-171 E O1	7.6
927201	AC1-214 C O1	1.66
927202	AC1-214 E O1	5.28
927511	AC1-113 1	0.65
927521	AC1-113 2	0.65
927531	AC1-185 1	0.42
927541	AC1-185 2	0.42
927551	AC1-185 3	0.42
927561	AC1-185 4	0.42
927571	AC1-185 5	0.42
927581	AC1-185 6	0.42
927591	AC1-185 7	0.42
927601	AC1-185 8	0.42
930481	AB1-089	35.24
930741	AB1-122 1O1	34.86
932881	AC2-115 1	1.29
932891	AC2-115 2	1.29
932921	AC2-116	0.45
933341	AC2-147 C	0.54
933342	AC2-147 E	0.88
933911	AD1-013 C	0.99
933912	AD1-013 E	1.59
933931	AD1-016 C	0.46
933932	AD1-016 E	0.75
934051	AD1-031 C O1	2.35
934052	AD1-031 E O1	3.83
934101	AD1-039 1	3.42
934401	AD1-064 C O1	1.63
934402	AD1-064 E O1	7.64
934431	AD1-067 C	0.07
934432	AD1-067 E	0.3

Bus #	Bus	MW Impact
934651	AD1-096 C	0.51
934652	AD1-096 E	0.83
934701	AD1-098 C O1	3.76
934702	AD1-098 E O1	2.75
934871	AD1-116 C	0.46
934872	AD1-116 E	0.75
934971	AD1-129 C	0.47
934972	AD1-129 E	0.31
935001	AD1-133 C O1	14.09
935002	AD1-133 E O1	9.39
935141	AD1-148	7.44
936291	AD2-038 C O1	1.34
936292	AD2-038 E O1	8.97
936511	AD2-066 C O1	4.75
936512	AD2-066 E O1	3.16
936771	AD2-100 C O1	21.1
936772	AD2-100 E O1	14.07
936791	AD2-102 C	6.71
936792	AD2-102 E	6.45
936972	AD2-131 E O1	8.37
937001	AD2-134 C	1.48
937002	AD2-134 E	6.12
937161	AD2-153 C O1	3.2
937162	AD2-153 E O1	14.98
937171	AD2-154 C O1	3.2
937172	AD2-154 E O1	14.98
937211	AD2-159 C	4.6
937212	AD2-159 E	21.54
937311	AD2-172 C	1.41
937312	AD2-172 E	1.95
937331	AD2-176 C O1	3.65
937332	AD2-176 E O1	2.43
937531	AD2-214 C	3.23
937532	AD2-214 E	1.52
938851	AE1-113 C O1	4.87
938852	AE1-113 E O1	15.3
938861	AE1-114 C O1	2.16
938862	AE1-114 E O1	8.26
939051	AE1-134 1	0.9
939061	AE1-134 2	0.9
939321	AE1-163 C O1	3.37
939322	AE1-163 E O1	20.68
939401	AE1-172 C O1	4.01
939402	AE1-172 E O1	18.78
939631	AE1-193 C O1	5.74
939632	AE1-193 E O1	38.43
939681	AE1-198 C O1	17.05
939682	AE1-198 E O1	14.49
939691	AE1-199	1.29
939701	AE1-201 C	1.0
939702	AE1-201 E	0.22
939741	AE1-205 C O1	8.32

Bus #	Bus	MW Impact
939742	AE1-205 E O1	11.49
939861	AE1-222 1	38.5
939921	AE1-228 C O1	5.4
939922	AE1-228 E O1	3.6
940101	AE1-252 C O1	6.84
940102	AE1-252 E O1	4.56
940501	AE2-035 C	1.41
940502	AE2-035 E	1.95
940881	AE2-077 C	1.74
940882	AE2-077 E	2.84
941131	AE2-107 C	3.68
941132	AE2-107 E	2.45
941342	AE2-130 E	31.63
941731	AE2-173	5.09
942111	AE2-223 C	1.94
942112	AE2-223 E	12.97
942421	AE2-255 C O1	1.68
942422	AE2-255 E O1	5.04
942481	AE2-261 C	31.3
942482	AE2-261 E	20.87
942602	AE2-276 BAT	13.97
942651	AE2-281 C	0.48
942652	AE2-281 E	2.95
942991	AE2-321 C O1	4.09
942992	AE2-321 E O1	2.01
950291	J291	3.19
950701	J196 C	1.32
950702	J196 E	5.29
951001	J339	6.02
951741	J474 C	2.02
951742	J474 E	10.93
952251	J641	10.33
952271	J644	9.55
952321	J734	5.06
952651	J756 C	2.46
952652	J756 E	13.3
952871	J757 C	4.05
952872	J757 E	21.93
953371	J808	9.04
953401	J811	17.74
953431	J853	11.08
953641	J813	43.76
953651	J815	32.07
953671	J817	10.65
953741	J826 C	1.65
953742	J826 E	8.93
953801	J835 C	2.67
953802	J835 E	14.45
953851	J845 C	1.72
953852	J845 E	9.3
953881	J848 C	5.26
953882	J848 E	28.47

