Generation Interconnection Request
System Impact Study Report
For
PJM Generation Interconnection Request
Queue Position AE2-152

Loretto-Wilton & Braidwood-Davis Creek

February 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 Kankakee County, Illinois. The installed facilities will have a total capability of 150 MW with 90 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is September 30, 2020. This study does not imply a TO commitment to this in-service date.

Point of Interconnection

Queue Position AE2-152 proposes to interconnect with the ComEd transmission system by utilizing the same attachment facilities as AD1-100 and AE1-166.

Cost Summary

The AE2-152 project will be responsible for the following costs.

Description	Cost Estimate
Total Physical Interconnection Costs	$200,000
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	$1,062,639
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	$0
Total Costs	$ 1,262,639

*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

Transmission Owner Scope of Work

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

Description	Cost Estimate
Attachment Facilities	$200,000
Direct Connection Network Upgrades	$0
Non-Direct Connection Network Upgrades	$0
Total Physical Interconnection Costs	$200,000

Attachment Facilities

Addition of a 150 MW solar facility behind the meter will require review and possible upgrade of SCADA, Communication, relays and metering. The estimated cost is $200,000.

Direct Connection Cost Estimate

None.

Non-Direct Connection Cost Estimate

None.

Schedule:

ComEd would take approximately 18-months to review and possibly upgrade SCADA, Communication, relays and metering 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/

Network Impacts

The Queue Project AE2-152 was evaluated as a 150 MW (Capacity 90 MW) injection at the AD1-100 Bus which taps the 345 kV line between Braidwood; B to Davis Creek; B substation in the ComEd area. Project AE2-152 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE2-152 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2022

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	LFFB	COMED_P4_023-65-BT2-3__	CE - CE	E FRANKFO; B-CRETE EC ;BP 345 kV line	270728	274750	1	DC	99.9	100.11	LDR	1399	20.64	
2	LFFB	COMED_P4_112-65-BT4-5__	CE - CE	E FRANKFO; B-CRETE EC ;BP 345 kV line	270728	274750	1	DC	99.82	100.03	LDR	1399	20.63	
3	LFFB	COMED_P4_112-65-BT3-4__	CE - CE	E FRANKFO; B-CRETE EC ;BP 345 kV line	270728	274750	1	DC	99.82	100.03	LDR	1399	20.64	

Notes:
Violation 1: ComEd SSTE rating is 1674 MVA (Not a violation)
Violation 2: ComEd SSTE rating is 1674 MVA (Not a violation)
Violation 3: ComEd SSTE rating is 1674 MVA (Not a violation)

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	Contingency		Affected		Bus			Power	Loading %		Rating		MW	Flowgate
Number	Type	Name	Area	Facility Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution	Appendix
4	LFFB	COMED_P4_023-65-BT2-3__	MISO NIPS - CE	17STJOHN-ST JOHN ; T 345 kV line	255112	270886	1	DC	120.05	120.24	ER	1091	14.64	1
5	LFFB	AEP_P4_#2978_05DUMONT 765_B	MISO NIPS - CE	17STJOHN-ST JOHN ; T 345 kV line	255112	270886	1	DC	119.96	120.14	ER	1091	14.53	
6	LFFB	COMED_P4_112-65-BT4-5__	MISO NIPS - CE	17STJOHN-ST JOHN ; T 345 kV line	255112	270886	1	DC	119.55	119.74	ER	1091	14.64	
7	LFFB	COMED_P4_112-65-BT3-4__	MISO NIPS - CE	17STJOHN-ST JOHN ; T 345 kV line	255112	270886	1	DC	119.55	119.74	ER	1091	14.64	
8	LFFB	AEP_P4_#2978_05DUMONT 765_B	MISO NIPS - AEP	17STILLWELL-05DUMONT 345 kV line	255113	243219	1	AC	121.18	121.5	ER	1409	22.72	2
9	LFFB	ADD AD1-100 5	CE - CE	BRAIDWOOD; B-BRAIDWOOD; R 345 kV line	270670	270671	1	AC	128.04	132.96	LDR	1341	66.38	3
10	LFFB	AEP_P4_#2978_05DUMONT 765_B	CE - CE	E FRANKFO; B-CRETE EC ;BP 345 kV line	270728	274750	1	DC	100.3	100.51	LDR	1399	20.54	4
11	LFFB	AEP_P4_#2978_05DUMONT 765_B	CE - AEP	GREENACRE; T-05OLIVE 345 kV line	270771	243229	1	DC	107.47	107.59	ER	971	13.17	5
12	LFFB	COMED_P4_023-65-BT2-3__	CE - MISO NIPS	ST JOHN ; T-17GREEN_ACRE 345 kV line	270886	255104	1	DC	120.05	120.24	ER	1091	14.64	6
13		AEP_P4_#2978_05DUMONT 765_B	CE - MISO NIPS	ST JOHN ; T-17GREEN_ACRE 345 kV line	270886	255104	1	DC	119.96	120.14	ER	1091	14.53	
14	LFFB	COMED_P4_112-65-BT4-5__	CE - MISO NIPS	ST JOHN ; T-17GREEN_ACRE 345 kV line	270886	255104	1	DC	119.55	119.74	ER	1091	14.64	
15	LFFB	COMED_P4_112-65-BT3-4__	CE - MISO NIPS	ST JOHN ; T-17GREEN_ACRE 345 kV line	270886	255104	1	DC	119.55	119.74	ER	1091	14.64	

16	LFFB	COMED_P4_112-65-BT5-6__	CE - CE	WILTON ; B-WILTON ;3M 345 kV line	270926	275232	1	AC	130.82	132.27	LDR	1379	27.96	7
17	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; R-WILTON ;4M 345 kV line	270927	275233	1	AC	133.53	135.01	LDR	1379	28.52	8
18	LFFB	AEP_P4_#2978_05DUMONT 765_B	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	145.09	145.29	ER	1399	20.3	9
19	LFFB	COMED_P4_023-65-BT2-3__	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	144.7	144.91	ER	1399	20.4	
20	LFFB	COMED_P4_112-65-BT4-5__	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	144.64	144.85	ER	1399	20.4	
21	LFFB	COMED_P4_112-65-BT3-4__	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	144.64	144.84	ER	1399	20.4	
22	LFFB	AEP_P4_#2978_05DUMONT 765_B	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	113.3	114.77	ER	971	15.94	10
23	LFFB	COMED_P4_023-65-BT2-3__	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	112.22	113.71	ER	971	16.08	
24	LFFB	COMED_P4_112-65-BT4-5__	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	112.21	113.7	ER	971	16.08	
25	LFFB	COMED_P4_112-65-BT3-4__	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	112.21	113.7	ER	971	16.08	
26	LFFB	COMED_P4_023-65-BT4-5__	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	112.2	113.69	ER	971	16.08	
27	LFFB	COMED_P4_112-65-BT5-6__	CE - CE	WILTON ; 765/345 kV transformer	275232	270644	1	AC	130.61	132.06	LDR	1379	27.96	11
28	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; 765/345 kV transformer	275233	270644	1	AC	133.32	134.8	LDR	1379	28.52	12
29	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	127.77	130.15	LDR	1846	43.49	13
30	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	127.77	130.15	LDR	1846	43.49	
31	LFFB	ADD AD1-100 5	CE - CE	AD1-100 TAP-BRAIDWOOD; B 345 kV line	934730	270670	1	AC	142.07	149.24	LDR	1528	112.29	14
32	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	127.68	130.06	LDR	1846	43.49	15

33	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	127.68	130.06	LDR	1846	43.49	

