Generation Interconnection Request
System Impact Study Report
For
PJM Generation Interconnection Request
Queue Position AE2-261

Kincaid-Pana

Revised: February 2022
Issued: January 2022

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. 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 System Impact Study is performed.

The System Impact 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. 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.

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.

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Point of Interconnection

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

Cost Summary

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

Description	Cost Estimate
Total Physical Interconnection Costs	$25,000,000
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	$9,876,757
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	$0
Total Costs	$34,876,757

*As your project progresses through the study process and other projects modify their request or withdraw, then your cost allocation could change.

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

Note 1: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

Note 2: For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc., the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required

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Transmission Owner Scope of Work

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

Description	Cost Estimate
Attachment Facilities	$1,000,000
Direct Connection Network Upgrades	$23,000,000
Non-Direct Connection Network Upgrades	$1,000,000
Total Physical Interconnection Costs	$25,000,000

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

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.

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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

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 Pana substation	$0*
Total Cost Estimate (see notes below on cost estimate)	$1,000,000

*Ameren's costs are not included in this report. Interconnection Customer will need to enter into an Affected System Study with Ameren to estimate the scope of work.

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Schedule:

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

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.

Meteorological Data Reporting Requirements

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Back Panel temperature (Fahrenheit) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Irradiance (Watts/meter2) - (Required for plants with Maximum Facility Output of 3 MW or higher)
- Ambient air temperature (Fahrenheit) - (Accepted, not required)
- Wind speed (meters/second) - (Accepted, not required)
- Wind direction (decimal degrees from true north) - (Accepted, not required)

Interconnected Transmission Owner Requirements

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

http://www.pjm.com/planning/design-engineering/to-tech-standards/

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Network Impacts

The Queue Project AE2-261 was evaluated as a 299 MW (Capacity 179.4 MW) injection at the 345 kV line between Kincaid - Pana substation 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 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Generator Deliverability

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

None.

Multiple Facility Contingency

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

Overload	Contingency		Affected		Bus			Power	Loading %		Rating		MW	Flowgate
Number	Type	Name	Area	Facility Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution	Appendix
1	DCTL	AEP_P7-1_#11042	AEP - AEP	05ROCKPT-05JEFRSO 765 kV line	243209	243208	1	AC	99.25	100.08	ER	3970	33.04	1
2	LFFB	COMED_P4_111-45-L1223T_	CE - CE	DRESDEN ; R-COLLINS ; R 345 kV line	270717	270697	1	DC	99.92	100.92	LDR	1528	17.55	
3	LFFB	COMED_P4_021-45-BT5-7__	CE - CE	W2-048 E-AC1-053 TAP 345 kV line	276150	925770	1	AC	97.98	105.42	LDR	1243	91.85	2

Notes:
Violation 1: 3970 MVA SE (Violation valid)
Violation 2: ComEd SSTE: 1837 MVA (Not a violation)
Violation 3: ComEd SN: 1327 MVA (Not a violation)

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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)

Overload Number	Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
4	LFFB	AEP_P4_#1760_05JEFRSO 765_A	AEP - OVEC	05JEFRSO-06CLIFTY 345 kV line	242865	248000	Z1	AC	113.55	114.46	ER	2354	24.73	3
5	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	LORETTO ; B-AE1-172 TAP 345 kV line	270704	939400	1	AC	104.18	106.53	ER	1528	35.86	4
6	LFFB	ADD AD1-100 2	CE - CE	DRESDEN ; R-COLLINS ; R 345 kV line	270717	270697	1	AC	100.09	101.27	LDR	1528	21.35	5
7	LFFB	COMED_P4_080-45-BT7-8_FSA	CE - MISO AMIL	KINCAID ; B-7AUSTIN 345 kV line	270796	347955	1	AC	126.88	138.14	ER	956	108.53	6
8	LFFB	COMED_P4_080-45-BT4-5__	CE - MISO AMIL	KINCAID ; B-7AUSTIN 345 kV line	270796	347955	1	AC	124.92	136.39	ER	956	111.54	
9	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	PONTIAC ; B-LORETTO ; B 345 kV line	270852	270704	1	AC	101.53	103.88	ER	1528	35.92	7
10	N-1	AEP_P1-2_#363	LGEE - OVEC	7TRIMBLE CO-06CLIFTY 345 kV line	324114	248000	1	AC	143.71	144.25	ER	1451	9.13	8
11	N-1	AEP_P1-2_#10136	LGEE - OVEC	7TRIMBLE CO-06CLIFTY 345 kV line	324114	248000	1	DC	138.57	139.11	ER	1451	9.23	
12	LFFB	COMED_P4_021-45-BT6-8__	MISO AMIL - CE	7AUSTIN-KINCAID ; B 345 kV line	347955	270796	1	AC	129.42	135.83	ER	956	60.63	9
13	N-1	COMED_P1-2_345-L8002___-S	CE - CE	Z2-087 TAP-PONTIAC ; R 345 kV line	917500	270853	1	AC	100.26	102.5	ER	1528	34.28	10
14	LFFB	COMED_P4_021-45-BT5-7__	CE - CE	AB2-070 TAP-BROKAW ; T 345 kV line	924260	270673	1	AC	119.69	127.13	LDR	1243	91.85	11
15	LFFB	COMED_P4_021-45-BT5-7__	CE - CE	AC1-053 TAP-AB2-070 TAP 345 kV line	925770	924260	1	AC	108.81	116.25	LDR	1243	91.85	12
16	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S_A	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	DC	134.42	135.48	LDR	1846	22.94	13

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17	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S_B	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	DC	134.42	135.48	LDR	1846	22.94	
18	LFFB	ADD AD1-100 5	CE - CE	AD1-100 TAP-BRAIDWOOD; B 345 kV line	934730	270670	1	AC	152.88	155.09	LDR	1528	34.65	14
19	N-1	COMED_P1-2_345-L11212_B-S-C-A	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	103.91	106.01	ER	1528	32.18	15
20	N-1	COMED_P1-2_345-L11212_B-S-C-B	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	100.08	102.19	ER	1528	32.18	
21	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S_B	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	DC	134.33	135.39	LDR	1846	22.94	16
22	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S_A	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	DC	134.33	135.39	LDR	1846	22.94	
23	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AE1-172 TAP-AD1-100 TAP 345 kV line	939400	934720	1	AC	109.53	111.88	ER	1528	35.86	17
24	N-1	COMED_P1-2_345-L8014___-S-A	CE - CE	AE1-172 TAP-AD1-100 TAP 345 kV line	939400	934720	1	AC	102.82	105.16	ER	1528	35.86	
25	LFFB	AEP_P4_#3128_05EUGENE 345_A2	MISO AMIL - AEP	J1180 TAP-05SULLIVAN 345 kV line	966790	247712	1	AC	129.71	131.74	ER	1466	52.2	18

Notes:

Violation 4: AEP: 2354 MVA SE. OVEC: 1868 MVA SE (Violation valid)

Violation 5: ComEd: 1846 MVA SSTE (Not a violation)

Violation 6: ComEd: 1837 MVA SSTE (Not a violation)

Violation 7: ComEd: 1667 MVA SSTE. MISO: 1319 MVA. (Not a violation)

Violation 8: ComEd: 1667 MVA SSTE. MISO: 1319 MVA. (Not a violation)

Violation 9: ComEd: 1846 MVA SSTE. (Not a violation)

Violation 10: LGEE: 1451 MVA SE. OVEC: 2354 MVA SE. (Violation for LGEE side)

Violation 11: LGEE: 1451 MVA SE. OVEC: 2354 MVA SE. (Violation for LGEE side)

Violation 12: ComEd: 1667 MVA SSTE. MISO: 1319 MVA. (Not a violation)

Violation 13: ComEd: 1837 MVA SSTE. (Not a violation)

Violation 14: ComEd: 1837 MVA SSTE. (Not a violation)

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Violation 15: This portion of the line is a ComEd-AMIL tie from Brokaw Tap – Lanesville. Sag limited by ComEd conductors:
1346 MVA SSSE. (A preliminary estimate is provided but ComEd to confirm during Facility Study Phase) (Violation valid)
Violation 16: ComEd ALDR rating is 2554 MVA (Not a violation)
Violation 17: ComEd ALDR rating is 2554 MVA (Not a violation)
Violation 18: ComEd SSTE rating is 1837 MVA (Violation valid)
Violation 19: ComEd SSTE rating is 1797 MVA (Not a violation)
Violation 20: ComEd SSTE rating is 1797 MVA (Not a violation)
Violation 21: ComEd ALDR rating is 2554 MVA (Not a violation)
Violation 22: ComEd ALDR rating is 2554 MVA (Not a violation)
Violation 23: ComEd SSTE rating is 1797 MVA (Not a violation)
Violation 24: ComEd SSTE rating is 1797 MVA (Not a violation)
Violation 25: AEP rating: 1443/1685 MVA. MISO/AMIL rating: 1332/1446 MVA (Violation valid).

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

Not Required.

Delivery of Energy Portion of Interconnection Request

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.

Only the most severely overloaded conditions are listed. 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 will study all overload conditions associated with the overloaded element(s) identified.

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Overload Number	Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
26	N-1	COMED_P1-2_345-L8001___-S_NO_FSA-A	CE - CE	BLUEMOUND; B-PONTIAC ; B 345 kV line	270668	270852	1	AC	140.2	143.58	ER	1528	49.97
27	Non	Non	CE - CE	BLUEMOUND; B-PONTIAC ; B 345 kV line	270668	270852	1	AC	100.45	103.07	NR	1334	34.48
28	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	LORETTO ; B-AE1-172 TAP 345 kV line	270704	939400	1	AC	197.41	201.38	ER	1528	59.77
29	Non	Non	CE - CE	LORETTO ; B-AE1-172 TAP 345 kV line	270704	939400	1	AC	146.52	149.57	NR	1364	41.97
30	N-1	COMED_P1-2_345-L1223_TR-S	CE - CE	DRESDEN ; R-COLLINS ; R 345 kV line	270717	270697	1	DC	99.87	100.87	ER	1528	17.51
31	N-1	COMED_P1-2_345-L9201___-S-A	CE - CE	KINCAID ; B-LATHAM ; T 345 kV line	270796	270804	1	AC	113.46	119.52	ER	1434	86.89
32	N-1	COMED_P1-2_SPS-2105&U1___B	CE - MISO AMIL	KINCAID ; B-7AUSTIN 345 kV line	270796	347955	1	DC	122.39	137.48	ER	956	144.21
33	Non	Non	CE - MISO AMIL	KINCAID ; B-7AUSTIN 345 kV line	270796	347955	1	AC	98.49	108.87	NR	956	101.64
34	N-1	COMED_P1-2_345-L8002___-S	CE - MISO AMIL	LATHAM ; T-7LATHAM 345 kV line	270804	348856	1	AC	133.46	139.5	ER	908	55.3
35	N-1	COMED_P1-2_345-L8001___-S_NO_FSA-A	CE - CE	LATHAM ; T-W4-005 TAP 345 kV line	270804	905080	1	AC	122.97	126.7	ER	1334	50.16
36	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	PONTIAC ; B-LORETTO ; B 345 kV line	270852	270704	1	AC	184.86	188.8	ER	1528	59.87
37	Non	Non	CE - CE	PONTIAC ; B-LORETTO ; B 345 kV line	270852	270704	1	AC	133.82	136.88	NR	1364	42.06
38	N-1	COMED_P1-2_345-L11212_B-S-C-A	CE - CE	PONTIAC ; R-AD1-133 TAP 345 kV line	270853	935000	1	AC	183.91	187.49	ER	1528	53.63
39	Non	Non	CE - CE	PONTIAC ; R-AD1-133 TAP 345 kV line	270853	935000	1	AC	123.24	125.55	NR	1334	31.13
40	N-1	COMED_P1-2_345-L2102___-S_W4-005-FSA	CE - CE	W2-048 E-AC1-053 TAP 345 kV line	276150	925770	1	AC	99.45	104.68	ER	1243	65.02