Bus #	Bus	MW Impact
953951	J859	9.76
954181	J884	7.65
954411	J912	14.22
954681	J949	38.88
954721	J750 C	2.1
954722	J750 E	11.37
954761	J468 C	7.07
954762	J468 E	28.29
990901	L-005 E	11.16
BLUEG	BLUEG	10.45
CARR	CARR	0.3
CBM-S1	CBM-S1	13.08
CBM-S2	CBM-S2	2.33
CBM-W1	CBM-W1	28.27
CBM-W2	CBM-W2	200.48
CIN	CIN	3.82
CPLE	CPLE	0.55
G-007	G-007	0.81
GIBSON	GIBSON	0.02
MEC	MEC	45.55
O-066	O-066	5.2
RENSSELAER	RENSSELAER	0.24
TRIMBLE	TRIMBLE	1.32
WEC	WEC	4.13
Z1-043	Z1-043	21.94

17.10 Index 10

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
8909478	917500	Z2-087 TAP	CE	270853	PONTIAC ; R	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	107.87	110.11	DC	34.26

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.1
274651	KINCAID ;2U	13.11
274853	TWINGROVE;U1	1.09
274854	TWINGROVE;U2	1.09
900404	X3-028 C	87.34
905081	W4-005 C	1.25
917501	Z2-087 C	2.18
924041	AB2-047 C O1	21.87
924261	AB2-070 C O1	8.98
925771	AC1-053 C	8.73
926841	AC1-171 C O1	1.02
930461	AB1-087	32.03
930471	AB1-088	32.03
933441	AC2-157 C	4.43
935141	AD1-148	15.44
936771	AD2-100 C O1	25.61
937161	AD2-153 C O1	14.03
937171	AD2-154 C O1	14.03
937211	AD2-159 C	7.44
941731	AE2-173	33.72
942111	AE2-223 C	13.41
942481	AE2-261 C	34.26
942601	AE2-276	2.92
942913	AE2-310 BAT	3.84
950291	J291	4.04
950701	J196 C	1.28
951001	J339	15.22
951741	J474 C	5.73
952271	J644	13.06
952321	J734	12.78
952651	J756 C	4.6
952871	J757 C	5.52
953401	J811	10.84
953651	J815	36.64
953741	J826 C	3.74
953801	J835 C	3.63
953851	J845 C	3.66
953881	J848 C	5.65
954181	J884	32.6
954411	J912	13.99
954721	J750 C	3.58

Bus #	Bus	MW Impact
954761	J468 C	4.33
AD2-098	AD2-098	0.43
CBM-N	CBM-N	0.68
CBM-S1	CBM-S1	11.06
CBM-S2	CBM-S2	3.46
CBM-W2	CBM-W2	129.01
CIN	CIN	12.12
CPLE	CPLE	1.23
G-007A	G-007A	2.28
IPL	IPL	6.57
LGEE	LGEE	1.81
MEC	MEC	6.08
NYISO	NYISO	2.97
TATANKA	TATANKA	0.01
VFT	VFT	6.12

17.11 Index 11

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
8909521	924040	AB2-047 TAP	CE	917500	Z2-087 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	107.51	109.75	DC	34.29

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.11
274651	KINCAID ;2U	13.12
274853	TWINGROVE;U1	1.09
274854	TWINGROVE;U2	1.09
900404	X3-028 C	87.56
905081	W4-005 C	1.25
924041	AB2-047 C O1	21.88
924261	AB2-070 C O1	8.98
925771	AC1-053 C	8.73
926841	AC1-171 C O1	1.03
930461	AB1-087	32.1
930471	AB1-088	32.1
933441	AC2-157 C	4.44
935141	AD1-148	15.45
936771	AD2-100 C O1	25.63
937161	AD2-153 C O1	14.04
937171	AD2-154 C O1	14.04
937211	AD2-159 C	7.45
941731	AE2-173	33.73
942481	AE2-261 C	34.29
942601	AE2-276	2.92
942913	AE2-310 BAT	3.84
950291	J291	4.04
950701	J196 C	1.28
951001	J339	15.22
951741	J474 C	5.73
952251	J641	12.82
952271	J644	13.06
952321	J734	12.78
952651	J756 C	4.6
952871	J757 C	5.52
953401	J811	10.84
953651	J815	36.64
953741	J826 C	3.74
953801	J835 C	3.63
953851	J845 C	3.66
953881	J848 C	5.65
954181	J884	32.6
954411	J912	13.99
954681	J949	19.05
954721	J750 C	3.58