Notes:
Violation 4: MISO STE: 1591 MVA (No violation). ComEd SSTE: 1134 MVA (violation valid).
Violation 5: MISO STE: 1591 MVA (No violation). ComEd SSTE: 1134 MVA (violation valid).
Violation 6: MISO STE: 1591 MVA (No violation). ComEd SSTE: 1134 MVA (violation valid).
Violation 7: MISO STE: 1591 MVA (Not a violation). ComEd SSTE: 1134 MVA (violation valid).
Violation 8: MISO ratings are 1409/1779 MVA (Not a violation). AEP SE rating is 1409 MVA (Violation Valid)
Violation 9: ComEd SSTE: 1915 MVA (Not a violation).
Violation 10: ComEd SSTE: 1674 MVA (Not a violation).
Violation 11: ComEd SSTE: 1134 MVA (No violation). AEP: 971 MVA SE (Violation Valid).
Violation 12: MISO: 1313/1591 MVA. ComEd SSTE: 1134 MVA (Violation for ComEd).
Violation 13: MISO: 1313/1591 MVA. ComEd SSTE: 1134 MVA (Violation for ComEd).
Violation 14: MISO: 1313/1591 MVA. ComEd SSTE: 1134 MVA (Violation for ComEd).
Violation 15: MISO: 1313/1591 MVA. ComEd SSTE: 1134 MVA (Violation for ComEd).
Violation 16: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 17: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 18: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 19: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 20: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 21: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 22: AEP: 971 MVA SE (AEP Violation valid). ComEd SSTE: 1134 MVA. (No violation)
Violation 23: AEP: 971 MVA SE (AEP Violation valid). ComEd SSTE: 1134 MVA. (No violation)
Violation 24: AEP: 971 MVA SE (AEP Violation valid). ComEd SSTE: 1134 MVA. (No violation)
Violation 25: AEP: 971 MVA SE (AEP Violation valid). ComEd SSTE: 1134 MVA. (No violation)
Violation 26: AEP: 971 MVA SE (AEP Violation valid). ComEd SSTE: 1134 MVA. (No violation)
Violation 27: ComEd SSTE rating is 1469 MVA (Violation valid).
Violation 28: ComEd SSTE rating is 1469 MVA (Violation valid).

Violation 29: ComEd ALDR rating is 2554 MVA (Not a violation).
Violation 30: ComEd ALDR rating is 2554 MVA (Not a violation).
Violation 31: ComEd SSTE rating is 1837 MVA (Violation valid).
Violation 32: ComEd ALDR rating is 2554 MVA (Not a violation).
Violation 33: ComEd ALDR rating is 2554 MVA (Not a violation).

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.

Overload	Contingency				Bus				Loading %		Rating		
Number	Type	Name	Affected Area	Facility Description	From	To	Circuit	Power Flow	Initial	Final	Type	MVA	MW Contribution
34	N-1	AEP_P1-2_#695A	MISO NIPS - CE	17STJOHN-ST JOHN ; T 345 kV line	255112	270886	1	DC	119.53	119.73	ER	1091	14.64
35	N-1	AEP_P1-2_#695A	CE - CE	E FRANKFO; B-CRETE EC ;BP 345 kV line	270728	274750	1	DC	99.77	99.99	ER	1399	20.65
36	N-1	AEP_P1-2_#695A	CE - AEP	GREENACRE; T-05OLIVE 345 kV line	270771	243229	1	DC	106.29	106.41	NR	971	13.33
37	N-1	AEP_P1-2_#695A	CE - MISO NIPS	ST JOHN ; T-17GREEN_ACRE 345 kV line	270886	255104	1	DC	119.53	119.73	ER	1091	14.64

38	N-1	AEP_P1-2_#695A	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	144.6	144.81	ER	1399	20.41
39	Non	Non	CE - MISO NIPS	CRETE EC ;BP-17STJOHN 345 kV line	274750	255112	1	DC	111.97	113.02	NR	1091	13.26
40	N-1	AEP_P1-2_#695A	CE - AEP	UNIV PK N;RP-05OLIVE 345 kV line	274804	243229	1	AC	112.19	113.68	NR	971	16.08
41	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	AC	142.53	144.79	ER	1528	34.79
42	Non	Non	CE - CE	AD1-100 TAP-AD2-137 TAP 345 kV line	934720	937030	1	AC	126.85	129.36	NR	1364	34.33
43	N-1	COMED_P1-2_345-L8014___-S-B	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	AC	142.5	144.76	ER	1528	34.79
44	Non	Non	CE - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	AC	126.82	129.33	NR	1364	34.33

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 in 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.

Light Load Analysis – 2022

Light load analysis not required.

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)

None.

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 AE2-152	Upgrade Number
17STJOHN-ST JOHN ; T 345 kV Ckt. 1	MISO Reinforcement: MISO Rating 1313/1591 MVA sufficient. No reinforcement required. ComEd Reinforcement: **Project ID**: n5833 **Description**: The upgrade will be to mitigate the sag on the line. Upon completion of this work the new line will be a minimum of 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD). PJM Network Upgrade N5833. **Type**: FAC **Cost:** $3,800,000 **Time Estimate**: 30 Months	$3,800,000	$0	N5833

	Ratings: 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD) **Notes**: Per PJM cost allocation rules, this reinforcement cost is driven by previous AE1 queue. AE2-152 presently does not receive cost allocation for this upgrade. This may change with future re-tools as projects withdraw.			
17STILLWELL-05DUMONT 345 kV Ckt. 1	MISO Ratings: 1409/1779 MVA SN/SE is sufficient. AEP Reinforcement: **Project ID**: n4058 **Description**: Sag mitigation work will include the replacement of tower 20 with a custom steel pole, replacement of tower 24 with a custom H-frame and the removal of swing angle brackets on 2 structures. Cost estimate is $1.613M. New SE rating will be 1718 MVA limited by a Dumont wave trap. **Type**: FAC **Cost:** $1,613,000 **Time Estimate**: Projected in service date 6/1/2022 **Ratings**: AEP SE: 1718 MVA **Notes**: Per PJM cost allocation rules, this reinforcement cost is driven by previous AE1 queue. AE2-152 presently does not receive cost allocation for this upgrade. This may change with future re-tools as projects withdraw.	$1,613,000	$0	N4058
GREENACRE; T-05OLIVE 345 kV Ckt. 1	ComEd Ratings: 1134 MVA SSTE is sufficient. AEP Rating: 971 MVA SE. Reinforcement required: **Project ID**: n5913 **Description**: Upgrade is a sag study will be required for the entire 40.64 miles of ACSR/PE ~ 1414 ~ 62/19 Conductor section 1 to determine if the line can be operated above its emergency rating 971 MVA. Estimated Cost: $162,560. If deemed necessary to rebuild the entire 40.64 miles of the section of the line, Estimated Cost: $81,280,000. New expected SE rating is 1318 MVA. **Type**: FAC **Cost:** $162,560 **Time Estimate**: N/A **Ratings**: 1318 MVA **Notes**: 1. Since the cost of the upgrade is less than $5M, based on PJM cost allocation criteria, AE2-152 currently does not receive cost allocation towards this upgrade. 2. As changes to the PJM queue process occur (such as prior queued projects withdrawing from the queue, reducing in size, etc.) AE2-152 could receive cost allocation. 3. Although Queue Project AE2-152 may not presently have cost responsibility for this upgrade, Queue Project AE1-198 may need this upgrade in-service to be deliverable to the PJM system. 4. If Queue Project AE2-152 comes into service prior to completion of the upgrade, Queue Project AE2-152 will need an interim study.	$162,560	$0	N5913
17ST JOHN ; T - 17GREEN_ACRE 345 kV line	**ComEd** ComEd SSTE rating is 1134 MVA. Upgrade Ratings. ComEd Reinforcement: **Project ID**: n5834	$3,800,000	$0	N5834

<table>
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<td><u>Description</u>: The upgrade is to mitigate the sag on the line. A preliminary estimate for this upgrade is $3.8 M with a preliminary construction timeline of 30 months. The estimate provided does not include potential tower upgrades. The cost for this potential work will not be identified until the Facilities Study phase. Upon completion of the upgrade the new ratings will be 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD).
<u>Type</u>: FAC
<u>Cost:</u> $3,800,000
<u>Time Estimate</u>: 30 Months
<u>Ratings</u>: 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD)

<u>Notes</u>:
1. Portion of this facility was purchased and is now owned by NEXTERA. NEXTERA will evaluate this violation in the Facility Study phase.
2. Per PJM cost allocation rules, this reinforcement cost is driven by previous AE1 queue. AE2-152 presently does not receive cost allocation for this upgrade. This may change with future re-tools as projects withdraw.