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41	N-1	AEP_P1-2_#363	LGEE - OVEC	7TRIMBLE CO-06CLIFTY 345 kV line	324114	248000	1	DC	150.03	150.92	ER	1451	15.22
42	N-1	COMED_P1-2_SPS-2105&U1___A_AE2-261A	MISO AMIL - CE	7AUSTIN-KINCAID ; B 345 kV line	347955	270796	1	AC	129.39	135.8	ER	956	60.63
43	N-1	COMED_P1-2_345-L8002___-S	MISO AMIL - CE	7BROKAW-AD2-153 TAP 345 kV line	348847	937160	1	AC	151.26	155.03	ER	1528	57.17
44	Non	Non	MISO AMIL - CE	7BROKAW-AD2-153 TAP 345 kV line	348847	937160	1	AC	118.18	121.08	NR	1334	38.75
45	N-1	COMED_P1-2_345-L8001___-S_NO_FSA-A	CE - CE	W4-005 TAP-BLUEMOUND; B 345 kV line	905080	270668	1	DC	142.97	146.72	ER	1334	50.09
46	N-1	COMED_P1-2_345-L8002___-S	CE - CE	Z2-087 TAP-PONTIAC ; R 345 kV line	917500	270853	1	AC	175.22	178.85	ER	1528	57.14
47	Non	Non	CE - CE	Z2-087 TAP-PONTIAC ; R 345 kV line	917500	270853	1	AC	146.04	148.89	NR	1334	38.71
48	N-1	COMED_P1-2_345-L2102___-S_W4-005-FSA	CE - CE	AB2-070 TAP-BROKAW ; T 345 kV line	924260	270673	1	AC	119.68	124.91	ER	1243	65.02
49	N-1	COMED_P1-2_345-L2102___-S_W4-005-FSA	CE - CE	AC1-053 TAP-AB2-070 TAP 345 kV line	925770	924260	1	AC	109	114.24	ER	1243	65.02
50	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	AC	149.58	151.16	ER	1528	28.76
51	Non	Non	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	AC	133.79	135.11	NR	1364	21.17
52	N-1	COMED_P1-2_345-L11212_B-S-C-A	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	195.29	198.89	ER	1528	53.63
53	Non	Non	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	133.26	135.56	NR	1334	31.13
54	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	AC	149.55	151.14	ER	1528	28.76
55	Non	Non	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	AC	133.77	135.09	NR	1364	21.17
56	N-1	COMED_P1-2_345-L8002___-S	CE - CE	AD2-153 TAP-Z2-087 TAP 345 kV line	937160	917500	1	AC	151.26	155.03	ER	1528	57.17

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57	Non	Non	CE - CE	AD2-153 TAP-Z2-087 TAP 345 kV line	937160	917500	1	AC	117.88	120.78	NR	1334	38.75
58	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AE1-172 TAP-AD1-100 TAP 345 kV line	939400	934720	1	AC	211.34	215.33	ER	1528	59.77
59	Non	Non	CE - CE	AE1-172 TAP-AD1-100 TAP 345 kV line	939400	934720	1	AC	159.47	162.51	NR	1364	41.97
60	N-1	AEP_P1-2_#286	MISO AMIL - AEP	J1180 TAP-05SULLIVAN 345 kV line	966790	247712	1	AC	121.72	123.65	NR	1466	51.47
61	Non	Non	MISO AMIL - AEP	J1180 TAP-05SULLIVAN 345 kV line	966790	247712	1	AC	114.71	116.78	NR	1334	42.33

Short Circuit

(Summary of impacted circuit breakers)

No overdutied breakers

Affected System Analysis & Mitigation

MISO Impacts:

Preliminary MISO impacts have been identified. Please refer to the MISO Affected System report for details. Final MISO impacts to be determined by MISO during the Facilities Study phase.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined during the Facilities Study.

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Light Load Analysis – 2021

Light load analysis not required.

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System Reinforcements

Summer Peak Load Flow Analysis Reinforcement

Note : For customers with System Reinforcements listed: If your present cost allocation to a System Reinforcement indicates $0, then please be aware that as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, reducing in size, etc, the cost responsibilities can change and a cost allocation may be assigned to your project. In addition, although your present cost allocation to a System Reinforcement is presently $0, your project may need this system reinforcement completed to be deliverable to the PJM system. If your project comes into service prior to completion of the system reinforcement, an interim deliverability study for your project will be required.

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

Facility	Upgrade Description	Cost	Cost Allocated to AE2-261	Upgrade Number
05ROCKPT-05JEFRSO 765 kV Ckt. 1	**Project ID**: N6497.1 **Description**: Rockport Relay Thermal Limit - An engineering study will need to be conducted to determine if the Relay Thermal limits settings (2996 A/3970 MVA) can be adjusted to mitigate the overload. New relay packages will be required if the settings cannot be adjusted. Estimated Cost for study: $50,000 ($25,000 each). Estimated Cost for new relay package: $1.2M ($600,000 each). New SE rating 3975 MVA. PJM Network Upgrade N6497.1 **Type**: FAC **Cost:** $500,000 **Time Estimate**: N/A **Ratings**: 3975 MVA SE **Notes**: Per PJM cost allocation rules, AE2-261 is the driver for this upgrade.	$50,000	$50,000	N6497.1

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AC1-053 TAP-AB2-070 TAP 345 kV Ckt. 1	The AC1-053 TAP – AB2-070 TAP is part of the Brokaw Tap - Lanesville section of the line and is currently sag limited by ComEd conductors. **Project ID**: N8037 **Description**: ComEd 345kV L18806 SSTE rating is 1346 MVA. The upgrade will be to mitigate the sag on the line. A preliminary estimate for this upgrade is $9.1M with an estimated construction timeline of 24 months. Upon completion of the upgrade the ratings will be 1679/2058/2107/2280 MVA (SN/SLTE/SSTE/SLD). **Type**: FAC **Cost:** $9,100,000 **Time Estimate**: 24 Months **Ratings**: 1679/2058/2107/2280 MVA (SN/SLTE/SSTE/SLD) **Note**: ComEd to confirm the scope and cost for this upgrade during Facility Study phase. With the withdrawal of **J979**, AE2-261 is expected to be the driver, The potential cost allocation is as follows: **Queue** / **MW Contribution** / **Cost %** / **Cost $ (9.1M)** AE2-261 / 91.6 / 100% / 9.1	$9,100,000	$9,100,000	N8037
	Total Cost	**$9,150,000**	**$9,150,000**	

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

Facility	Upgrade Description	Cost	Cost Allocated to AE2-261	Upgrade Number
05JEFRSO-06CLIFTY 345 kV Ckt. Z1	**Project ID**: n4106.3 **Description**: A sag check will be required for the ACSR ~ 2156 ~ 84/19 ~ BLUEBIRD Conductor Section 1 to determine if the line section can be operated above its emergency rating. Z1-070 LTF Facilities Study sag study results: Jefferson – Clifty Creek 345 kV line work will include one location of grading to remediate clearance location of concern in span 1 to 2. Cost is $244 K. (6-12 Months). New Ratings: 2826 MVA SE **Type**: FAC **Cost:** $244,000 **Time Estimate**: 6-12 Months **Ratings**: 2826 MVA SE **Project ID**: n4106.4 **Description**: Reconductor the 0.75 mile line. $1.96M. New SE rating to be 2826 MVA. **Type**: FAC **Cost:** $1,960,000	$2,204,000	$122,170	N4106.3 N4106.4

<table>
<tr><td></td><td><u>Time Estimate</u>: N/A
<u>Ratings</u>: 2826 MVA SE
<table><tr><th>Queue</th><th>MW Contribution</th><th>Cost %</th><th>Cost $ (12M)</th></tr><tr><td>AE2-130</td><td>386.1</td><td>86.6%</td><td>$1,909,705</td></tr><tr><td>AE2-154</td><td>34.8</td><td>7.8%</td><td>$172,156</td></tr><tr><td>AE2-261</td><td>24.7</td><td>5.5%</td><td>$122,170</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td>7TRIMBLE CO-06CLIFTY Ckt. 1</td><td><u>Project ID</u>: LG&E Project Upgrade
<u>Description</u>: Reconductor the line with a high temperature conductor and upgrade necessary terminal equipment to achieve ratings of 2610/2610 MVA SN/SE. Cost estimate is $17.4M with a time estimate of 18 months.
<u>Type</u>: FAC
<u>Cost:</u> $17,400,000
<u>Time Estimate</u>: 18 Months
<u>Ratings</u>: 2610 MVA SE
<u>Notes:</u> Per PJM cost allocation rules, AE2-261 presently does not receive cost allocation for this upgrade. This may change with future re-tools as projects ahead withdraw from Queue.</td><td>$17,400,000</td><td>$0</td><td>N5469</td></tr>
<tr><td>AD1-100 TAP-BRAIDWOOD; B 345 kV</td><td><u>ComEd Reinforcement:</u>
<u>Project ID</u>: n7206
<u>Description</u>: Move and re-terminate the L2002 Davis Creek line into the same breaker bay as the AD1-100 attachment at the AD1-100 interconnection substation. This eliminates the stuck breaker contingency loss of the Wilton Center line and Davis Creek L2002 line. Estimated cost for this AD1-100 interconnection sub work would cost $3M. Time estimate is 24 months. Revised AD1-100 breaker diagram in AD1-133 public folder.
PJM Network Upgrade N7206.
<u>Type</u>: CON
<u>Cost:</u> $3,000,000
<u>Time Estimate</u>: 24 Months
<u>Ratings</u>: N/A
<u>Notes</u>: This upgrade is driven by a prior AD2 Queue. Per PJM Cost Allocation rules, AE2-152 does not receive Cost Allocation for this upgrade. This may change as projects ahead in Queue Withdraws.</td><td>$3,000,000</td><td>$0</td><td>N7206</td></tr>
<tr><td>J1180 TAP-05SULLIVAN 345 kV Ckt. 1</td><td><u>MISO Upgrade:</u>
<u>Description</u>: Ameren end upgrade: Install splice and dead-end shunts on the Ameren-owned portion of the Casey West – Sullivan 345 kV line, which will increase the rating to 1692 MVA SE. Cost estimate is $506K.
Driven by MISO 2017. AE2-261 presently does not meet Cost Allocation for this upgrade.
<u>Type</u>: FAC
<u>Cost:</u> $506,000
<u>Ratings</u>: N/A

<u>AEP Reinforcement:</u>
<u>Project ID</u>: n5808
<u>Description</u>: AEP can eliminate this contingency by requiring a new string, expanding the 345 kV buses, add two (2) additional 345 kV circuit breakers, and repositioning the Bensenville 345 kV line between the two new breakers on the new string.
Estimated cost is $5M. PJM Network Upgrade N5808.
<u>Type</u>: CON</td><td>$5,506,000</td><td>$604,587</td><td>N5808</td></tr>
</table>

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	Cost: $5,000,000 **Time Estimate**: N/A **Ratings**: N/A MISO/AMEREN Reinforcement is not needed at this time since AEP can relieve the Eugene Stuck Breaker contingency.			
	Total Cost	**$28,110,00**	**$726,757**	

Queue	MW Contribution	Cost %	Cost $ (5M)
AD1-100	49.3	11.42%	$570,998
AD1-133	23.9	5.54%	$276,813
AD2-100	37.7	8.73%	$436,646
AD2-159	26	6.02%	$301,135
J955	109.2	25.30%	$1,264,767
J991	30.7	7.11%	$355,571
J1022	15.6	3.61%	$180,681
J1115	18.4	4.26%	$213,111
J1139	22.2	5.14%	$257,123
AE2-130	31.6	7.32%	$365,995
AE2-223	14.9	3.45%	$172,574
AE2-261	52.2	12.09%	$604,587

Light Load Load Flow Analysis Reinforcements

None.