Bus #	Bus	MW Impact
954761	J468 C	4.33
AD2-098	AD2-098	0.43
CBM-N	CBM-N	0.7
CBM-S1	CBM-S1	11.11
CBM-S2	CBM-S2	3.48
CBM-W2	CBM-W2	129.36
CIN	CIN	12.16
CPLE	CPLE	1.24
G-007A	G-007A	2.31
IPL	IPL	6.59
LGEE	LGEE	1.82
MEC	MEC	6.14
NYISO	NYISO	3.02
VFT	VFT	6.22

17.12 Index 12

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
8909232	924260	AB2-070 TAP	CE	270673	BROKAW ; T	CE	1	COMED_P4_021-45-BT5-7__	breaker	1243.0	104.56	111.92	DC	91.63

Bus #	Bus	MW Impact
274650	KINCAID ;1U	21.61
274651	KINCAID ;2U	21.65
276150	W2-048 E	8.35
909052	X2-022 E	115.96
924261	AB2-070 C O1	18.21
924262	AB2-070 E O1	121.87
925771	AC1-053 C	17.53
925772	AC1-053 E	117.31
935141	AD1-148	30.3
940103	AE1-252 EBAT	2.59
941732	AE2-173 BAT	2.56
942481	AE2-261 C	54.98
942482	AE2-261 E	36.65
950291	J291	2.97
952251	J641	9.41
952271	J644	9.35
952871	J757 C	3.63
952872	J757 E	19.67
953401	J811	7.6
953651	J815	27.3
953801	J835 C	2.39
953802	J835 E	12.96
953881	J848 C	5.01
953882	J848 E	27.12
954411	J912	10.88
954721	J750 C	3.36
954722	J750 E	18.15
CBM-N	CBM-N	0.08
CBM-S1	CBM-S1	4.98
CBM-S2	CBM-S2	1.33
CBM-W2	CBM-W2	55.53
CIN	CIN	1.76
CPLE	CPLE	0.43
EDWARDS	EDWARDS	0.14
G-007A	G-007A	0.32
IPL	IPL	1.18
LGEE	LGEE	0.38
MEC	MEC	7.26
NYISO	NYISO	0.36
TILTON	TILTON	1.17
VFT	VFT	0.84

17.13 Index 13

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
8909994	934720	AD1-100 TAP	CE	937030	AD2-137 TAP	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B	tower	1846.0	151.72	152.28	DC	22.85

Bus #	Bus	MW Impact
274654	BRAIDWOOD;1U	33.97
274655	BRAIDWOOD;2U	32.44
274660	LASCO STA;1U	21.33
274661	LASCO STA;2U	21.37
274847	GR RIDGE ;BU	0.46
274853	TWINGROVE;U1	0.72
274854	TWINGROVE;U2	0.72
274863	CAYUGA RI;1U	0.94
274864	CAYUGA RI;2U	0.94
274871	GR RIDGE ;2U	0.59
274881	PLEAS RDG;2U	0.62
274887	PILOT HIL;1U	0.62
274888	PILOT HIL;1E	20.33
274890	CAYUG;1U E	31.01
274891	CAYUG;2U E	31.01
275149	KEMPTON ;1E	20.33
276150	W2-048 E	1.39
290261	S-027 E	23.71
290265	S-028 E	23.71
293061	N-015 E	15.16
294392	P-010 E	19.26
296125	R-030 C3	6.08
296128	R-030 E3	24.33
296271	R-030 C2	6.01
296272	R-030 E2	24.04
296308	R-030 C1	6.01
296309	R-030 E1	24.04
905081	W4-005 C	0.7
905082	W4-005 E	38.29
909052	X2-022 E	19.29
917501	Z2-087 C	0.57
917502	Z2-087 E	31.42
924041	AB2-047 C O1	5.77
924042	AB2-047 E O1	38.6
924261	AB2-070 C O1	2.84
924262	AB2-070 E O1	18.99
925771	AC1-053 C	2.79
925772	AC1-053 E	18.64
926821	AC1-168 C O1	0.69
926822	AC1-168 E O1	4.62

Bus #	Bus	MW Impact
930501	AB1-091 O1	92.41
933411	AC2-154 C	2.76
933412	AC2-154 E	4.5
934721	AD1-100 C	51.69
934722	AD1-100 E	241.21
935001	AD1-133 C O1	18.06
935002	AD1-133 E O1	12.04
935141	AD1-148	5.04
936371	AD2-047 C O1	2.47
936372	AD2-047 E O1	26.58
936461	AD2-060	2.9
936771	AD2-100 C O1	10.69
936772	AD2-100 E O1	7.13
936781	AD2-101 C	3.9
936782	AD2-101 E	18.24
936972	AD2-131 E O1	2.25
937121	AD2-148 C O1	4.45
937122	AD2-148 E O1	20.84
937131	AD2-149 C O1	4.45
937132	AD2-149 E O1	20.84
937141	AD2-150 C O1	4.45
937142	AD2-150 E O1	20.84
937161	AD2-153 C O1	3.91
937162	AD2-153 E O1	18.29
937171	AD2-154 C O1	3.91
937172	AD2-154 E O1	18.29
937181	AD2-155 C O1	4.45
937182	AD2-155 E O1	20.84
937211	AD2-159 C	4.14
937212	AD2-159 E	19.37
937321	AD2-175 C	20.73
937322	AD2-175 E	13.82
938012	AE1-002 E O1	28.93
939351	AE1-166 C O1	22.6
939352	AE1-166 E O1	20.86
939401	AE1-172 C O1	15.93
939402	AE1-172 E O1	74.58
939741	AE1-205 C O1	15.3
939742	AE1-205 E O1	21.13
940101	AE1-252 C O1	27.15
940102	AE1-252 E O1	18.1
940621	AE2-049 C O1	9.11
940622	AE2-049 E O1	6.07
940631	AE2-050 C O1	20.86
940632	AE2-050 E O1	13.9
941551	AE2-152 C	28.97
941552	AE2-152 E	14.48
941561	AE2-153 C O1	7.41
941562	AE2-153 E O1	34.7
941731	AE2-173	8.89
942111	AE2-223 C	3.52
942112	AE2-223 E	23.57