<u>MISO</u>
MISO-end ratings (1313/1591 MVA -SN/SE) are sufficient.</td>
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<td>WILTON ; B-WILTON ;3M 345 kV line Ckt 1 (from bus 270926 to bus 275232)

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WILTON ; R-WILTON ;4M 345 kV line Ckt 1 (from bus 270927 to bus 275233)

&

WILTON ; 765/345 kV transformer Ckt 1 (from bus 275233 to bus 270644)</td>
<td><u>ComEd</u>
ComEd SSTE rating is 1469 MVA.

<u>ComEd Reinforcement:</u>
<u>Project ID</u>: n5145
<u>Description</u>: Build out the 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 CB’s (6-8 & 8-2).
<u>Type</u>: CON
<u>Cost:</u> $12,000,000
<u>Time Estimate</u>: 36-40 Months
<u>Ratings</u>: N/A
The cost allocation is as follows:
<table>
<tr><th>Queue</th><th>MW Contribution</th><th>Cost %</th><th>Cost $ (12M)</th></tr>
<tr><td>AD1-100</td><td>116.8</td><td>17.9%</td><td>$2,063,361</td></tr>
<tr><td>AD2-047</td><td>26.4</td><td>3.89%</td><td>$466,376</td></tr>
<tr><td>AD2-066</td><td>17.7</td><td>2.61%</td><td>$313,037</td></tr>
<tr><td>AD2-102</td><td>29.7</td><td>4.36%</td><td>$523,790</td></tr>
<tr><td>AD2-134</td><td>16.2</td><td>2.38%</td><td>$286,185</td></tr>
<tr><td>AD2-159</td><td>16.6</td><td>2.44%</td><td>$293,252</td></tr>
<tr><td>AD2-194</td><td>19.6</td><td>2.89%</td><td>$346,602</td></tr>
<tr><td>AE1-113</td><td>44.5</td><td>6.73%</td><td>$807,325</td></tr>
<tr><td>AE1-114</td><td>21.2</td><td>3.21%</td><td>$385,114</td></tr>
<tr><td>AE1-163</td><td>53.1</td><td>7.82%</td><td>$938,052</td></tr>
<tr><td>AE1-166</td><td>28.6</td><td>4.21%</td><td>$505,594</td></tr>
<tr><td>AE1-172</td><td>47.1</td><td>6.93%</td><td>$832,057</td></tr>
<tr><td>AE1-193</td><td>45.8</td><td>6.75%</td><td>$809,445</td></tr>
</table>
</td>
<td>$12,000,000</td>
<td>$502,591</td>
<td>N5145</td>
</tr>
</table>

	AE1-194	45.8	6.75%	$809,445			
	AE1-195	45.8	6.75%	$809,445			
	AE1-205	30.4	4.47%	$536,686			
	AE1-252	27.2	4.2%	$503,828			
	AE2-107	15.2	2.23%	$267,813			
	AE2-152	28.52	4.19%	$502,591			
Crete – St John 345 kV line Ckt 1	**ComEd** ComEd SSTE rating is 1483 MVA. ComEd Reinforcement: **Project ID**: n5253 **Description**: The upgrade will be to Reconductor the line. A preliminary estimate for this upgrade is $14.9M with a preliminary construction timeline of 30-36 months. The estimate provided does not consider potential tower upgrades. This cost component will be determined during the Facilities Study phase. Upon completion of this upgrade, the new will be a minimum of 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD). **Type**: FAC **Cost:** $14,900,000 **Time Estimate**: 30-36 Months **Ratings**: 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD) The cost allocation is as follows: **Queue** | **MW contribution** | **Cost %** | **Cost ($14.9 M)** AE1-193 | 251.82 | 25.53% | $3,804,313 AE1-194 | 249.95 | 25.53% | $3,804,313 AE1-195 | 249.95 | 25.34% | $3,776,063 AE1-198 | 178.46 | 18.1% | $2,696,044 AE1-252 | 17.69 | 1.79% | $245,342 J974 | 16.24 | 1.65% | $245,342 AE2-152 | 20.3 | 2.06% | $306,678 **Project ID**: n6629 **Description**: ComEd upgrade: Replace a 345kV circuit breaker and associated equipment at Crete. A preliminary estimate for this upgrade is $6 M with a preliminary construction timeline of 30 months. Upon completion of this upgrade the new ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). PJM Network Upgrade N6629 **Type**: FAC **Cost:** $6,000,000 **Time Estimate**: 30 Months **Ratings**: 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD) The cost allocation is as follows: **Queue** | **MW contribution** | **Cost %** | **Cost ($6M)** AE1-195 | 248.03 | 51.6% | $3,095,731 AE1-198 | 178.46 | 37.12% | $2,227,409	$23,900,000	$560,048	N5253 N6629

	<table><tr><td>AE1-252</td><td>17.69</td><td>3.68%</td><td>$220,794</td></tr><tr><td>J974</td><td>16.24</td><td>3.38%</td><td>$202,696</td></tr><tr><td>AE2-152</td><td>20.30</td><td>4.22%</td><td>$253,370</td></tr></table> **Notes**: This facility was purchased and is now owned by NEXTERA. NEXTERA will evaluate this violation in the Facility Study phase. **MISO** MISO end ratings are 1206/1508 MVA (SN/SE) MISO Reinforcement: **Project ID**: Reinforcement #1 **Description**: MISO-End upgrade: Upgrade St John substation conductor drop and switch ($1M). New MISO end SE rating will be 1900 MVA. **Type**: FAC **Cost:** $1,000,000 **Time Estimate**: N/A **Ratings**: 1900 MVA (SE) **Notes**: Per PJM cost allocation rules, this reinforcement cost is driven by previous AE1 queue. AE2-152 presently does not receive cost allocation for this MISO upgrade. This may change with future re-tools as projects withdraw. **Project ID**: Reinforcement #2 **Description**: Additional MISO-end upgrades (if needed): Upgrade switch to 4000 A and upgrade substation conductor drop to bundled 1590 AL ($2M) New MISO-end ratings to be 1961/2390 MVA SN/SE. **Type**: FAC **Cost:** $2,000,000 **Time Estimate**: N/A **Ratings**: 1961/2390 MVA SN/SE **Notes**: Per PJM cost allocation rules, this reinforcement cost is driven by previous AE1 queue. AE2-152 presently does not receive cost allocation for this MISO upgrade. This may change with future re-tools as projects withdraw.			
UNIV PK N;RP-05OLIVE 345 kV Ckt. 1	AEP Upgrade: **Project ID**: n4057 **Description**: To increase SE rating: AEP: a sag check will be required for the ACSR/PE ~ 1414 ~ 62/19 ~ Conductor Section 1 to determine if the line section can be operated above its emergency rating of 971 MVA. The results could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 40.61 mile section of line would need to be rebuilt. Estimated Cost: $162,440 (2016 dollars). If deemed necessary to rebuild the entire 40.61 miles of the section of the line, Estimated Cost: $81,220,000. Schedule: (1) Sag Study: 6 to 12 months. (2) Rebuild: The standard time required for construction differs from state to state.	$162,440	$0	N4057