Short Circuit System Reinforcement

(Summary form of Cost allocation for breakers will be inserted here if any)

None.

Contingencies (Summer Peak Analysis)

Contingency Name	Description
ADD AD1-100 2	CONTINGENCY 'ADD AD1-100 2' OPEN BRANCH FROM BUS 934720 TO BUS 939400 CKT 1 / AD1-100 - AE1-172 TAP (LORETTO) OPEN BRANCH FROM BUS 934730 TO BUS 270670 CKT 1 / AD1-100 - BRAIDWOOD END

ADD AD1-100 5	CONTINGENCY 'ADD AD1-100 5' OPEN BRANCH FROM BUS 934730 TO BUS 270710 CKT 1 / AD1-100 - DAVIS CREEK OPEN BRANCH FROM BUS 934720 TO BUS 937030 CKT 1 / AD1-100 - AD2-137 TAP (WILTON) END
AEP_P1-2_#10136	CONTINGENCY 'AEP_P1-2_#10136' OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1 OPEN BRANCH FROM BUS 243209 TO BUS 243443 CKT 2 / 243209 05ROCKPT 765 243443 05RKG2 26.0 2 REMOVE UNIT 2H FROM BUS 243443 / 243443 05RKG2 26.0 REMOVE UNIT 2L FROM BUS 243443 / 243443 05RKG2 26.0 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
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
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
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
AEP_P7-1_#11042	CONTINGENCY 'AEP_P7-1_#11042' OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1 / 243878 05MEADOW 345 255205 17REYNOLDS 345 1 OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2 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

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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
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
COMED_P1-2_345-L2102___-S_W4-005-FSA	CONTINGENCY 'COMED_P1-2_345-L2102___-S_W4-005-FSA' TRIP BRANCH FROM BUS 270804 TO BUS 905080 CKT 1 / LATHAM TAP W4-005 TRIP BRANCH FROM BUS 270804 TO BUS 270796 CKT 1 / LATHA; T 345 KINCA; B 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-L8001___-S_NO_FSA-A	CONTINGENCY 'COMED_P1-2_345-L8001___-S_NO_FSA-A' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTI; R 345 Z2-087 TAP 345 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
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-L9201___-S-A	CONTINGENCY 'COMED_P1-2_345-L9201___-S-A' TRIP BRANCH FROM BUS 270673 TO BUS 348847 CKT Z1 / BROKA; T 345 7BROKAW T1 345 TRIP BRANCH FROM BUS 270673 TO BUS 924260 CKT 1 / BROKA; T 345 AB2-070 TAP 345

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	END
COMED_P1-2_SPS-2105&U1___A_AE2-261A	CONTINGENCY 'COMED_P1-2_SPS-2105&U1___A_AE2-261A' TRIP BRANCH FROM BUS 270797 TO BUS 942480 CKT 1 / KINCA; R 345 AD2-100 TAP 345 REMOVE UNIT 1 FROM BUS 274650 / KINCA;1U 20 END
COMED_P1-2_SPS-2105&U1___B	CONTINGENCY 'COMED_P1-2_SPS-2105&U1___B' TRIP BRANCH FROM BUS 936770 TO BUS 347945 CKT 1 / AD2-100 TAP 345 7PANA 345 TRIP BRANCH FROM BUS 347945 TO BUS 346895 CKT 1 / 7PANA 345 7COFFEEN 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 270804 TO BUS 270796 CKT 1 / LATHA; T 345 KINCA; B 345 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_021-45-BT6-8__	CONTINGENCY 'COMED_P4_021-45-BT6-8__' TRIP BRANCH FROM BUS 270797 TO BUS 942480 CKT 1 / KINCAID ; R 345 AD2-100 TAP 345/* CONTINGENCY LINE ADDED FOR AE1 BUILD REMOVE UNIT 2 FROM BUS 274651 / KINCAID ;2U 20 END
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_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

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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_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 942880 CKT 1 / BRAID; B 345 AE2-307 TAP 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_B	CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S_B' TRIP BRANCH FROM BUS 942880 TO BUS 270728 CKT 1 / AE2-307 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

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Appendices (Summer Peak Analysis)

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. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the Appendices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the Appendices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators.

It should be noted the project/generator MW contributions presented in the body of the report and appendices sections are full contributions, whereas the loading percentages reported in the body of the report, take into consideration the commercial probability of each project as well as the ramping impact of "Adder" contributions.

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Appendix 1

(AEP - AEP) The 05ROCKPT-05JEFRSO 765 kV line (from bus 243209 to bus 243208 ckt 1) loads from 99.25% to 100.08% (AC power flow) of its emergency rating (3970 MVA) for the tower line contingency outage of 'AEP_P7-1_#11042'. This project contributes approximately 33.04 MW to the thermal violation.

CONTINGENCY 'AEP_P7-1_#11042'
OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 1 / 243878 05MEADOW 345 255205 17REYNOLDS 345 1
OPEN BRANCH FROM BUS 243878 TO BUS 255205 CKT 2 / 243878 05MEADOW 345 255205 17REYNOLDS 345 2
END

Bus Number	*Bus Name*	*Full Contribution*
243859	*05FR-11G C*	*0.55*
247900	*05FR-11G E*	*14.29*
243862	*05FR-12G C*	*0.55*
247901	*05FR-12G E*	*14.05*
243864	*05FR-21G C*	*0.58*
247902	*05FR-21G E*	*15.02*
243866	*05FR-22G C*	*0.56*
247903	*05FR-22G E*	*14.38*
243870	*05FR-3G C*	*1.13*
247904	*05FR-3G E*	*29.12*
243873	*05FR-4G C*	*0.87*
247905	*05FR-4G E*	*21.9*
246909	*05MDL-1G C*	*1.13*
247906	*05MDL-1G E*	*29.14*
246910	*05MDL-2G C*	*0.56*
247907	*05MDL-2G E*	*14.45*
246976	*05MDL-3G C*	*0.56*
247912	*05MDL-3G E*	*15.11*
246979	*05MDL-4G C*	*1.13*
247913	*05MDL-4G E*	*14.6*
243442	*05RKG1*	*133.26*
243443	*05RKG2*	*127.75*
933441	*AC2-157 C*	*25.31*
933442	*AC2-157 E*	*41.29*
936771	*AD2-100 C O1*	*14.27*
936772	*AD2-100 E O1*	*9.51*
936971	*AD2-131 C O1*	*0.94*
936972	*AD2-131 E O1*	*4.72*

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941341	*AE2-130 C*	*304.76*
941342	*AE2-130 E*	*203.17*
941571	*AE2-154 C*	*5.93*
941572	*AE2-154 E*	*39.69*
942481	*AE2-261 C*	*19.82*
942482	*AE2-261 E*	*13.22*
942601	*AE2-276*	*16.65*
LTF	*BLUEG*	*8.45*
LTF	*CARR*	*0.71*
LTF	*CATAWBA*	*0.1*
LTF	*CBM-S1*	*8.5*
LTF	*CBM-W1*	*18.68*
LTF	*CBM-W2*	*173.22*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*26.46*
LTF	*G-007*	*2.02*
LTF	*HAMLET*	*0.29*
LTF	*IPL*	*17.76*
966791	*J1180*	*16.04*
954761	*J468 C*	*4.19*
954762	*J468 E*	*16.78*
954681	*J949*	*22.17*
LTF	*LGE-0092018*	*< 0.01*
LTF	*MEC*	*29.45*
LTF	*O-066*	*12.92*
LTF	*RENSSELAER*	*0.56*
247556	*T-127 C*	*0.56*
247943	*T-127 E*	*14.6*
LTF	*TRIMBLE*	*1.36*
LTF	*WEC*	*2.83*
930041	*AB1-006 C*	*0.73*
930042	*AB1-006 E*	*31.75*
930461	*AB1-087*	*183.14*
930471	*AB1-088*	*183.14*

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Appendix 2

(CE - CE) The W2-048 E-AC1-053 TAP 345 kV line (from bus 276150 to bus 925770 ckt 1) loads from 97.98% to 105.42% (AC power flow) of its load dump rating (1243 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_021-45-BT5-7__'. This project contributes approximately 91.85 MW to the thermal violation.

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 270804 TO BUS 270796 CKT 1 / LATHA; T 345 KINCA; B 345
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

Bus Number	*Bus Name*	*Full Contribution*
935141	*AD1-148*	*30.31*
936771	*AD2-100 C O1*	*34.67*
936772	*AD2-100 E O1*	*23.11*
936971	*AD2-131 C O1*	*2.28*
936972	*AD2-131 E O1*	*11.47*
940103	*AE1-252 EBAT*	*4.87*
941732	*AE2-173 BAT*	*4.62*
942481	*AE2-261 C*	*55.11*
942482	*AE2-261 E*	*36.74*
LTF	*CBM-N*	*0.09*
LTF	*CBM-S1*	*5.01*
LTF	*CBM-S2*	*1.34*
LTF	*CBM-W2*	*55.72*
LTF	*CIN*	*1.78*
LTF	*CPLE*	*0.44*
LTF	*EDWARDS*	*0.13*
LTF	*G-007A*	*0.34*
LTF	*IPL*	*1.19*
950291	*J291*	*2.97*
952251	*J641*	*9.41*
952271	*J644*	*9.36*
954721	*J750 C*	*3.36*
954722	*J750 E*	*18.16*
952871	*J757 C*	*3.64*
952872	*J757 E*	*19.67*

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953401	*J811*	*7.6*
953651	*J815*	*27.3*
953881	*J848 C*	*4.71*
953882	*J848 E*	*26.01*
954411	*J912*	*10.89*
964791	*J955*	*109.62*
965001	*J979 C*	*4.01*
965002	*J979 E*	*21.7*
274650	*KINCAID ;1U*	*27.45*
274651	*KINCAID ;2U*	*27.5*
LTF	*LGEE*	*0.39*
LTF	*MEC*	*7.29*
LTF	*NYISO*	*0.39*
LTF	*TILTON*	*1.17*
LTF	*VFT*	*0.91*
276150	*W2-048 E*	*8.35*
909052	*X2-022 E*	*115.97*

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Appendix 3

(AEP - OVEC) The 05JEFRSO-06CLIFTY 345 kV line (from bus 242865 to bus 248000 ckt Z1) loads from 113.55% to 114.46% (AC power flow) of its emergency rating (2354 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#1760_05JEFRSO 765_A'. This project contributes approximately 24.73 MW to the thermal violation.