Bus #	Bus	MW Impact
942481	AE2-261 C	13.71
942482	AE2-261 E	9.14
942881	AE2-307 C	38.24
942882	AE2-307 E	13.9
942911	AE2-310 C	8.85
942912	AE2-310 E	2.39
951741	J474 C	1.79
951742	J474 E	9.69
953741	J826 C	1.05
953742	J826 E	5.67
954181	J884	9.28
BLUEG	BLUEG	0.29
CARR	CARR	0.29
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	2.5
CBM-W1	CBM-W1	3.98
CBM-W2	CBM-W2	47.18
CIN	CIN	2.43
G-007	G-007	0.8
HAMLET	HAMLET	0.07
IPL	IPL	1.03
MEC	MEC	12.37
O-066	O-066	5.13
RENSSELAER	RENSSELAER	0.23
TRIMBLE	TRIMBLE	0.07
WEC	WEC	0.85
Z1-043	Z1-043	15.21

17.14 Index 14

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
8909440	935000	AD1-133 TAP	CE	270717	DRESDEN ; R	CE	1	COMED_P1-2_345-L11212_B-S-C-A	single	1528.0	110.24	112.35	DC	32.16

Bus #	Bus	MW Impact
274650	KINCAID ;1U	12.31
274651	KINCAID ;2U	12.33
274853	TWINGROVE;U1	1.83
274854	TWINGROVE;U2	1.83
274863	CAYUGA RI;1U	1.7
274864	CAYUGA RI;2U	1.7
900404	X3-028 C	78.44
905081	W4-005 C	1.74
917501	Z2-087 C	1.47
924041	AB2-047 C O1	14.84
924261	AB2-070 C O1	6.98
925771	AC1-053 C	6.83
926841	AC1-171 C O1	0.75
930461	AB1-087	28.76
930471	AB1-088	28.76
933441	AC2-157 C	3.97
935001	AD1-133 C O1	120.39
935141	AD1-148	12.3
936771	AD2-100 C O1	25.49
937161	AD2-153 C O1	9.91
937171	AD2-154 C O1	9.91
937211	AD2-159 C	10.33
939401	AE1-172 C O1	24.59
939741	AE1-205 C O1	39.12
940101	AE1-252 C O1	41.91
941731	AE2-173	22.87
942111	AE2-223 C	9.07
942481	AE2-261 C	32.16
942601	AE2-276	2.62
942913	AE2-310 BAT	2.96
950701	J196 C	1.11
951001	J339	12.11
951741	J474 C	4.81
952271	J644	12.24
952321	J734	10.17
952651	J756 C	4.36
952871	J757 C	5.19
953401	J811	10.29
953651	J815	34.82
953741	J826 C	3.01

Bus #	Bus	MW Impact
953801	J835 C	3.42
953851	J845 C	2.96
953881	J848 C	5.38
954181	J884	24.97
954411	J912	13.29
954721	J750 C	3.3
954761	J468 C	3.94
AD2-098	AD2-098	0.45
CBM-N	CBM-N	0.66
CBM-S1	CBM-S1	9.88
CBM-S2	CBM-S2	3.14
CBM-W2	CBM-W2	112.92
CIN	CIN	10.83
CPLE	CPLE	1.12
EDWARDS	EDWARDS	0.05
G-007A	G-007A	2.19
IPL	IPL	5.91
LGEE	LGEE	1.65
MEC	MEC	2.68
NYISO	NYISO	2.87
TATANKA	TATANKA	0.42
VFT	VFT	5.88

17.15 Index 15

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
8909989	937030	AD2-137 TAP	CE	270926	WILTON ; B	CE	1	COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B	tower	1846.0	159.67	160.23	DC	22.85