	An approximate construction time would be 24 to 36 months after signing an interconnection agreement. **Type**: FAC **Cost:** $162,440 **Time Estimate**: 6-12 / 24-36 Months **Ratings**: 971/1304 MVA SN/SE **Notes**: 1. Since the cost of the upgrade is less than $5M, based on PJM cost allocation criteria, this upgrade stays in the previous queue. AE2-152 currently does not receive cost allocation towards this upgrade. 2. As changes to the PJM queue process occur (such as prior queued projects withdrawing from the queue, reducing in size, etc.) AE2-152 could receive cost allocation. 3. Although Queue Project AE2-152 may not presently have cost responsibility for this upgrade, Queue Project AE2-152 may need this upgrade in-service to be deliverable to the PJM system. 4. If Queue Project AE2-152 comes into service prior to completion of the upgrade, Queue Project AE2-152 will need an interim study.			
AD1-100 TAP-BRAIDWOOD; B 345 kV	**ComEd** ComEd SSTE rating is 1837 MVA. ComEd Reinforcement: **Project ID**: n7206 **Description**: 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. **Type**: CON **Cost:** $3,000,000 **Time Estimate**: 24 Months **Ratings**: N/A **Notes**: 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.	$3,000,000	$0	N7206
	Total Cost	**$48,438,000**	**$1,062,639**	

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 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_#695A	CONTINGENCY 'AEP_P1-2_#695A' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 END
AEP_P4_#2978_05DUMONT 765_B	CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B' OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1 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_P4_023-65-BT2-3__	CONTINGENCY 'COMED_P4_023-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765 END

COMED_P4_023-65-BT4-5__	CONTINGENCY 'COMED_P4_023-65-BT4-5__' TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 / COLLI;2M 345 COLLI; 765 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 / COLLI;2M 345 COLLI; R 345 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 / COLLI;2M 345 COLLI;2C 33 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 END
COMED_P4_112-65-BT2-3__	CONTINGENCY 'COMED_P4_112-65-BT2-3__' TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
COMED_P4_112-65-BT3-4__	CONTINGENCY 'COMED_P4_112-65-BT3-4__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33 END
COMED_P4_112-65-BT4-5__	CONTINGENCY 'COMED_P4_112-65-BT4-5__' TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1

	/ WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END
COMED_P4_112-65-BT5-6__	CONTINGENCY 'COMED_P4_112-65-BT5-6__' TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33 END
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

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.

Appendix 1

(MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 120.05% to 120.24% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 14.64 MW to the thermal violation.

CONTINGENCY 'COMED_P4_023-65-BT2-3__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.78*
932891	*AC2-115 2*	*1.78*
932921	*AC2-116*	*0.62*
933411	*AC2-154 C*	*1.74*
933412	*AC2-154 E*	*2.84*
933911	*AD1-013 C*	*1.37*
933912	*AD1-013 E*	*2.19*
933931	*AD1-016 C*	*0.7*
933932	*AD1-016 E*	*1.13*
934101	*AD1-039 1*	*5.2*
934111	*AD1-039 2*	*5.53*
934431	*AD1-067 C*	*0.1*
934432	*AD1-067 E*	*0.41*
934701	*AD1-098 C O1*	*5.12*
934702	*AD1-098 E O1*	*3.74*
934721	*AD1-100 C*	*14.29*
934722	*AD1-100 E*	*66.68*
934871	*AD1-116 C*	*0.68*
934872	*AD1-116 E*	*1.11*
934971	*AD1-129 C*	*0.68*
934972	*AD1-129 E*	*0.45*
935001	*AD1-133 C O1*	*15.18*
935002	*AD1-133 E O1*	*10.12*

936291	*AD2-038 C O1*	*1.71*
936292	*AD2-038 E O1*	*11.47*
936371	*AD2-047 C O1*	*3.12*
936372	*AD2-047 E O1*	*15.21*
936461	*AD2-060*	*1.83*
936511	*AD2-066 C O1*	*6.2*
936512	*AD2-066 E O1*	*4.14*
936791	*AD2-102 C*	*10.56*
936792	*AD2-102 E*	*7.04*
937001	*AD2-134 C*	*1.93*
937002	*AD2-134 E*	*7.7*
937311	*AD2-172 C*	*1.83*
937312	*AD2-172 E*	*2.53*
937401	*AD2-194 1*	*5.94*
937411	*AD2-194 2*	*5.93*
937531	*AD2-214 C*	*3.26*
937532	*AD2-214 E*	*2.17*
938511	*AE1-070 1*	*6.98*
938521	*AE1-070 2*	*6.38*
938851	*AE1-113 C O1*	*6.05*
938852	*AE1-113 E O1*	*21.46*
938861	*AE1-114 C O1*	*2.93*
938862	*AE1-114 E O1*	*9.98*
939051	*AE1-134 1*	*1.01*
939061	*AE1-134 2*	*1.01*
939321	*AE1-163 C O1*	*4.31*
939322	*AE1-163 E O1*	*26.45*
939351	*AE1-166 C O1*	*7.61*
939352	*AE1-166 E O1*	*7.03*
939401	*AE1-172 C O1*	*3.81*
939402	*AE1-172 E O1*	*17.83*
939641	*AE1-194 C*	*18.97*
939642	*AE1-194 E*	*126.92*
939651	*AE1-195 C*	*18.97*
939652	*AE1-195 E*	*126.92*
940101	*AE1-252 C O1*	*7.64*
940102	*AE1-252 E O1*	*5.09*
940501	*AE2-035 C*	*1.83*
940502	*AE2-035 E*	*2.53*
940752	*AE2-062 E*	*0.1*
941131	*AE2-107 C*	*4.89*
941132	*AE2-107 E*	*3.26*
941551	*AE2-152 C O1*	*8.78*
941552	*AE2-152 E O1*	*5.86*
941561	*AE2-153 C O1*	*3.5*

941562	*AE2-153 E O1*	*16.39*
942421	*AE2-255 C O1*	*2.29*
942422	*AE2-255 E O1*	*6.88*
942651	*AE2-281 C O1*	*0.62*
942652	*AE2-281 E O1*	*3.78*
942991	*AE2-321 C*	*6.12*
942992	*AE2-321 E*	*3.01*
943121	*AE2-341 C*	*9.52*
943122	*AE2-341 E*	*4.67*
LTF	*BLUEG*	*4.99*
274654	*BRAIDWOOD;1U*	*19.26*
274655	*BRAIDWOOD;2U*	*18.43*
LTF	*CALDERWOOD*	*0.08*
LTF	*CANNELTON*	*0.1*
LTF	*CARR*	*0.56*
LTF	*CATAWBA*	*0.23*
274890	*CAYUG;1U E*	*9.76*
274891	*CAYUG;2U E*	*9.76*
LTF	*CBM-S1*	*0.79*
LTF	*CBM-W1*	*20.14*
LTF	*CBM-W2*	*37.59*
LTF	*CHEOAH*	*0.08*
LTF	*CHILHOWEE*	*0.03*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
274751	*CRETE EC ;1U*	*3.4*
274752	*CRETE EC ;2U*	*3.4*
274753	*CRETE EC ;3U*	*3.4*
274754	*CRETE EC ;4U*	*3.4*
274859	*EASYR;U1 E*	*8.18*
274860	*EASYR;U2 E*	*8.18*
LTF	*G-007*	*1.56*
LTF	*GIBSON*	*0.06*
290051	*GSG-6; E*	*7.79*
LTF	*HAMLET*	*0.43*
275149	*KEMPTON ;1E*	*12.83*
274704	*KENDALL ;1C*	*2.84*
274705	*KENDALL ;1S*	*1.9*
274706	*KENDALL ;2C*	*2.84*
274707	*KENDALL ;2S*	*1.9*
274661	*LASCO STA;2U*	*17.79*
290108	*LEEDK;1U E*	*18.11*
LTF	*LGE-0092018*	*< 0.01*
LTF	*MEC*	*27.63*
293061	*N-015 E*	*11.63*