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 05HANGR 765 243208 05JEFRSO 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
247900	*05FR-11G E*	*6.17*
247901	*05FR-12G E*	*6.07*
247902	*05FR-21G E*	*6.48*
247903	*05FR-22G E*	*6.21*
247904	*05FR-3G E*	*12.57*
247905	*05FR-4G E*	*9.45*
247906	*05MDL-1G E*	*10.77*
247907	*05MDL-2G E*	*5.34*
247912	*05MDL-3G E*	*5.58*
247913	*05MDL-4G E*	*5.39*
243442	*05RKG1*	*101.35*
243443	*05RKG2*	*97.16*
933441	*AC2-157 C*	*17.94*
933442	*AC2-157 E*	*29.28*
935141	*AD1-148*	*3.8*
936771	*AD2-100 C O1*	*10.59*
936772	*AD2-100 E O1*	*7.06*
936971	*AD2-131 C O1*	*0.7*
936972	*AD2-131 E O1*	*3.51*
937211	*AD2-159 C*	*2.45*
937212	*AD2-159 E*	*11.47*
939741	*AE1-205 C O1*	*5.31*
939742	*AE1-205 E O1*	*7.33*
941341	*AE2-130 C*	*231.78*
941342	*AE2-130 E*	*154.52*
941571	*AE2-154 C*	*2.19*
941572	*AE2-154 E*	*14.66*
941731	*AE2-173 O1*	*3.17*

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942111	*AE2-223 C*	*1.23*
942112	*AE2-223 E*	*8.26*
942481	*AE2-261 C*	*14.84*
942482	*AE2-261 E*	*9.89*
942601	*AE2-276*	*11.81*
LTF	*BLUEG*	*54.19*
LTF	*CALDERWOOD*	*0.27*
LTF	*CANNELTON*	*0.32*
LTF	*CARR*	*0.58*
LTF	*CATAWBA*	*0.35*
LTF	*CBM-W1*	*20.17*
LTF	*CBM-W2*	*93.45*
LTF	*CHEOAH*	*0.26*
LTF	*CHILHOWEE*	*0.09*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*12.05*
LTF	*G-007*	*1.68*
LTF	*HAMLET*	*0.61*
LTF	*IPL*	*8.55*
966791	*J1180*	*10.79*
954681	*J949*	*13.19*
LTF	*LGE-0012019*	*4.67*
LTF	*LGE-0092018*	*< 0.01*
LTF	*MEC*	*24.37*
LTF	*MECS*	*4.54*
LTF	*O-066*	*10.75*
LTF	*RENSSELAER*	*0.46*
290261	*S-027 E*	*11.01*
290265	*S-028 E*	*11.01*
LTF	*SANTEETLA*	*0.08*
247943	*T-127 E*	*5.39*
LTF	*TRIMBLE*	*6.66*
276150	*W2-048 E*	*1.05*
905082	*W4-005 E*	*22.66*
LTF	*WEC*	*3.31*
909052	*X2-022 E*	*14.54*
913222	*Y1-054 E*	*-1.26*
915662	*Y3-099 E*	*0.13*
915672	*Y3-100 E*	*0.13*
917502	*Z2-087 E*	*11.02*
930042	*AB1-006 E*	*11.73*
930461	*AB1-087*	*129.86*
930471	*AB1-088*	*129.86*
924041	*AB2-047 C O1*	*2.06*

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924042	*AB2-047 E O1*	*13.77*
924261	*AB2-070 C O1*	*1.99*
924262	*AB2-070 E O1*	*13.32*
925771	*AC1-053 C*	*2.*
925772	*AC1-053 E*	*13.37*
926841	*AC1-171 C O1*	*0.66*
926842	*AC1-171 E O1*	*4.44*

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Appendix 4

(CE - CE) The LORETTO ; B-AE1-172 TAP 345 kV line (from bus 270704 to bus 939400 ckt 1) loads from 104.18% to 106.53% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8014___-S-B'. This project contributes approximately 35.86 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
933441	*AC2-157 C*	*4.3*
935001	*AD1-133 C O1*	*90.84*
935141	*AD1-148*	*13.51*
LTF	*AD2-098*	*0.21*
936771	*AD2-100 C O1*	*24.33*
936971	*AD2-131 C O1*	*1.6*
937211	*AD2-159 C*	*11.3*
939741	*AE1-205 C O1*	*42.49*
941731	*AE2-173 O1*	*25.17*
942111	*AE2-223 C*	*9.81*
942481	*AE2-261 C*	*35.86*
942601	*AE2-276*	*2.83*
274863	*CAYUGA RI;1U*	*2.84*
274864	*CAYUGA RI;2U*	*2.84*
LTF	*CBM-N*	*0.58*
LTF	*CBM-S1*	*11.1*
LTF	*CBM-S2*	*3.36*
LTF	*CBM-W2*	*130.85*
LTF	*CIN*	*11.61*
LTF	*CPLE*	*1.18*
LTF	*G-007A*	*1.96*
LTF	*IPL*	*6.28*
965371	*J1022 C*	*4.79*
966251	*J1115 C*	*7.73*
950701	*J196 C*	*1.14*
950291	*J291*	*4.23*
951001	*J339*	*12.8*
954761	*J468 C*	*4.05*
951741	*J474 C*	*5.16*
952271	*J644*	*13.57*
952321	*J734*	*10.75*

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954721	*J750 C*	*3.62*
952651	*J756 C*	*4.83*
952871	*J757 C*	*5.78*
953401	*J811*	*10.86*
953651	*J815*	*37.41*
953741	*J826 C*	*3.19*
953851	*J845 C*	*3.12*
953881	*J848 C*	*5.41*
954411	*J912*	*14.2*
965001	*J979 C*	*4.6*
274650	*KINCAID ;1U*	*17.42*
274651	*KINCAID ;2U*	*17.45*
LTF	*LGEE*	*1.71*
LTF	*MEC*	*9.2*
LTF	*NYISO*	*2.53*
274853	*TWINGROVE;U1*	*2.53*
274854	*TWINGROVE;U2*	*2.53*
LTF	*VFT*	*5.27*
905081	*W4-005 C*	*2.42*
917501	*Z2-087 C*	*2.03*
930461	*AB1-087*	*31.09*
930471	*AB1-088*	*31.09*
924041	*AB2-047 C O1*	*16.36*
924261	*AB2-070 C O1*	*7.65*
925771	*AC1-053 C*	*7.5*
926841	*AC1-171 C O1*	*0.96*

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Appendix 5

(CE - CE) The DRESDEN ; R-COLLINS ; R 345 kV line (from bus 270717 to bus 270697 ckt 1) loads from 100.09% to 101.27% (AC power flow) of its load dump rating (1528 MVA) for the line fault with failed breaker contingency outage of 'ADD AD1-100 2'. This project contributes approximately 21.35 MW to the thermal violation.

CONTINGENCY 'ADD AD1-100 2'
OPEN BRANCH FROM BUS 934720 TO BUS 939400 CKT 1 / AD1-100 - AE1-172 TAP (LORETTO)
OPEN BRANCH FROM BUS 934730 TO BUS 270670 CKT 1 / AD1-100 - BRAIDWOOD
END

Bus Number	*Bus Name*	*Full Contribution*
934051	*AD1-031 C O1*	*1.45*
934052	*AD1-031 E O1*	*2.37*
934101	*AD1-039 1*	*13.5*
934111	*AD1-039 2*	*3.11*
935001	*AD1-133 C O1*	*35.51*
935002	*AD1-133 E O1*	*23.67*
935141	*AD1-148*	*4.39*
936291	*AD2-038 C O1*	*0.98*
936292	*AD2-038 E O1*	*6.56*
936511	*AD2-066 C O1*	*4.05*
936512	*AD2-066 E O1*	*2.7*
936771	*AD2-100 C O1*	*8.71*
936772	*AD2-100 E O1*	*5.8*
936971	*AD2-131 C O1*	*0.57*
936972	*AD2-131 E O1*	*2.88*
937211	*AD2-159 C*	*3.46*
937212	*AD2-159 E*	*16.2*
937401	*AD2-194 1*	*5.57*
937411	*AD2-194 2*	*5.63*
938511	*AE1-070 1*	*6.55*
938521	*AE1-070 2*	*6.06*
938851	*AE1-113 C O1*	*4.17*
938852	*AE1-113 E O1*	*14.78*
939321	*AE1-163 C O1*	*2.46*
939322	*AE1-163 E O1*	*15.13*
939401	*AE1-172 C O1*	*6.48*
939402	*AE1-172 E O1*	*30.34*
939631	*AE1-193 C O1*	*3.53*

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939632	*AE1-193 E O1*	*23.62*
939681	*AE1-198 C O1*	*10.48*
939682	*AE1-198 E O1*	*8.91*
939741	*AE1-205 C O1*	*12.13*
939742	*AE1-205 E O1*	*16.76*
940101	*AE1-252 C O1*	*13.*
940102	*AE1-252 E O1*	*8.66*
941731	*AE2-173 O1*	*7.22*
942111	*AE2-223 C*	*2.81*
942112	*AE2-223 E*	*18.83*
942421	*AE2-255 C O1*	*1.58*
942422	*AE2-255 E O1*	*4.74*
942481	*AE2-261 C*	*12.81*
942482	*AE2-261 E*	*8.54*
942651	*AE2-281 C O1*	*0.35*
942652	*AE2-281 E O1*	*2.16*
294401	*BSHIL;1U E*	*4.35*
294410	*BSHIL;2U E*	*4.35*
LTF	*CARR*	*0.19*
274890	*CAYUG;1U E*	*17.33*
274891	*CAYUG;2U E*	*17.33*
274863	*CAYUGA RI;1U*	*0.67*
274864	*CAYUGA RI;2U*	*0.67*
LTF	*CBM-S1*	*3.44*
LTF	*CBM-S2*	*0.43*
LTF	*CBM-W1*	*7.5*
LTF	*CBM-W2*	*55.13*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*2.67*
LTF	*CPLE*	*0.06*
274659	*DRESDEN ;3U*	*33.81*
274837	*EQUISTAR ; B*	*1.17*
LTF	*G-007*	*0.5*
LTF	*IPL*	*1.24*
965371	*J1022 C*	*1.21*
965372	*J1022 E*	*6.55*
965681	*J1055 C*	*1.27*
965682	*J1055 E*	*6.86*
966121	*J1102*	*3.96*
966251	*J1115 C*	*2.06*
966252	*J1115 E*	*11.16*
951741	*J474 C*	*1.44*
951742	*J474 E*	*7.77*
954721	*J750 C*	*1.23*

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954722	*J750 E*	*6.67*
952651	*J756 C*	*1.79*
952652	*J756 E*	*9.67*
953741	*J826 C*	*0.81*
953742	*J826 E*	*4.36*
964791	*J955*	*52.53*
964951	*J974 C*	*2.17*
964952	*J974 E*	*11.72*
990901	*L-005 E*	*6.84*
LTF	*LGEE*	*0.14*
LTF	*MEC*	*16.89*
293771	*O-035 E*	*3.29*
LTF	*O-066*	*3.24*
290021	*O50 E*	*10.11*
LTF	*RENSSELAER*	*0.15*
290261	*S-027 E*	*19.3*
290265	*S-028 E*	*19.3*
274853	*TWINGROVE;U1*	*0.75*
274854	*TWINGROVE;U2*	*0.75*
276150	*W2-048 E*	*1.21*
904211	*W3-135*	*0.19*
905081	*W4-005 C*	*0.74*
905082	*W4-005 E*	*32.02*
905493	*W4-086*	*0.05*
LTF	*WEC*	*1.12*
909052	*X2-022 E*	*16.81*
916211	*Z1-072 E*	*2.49*
916512	*Z1-107 E*	*1.08*
917501	*Z2-087 C*	*0.58*
917502	*Z2-087 E*	*25.11*
930741	*AB1-122 1O1*	*137.76*
930751	*AB1-122 2O1*	*31.7*
924041	*AB2-047 C O1*	*4.69*
924042	*AB2-047 E O1*	*31.39*
924261	*AB2-070 C O1*	*2.44*
924262	*AB2-070 E O1*	*16.33*
925581	*AC1-033 C*	*0.71*
925582	*AC1-033 E*	*4.76*
925771	*AC1-053 C*	*2.4*
925772	*AC1-053 E*	*16.09*
926821	*AC1-168 C O1*	*0.53*
926822	*AC1-168 E O1*	*3.58*
926841	*AC1-171 C O1*	*0.69*
926842	*AC1-171 E O1*	*4.61*
927091	*AC1-204 1*	*51.81*

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927101	*AC1-204 2*	*52.39*
927201	*AC1-214 C O1*	*1.06*
927202	*AC1-214 E O1*	*3.35*