Bus #	Bus	MW Impact
274654	BRAIDWOOD;1U	33.97
274655	BRAIDWOOD;2U	32.44
274660	LASCO STA;1U	21.33
274661	LASCO STA;2U	21.37
274847	GR RIDGE ;BU	0.46
274853	TWINGROVE;U1	0.72
274854	TWINGROVE;U2	0.72
274863	CAYUGA RI;1U	0.94
274864	CAYUGA RI;2U	0.94
274871	GR RIDGE ;2U	0.59
274881	PLEAS RDG;2U	0.62
274887	PILOT HIL;1U	0.62
274888	PILOT HIL;1E	20.33
274890	CAYUG;1U E	31.01
274891	CAYUG;2U E	31.01
275149	KEMPTON ;1E	20.33
276150	W2-048 E	1.39
290261	S-027 E	23.71
290265	S-028 E	23.71
293061	N-015 E	15.16
294392	P-010 E	19.26
296125	R-030 C3	6.08
296128	R-030 E3	24.33
296271	R-030 C2	6.01
296272	R-030 E2	24.04
296308	R-030 C1	6.01
296309	R-030 E1	24.04
905081	W4-005 C	0.7
905082	W4-005 E	38.29
909052	X2-022 E	19.29
917501	Z2-087 C	0.57
917502	Z2-087 E	31.42
924041	AB2-047 C O1	5.77
924042	AB2-047 E O1	38.6
924261	AB2-070 C O1	2.84
924262	AB2-070 E O1	18.99
925771	AC1-053 C	2.79
925772	AC1-053 E	18.64
926821	AC1-168 C O1	0.69
926822	AC1-168 E O1	4.62

Bus #	Bus	MW Impact
930501	AB1-091 O1	92.41
933411	AC2-154 C	2.76
933412	AC2-154 E	4.5
934721	AD1-100 C	51.69
934722	AD1-100 E	241.21
935001	AD1-133 C O1	18.06
935002	AD1-133 E O1	12.04
935141	AD1-148	5.04
936371	AD2-047 C O1	2.47
936372	AD2-047 E O1	26.58
936461	AD2-060	2.9
936771	AD2-100 C O1	10.69
936772	AD2-100 E O1	7.13
936781	AD2-101 C	3.9
936782	AD2-101 E	18.24
936972	AD2-131 E O1	2.25
937031	AD2-137 C O1	18.76
937032	AD2-137 E O1	87.84
937121	AD2-148 C O1	4.45
937122	AD2-148 E O1	20.84
937131	AD2-149 C O1	4.45
937132	AD2-149 E O1	20.84
937141	AD2-150 C O1	4.45
937142	AD2-150 E O1	20.84
937161	AD2-153 C O1	3.91
937162	AD2-153 E O1	18.29
937171	AD2-154 C O1	3.91
937172	AD2-154 E O1	18.29
937181	AD2-155 C O1	4.45
937182	AD2-155 E O1	20.84
937211	AD2-159 C	4.14
937212	AD2-159 E	19.37
937321	AD2-175 C	20.73
937322	AD2-175 E	13.82
938012	AE1-002 E O1	71.07
939351	AE1-166 C O1	22.6
939352	AE1-166 E O1	20.86
939401	AE1-172 C O1	15.93
939402	AE1-172 E O1	74.58
939741	AE1-205 C O1	15.3
939742	AE1-205 E O1	21.13
940101	AE1-252 C O1	27.15
940102	AE1-252 E O1	18.1
940621	AE2-049 C O1	9.11
940622	AE2-049 E O1	6.07
940631	AE2-050 C O1	20.86
940632	AE2-050 E O1	13.9
941551	AE2-152 C	28.97
941552	AE2-152 E	14.48
941561	AE2-153 C O1	7.41
941562	AE2-153 E O1	34.7
941731	AE2-173	8.89

Bus #	Bus	MW Impact
942111	AE2-223 C	3.52
942112	AE2-223 E	23.57
942481	AE2-261 C	13.71
942482	AE2-261 E	9.14
942881	AE2-307 C	38.24
942882	AE2-307 E	13.9
942911	AE2-310 C	8.85
942912	AE2-310 E	2.39
951741	J474 C	1.79
951742	J474 E	9.69
953741	J826 C	1.05
953742	J826 E	5.67
954181	J884	9.28
BLUEG	BLUEG	0.29
CARR	CARR	0.29
CATAWBA	CATAWBA	0.01
CBM-S1	CBM-S1	2.5
CBM-W1	CBM-W1	3.98
CBM-W2	CBM-W2	47.18
CIN	CIN	2.43
G-007	G-007	0.8
HAMLET	HAMLET	0.07
IPL	IPL	1.03
MEC	MEC	12.37
O-066	O-066	5.13
RENSSELAER	RENSSELAER	0.23
TRIMBLE	TRIMBLE	0.07
WEC	WEC	0.85
Z1-043	Z1-043	15.21

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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
8909560	937160	AD2-153 TAP	CE	924040	AB2-047 TAP	CE	1	COMED_P1-2_345-L8002___-S	single	1528.0	103.99	106.24	DC	34.29