293516	*O-009 E1*	*6.76*
293517	*O-009 E2*	*3.43*
293518	*O-009 E3*	*3.78*
293715	*O-029 E*	*7.23*
293716	*O-029 E*	*3.96*
293717	*O-029 E*	*3.64*
LTF	*O-066*	*10.01*
293644	*O22 E1*	*8.51*
293645	*O22 E2*	*16.53*
290021	*O50 E*	*14.67*
294392	*P-010 E*	*14.77*
294763	*P-046 E*	*6.99*
274888	*PILOT HIL;1E*	*12.83*
270859	*PWR VTR EC;R*	*9.05*
LTF	*RENSSELAER*	*0.44*
274722	*S-055 E*	*8.46*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*2.03*
274861	*TOP CROP ;1U*	*0.33*
274862	*TOP CROP ;2U*	*0.64*
LTF	*TRIMBLE*	*0.59*
LTF	*WEC*	*5.98*
295109	*WESTBROOK E*	*4.17*
274687	*WILL CNTY;4U*	*8.11*
910542	*X3-005 E*	*0.45*
915011	*Y3-013 1*	*2.82*
915021	*Y3-013 2*	*2.82*
915031	*Y3-013 3*	*2.82*
916221	*Z1-073 E*	*4.02*
916502	*Z1-106 E1*	*0.95*
916504	*Z1-106 E2*	*0.95*
916512	*Z1-107 E*	*1.85*
916522	*Z1-108 E*	*1.86*
918052	*AA1-018 E*	*11.66*
919221	*AA1-146*	*13.06*
919581	*AA2-030*	*13.06*
920272	*AA2-123 E*	*1.83*
930481	*AB1-089*	*49.11*
930501	*AB1-091 O1*	*50.68*
930741	*AB1-122 1O1*	*53.06*
930751	*AB1-122 2O1*	*56.4*
924471	*AB2-096*	*31.67*
925302	*AB2-191 E*	*1.03*
926311	*AC1-109 1*	*1.42*
926321	*AC1-109 2*	*1.42*

926331	*AC1-110 1*	*1.42*
926341	*AC1-110 2*	*1.42*
926351	*AC1-111 1*	*0.57*
926361	*AC1-111 2*	*0.57*
926371	*AC1-111 3*	*0.57*
926381	*AC1-111 4*	*0.57*
926391	*AC1-111 5*	*0.57*
926401	*AC1-111 6*	*0.57*
927511	*AC1-113 1*	*0.89*
927521	*AC1-113 2*	*0.89*
926431	*AC1-114*	*1.78*
927451	*AC1-142A 1*	*3.2*
927461	*AC1-142A 2*	*3.21*
926821	*AC1-168 C O1*	*0.85*
926822	*AC1-168 E O1*	*5.69*
927091	*AC1-204 1*	*55.26*
927101	*AC1-204 2*	*55.19*
927201	*AC1-214 C O1*	*0.57*
927202	*AC1-214 E O1*	*1.82*

Appendix 2

(MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 121.18% to 121.5% (AC power flow) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765_B'. This project contributes approximately 22.72 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B'
OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.74*
932891	*AC2-115 2*	*2.74*
932921	*AC2-116*	*0.96*
932931	*AC2-117*	*5.82*
933411	*AC2-154 C*	*3.03*
933412	*AC2-154 E*	*4.94*
933911	*AD1-013 C*	*2.12*
933912	*AD1-013 E*	*3.39*
933931	*AD1-016 C*	*1.07*
933932	*AD1-016 E*	*1.75*
934051	*AD1-031 C O1*	*3.29*
934052	*AD1-031 E O1*	*5.36*
934101	*AD1-039 1*	*8.09*
934111	*AD1-039 2*	*8.34*
934431	*AD1-067 C*	*0.15*
934432	*AD1-067 E*	*0.64*
934701	*AD1-098 C O1*	*7.92*
934702	*AD1-098 E O1*	*5.79*
934721	*AD1-100 C*	*22.48*
934722	*AD1-100 E*	*104.92*
934871	*AD1-116 C*	*1.09*
934872	*AD1-116 E*	*1.78*
934971	*AD1-129 C*	*1.04*
934972	*AD1-129 E*	*0.69*
935001	*AD1-133 C O1*	*24.1*
935002	*AD1-133 E O1*	*16.07*
936291	*AD2-038 C O1*	*2.7*

936292	*AD2-038 E O1*	*18.05*
936371	*AD2-047 C O1*	*5.42*
936372	*AD2-047 E O1*	*26.48*
936461	*AD2-060*	*3.19*
936511	*AD2-066 C O1*	*9.69*
936512	*AD2-066 E O1*	*6.46*
936791	*AD2-102 C*	*16.32*
936792	*AD2-102 E*	*10.88*
937001	*AD2-134 C*	*2.98*
937002	*AD2-134 E*	*11.91*
937311	*AD2-172 C*	*2.84*
937312	*AD2-172 E*	*3.92*
937401	*AD2-194 1*	*8.97*
937411	*AD2-194 2*	*8.96*
937531	*AD2-214 C*	*5.1*
937532	*AD2-214 E*	*3.4*
938511	*AE1-070 1*	*10.54*
938521	*AE1-070 2*	*9.64*
938851	*AE1-113 C O1*	*9.22*
938852	*AE1-113 E O1*	*32.69*
938861	*AE1-114 C O1*	*4.53*
938862	*AE1-114 E O1*	*15.47*
939051	*AE1-134 1*	*1.58*
939061	*AE1-134 2*	*1.58*
939321	*AE1-163 C O1*	*6.78*
939322	*AE1-163 E O1*	*41.64*
939351	*AE1-166 C O1*	*11.81*
939352	*AE1-166 E O1*	*10.91*
939401	*AE1-172 C O1*	*6.14*
939402	*AE1-172 E O1*	*28.72*
939631	*AE1-193 C O1*	*8.03*
939632	*AE1-193 E O1*	*53.74*
939641	*AE1-194 C*	*10.26*
939642	*AE1-194 E*	*68.64*
939651	*AE1-195 C*	*10.26*
939652	*AE1-195 E*	*68.64*
939681	*AE1-198 C O1*	*23.85*
939682	*AE1-198 E O1*	*20.26*
939741	*AE1-205 C O1*	*3.29*
939742	*AE1-205 E O1*	*4.55*
940101	*AE1-252 C O1*	*12.3*
940102	*AE1-252 E O1*	*8.2*
940501	*AE2-035 C*	*2.84*
940502	*AE2-035 E*	*3.92*
940752	*AE2-062 E*	*0.15*

941131	*AE2-107 C*	*7.55*
941132	*AE2-107 E*	*5.03*
941551	*AE2-152 C O1*	*13.63*
941552	*AE2-152 E O1*	*9.09*
941561	*AE2-153 C O1*	*5.44*
941562	*AE2-153 E O1*	*25.46*
942421	*AE2-255 C O1*	*3.49*
942422	*AE2-255 E O1*	*10.48*
942651	*AE2-281 C O1*	*0.97*
942652	*AE2-281 E O1*	*5.95*
942991	*AE2-321 C*	*9.42*
942992	*AE2-321 E*	*4.64*
943121	*AE2-341 C*	*14.67*
943122	*AE2-341 E*	*7.2*
LTF	*BLUEG*	*0.95*
294401	*BSHIL;1U E*	*9.88*
294410	*BSHIL;2U E*	*9.88*
LTF	*CARR*	*0.89*
LTF	*CATAWBA*	*0.21*
274890	*CAYUG;1U E*	*15.79*
274891	*CAYUG;2U E*	*15.79*
LTF	*CBM-S1*	*4.01*
LTF	*CBM-W1*	*36.06*
LTF	*CBM-W2*	*82.98*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*3.36*
274859	*EASYR;U1 E*	*12.69*
274860	*EASYR;U2 E*	*12.69*
LTF	*G-007*	*2.48*
290051	*GSG-6; E*	*12.04*
LTF	*HAMLET*	*0.46*
LTF	*IPL*	*1.15*
275149	*KEMPTON ;1E*	*22.33*
290108	*LEEDK;1U E*	*27.96*
LTF	*LGE-0092018*	*< 0.01*
LTF	*MEC*	*44.8*
293061	*N-015 E*	*17.56*
293516	*O-009 E1*	*10.54*
293517	*O-009 E2*	*5.35*
293518	*O-009 E3*	*5.89*
293715	*O-029 E*	*11.27*
293716	*O-029 E*	*6.18*
293717	*O-029 E*	*5.68*
293771	*O-035 E*	*7.38*