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Appendix 6

(CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 126.88% to 138.14% (AC power flow) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_080-45-BT7-8_FSA'. This project contributes approximately 108.53 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
935141	*AD1-148*	*12.07*
936771	*AD2-100 C O1*	*35.95*
936772	*AD2-100 E O1*	*23.97*
936971	*AD2-131 C O1*	*2.37*
936972	*AD2-131 E O1*	*11.9*
937211	*AD2-159 C*	*6.28*
937212	*AD2-159 E*	*29.4*
939401	*AE1-172 C O1*	*2.54*
939402	*AE1-172 E O1*	*11.89*
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*	*3.39*
941731	*AE2-173 O1*	*9.57*
942111	*AE2-223 C*	*3.73*
942112	*AE2-223 E*	*24.98*
942481	*AE2-261 C*	*65.12*
942482	*AE2-261 E*	*43.41*
LTF	*BIG_CAJUN1 /* 35% REVERSE 4646887 4392735*	*< 0.01*
LTF	*CALDERWOOD*	*0.71*
LTF	*CANNELTON*	*0.1*
LTF	*CARR*	*0.06*
LTF	*CATAWBA*	*0.3*
274890	*CAYUG;1U E*	*8.37*
274891	*CAYUG;2U E*	*8.37*
LTF	*CHEOAH*	*0.64*
LTF	*CHILHOWEE*	*0.23*

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LTF	*CIN*	*1.78*
LTF	*COFFEEN*	*2.24*
LTF	*COTTONWOOD*	*6.35*
LTF	*DUCKCREEK*	*11.8*
LTF	*EDWARDS*	*1.72*
LTF	*FARMERCITY*	*1.97*
LTF	*G-007*	*0.18*
LTF	*HAMLET*	*0.46*
LTF	*IPL*	*0.72*
965371	*J1022 C*	*3.35*
965372	*J1022 E*	*18.14*
966121	*J1102*	*5.63*
966251	*J1115 C*	*6.93*
966252	*J1115 E*	*37.49*
966421	*J1139*	*11.7*
950701	*J196 C*	*0.82*
950702	*J196 E*	*3.27*
951001	*J339*	*9.08*
954761	*J468 C*	*2.16*
954762	*J468 E*	*8.63*
951741	*J474 C*	*3.6*
951742	*J474 E*	*19.46*
952321	*J734*	*7.63*
952651	*J756 C*	*2.54*
952652	*J756 E*	*13.73*
953741	*J826 C*	*2.24*
953742	*J826 E*	*12.1*
953851	*J845 C*	*2.23*
953852	*J845 E*	*12.07*
274650	*KINCAID ;1U*	*33.7*
274651	*KINCAID ;2U*	*34.06*
LTF	*MECS*	*1.01*
LTF	*NEWTON*	*1.49*
LTF	*O-066*	*1.18*
LTF	*PRAIRIE*	*11.38*
LTF	*RENSSELAER*	*0.05*
290261	*S-027 E*	*23.54*
290265	*S-028 E*	*23.54*
LTF	*SANTEETLA*	*0.19*
LTF	*SMITHLAND*	*0.5*
LTF	*TVA*	*3.47*
274853	*TWINGROVE;U1*	*0.91*
274854	*TWINGROVE;U2*	*0.91*
LTF	*UNIONPOWER*	*2.11*
276150	*W2-048 E*	*3.33*

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905081	*W4-005 C*	*1.34*
905082	*W4-005 E*	*58.12*
909052	*X2-022 E*	*46.19*
917501	*Z2-087 C*	*0.77*
917502	*Z2-087 E*	*33.3*
924041	*AB2-047 C O1*	*6.22*
924042	*AB2-047 E O1*	*41.63*
924261	*AB2-070 C O1*	*5.83*
924262	*AB2-070 E O1*	*39.*
925771	*AC1-053 C*	*6.01*
925772	*AC1-053 E*	*40.24*

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Appendix 7

(CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 101.53% to 103.88% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8014___-S-B'. This project contributes approximately 35.92 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
933441	*AC2-157 C*	*4.32*
935001	*AD1-133 C O1*	*90.89*
935141	*AD1-148*	*13.53*
LTF	*AD2-098*	*0.2*
936771	*AD2-100 C O1*	*24.37*
936971	*AD2-131 C O1*	*1.61*
937211	*AD2-159 C*	*11.31*
939741	*AE1-205 C O1*	*42.51*
941731	*AE2-173 O1*	*25.18*
942111	*AE2-223 C*	*9.82*
942481	*AE2-261 C*	*35.92*
942601	*AE2-276*	*2.84*
LTF	*CBM-N*	*0.61*
LTF	*CBM-S1*	*11.2*
LTF	*CBM-S2*	*3.41*
LTF	*CBM-W2*	*131.6*
LTF	*CIN*	*11.69*
LTF	*CPLE*	*1.2*
LTF	*G-007A*	*2.04*
LTF	*IPL*	*6.33*
965371	*J1022 C*	*4.79*
966251	*J1115 C*	*7.73*
950701	*J196 C*	*1.14*
950291	*J291*	*4.23*
951001	*J339*	*12.8*
954761	*J468 C*	*4.05*
951741	*J474 C*	*5.16*
952251	*J641*	*13.48*
952271	*J644*	*13.57*
952321	*J734*	*10.75*
954721	*J750 C*	*3.62*

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952651	*J756 C*	*4.83*
952871	*J757 C*	*5.78*
953401	*J811*	*10.86*
953651	*J815*	*37.41*
953741	*J826 C*	*3.19*
953851	*J845 C*	*3.12*
953881	*J848 C*	*5.41*
954411	*J912*	*14.2*
965001	*J979 C*	*4.6*
274650	*KINCAID ;1U*	*17.45*
274651	*KINCAID ;2U*	*17.47*
LTF	*LGEE*	*1.73*
LTF	*MEC*	*9.35*
LTF	*NYISO*	*2.63*
274853	*TWINGROVE;U1*	*2.53*
274854	*TWINGROVE;U2*	*2.53*
LTF	*VFT*	*5.48*
905081	*W4-005 C*	*2.42*
917501	*Z2-087 C*	*2.03*
930461	*AB1-087*	*31.27*
930471	*AB1-088*	*31.27*
924041	*AB2-047 C O1*	*16.37*
924261	*AB2-070 C O1*	*7.66*
925771	*AC1-053 C*	*7.5*
926841	*AC1-171 C O1*	*0.96*

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Appendix 8

(LGEE - OVEC) The 7TRIMBLE CO-06CLIFTY 345 kV line (from bus 324114 to bus 248000 ckt 1) loads from 143.71% to 144.25% (AC power flow) of its emergency rating (1451 MVA) for the single line contingency outage of 'AEP_P1-2_#363'. This project contributes approximately 9.13 MW to the thermal violation.

CONTINGENCY 'AEP_P1-2_#363'
OPEN BRANCH FROM BUS 243208 TO BUS 243209 CKT 1 / 243208 05JEFRSO 765 243209 05ROCKPT 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
243442	*05RKG1*	*15.74*
342900	*1COOPER1 G*	*2.65*
342903	*1COOPER2 G*	*5.15*
342918	*1JKCT 1G*	*2.1*
342921	*1JKCT 2G*	*2.1*
342924	*1JKCT 3G*	*2.1*
342927	*1JKCT 4G*	*1.39*
342930	*1JKCT 5G*	*1.39*
342933	*1JKCT 6G*	*1.39*
342936	*1JKCT 7G*	*1.39*
342939	*1JKCT 9G*	*1.43*
342942	*1JKCT 10G*	*1.43*
342945	*1LAUREL 1G*	*1.5*
932551	*AC2-075 C*	*1.18*
933441	*AC2-157 C*	*5.71*
936381	*AD2-048 C*	*4.34*
936571	*AD2-072 C O1*	*12.31*
936771	*AD2-100 C O1*	*6.56*
936971	*AD2-131 C O1*	*0.43*
939131	*AE1-143 C*	*11.67*
940041	*AE1-246 C O1*	*14.57*
940831	*AE2-071 C*	*3.69*
941341	*AE2-130 C*	*36.*
941411	*AE2-138 C*	*18.78*
941981	*AE2-210 C O1*	*6.47*
942411	*AE2-254 C O1*	*4.89*
942481	*AE2-261 C*	*9.13*
942591	*AE2-275 C O1*	*8.4*
942601	*AE2-276*	*3.75*
942891	*AE2-308 C O1*	*14.13*

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943111	*AE2-339 C*	*3.16*
LTF	*CARR*	*0.22*
LTF	*CBM-S1*	*45.93*
LTF	*CBM-S2*	*4.74*
LTF	*CBM-W1*	*9.46*
LTF	*CBM-W2*	*191.42*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*28.85*
LTF	*CPLE*	*1.33*
LTF	*IPL*	*15.41*
952811	*J759*	*11.49*
952821	*J762*	*35.64*
952861	*J783 C*	*10.9*
953611	*J800*	*16.58*
953931	*J856*	*11.02*
LTF	*LGEE*	*27.68*
LTF	*MEC*	*20.16*
LTF	*RENSSELAER*	*0.17*
LTF	*WEC*	*1.47*
930461	*AB1-087*	*41.29*
930471	*AB1-088*	*41.29*
925981	*AC1-074 C O1*	*4.96*

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Appendix 9

(MISO AMIL - CE) The 7AUSTIN-KINCAID ; B 345 kV line (from bus 347955 to bus 270796 ckt 1) loads from 129.42% to 135.83% (AC power flow) of its emergency rating (956 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_021-45-BT6-8__'. This project contributes approximately 60.63 MW to the thermal violation.

CONTINGENCY 'COMED_P4_021-45-BT6-8__'
TRIP BRANCH FROM BUS 270797 TO BUS 942480 CKT 1 / KINCAID ; R 345
AD2-100 TAP 345/* CONTINGENCY LINE ADDED FOR AE1 BUILD
REMOVE UNIT 2 FROM BUS 274651 / KINCAID ;2U 20
END

Bus Number	*Bus Name*	*Full Contribution*
936771	*AD2-100 C O1*	*25.55*
936772	*AD2-100 E O1*	*17.03*
936971	*AD2-131 C O1*	*1.68*
936972	*AD2-131 E O1*	*8.46*
940103	*AE1-252 EBAT*	*6.66*
941732	*AE2-173 BAT*	*6.46*
942481	*AE2-261 C*	*36.38*
942482	*AE2-261 E*	*24.25*
LTF	*CBM-N*	*0.52*
LTF	*CBM-S1*	*10.14*
LTF	*CBM-S2*	*3.12*
LTF	*CBM-W1*	*6.17*
LTF	*CBM-W2*	*101.39*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*2.63*
LTF	*CPLE*	*1.08*
LTF	*G-007A*	*1.75*
LTF	*IPL*	*1.93*
965401	*J1025 C*	*3.73*
965402	*J1025 E*	*20.16*
965411	*J1026 C*	*5.2*
965412	*J1026 E*	*28.13*
965521	*J1039*	*3.39*
966041	*J1094*	*8.7*
966401	*J1135*	*2.78*
966471	*J1145*	*15.49*
966811	*J1182*	*17.33*
950291	*J291*	*6.92*

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951631	*J456 C*	*1.84*
951632	*J456 E*	*9.93*
951821	*J541 C*	*3.63*
951822	*J541 E*	*19.66*
952251	*J641*	*22.1*
952271	*J644*	*23.82*
952871	*J757 C*	*12.53*
952872	*J757 E*	*67.81*
953371	*J808*	*5.71*
953401	*J811*	*10.68*
953641	*J813*	*15.68*
953651	*J815*	*53.35*
953671	*J817*	*9.31*
953881	*J848 C*	*6.67*
953882	*J848 E*	*36.81*
953951	*J859*	*19.58*
954411	*J912*	*15.71*
964791	*J955*	*402.41*
964801	*J956*	*15.35*
964971	*J976*	*20.33*
965001	*J979 C*	*5.68*
965002	*J979 E*	*30.71*
965071	*J987*	*6.62*
965131	*J994*	*6.15*
LTF	*LGEE*	*0.84*
LTF	*MEC*	*21.8*
LTF	*NYISO*	*2.27*
LTF	*TILTON*	*2.28*
LTF	*VFT*	*4.7*
909052	*X2-022 E*	*-53.26*