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.11
274651	KINCAID ;2U	13.12
274853	TWINGROVE;U1	1.09
274854	TWINGROVE;U2	1.09
900404	X3-028 C	87.56
905081	W4-005 C	1.25
924261	AB2-070 C O1	8.98
925771	AC1-053 C	8.73
926841	AC1-171 C O1	1.03
930461	AB1-087	32.1
930471	AB1-088	32.1
933441	AC2-157 C	4.44
935141	AD1-148	15.45
936771	AD2-100 C O1	25.63
937161	AD2-153 C O1	14.04
937171	AD2-154 C O1	14.04
937211	AD2-159 C	7.45
942481	AE2-261 C	34.29
942601	AE2-276	2.92
942913	AE2-310 BAT	3.84
950291	J291	4.04
950701	J196 C	1.28
951001	J339	15.22
951741	J474 C	5.73
952251	J641	12.82
952271	J644	13.06
952321	J734	12.78
952651	J756 C	4.6
952871	J757 C	5.52
953401	J811	10.84
953651	J815	36.64
953741	J826 C	3.74
953801	J835 C	3.63
953851	J845 C	3.66
953881	J848 C	5.65
954181	J884	32.6
954411	J912	13.99
954681	J949	19.05
954721	J750 C	3.58
954761	J468 C	4.33
AD2-098	AD2-098	0.43

Bus #	Bus	MW Impact
CBM-N	CBM-N	0.7
CBM-S1	CBM-S1	11.11
CBM-S2	CBM-S2	3.48
CBM-W2	CBM-W2	129.36
CIN	CIN	12.16
CPLE	CPLE	1.24
G-007A	G-007A	2.31
IPL	IPL	6.59
LGEE	LGEE	1.82
MEC	MEC	6.14
NYISO	NYISO	3.02
VFT	VFT	6.22

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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
8909424	939400	AE1-172 TAP	CE	934720	AD1-100 TAP	CE	1	COMED_P1-2_345-L8014___-S-B	single	1528.0	117.25	119.59	DC	35.83

Bus #	Bus	MW Impact
274650	KINCAID ;1U	13.71
274651	KINCAID ;2U	13.73
274853	TWINGROVE;U1	1.99
274854	TWINGROVE;U2	1.99
274863	CAYUGA RI;1U	2.24
274864	CAYUGA RI;2U	2.24
900404	X3-028 C	84.7
905081	W4-005 C	1.9
917501	Z2-087 C	1.59
924041	AB2-047 C O1	16.06
924261	AB2-070 C O1	7.65
925771	AC1-053 C	7.5
926841	AC1-171 C O1	0.96
930461	AB1-087	31.06
930471	AB1-088	31.06
933441	AC2-157 C	4.29
935001	AD1-133 C O1	90.83
935141	AD1-148	13.51
936771	AD2-100 C O1	28.25
937161	AD2-153 C O1	10.77
937171	AD2-154 C O1	10.77
937211	AD2-159 C	11.3
939401	AE1-172 C O1	35.5
939741	AE1-205 C O1	42.48
940101	AE1-252 C O1	60.51
941731	AE2-173	24.76
942111	AE2-223 C	9.81
942481	AE2-261 C	35.83
942601	AE2-276	2.83
942913	AE2-310 BAT	4.28
950701	J196 C	1.14
951001	J339	12.81
951741	J474 C	5.16
952271	J644	13.58
952321	J734	10.76
952651	J756 C	4.83
952871	J757 C	5.78
953401	J811	10.87
953651	J815	37.43
953741	J826 C	3.19

Bus #	Bus	MW Impact
953801	J835 C	3.81
953851	J845 C	3.12
953881	J848 C	5.76
954181	J884	26.74
954411	J912	14.21
954721	J750 C	3.62
AD2-098	AD2-098	0.36
CBM-N	CBM-N	0.57
CBM-S1	CBM-S1	11.07
CBM-S2	CBM-S2	3.34
CBM-W2	CBM-W2	130.63
CIN	CIN	11.59
CPLE	CPLE	1.17
G-007A	G-007A	1.93
IPL	IPL	6.27
LGEE	LGEE	1.71
MEC	MEC	9.12
NYISO	NYISO	2.49
VFT	VFT	5.19