LTF	*O-066*	*15.91*
293644	*O22 E1*	*11.97*
293645	*O22 E2*	*23.24*
290021	*O50 E*	*22.35*
294392	*P-010 E*	*22.31*
294763	*P-046 E*	*10.81*
274888	*PILOT HIL;1E*	*22.33*
270859	*PWR VTR EC;R*	*13.94*
LTF	*RENSSELAER*	*0.71*
274724	*RIVER EC ;11*	*4.8*
274722	*S-055 E*	*12.97*
274795	*SE CHICAG;2U*	*1.13*
274788	*SE CHICAG;5U*	*1.15*
274789	*SE CHICAG;6U*	*1.15*
274790	*SE CHICAG;7U*	*1.15*
274791	*SE CHICAG;8U*	*1.15*
295111	*SUBLETTE E*	*3.13*
LTF	*TRIMBLE*	*0.15*
LTF	*WEC*	*9.21*
295109	*WESTBROOK E*	*6.45*
910542	*X3-005 E*	*1.*
915011	*Y3-013 1*	*4.32*
915021	*Y3-013 2*	*4.32*
915031	*Y3-013 3*	*4.32*
916211	*Z1-072 E*	*5.59*
916221	*Z1-073 E*	*6.21*
916502	*Z1-106 E1*	*1.45*
916504	*Z1-106 E2*	*1.45*
916512	*Z1-107 E*	*3.04*
916522	*Z1-108 E*	*2.86*
918052	*AA1-018 E*	*18.77*
919221	*AA1-146*	*20.31*
919581	*AA2-030*	*20.31*
920272	*AA2-123 E*	*2.82*
930481	*AB1-089*	*75.78*
930501	*AB1-091 O1*	*88.35*
930741	*AB1-122 1O1*	*82.55*
930751	*AB1-122 2O1*	*85.08*
924471	*AB2-096*	*48.81*
925302	*AB2-191 E*	*1.59*
925581	*AC1-033 C*	*1.62*
925582	*AC1-033 E*	*10.84*
926311	*AC1-109 1*	*2.19*
926321	*AC1-109 2*	*2.19*
926331	*AC1-110 1*	*2.19*

926341	*AC1-110 2*	*2.19*
926351	*AC1-111 1*	*0.88*
926361	*AC1-111 2*	*0.88*
926371	*AC1-111 3*	*0.88*
926381	*AC1-111 4*	*0.88*
926391	*AC1-111 5*	*0.88*
926401	*AC1-111 6*	*0.88*
927511	*AC1-113 1*	*1.37*
927521	*AC1-113 2*	*1.37*
926431	*AC1-114*	*2.74*
927451	*AC1-142A 1*	*4.84*
927461	*AC1-142A 2*	*4.84*
926821	*AC1-168 C O1*	*1.32*
926822	*AC1-168 E O1*	*8.87*
927091	*AC1-204 1*	*83.39*
927101	*AC1-204 2*	*83.36*
927201	*AC1-214 C O1*	*2.37*
927202	*AC1-214 E O1*	*7.53*

Appendix 3

(CE - CE) The BRAIDWOOD; B-BRAIDWOOD; R 345 kV line (from bus 270670 to bus 270671 ckt 1) loads from 128.04% to 132.96% (AC power flow) of its load dump rating (1341 MVA) for the line fault with failed breaker contingency outage of 'ADD AD1-100 5'. This project contributes approximately 66.38 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*	*62.26*
934722	*AD1-100 E*	*290.53*
935001	*AD1-133 C O1*	*15.09*
935002	*AD1-133 E O1*	*10.06*
935141	*AD1-148*	*4.56*
937211	*AD2-159 C*	*3.8*
937212	*AD2-159 E*	*17.8*
939351	*AE1-166 C O1*	*34.52*
939352	*AE1-166 E O1*	*31.86*
939401	*AE1-172 C O1*	*12.99*
939402	*AE1-172 E O1*	*60.8*
939741	*AE1-205 C O1*	*14.22*
939742	*AE1-205 E O1*	*19.64*
940101	*AE1-252 C O1*	*26.04*
940102	*AE1-252 E O1*	*17.36*
941551	*AE2-152 C O1*	*39.83*
941552	*AE2-152 E O1*	*26.55*
941731	*AE2-173 O1*	*8.39*
942111	*AE2-223 C*	*3.27*
942112	*AE2-223 E*	*21.89*
274654	*BRAIDWOOD;1U*	*91.39*
274890	*CAYUG;1U E*	*29.51*
274891	*CAYUG;2U E*	*29.51*
274863	*CAYUGA RI;1U*	*1.14*
274864	*CAYUGA RI;2U*	*1.14*
LTF	*CBM-N*	*0.11*
LTF	*CBM-S1*	*3.68*
LTF	*CBM-S2*	*1.03*
LTF	*CBM-W2*	*45.37*

LTF	*CIN*	*3.72*
LTF	*CPLE*	*0.35*
LTF	*G-007A*	*0.39*
LTF	*IPL*	*1.98*
966251	*J1115 C*	*2.57*
966252	*J1115 E*	*13.88*
951741	*J474 C*	*1.72*
951742	*J474 E*	*9.29*
LTF	*LGEE*	*0.51*
LTF	*MEC*	*4.91*
LTF	*NYISO*	*0.47*
290261	*S-027 E*	*21.92*
290265	*S-028 E*	*21.92*
274853	*TWINGROVE;U1*	*0.85*
274854	*TWINGROVE;U2*	*0.85*
LTF	*VFT*	*1.05*
276150	*W2-048 E*	*1.26*
905081	*W4-005 C*	*0.81*
905082	*W4-005 E*	*35.18*
909052	*X2-022 E*	*17.45*
917501	*Z2-087 C*	*0.68*
917502	*Z2-087 E*	*29.19*
924041	*AB2-047 C O1*	*5.45*
924042	*AB2-047 E O1*	*36.49*
924261	*AB2-070 C O1*	*2.58*
924262	*AB2-070 E O1*	*17.24*
925771	*AC1-053 C*	*2.53*
925772	*AC1-053 E*	*16.9*

Appendix 4

(CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 100.3% to 100.51% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765_B'. This project contributes approximately 20.54 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B'
OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.5*
932891	*AC2-115 2*	*2.5*
932921	*AC2-116*	*0.88*
933411	*AC2-154 C*	*2.32*
933412	*AC2-154 E*	*3.79*
933911	*AD1-013 C*	*1.93*
933912	*AD1-013 E*	*3.08*
933931	*AD1-016 C*	*0.98*
933932	*AD1-016 E*	*1.6*
934051	*AD1-031 C O1*	*2.95*
934052	*AD1-031 E O1*	*4.82*
934101	*AD1-039 1*	*7.33*
934111	*AD1-039 2*	*7.84*
934431	*AD1-067 C*	*0.14*
934432	*AD1-067 E*	*0.58*
934701	*AD1-098 C O1*	*7.21*
934702	*AD1-098 E O1*	*5.26*
934721	*AD1-100 C*	*19.98*
934722	*AD1-100 E*	*93.23*
934871	*AD1-116 C*	*0.94*
934872	*AD1-116 E*	*1.54*
934971	*AD1-129 C*	*0.95*
934972	*AD1-129 E*	*0.63*
935001	*AD1-133 C O1*	*21.37*
935002	*AD1-133 E O1*	*14.25*
936291	*AD2-038 C O1*	*2.41*
936292	*AD2-038 E O1*	*16.12*
936371	*AD2-047 C O1*	*4.16*