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Appendix 10

(CE - CE) The Z2-087 TAP-PONTIAC ; R 345 kV line (from bus 917500 to bus 270853 ckt 1) loads from 100.26% to 102.5% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8002___-S'. This project contributes approximately 34.28 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L8002___-S'
TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345
END

Bus Number	*Bus Name*	*Full Contribution*
933441	*AC2-157 C*	*4.43*
935141	*AD1-148*	*15.44*
LTF	*AD2-098*	*0.24*
936771	*AD2-100 C O1*	*23.3*
936971	*AD2-131 C O1*	*1.53*
937211	*AD2-159 C*	*7.44*
941731	*AE2-173 O1*	*34.4*
942111	*AE2-223 C*	*13.42*
942481	*AE2-261 C*	*34.28*
942601	*AE2-276*	*2.91*
LTF	*CBM-N*	*0.69*
LTF	*CBM-S1*	*11.08*
LTF	*CBM-S2*	*3.47*
LTF	*CBM-W2*	*129.12*
LTF	*CIN*	*12.13*
LTF	*CPLE*	*1.23*
LTF	*G-007A*	*2.3*
LTF	*IPL*	*6.57*
965371	*J1022 C*	*5.6*
966251	*J1115 C*	*7.14*
950701	*J196 C*	*1.28*
950291	*J291*	*4.04*
951001	*J339*	*15.21*
954761	*J468 C*	*4.32*
951741	*J474 C*	*5.73*
952271	*J644*	*13.04*
952321	*J734*	*12.77*
954721	*J750 C*	*3.57*
952651	*J756 C*	*4.59*
952871	*J757 C*	*5.51*
953401	*J811*	*10.83*

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953651	*J815*	*36.61*
953741	*J826 C*	*3.73*
953851	*J845 C*	*3.66*
953881	*J848 C*	*5.31*
954411	*J912*	*13.98*
965001	*J979 C*	*4.52*
274650	*KINCAID ;1U*	*16.64*
274651	*KINCAID ;2U*	*16.65*
LTF	*LGEE*	*1.81*
LTF	*MEC*	*6.14*
LTF	*NYISO*	*2.99*
274853	*TWINGROVE;U1*	*1.38*
274854	*TWINGROVE;U2*	*1.38*
LTF	*VFT*	*6.17*
905081	*W4-005 C*	*1.59*
917501	*Z2-087 C*	*2.77*
930461	*AB1-087*	*32.03*
930471	*AB1-088*	*32.03*
924041	*AB2-047 C O1*	*22.36*
924261	*AB2-070 C O1*	*8.98*
925771	*AC1-053 C*	*8.73*
926841	*AC1-171 C O1*	*1.02*

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Appendix 11

(CE - CE) The AB2-070 TAP-BROKAW ; T 345 kV line (from bus 924260 to bus 270673 ckt 1) loads from 119.69% to 127.13% (AC power flow) of its load dump rating (1243 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_021-45-BT5-7__'. This project contributes approximately 91.85 MW to the thermal violation.

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 270804 TO BUS 270796 CKT 1 / LATHA; T 345 KINCA; B 345
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

Bus Number	*Bus Name*	*Full Contribution*
935141	*AD1-148*	*30.31*
936771	*AD2-100 C O1*	*34.67*
936772	*AD2-100 E O1*	*23.11*
936971	*AD2-131 C O1*	*2.28*
936972	*AD2-131 E O1*	*11.47*
941732	*AE2-173 BAT*	*4.62*
942481	*AE2-261 C*	*55.11*
942482	*AE2-261 E*	*36.74*
LTF	*CBM-N*	*0.09*
LTF	*CBM-S1*	*5.01*
LTF	*CBM-S2*	*1.34*
LTF	*CBM-W2*	*55.72*
LTF	*CIN*	*1.78*
LTF	*CPLE*	*0.44*
LTF	*EDWARDS*	*0.13*
LTF	*G-007A*	*0.34*
LTF	*IPL*	*1.19*
950291	*J291*	*2.97*
952251	*J641*	*9.41*
952271	*J644*	*9.36*
954721	*J750 C*	*3.36*
954722	*J750 E*	*18.16*
952871	*J757 C*	*3.64*
952872	*J757 E*	*19.67*
953401	*J811*	*7.6*

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953651	*J815*	*27.3*
953881	*J848 C*	*4.71*
953882	*J848 E*	*26.01*
954411	*J912*	*10.89*
964791	*J955*	*109.62*
965001	*J979 C*	*4.01*
965002	*J979 E*	*21.7*
274650	*KINCAID ;1U*	*27.45*
274651	*KINCAID ;2U*	*27.5*
LTF	*LGEE*	*0.39*
LTF	*MEC*	*7.29*
LTF	*NYISO*	*0.39*
LTF	*TILTON*	*1.17*
LTF	*VFT*	*0.91*
276150	*W2-048 E*	*8.35*
909052	*X2-022 E*	*115.97*
924261	*AB2-070 C O1*	*18.21*
924262	*AB2-070 E O1*	*121.89*
925771	*AC1-053 C*	*17.53*
925772	*AC1-053 E*	*117.32*

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Appendix 12

(CE - CE) The AC1-053 TAP-AB2-070 TAP 345 kV line (from bus 925770 to bus 924260 ckt 1) loads from 108.81% to 116.25% (AC power flow) of its load dump rating (1243 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_021-45-BT5-7__'. This project contributes approximately 91.85 MW to the thermal violation.

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 270804 TO BUS 270796 CKT 1 / LATHA; T 345 KINCA; B 345
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

Bus Number	*Bus Name*	*Full Contribution*
935141	*AD1-148*	*30.31*
936771	*AD2-100 C O1*	*34.67*
936772	*AD2-100 E O1*	*23.11*
936971	*AD2-131 C O1*	*2.28*
936972	*AD2-131 E O1*	*11.47*
940103	*AE1-252 EBAT*	*4.87*
941732	*AE2-173 BAT*	*4.62*
942481	*AE2-261 C*	*55.11*
942482	*AE2-261 E*	*36.74*
LTF	*CBM-N*	*0.09*
LTF	*CBM-S1*	*5.01*
LTF	*CBM-S2*	*1.34*
LTF	*CBM-W2*	*55.72*
LTF	*CIN*	*1.78*
LTF	*CPLE*	*0.44*
LTF	*EDWARDS*	*0.13*
LTF	*G-007A*	*0.34*
LTF	*IPL*	*1.19*
950291	*J291*	*2.97*
952251	*J641*	*9.41*
952271	*J644*	*9.36*
954721	*J750 C*	*3.36*
954722	*J750 E*	*18.16*
952871	*J757 C*	*3.64*
952872	*J757 E*	*19.67*

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953401	*J811*	*7.6*
953651	*J815*	*27.3*
953881	*J848 C*	*4.71*
953882	*J848 E*	*26.01*
954411	*J912*	*10.89*
964791	*J955*	*109.62*
965001	*J979 C (Withdrawn)*	*4.01*
965002	*J979 E (Withdrawn)*	*21.7*
274650	*KINCAID ;1U*	*27.45*
274651	*KINCAID ;2U*	*27.5*
LTF	*LGEE*	*0.39*
LTF	*MEC*	*7.29*
LTF	*NYISO*	*0.39*
LTF	*TILTON*	*1.17*
LTF	*VFT*	*0.91*
276150	*W2-048 E*	*8.35*
909052	*X2-022 E*	*115.97*
925771	*AC1-053 C*	*17.53*
925772	*AC1-053 E*	*117.32*

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Appendix 13

(CE - CE) The AD1-100 TAP-AD2-137 TAP 345 kV line (from bus 934720 to bus 937030 ckt 1) loads from 134.42% to 135.48% (**DC power flow**) of its load dump rating (1846 MVA) for the tower line contingency outage of 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S_A'. This project contributes approximately 22.94 MW to the thermal violation.

CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S_A'
 TRIP BRANCH FROM BUS 270670 TO BUS 942880 CKT 1 / BRAID; B 345 AE2-307 TAP 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

Bus Number	*Bus Name*	*Full Contribution*
933411	*AC2-154 C*	*2.76*
933412	*AC2-154 E*	*4.51*
934721	*AD1-100 C*	*51.73*
934722	*AD1-100 E*	*241.4*
935001	*AD1-133 C O1*	*18.11*
935002	*AD1-133 E O1*	*12.07*
935141	*AD1-148*	*5.05*
936371	*AD2-047 C O1*	*4.95*
936372	*AD2-047 E O1*	*24.15*
936461	*AD2-060*	*2.91*
936771	*AD2-100 C O1*	*9.33*
936772	*AD2-100 E O1*	*6.22*
936971	*AD2-131 C O1*	*0.61*
936972	*AD2-131 E O1*	*3.09*
937211	*AD2-159 C*	*4.15*
937212	*AD2-159 E*	*19.41*
939351	*AE1-166 C O1*	*22.62*
939352	*AE1-166 E O1*	*20.88*
939401	*AE1-172 C O1*	*13.55*
939402	*AE1-172 E O1*	*63.44*
939741	*AE1-205 C O1*	*15.32*
939742	*AE1-205 E O1*	*21.16*
940101	*AE1-252 C O1*	*27.17*
940102	*AE1-252 E O1*	*18.12*
941551	*AE2-152 C O1*	*26.1*

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941552	*AE2-152 E O1*	*17.4*
941561	*AE2-153 C O1*	*7.38*
941562	*AE2-153 E O1*	*34.55*
941731	*AE2-173 O1*	*9.04*
942111	*AE2-223 C*	*3.53*
942112	*AE2-223 E*	*23.6*
942481	*AE2-261 C*	*13.77*
942482	*AE2-261 E*	*9.18*
LTF	*BLUEG*	*0.15*
274654	*BRAIDWOOD;1U*	*43.2*
274655	*BRAIDWOOD;2U*	*41.26*
LTF	*CARR*	*0.28*
LTF	*CATAWBA*	*< 0.01*
274890	*CAYUG;1U E*	*31.04*
274891	*CAYUG;2U E*	*31.04*
274863	*CAYUGA RI;1U*	*1.2*
274864	*CAYUGA RI;2U*	*1.2*
LTF	*CBM-S1*	*2.59*
LTF	*CBM-W1*	*4.12*
LTF	*CBM-W2*	*47.82*
LTF	*CIN*	*2.49*
LTF	*G-007*	*0.77*
274871	*GR RIDGE ;2U*	*0.75*
274847	*GR RIDGE ;BU*	*0.59*
LTF	*HAMLET*	*0.05*
LTF	*IPL*	*1.07*
965371	*J1022 C*	*1.57*
965372	*J1022 E*	*8.5*
966121	*J1102*	*4.02*
966251	*J1115 C*	*2.62*
966252	*J1115 E*	*14.16*
951001	*J339*	*4.12*
951741	*J474 C*	*1.79*
951742	*J474 E*	*9.68*
952321	*J734*	*3.46*
952651	*J756 C*	*1.81*
952652	*J756 E*	*9.81*
953741	*J826 C*	*1.05*
953742	*J826 E*	*5.67*
964791	*J955*	*60.96*
275149	*KEMPTON ;1E*	*20.37*
274660	*LASCO STA;1U*	*27.14*
274661	*LASCO STA;2U*	*27.19*
LTF	*LGEE*	*< 0.01*
LTF	*MEC*	*12.51*

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293061	*N-015 E*	*15.19*
LTF	*O-066*	*4.93*
294392	*P-010 E*	*19.29*
274888	*PILOT HIL;1E*	*20.37*
274887	*PILOT HIL;1U*	*0.79*
274881	*PLEAS RDG;2U*	*0.79*
LTF	*RENSSELAER*	*0.22*
290261	*S-027 E*	*23.75*
290265	*S-028 E*	*23.75*
LTF	*TRIMBLE*	*0.05*
274853	*TWINGROVE;U1*	*0.92*
274854	*TWINGROVE;U2*	*0.92*
276150	*W2-048 E*	*1.39*
905081	*W4-005 C*	*0.89*
905082	*W4-005 E*	*38.37*
LTF	*WEC*	*0.87*
909052	*X2-022 E*	*19.33*
917501	*Z2-087 C*	*0.73*
917502	*Z2-087 E*	*31.47*
930501	*AB1-091 O1*	*92.55*
924041	*AB2-047 C O1*	*5.88*
924042	*AB2-047 E O1*	*39.33*
924261	*AB2-070 C O1*	*2.84*
924262	*AB2-070 E O1*	*19.04*
925771	*AC1-053 C*	*2.79*
925772	*AC1-053 E*	*18.68*
926821	*AC1-168 C O1*	*0.69*
926822	*AC1-168 E O1*	*4.62*
926841	*AC1-171 C O1*	*0.6*
926842	*AC1-171 E O1*	*3.99*

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Appendix 14

(CE - CE) The AD1-100 TAP-BRAIDWOOD; B 345 kV line (from bus 934730 to bus 270670 ckt 1) loads from 152.88% to 155.09% (AC power flow) of its load dump rating (1528 MVA) for the line fault with failed breaker contingency outage of 'ADD AD1-100 5'. This project contributes approximately 34.65 MW to the thermal violation.