Affected Systems

18 Affected Systems

18.1 LG&E

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

18.2 MISO

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

18.3 TVA

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

18.4 Duke Energy Progress

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

18.5 NYISO

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

Contingency Name	Contingency Definition
COMED_P4_080-45-BT4-5__	CONTINGENCY 'COMED_P4_080-45-BT4-5__' TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1 / PONTI; B 345 LORET; B 345 END
COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B	CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S-B' TRIP BRANCH FROM BUS 940630 TO BUS 270728 CKT 1 / AE2-050 TAP 345 E FRA; B 345 TRIP BRANCH FROM BUS 270728 TO BUS 270766 CKT 1 / E FRA; B 345 GOODI;3B 345 TRIP BRANCH FROM BUS 270728 TO BUS 274750 CKT 1 / E FRA; B 345 CRETE;BP 345 TRIP BRANCH FROM BUS 270671 TO BUS 270729 CKT 1 / BRAID; R 345 E FRA; R 345 END
COMED_P7_345-L2001__B-S_+_345-L2003__R-S-A	CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S-A' TRIP BRANCH FROM BUS 270670 TO BUS 940630 CKT 1 / BRAID; B 345 AE2-050 TAP 345 TRIP BRANCH FROM BUS 270671 TO BUS 270729 CKT 1 / BRAID; R 345 E FRA; R 345 END
COMED_P4_021-45-BT5-7__	CONTINGENCY 'COMED_P4_021-45-BT5-7__' TRIP BRANCH FROM BUS 270804 TO BUS 905080 CKT 1 / LATHAM TAP W4-005 TRIP BRANCH FROM BUS 936770 TO BUS 270796 CKT 1 / AD2-100 TAP 345 KINCA; B 345 /* CONTINGENCY LINE ADDED FOR AE1 BUILD TRIP BRANCH FROM BUS 270804 TO BUS 348856 CKT 1 / LATHA; T 345 7LATHAM 345 TRIP BRANCH FROM BUS 270796 TO BUS 347955 CKT 1 / KINCA; B 345 AUSTIN 345 (THE) END
COMED_P4_080-45-BT7-8_FSA	CONTINGENCY 'COMED_P4_080-45-BT7-8_FSA' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTIAC ; R 345 Z2-087 TAP 345 TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1 / PONTIAC ; R 345 AD1-133 TAP 345 /* CONTINGENCY LINE ADDED FOR AE1 BUILD END
COMED_P1-2_345-L8002___-S	CONTINGENCY 'COMED_P1-2_345-L8002___-S' TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345 END
AEP_P1-2_#286	CONTINGENCY 'AEP_P1-2_#286' OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
COMED_P1-2_345-L11212_B-S-C-A	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-C-A' TRIP BRANCH FROM BUS 934720 TO BUS 939400 CKT 1 / AD1-100 TAP 345 AE1-172 TAP 345 END
COMED_P1-2_345-L11212_B-S-C-B	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-C-B' TRIP BRANCH FROM BUS 939400 TO BUS 270704 CKT 1 / AE1-172 TAP 345 LORET; B 345 END

Contingency Name	Contingency Definition
AEP_P4_#3128_05EUGENE 345_A2	CONTINGENCY 'AEP_P4_#3128_05EUGENE 345_A2' OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
COMED_P1-2_345-L8001___-S_1_FSA	CONTINGENCY 'COMED_P1-2_345-L8001___-S_1_FSA' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTI; R 345 Z2-087 TAP 345 END
COMED_P1-2_345-L8014___-S-A	CONTINGENCY 'COMED_P1-2_345-L8014___-S-A' TRIP BRANCH FROM BUS 270853 TO BUS 935000 CKT 1 / PONTIAC ; R 345 AD1-133 TAP 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
COMED_P1-2_345-L1223_TR-S	CONTINGENCY 'COMED_P1-2_345-L1223_TR-S' TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1 / DRESD; R 345 ELECT;4R 345 TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1 / DRESD;3M 138 DRESD; R 345 TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1 / DRESD;3M 138 DRESD; B 138 TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1 / DRESD;3M 138 DRESD;3C 34.5 END
AEP_P4_#1760_05JEFRSO 765_A	CONTINGENCY 'AEP_P4_#1760_05JEFRSO 765_A' OPEN BRANCH FROM BUS 243207 TO BUS 243208 CKT 1 / 243207 05GRNTWN 765 243208 05JEFRSO 765 1 OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1 END
COMED_P1-2_SPS-2105&U1___-A	CONTINGENCY 'COMED_P1-2_SPS-2105&U1___-A' TRIP BRANCH FROM BUS 942480 TO BUS 347945 CKT 1 / AE2-261 TAP 345 7PANA 345 TRIP BRANCH FROM BUS 347945 TO BUS 346895 CKT 1 / 7PANA 345 7COFFEEN 345 END
COMED_P1-2_345-L11212_B-S-A	CONTINGENCY 'COMED_P1-2_345-L11212_B-S-A' TRIP BRANCH FROM BUS 270926 TO BUS 937030 CKT 1 / WILTO; B 345 AD2-137 TAP 345 END
Base Case	