936372	*AD2-047 E O1*	*20.31*
936461	*AD2-060*	*2.45*
936511	*AD2-066 C O1*	*8.73*
936512	*AD2-066 E O1*	*5.82*
936791	*AD2-102 C*	*14.88*
936792	*AD2-102 E*	*9.92*
937001	*AD2-134 C*	*2.71*
937002	*AD2-134 E*	*10.83*
937311	*AD2-172 C*	*2.59*
937312	*AD2-172 E*	*3.57*
937401	*AD2-194 1*	*8.43*
937411	*AD2-194 2*	*8.42*
937531	*AD2-214 C*	*4.61*
937532	*AD2-214 E*	*3.07*
938511	*AE1-070 1*	*9.91*
938521	*AE1-070 2*	*9.05*
938851	*AE1-113 C O1*	*8.59*
938852	*AE1-113 E O1*	*30.45*
938861	*AE1-114 C O1*	*4.12*
938862	*AE1-114 E O1*	*14.07*
939051	*AE1-134 1*	*1.43*
939061	*AE1-134 2*	*1.43*
939321	*AE1-163 C O1*	*6.05*
939322	*AE1-163 E O1*	*37.18*
939351	*AE1-166 C O1*	*10.68*
939352	*AE1-166 E O1*	*9.86*
939401	*AE1-172 C O1*	*5.32*
939402	*AE1-172 E O1*	*24.93*
939681	*AE1-198 C O1*	*18.81*
939682	*AE1-198 E O1*	*15.98*
940101	*AE1-252 C O1*	*10.68*
940102	*AE1-252 E O1*	*7.12*
940501	*AE2-035 C*	*2.59*
940502	*AE2-035 E*	*3.57*
940752	*AE2-062 E*	*0.14*
941131	*AE2-107 C*	*6.87*
941132	*AE2-107 E*	*4.58*
941551	*AE2-152 C O1*	*12.32*
941552	*AE2-152 E O1*	*8.22*
941561	*AE2-153 C O1*	*4.9*
941562	*AE2-153 E O1*	*22.93*
942421	*AE2-255 C O1*	*3.25*
942422	*AE2-255 E O1*	*9.76*
942651	*AE2-281 C O1*	*0.86*
942652	*AE2-281 E O1*	*5.31*

942991	AE2-321 C	8.62
942992	AE2-321 E	4.24
943121	AE2-341 C	13.33
943122	AE2-341 E	6.55
LTF	BLUEG	5.77
274654	BRAIDWOOD;1U	27.55
274655	BRAIDWOOD;2U	26.36
LTF	CALDERWOOD	0.02
LTF	CANNELTON	0.09
LTF	CARR	0.73
LTF	CATAWBA	0.26
274890	CAYUG;1U E	13.66
274891	CAYUG;2U E	13.66
LTF	CBM-S1	1.69
LTF	CBM-W1	26.62
LTF	CBM-W2	56.43
LTF	CHEOAH	0.03
LTF	CHILHOWEE	< 0.01
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
274859	EASYR;U1 E	11.54
274860	EASYR;U2 E	11.54
274736	ELWOOD EC;9P	3.26
LTF	G-007	2.04
LTF	GIBSON	0.04
290051	GSG-6; E	10.96
LTF	HAMLET	0.5
274675	JOLIET 29;7U	11.37
274676	JOLIET 29;8U	11.38
275149	KEMPTON ;1E	17.13
274704	KENDALL ;1C	4.05
274705	KENDALL ;1S	2.7
274706	KENDALL ;2C	4.05
274707	KENDALL ;2S	2.7
274660	LASCO STA;1U	25.16
274661	LASCO STA;2U	25.21
290108	LEEDK;1U E	25.46
LTF	LGE-0092018	< 0.01
LTF	MEC	39.27
293061	N-015 E	16.45
293516	O-009 E1	9.54
293517	O-009 E2	4.85
293518	O-009 E3	5.34
293715	O-029 E	10.21
293716	O-029 E	5.6

293717	*O-029 E*	*5.14*
293771	*O-035 E*	*6.63*
LTF	*O-066*	*13.07*
293644	*O22 E1*	*12.36*
293645	*O22 E2*	*23.99*
290021	*O50 E*	*20.82*
294392	*P-010 E*	*20.89*
294763	*P-046 E*	*9.85*
274888	*PILOT HIL;1E*	*17.13*
270859	*PWR VTR EC;R*	*12.75*
LTF	*RENSSELAER*	*0.58*
274722	*S-055 E*	*11.92*
LTF	*SANTEETLA*	*0.01*
295111	*SUBLETTE E*	*2.85*
274861	*TOP CROP ;1U*	*0.48*
274862	*TOP CROP ;2U*	*0.93*
LTF	*TRIMBLE*	*0.68*
LTF	*WEC*	*8.43*
295109	*WESTBROOK E*	*5.87*
274687	*WILL CNTY;4U*	*11.49*
915011	*Y3-013 1*	*3.97*
915021	*Y3-013 2*	*3.97*
915031	*Y3-013 3*	*3.97*
916211	*Z1-072 E*	*5.02*
916221	*Z1-073 E*	*5.65*
916502	*Z1-106 E1*	*1.33*
916504	*Z1-106 E2*	*1.33*
916512	*Z1-107 E*	*2.55*
916522	*Z1-108 E*	*2.63*
918052	*AA1-018 E*	*16.22*
919221	*AA1-146*	*18.43*
919581	*AA2-030*	*18.43*
920272	*AA2-123 E*	*2.58*
930481	*AB1-089*	*69.18*
930501	*AB1-091 O1*	*67.48*
930741	*AB1-122 1O1*	*74.78*
930751	*AB1-122 2O1*	*79.96*
924471	*AB2-096*	*44.61*
925302	*AB2-191 E*	*1.45*
925581	*AC1-033 C*	*1.45*
925582	*AC1-033 E*	*9.73*
926311	*AC1-109 1*	*2.*
926321	*AC1-109 2*	*2.*
926331	*AC1-110 1*	*2.*
926341	*AC1-110 2*	*2.*

926351	*AC1-111 1*	*0.8*
926361	*AC1-111 2*	*0.8*
926371	*AC1-111 3*	*0.8*
926381	*AC1-111 4*	*0.8*
926391	*AC1-111 5*	*0.8*
926401	*AC1-111 6*	*0.8*
927511	*AC1-113 1*	*1.25*
927521	*AC1-113 2*	*1.25*
926431	*AC1-114*	*2.5*
927451	*AC1-142A 1*	*4.54*
927461	*AC1-142A 2*	*4.54*
926821	*AC1-168 C O1*	*1.2*
926822	*AC1-168 E O1*	*8.05*
927091	*AC1-204 1*	*78.41*
927101	*AC1-204 2*	*78.27*
927201	*AC1-214 C O1*	*2.13*
927202	*AC1-214 E O1*	*6.76*