CONTINGENCY 'ADD AD1-100 5'
OPEN BRANCH FROM BUS 934730 TO BUS 270710 CKT 1 / AD1-100 - DAVIS CREEK
OPEN BRANCH FROM BUS 934720 TO BUS 937030 CKT 1 / AD1-100 - AD2-137 TAP (WILTON)
END

Bus Number	*Bus Name*	*Full Contribution*
934721	*AD1-100 C*	*105.34*
934722	*AD1-100 E*	*491.58*
935001	*AD1-133 C O1*	*25.95*
935002	*AD1-133 E O1*	*17.3*
935141	*AD1-148*	*7.74*
936771	*AD2-100 C O1*	*14.11*
936772	*AD2-100 E O1*	*9.41*
936971	*AD2-131 C O1*	*0.93*
936972	*AD2-131 E O1*	*4.67*
937211	*AD2-159 C*	*6.46*
937212	*AD2-159 E*	*30.24*
939351	*AE1-166 C O1*	*58.39*
939352	*AE1-166 E O1*	*53.9*
939401	*AE1-172 C O1*	*22.*
939402	*AE1-172 E O1*	*103.*
939741	*AE1-205 C O1*	*24.16*
939742	*AE1-205 E O1*	*33.37*
940101	*AE1-252 C O1*	*44.12*
940102	*AE1-252 E O1*	*29.41*
941551	*AE2-152 C O1*	*67.37*
941552	*AE2-152 E O1*	*44.92*
941731	*AE2-173 O1*	*14.25*
942111	*AE2-223 C*	*5.56*
942112	*AE2-223 E*	*37.19*
942481	*AE2-261 C*	*20.79*
942482	*AE2-261 E*	*13.86*
274890	*CAYUG;1U E*	*50.02*
274891	*CAYUG;2U E*	*50.02*
274863	*CAYUGA RI;1U*	*1.94*

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274864	*CAYUGA RI;2U*	*1.94*
LTF	*CBM-N*	*0.43*
LTF	*CBM-S1*	*6.9*
LTF	*CBM-S2*	*2.18*
LTF	*CBM-W2*	*79.63*
LTF	*CIN*	*6.91*
LTF	*CPLE*	*0.77*
LTF	*G-007A*	*1.45*
LTF	*IPL*	*3.77*
965371	*J1022 C*	*2.69*
965372	*J1022 E*	*14.56*
966121	*J1102*	*6.19*
966251	*J1115 C*	*4.37*
966252	*J1115 E*	*23.63*
951001	*J339*	*7.18*
951741	*J474 C*	*2.91*
951742	*J474 E*	*15.76*
952321	*J734*	*6.03*
954721	*J750 C*	*2.08*
954722	*J750 E*	*11.26*
952651	*J756 C*	*2.79*
952652	*J756 E*	*15.12*
953741	*J826 C*	*1.79*
953742	*J826 E*	*9.7*
953851	*J845 C*	*1.74*
953852	*J845 E*	*9.44*
964791	*J955*	*100.97*
274650	*KINCAID ;1U*	*10.1*
274651	*KINCAID ;2U*	*10.11*
LTF	*LGEE*	*1.07*
LTF	*MEC*	*7.1*
LTF	*NYISO*	*1.88*
290261	*S-027 E*	*37.24*
290265	*S-028 E*	*37.24*
274853	*TWINGROVE;U1*	*1.44*
274854	*TWINGROVE;U2*	*1.44*
LTF	*VFT*	*3.88*
276150	*W2-048 E*	*2.13*
905081	*W4-005 C*	*1.38*
905082	*W4-005 E*	*59.78*
909052	*X2-022 E*	*29.63*
917501	*Z2-087 C*	*1.15*
917502	*Z2-087 E*	*49.59*
924041	*AB2-047 C O1*	*9.26*
924042	*AB2-047 E O1*	*61.99*

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924261	*AB2-070 C O1*	*4.37*
924262	*AB2-070 E O1*	*29.27*
925771	*AC1-053 C*	*4.29*
925772	*AC1-053 E*	*28.7*

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Appendix 15

(CE - CE) The AD1-133 TAP-DRESDEN ; R 345 kV line (from bus 935000 to bus 270717 ckt 1) loads from 103.91% to 106.01% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L11212_B-S-C-A'. This project contributes approximately 32.18 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
933441	*AC2-157 C*	*3.97*
935001	*AD1-133 C O1*	*120.38*
935141	*AD1-148*	*12.29*
LTF	*AD2-098*	*0.26*
936771	*AD2-100 C O1*	*21.82*
936971	*AD2-131 C O1*	*1.44*
937211	*AD2-159 C*	*10.33*
939401	*AE1-172 C O1*	*20.9*
939741	*AE1-205 C O1*	*39.11*
940101	*AE1-252 C O1*	*41.91*
941731	*AE2-173 O1*	*23.25*
942111	*AE2-223 C*	*9.07*
942481	*AE2-261 C*	*32.18*
942601	*AE2-276*	*2.61*
274863	*CAYUGA RI;1U*	*2.16*
274864	*CAYUGA RI;2U*	*2.16*
LTF	*CBM-N*	*0.67*
LTF	*CBM-S1*	*9.89*
LTF	*CBM-S2*	*3.15*
LTF	*CBM-W2*	*112.97*
LTF	*CIN*	*10.83*
LTF	*CPLE*	*1.13*
LTF	*EDWARDS*	*0.06*
LTF	*G-007A*	*2.2*
LTF	*IPL*	*5.91*
965371	*J1022 C*	*4.51*
966251	*J1115 C*	*7.22*
950701	*J196 C*	*1.11*
951001	*J339*	*12.1*
951741	*J474 C*	*4.81*
952271	*J644*	*12.23*

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952321	*J734*	*10.16*
954721	*J750 C*	*3.3*
952651	*J756 C*	*4.36*
952871	*J757 C*	*5.19*
953401	*J811*	*10.28*
953651	*J815*	*34.8*
953741	*J826 C*	*3.01*
953851	*J845 C*	*2.96*
953881	*J848 C*	*5.05*
954411	*J912*	*13.28*
965001	*J979 C*	*4.3*
274650	*KINCAID ;1U*	*15.63*
274651	*KINCAID ;2U*	*15.65*
LTF	*LGEE*	*1.65*
LTF	*MEC*	*2.72*
LTF	*NYISO*	*2.88*
274853	*TWINGROVE;U1*	*2.32*
274854	*TWINGROVE;U2*	*2.32*
LTF	*VFT*	*5.91*
905081	*W4-005 C*	*2.21*
917501	*Z2-087 C*	*1.87*
930461	*AB1-087*	*28.75*
930471	*AB1-088*	*28.75*
924041	*AB2-047 C O1*	*15.12*
924261	*AB2-070 C O1*	*6.98*
925771	*AC1-053 C*	*6.83*
926841	*AC1-171 C O1*	*0.75*

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Appendix 16

(CE - CE) The AD2-137 TAP-WILTON ; B 345 kV line (from bus 937030 to bus 270926 ckt 1) loads from 134.33% to 135.39% (**DC power flow**) of its load dump rating (1846 MVA) for the tower line contingency outage of 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S_B'. This project contributes approximately 22.94 MW to the thermal violation.

CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S_B'
TRIP BRANCH FROM BUS 942880 TO BUS 270728 CKT 1 / AE2-307 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

Bus Number	*Bus Name*	*Full Contribution*
933411	*AC2-154 C*	*2.76*
933412	*AC2-154 E*	*4.51*
934721	*AD1-100 C*	*51.73*
934722	*AD1-100 E*	*241.4*
935001	*AD1-133 C O1*	*18.11*
935002	*AD1-133 E O1*	*12.07*
935141	*AD1-148*	*5.05*
936371	*AD2-047 C O1*	*4.95*
936372	*AD2-047 E O1*	*24.15*
936461	*AD2-060*	*2.91*
936771	*AD2-100 C O1*	*9.33*
936772	*AD2-100 E O1*	*6.22*
936971	*AD2-131 C O1*	*0.61*
936972	*AD2-131 E O1*	*3.09*
937211	*AD2-159 C*	*4.15*
937212	*AD2-159 E*	*19.41*
939351	*AE1-166 C O1*	*22.62*
939352	*AE1-166 E O1*	*20.88*
939401	*AE1-172 C O1*	*13.55*
939402	*AE1-172 E O1*	*63.44*
939741	*AE1-205 C O1*	*15.32*
939742	*AE1-205 E O1*	*21.16*
940101	*AE1-252 C O1*	*27.17*
940102	*AE1-252 E O1*	*18.12*
941551	*AE2-152 C O1*	*26.1*

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941552	*AE2-152 E O1*	*17.4*
941561	*AE2-153 C O1*	*7.38*
941562	*AE2-153 E O1*	*34.55*
941731	*AE2-173 O1*	*9.04*
942111	*AE2-223 C*	*3.53*
942112	*AE2-223 E*	*23.6*
942481	*AE2-261 C*	*13.77*
942482	*AE2-261 E*	*9.18*
LTF	*BLUEG*	*0.15*
274654	*BRAIDWOOD;1U*	*43.2*
274655	*BRAIDWOOD;2U*	*41.26*
LTF	*CARR*	*0.28*
LTF	*CATAWBA*	*< 0.01*
274890	*CAYUG;1U E*	*31.04*
274891	*CAYUG;2U E*	*31.04*
274863	*CAYUGA RI;1U*	*1.2*
274864	*CAYUGA RI;2U*	*1.2*
LTF	*CBM-S1*	*2.59*
LTF	*CBM-W1*	*4.12*
LTF	*CBM-W2*	*47.82*
LTF	*CIN*	*2.49*
LTF	*G-007*	*0.77*
274871	*GR RIDGE ;2U*	*0.75*
274847	*GR RIDGE ;BU*	*0.59*
LTF	*HAMLET*	*0.05*
LTF	*IPL*	*1.07*
965371	*J1022 C*	*1.57*
965372	*J1022 E*	*8.5*
966121	*J1102*	*4.02*
966251	*J1115 C*	*2.62*
966252	*J1115 E*	*14.16*
951001	*J339*	*4.12*
951741	*J474 C*	*1.79*
951742	*J474 E*	*9.68*
952321	*J734*	*3.46*
952651	*J756 C*	*1.81*
952652	*J756 E*	*9.81*
953741	*J826 C*	*1.05*
953742	*J826 E*	*5.67*
964791	*J955*	*60.96*
275149	*KEMPTON ;1E*	*20.37*
274660	*LASCO STA;1U*	*27.14*
274661	*LASCO STA;2U*	*27.19*
LTF	*LGEE*	*< 0.01*
LTF	*MEC*	*12.51*