Contingency Name	Contingency Definition
COMED_P4_111-45-L1223T_	CONTINGENCY 'COMED_P4_111-45-L1223T_' TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1 / DRESDEN ; R 345 ELEC JUNC;4R 345 TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1 / DRESDEN ;3M 138 DRESDEN ; R 345 TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1 / DRESDEN ;3M 138 DRESDEN ; B 138 TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1 / DRESDEN ;3M 138 DRESDEN ;3C 34.5 DISCONNECT BUS 270731 / ELEC JUNC;4R 345 DISCONNECT BUS 275184 / ELEC JUNC;4M 138 END
COMED_P1-2_345-L2102___-S_W4-005-FSA-A	CONTINGENCY 'COMED_P1-2_345-L2102___-S_W4-005-FSA-A' TRIP BRANCH FROM BUS 270804 TO BUS 905080 CKT 1 / LATHAM TAP W4-005 TRIP BRANCH FROM BUS 270804 TO BUS 936770 CKT 1 / LATHA; T 345 AD2-100 TAP 345 TRIP BRANCH FROM BUS 270804 TO BUS 348856 CKT 1 / LATHA; T 345 7LATHAM 345 TRIP BRANCH FROM BUS 270668 TO BUS 905080 CKT 1 / BLUEM; B 345 W4-005 END
COMED_P1-2_345-L17802__-S	CONTINGENCY 'COMED_P1-2_345-L17802__-S' TRIP BRANCH FROM BUS 270668 TO BUS 905080 CKT 1 / BLUEM; B 345 W4-005 END
AEP_P1-2_#363	CONTINGENCY 'AEP_P1-2_#363' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 END

Short Circuit

19 Short Circuit

No issues identified.

20 Secondary Point of Interconnection General

20.1 Secondary Point of Interconnection

Queue Position AE2-261, a 299 MW solar facility, proposes to interconnect with the ComEd transmission system by tying into the 'Kincaid – Pana' 345kV transmission line, approximately 1.8 miles from Kincaid. ComEd has stated it is not a good utility practice to cut a transmission line in close proximity to existing substation. For that reason, ComEd has proposed to interconnect the generator lead to 345kV bus at Kincaid Station 21.

20.2 Cost Summary

The AE2-261 generator lead would interconnect to the 345kV bus at Kincaid Station 21. The required Attachment Facilities are one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

Scope of Work	Cost Estimate
Installation of one 345kV line MOD, one dead-end structure and one set of revenue metering (see notes below on cost estimate)	$1,000,000

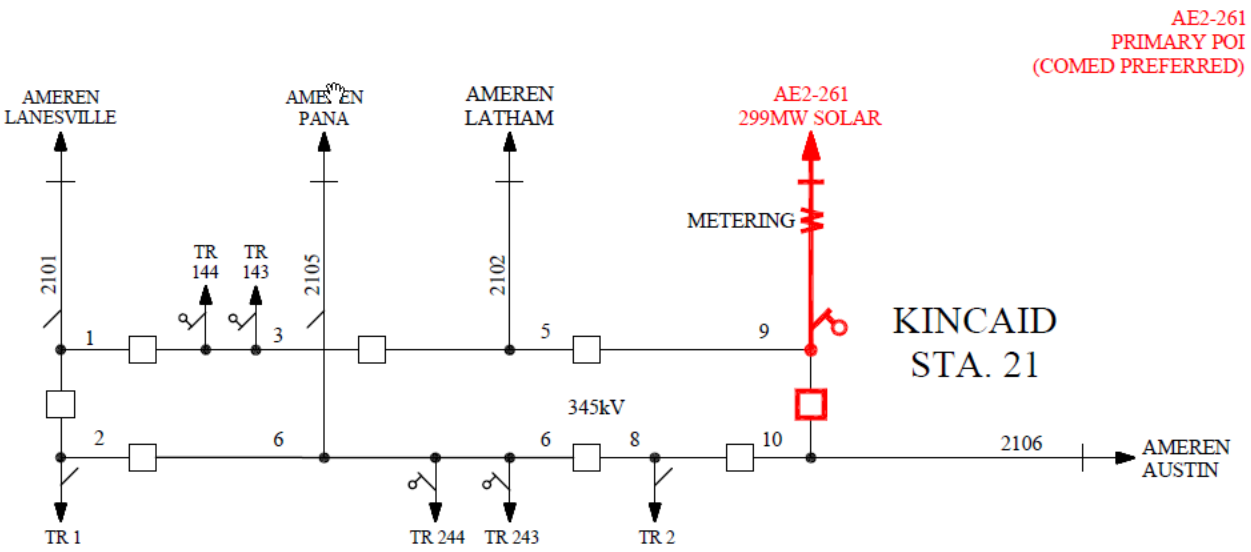
Kincaid Station 21 is a 345kV substation in a ring bus configuration. The generator lead for AE2-261 would be interconnected to this substation by expanding it.

The scope of work includes the installation of one 345 kV circuit breaker at Kincaid Station 21 to create a line position for the IC's generator lead, as shown in the one-line diagram below.

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

Scope of Work	Cost Estimate
Installation of one 345kV circuit breaker at Kincaid Station 21 and relay/protection work	$3,000,000
Total Cost Estimate (see notes below on cost estimate)	$3,000,000

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



21 Network Impacts for Secondary Point of Interconnection

No analysis was performed for this option, but the results of the Primary POI are expected to be nearly identical.