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293061	*N-015 E*	*15.19*
LTF	*O-066*	*4.93*
294392	*P-010 E*	*19.29*
274888	*PILOT HIL;1E*	*20.37*
274887	*PILOT HIL;1U*	*0.79*
274881	*PLEAS RDG;2U*	*0.79*
LTF	*RENSSELAER*	*0.22*
290261	*S-027 E*	*23.75*
290265	*S-028 E*	*23.75*
LTF	*TRIMBLE*	*0.05*
274853	*TWINGROVE;U1*	*0.92*
274854	*TWINGROVE;U2*	*0.92*
276150	*W2-048 E*	*1.39*
905081	*W4-005 C*	*0.89*
905082	*W4-005 E*	*38.37*
LTF	*WEC*	*0.87*
909052	*X2-022 E*	*19.33*
917501	*Z2-087 C*	*0.73*
917502	*Z2-087 E*	*31.47*
930501	*AB1-091 O1*	*92.55*
924041	*AB2-047 C O1*	*5.88*
924042	*AB2-047 E O1*	*39.33*
924261	*AB2-070 C O1*	*2.84*
924262	*AB2-070 E O1*	*19.04*
925771	*AC1-053 C*	*2.79*
925772	*AC1-053 E*	*18.68*
926821	*AC1-168 C O1*	*0.69*
926822	*AC1-168 E O1*	*4.62*
926841	*AC1-171 C O1*	*0.6*
926842	*AC1-171 E O1*	*3.99*

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Appendix 17

(CE - CE) The AE1-172 TAP-AD1-100 TAP 345 kV line (from bus 939400 to bus 934720 ckt 1) loads from 109.53% to 111.88% (AC power flow) of its emergency rating (1528 MVA) for the single line contingency outage of 'COMED_P1-2_345-L8014___-S-B'. This project contributes approximately 35.86 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
933441	*AC2-157 C*	*4.3*
935001	*AD1-133 C O1*	*90.84*
935141	*AD1-148*	*13.51*
LTF	*AD2-098*	*0.21*
936771	*AD2-100 C O1*	*24.33*
936971	*AD2-131 C O1*	*1.6*
937211	*AD2-159 C*	*11.3*
939401	*AE1-172 C O1*	*30.18*
939741	*AE1-205 C O1*	*42.49*
940101	*AE1-252 C O1*	*60.51*
941731	*AE2-173 O1*	*25.17*
942111	*AE2-223 C*	*9.81*
942481	*AE2-261 C*	*35.86*
942601	*AE2-276*	*2.83*
274863	*CAYUGA RI;1U*	*2.84*
274864	*CAYUGA RI;2U*	*2.84*
LTF	*CBM-N*	*0.58*
LTF	*CBM-S1*	*11.1*
LTF	*CBM-S2*	*3.36*
LTF	*CBM-W2*	*130.85*
LTF	*CIN*	*11.61*
LTF	*CPLE*	*1.18*
LTF	*G-007A*	*1.96*
LTF	*IPL*	*6.28*
965371	*J1022 C*	*4.79*
966251	*J1115 C*	*7.73*
950701	*J196 C*	*1.14*
951001	*J339*	*12.8*
951741	*J474 C*	*5.16*
952271	*J644*	*13.57*
952321	*J734*	*10.75*

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954721	*J750 C*	*3.62*
952651	*J756 C*	*4.83*
952871	*J757 C*	*5.78*
953401	*J811*	*10.86*
953651	*J815*	*37.41*
953741	*J826 C*	*3.19*
953851	*J845 C*	*3.12*
953881	*J848 C*	*5.41*
954411	*J912*	*14.2*
965001	*J979 C*	*4.6*
274650	*KINCAID ;1U*	*17.42*
274651	*KINCAID ;2U*	*17.45*
LTF	*LGEE*	*1.71*
LTF	*MEC*	*9.2*
LTF	*NYISO*	*2.53*
274853	*TWINGROVE;U1*	*2.53*
274854	*TWINGROVE;U2*	*2.53*
LTF	*VFT*	*5.27*
905081	*W4-005 C*	*2.42*
917501	*Z2-087 C*	*2.03*
930461	*AB1-087*	*31.09*
930471	*AB1-088*	*31.09*
924041	*AB2-047 C O1*	*16.36*
924261	*AB2-070 C O1*	*7.65*
925771	*AC1-053 C*	*7.5*
926841	*AC1-171 C O1*	*0.96*

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Appendix 18

(MISO AMIL - AEP) The J1180 TAP-05SULLIVAN 345 kV line (from bus 966790 to bus 247712 ckt 1) loads from 129.71% to 131.74% (AC power flow) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#3128_05EUGENE 345_A2'. This project contributes approximately 52.2 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.3*
932891	*AC2-115 2*	*1.3*
932921	*AC2-116*	*0.45*
933911	*AD1-013 C*	*1.*
933912	*AD1-013 E*	*1.59*
933931	*AD1-016 C*	*0.46*
933932	*AD1-016 E*	*0.76*
934051	*AD1-031 C O1*	*2.35*
934052	*AD1-031 E O1*	*3.83*
934101	*AD1-039 1*	*3.43*
934431	*AD1-067 C*	*0.07*
934432	*AD1-067 E*	*0.3*
934701	*AD1-098 C O1*	*3.78*
934702	*AD1-098 E O1*	*2.76*
934871	*AD1-116 C*	*0.46*
934872	*AD1-116 E*	*0.75*
934971	*AD1-129 C*	*0.47*
934972	*AD1-129 E*	*0.32*
935001	*AD1-133 C O1*	*14.13*
935002	*AD1-133 E O1*	*9.42*
935141	*AD1-148*	*7.45*
936291	*AD2-038 C O1*	*1.34*
936292	*AD2-038 E O1*	*8.99*
936511	*AD2-066 C O1*	*4.76*
936512	*AD2-066 E O1*	*3.17*
936771	*AD2-100 C O1*	*22.64*
936772	*AD2-100 E O1*	*15.1*
936791	*AD2-102 C*	*7.93*

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936792	*AD2-102 E*	*5.28*
936971	*AD2-131 C O1*	*1.49*
936972	*AD2-131 E O1*	*7.49*
937001	*AD2-134 C*	*1.41*
937002	*AD2-134 E*	*5.63*
937211	*AD2-159 C*	*4.61*
937212	*AD2-159 E*	*21.57*
937311	*AD2-172 C*	*1.42*
937312	*AD2-172 E*	*1.96*
937531	*AD2-214 C*	*3.25*
937532	*AD2-214 E*	*2.17*
938851	*AE1-113 C O1*	*4.45*
938852	*AE1-113 E O1*	*15.78*
938861	*AE1-114 C O1*	*2.37*
938862	*AE1-114 E O1*	*8.1*
939051	*AE1-134 1*	*0.91*
939061	*AE1-134 2*	*0.91*
939321	*AE1-163 C O1*	*3.38*
939322	*AE1-163 E O1*	*20.74*
939401	*AE1-172 C O1*	*3.42*
939402	*AE1-172 E O1*	*16.01*
939631	*AE1-193 C O1*	*5.74*
939632	*AE1-193 E O1*	*38.39*
939681	*AE1-198 C O1*	*17.03*
939682	*AE1-198 E O1*	*14.47*
939741	*AE1-205 C O1*	*8.34*
939742	*AE1-205 E O1*	*11.52*
940101	*AE1-252 C O1*	*6.86*
940102	*AE1-252 E O1*	*4.57*
940501	*AE2-035 C*	*1.42*
940502	*AE2-035 E*	*1.96*
941131	*AE2-107 C*	*3.36*
941132	*AE2-107 E*	*2.24*
941343	*AE2-130 BAT*	*31.59*
941731	*AE2-173 O1*	*4.98*
942111	*AE2-223 C*	*1.94*
942112	*AE2-223 E*	*13.*
942421	*AE2-255 C O1*	*1.69*
942422	*AE2-255 E O1*	*5.06*
942481	*AE2-261 C*	*31.32*
942482	*AE2-261 E*	*20.88*
942602	*AE2-276 BAT*	*13.95*
942651	*AE2-281 C O1*	*0.48*
942652	*AE2-281 E O1*	*2.96*
942991	*AE2-321 C*	*4.1*

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942992	AE2-321 E	2.02
LTF	BLUEG	10.34
294401	BSHIL;1U E	7.06
294410	BSHIL;2U E	7.06
LTF	CARR	0.29
274890	CAYUG;1U E	10.15
274891	CAYUG;2U E	10.15
LTF	CBM-S1	13.15
LTF	CBM-S2	2.37
LTF	CBM-W1	28.28
LTF	CBM-W2	201.02
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
LTF	CIN	3.87
LTF	CPLE	0.57
274859	EASYR;U1 E	6.82
274860	EASYR;U2 E	6.82
LTF	G-007	0.79
LTF	GIBSON	0.02
290051	GSG-6; E	5.69
966421	J1139	22.45
966791	J1180	36.73
950701	J196 C	1.32
950702	J196 E	5.3
954761	J468 C	7.07
954762	J468 E	28.29
953401	J811	17.75
953641	J813	43.77
953651	J815	32.08
953881	J848 C	4.95
953882	J848 E	27.31
954411	J912	14.22
954681	J949	38.89
964791	J955	79.46
965001	J979 C	4.21
965002	J979 E	22.78
965101	J991	41.22
274650	KINCAID ;1U	14.86
274651	KINCAID ;2U	14.88
990901	L-005 E	11.15
290108	LEEDK;1U E	12.43
LTF	LGE-0092018	< 0.01
LTF	MEC	45.66
293516	O-009 E1	6.29
293517	O-009 E2	3.2

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293518	*O-009 E3*	*3.52*
293715	*O-029 E*	*6.72*
293716	*O-029 E*	*3.68*
293717	*O-029 E*	*3.38*
293771	*O-035 E*	*5.17*
LTF	*O-066*	*5.05*
290021	*O50 E*	*10.79*
294763	*P-046 E*	*5.4*
270859	*PWR VTR EC;R*	*6.25*
LTF	*RENSSELAER*	*0.23*
290261	*S-027 E*	*19.38*
290265	*S-028 E*	*19.38*
295111	*SUBLETTE E*	*1.48*
LTF	*TRIMBLE*	*1.3*
274853	*TWINGROVE;U1*	*0.75*
274854	*TWINGROVE;U2*	*0.75*
276150	*W2-048 E*	*2.05*
905081	*W4-005 C*	*0.99*
905082	*W4-005 E*	*42.64*
LTF	*WEC*	*4.14*
295109	*WESTBROOK E*	*3.05*
909052	*X2-022 E*	*28.52*
916211	*Z1-072 E*	*3.92*
916221	*Z1-073 E*	*2.94*
917502	*Z2-087 E*	*17.34*
918052	*AA1-018 E*	*7.93*
919221	*AA1-146*	*11.68*
919581	*AA2-030*	*11.68*
920272	*AA2-123 E*	*1.22*
930481	*AB1-089*	*35.39*
930741	*AB1-122 1O1*	*34.99*
924041	*AB2-047 C O1*	*3.24*
924042	*AB2-047 E O1*	*21.67*
924261	*AB2-070 C O1*	*3.84*
924262	*AB2-070 E O1*	*25.69*
924471	*AB2-096*	*21.88*
925302	*AB2-191 E*	*0.75*
925581	*AC1-033 C*	*1.16*
925582	*AC1-033 E*	*7.74*
925771	*AC1-053 C*	*3.88*
925772	*AC1-053 E*	*25.94*
927511	*AC1-113 1*	*0.65*
927521	*AC1-113 2*	*0.65*
926431	*AC1-114*	*1.3*
926821	*AC1-168 C O1*	*0.82*

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926822	*AC1-168 E O1*	*5.54*
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*

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Attachment 1: Single Line Diagram