Appendix 5

(CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 107.47% to 107.59% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765_B'. This project contributes approximately 13.17 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B'
OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.59*
932891	*AC2-115 2*	*1.59*
932921	*AC2-116*	*0.56*
933411	*AC2-154 C*	*1.68*
933412	*AC2-154 E*	*2.75*
933911	*AD1-013 C*	*1.22*
933912	*AD1-013 E*	*1.96*
933931	*AD1-016 C*	*0.62*
933932	*AD1-016 E*	*1.01*
934051	*AD1-031 C O1*	*1.87*
934052	*AD1-031 E O1*	*3.06*
934101	*AD1-039 1*	*4.67*
934111	*AD1-039 2*	*4.88*
934431	*AD1-067 C*	*0.09*
934432	*AD1-067 E*	*0.37*
934701	*AD1-098 C O1*	*4.58*
934702	*AD1-098 E O1*	*3.34*
934721	*AD1-100 C*	*12.96*
934722	*AD1-100 E*	*60.48*
934871	*AD1-116 C*	*0.62*
934872	*AD1-116 E*	*1.01*
934971	*AD1-129 C*	*0.6*
934972	*AD1-129 E*	*0.4*
935001	*AD1-133 C O1*	*13.75*
935002	*AD1-133 E O1*	*9.17*
936291	*AD2-038 C O1*	*1.54*
936292	*AD2-038 E O1*	*10.33*
936371	*AD2-047 C O1*	*3.02*

936372	*AD2-047 E O1*	*14.72*
936461	*AD2-060*	*1.77*
936511	*AD2-066 C O1*	*5.57*
936512	*AD2-066 E O1*	*3.71*
936791	*AD2-102 C*	*9.42*
936792	*AD2-102 E*	*6.28*
937001	*AD2-134 C*	*1.72*
937002	*AD2-134 E*	*6.88*
937311	*AD2-172 C*	*1.64*
937312	*AD2-172 E*	*2.26*
937401	*AD2-194 1*	*5.25*
937411	*AD2-194 2*	*5.25*
937531	*AD2-214 C*	*2.92*
937532	*AD2-214 E*	*1.95*
938511	*AE1-070 1*	*6.17*
938521	*AE1-070 2*	*5.64*
938851	*AE1-113 C O1*	*5.36*
938852	*AE1-113 E O1*	*19.02*
938861	*AE1-114 C O1*	*2.61*
938862	*AE1-114 E O1*	*8.92*
939051	*AE1-134 1*	*0.91*
939061	*AE1-134 2*	*0.91*
939321	*AE1-163 C O1*	*3.88*
939322	*AE1-163 E O1*	*23.83*
939351	*AE1-166 C O1*	*6.85*
939352	*AE1-166 E O1*	*6.32*
939401	*AE1-172 C O1*	*3.49*
939402	*AE1-172 E O1*	*16.32*
939631	*AE1-193 C O1*	*4.58*
939632	*AE1-193 E O1*	*30.65*
939641	*AE1-194 C*	*10.89*
939642	*AE1-194 E*	*72.9*
939651	*AE1-195 C*	*10.89*
939652	*AE1-195 E*	*72.9*
939681	*AE1-198 C O1*	*13.6*
939682	*AE1-198 E O1*	*11.56*
940101	*AE1-252 C O1*	*6.99*
940102	*AE1-252 E O1*	*4.66*
940501	*AE2-035 C*	*1.64*
940502	*AE2-035 E*	*2.26*
940752	*AE2-062 E*	*0.09*
941131	*AE2-107 C*	*4.36*
941132	*AE2-107 E*	*2.91*
941551	*AE2-152 C O1*	*7.9*
941552	*AE2-152 E O1*	*5.27*

941561	AE2-153 C O1	3.15
941562	AE2-153 E O1	14.76
942421	AE2-255 C O1	2.03
942422	AE2-255 E O1	6.1
942651	AE2-281 C O1	0.55
942652	AE2-281 E O1	3.4
942991	AE2-321 C	5.46
942992	AE2-321 E	2.69
943121	AE2-341 C	8.49
943122	AE2-341 E	4.17
LTF	BLUEG	2.8
294401	BSHIL;1U E	3.25
294410	BSHIL;2U E	3.25
LTF	CANNELTON	< 0.01
LTF	CARR	0.49
LTF	CATAWBA	0.16
274890	CAYUG;1U E	8.94
274891	CAYUG;2U E	8.94
LTF	CBM-S1	1.39
LTF	CBM-W1	20.1
LTF	CBM-W2	38.93
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
LTF	CIN	0.15
274751	CRETE EC ;1U	1.95
274752	CRETE EC ;2U	1.95
274753	CRETE EC ;3U	1.95
274754	CRETE EC ;4U	1.95
274859	EASYR;U1 E	7.31
274860	EASYR;U2 E	7.31
LTF	G-007	1.37
290051	GSG-6; E	6.95
LTF	HAMLET	0.31
965711	J1058	< 0.01
275149	KEMPTON ;1E	12.42
290108	LEEDK;1U E	16.17
LTF	LGE-0092018	< 0.01
LTF	MEC	25.11
293061	N-015 E	10.25
293516	O-009 E1	6.05
293517	O-009 E2	3.07
293518	O-009 E3	3.38
293715	O-029 E	6.47
293716	O-029 E	3.55
293717	O-029 E	3.26

293771	*O-035 E*	*4.21*
LTF	*O-066*	*8.76*
293644	*O22 E1*	*7.25*
293645	*O22 E2*	*14.08*
290021	*O50 E*	*13.*
294392	*P-010 E*	*13.02*
294763	*P-046 E*	*6.24*
274888	*PILOT HIL;1E*	*12.42*
270859	*PWR VTR EC;R*	*8.07*
LTF	*RENSSELAER*	*0.39*
274722	*S-055 E*	*7.53*
295111	*SUBLETTE E*	*1.81*
LTF	*TRIMBLE*	*0.34*
LTF	*WEC*	*5.33*
295109	*WESTBROOK E*	*3.72*
910542	*X3-005 E*	*0.52*
915011	*Y3-013 1*	*2.51*
915021	*Y3-013 2*	*2.51*
915031	*Y3-013 3*	*2.51*
916211	*Z1-072 E*	*3.19*
916221	*Z1-073 E*	*3.59*
916502	*Z1-106 E1*	*0.84*
916504	*Z1-106 E2*	*0.84*
916512	*Z1-107 E*	*1.72*
916522	*Z1-108 E*	*1.66*
918052	*AA1-018 E*	*10.64*
919221	*AA1-146*	*11.68*
919581	*AA2-030*	*11.68*
920272	*AA2-123 E*	*1.63*
930481	*AB1-089*	*43.82*
930501	*AB1-091 O1*	*49.21*
930741	*AB1-122 1O1*	*47.66*
930751	*AB1-122 2O1*	*49.82*
924471	*AB2-096*	*28.25*
925302	*AB2-191 E*	*0.92*
925581	*AC1-033 C*	*0.92*
925582	*AC1-033 E*	*6.18*
926311	*AC1-109 1*	*1.27*
926321	*AC1-109 2*	*1.27*
926331	*AC1-110 1*	*1.27*
926341	*AC1-110 2*	*1.27*
926351	*AC1-111 1*	*0.51*
926361	*AC1-111 2*	*0.51*
926371	*AC1-111 3*	*0.51*
926381	*AC1-111 4*	*0.51*

926391	*AC1-111 5*	*0.51*
926401	*AC1-111 6*	*0.51*
927511	*AC1-113 1*	*0.79*
927521	*AC1-113 2*	*0.79*
926431	*AC1-114*	*1.59*
927451	*AC1-142A 1*	*2.83*
927461	*AC1-142A 2*	*2.84*
926821	*AC1-168 C O1*	*0.76*
926822	*AC1-168 E O1*	*5.09*
927091	*AC1-204 1*	*48.84*
927101	*AC1-204 2*	*48.8*
927201	*AC1-214 C O1*	*1.35*
927202	*AC1-214 E O1*	*4.3*

Appendix 6

(CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 120.05% to 120.24% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 14.64 MW to the thermal violation.

CONTINGENCY 'COMED_P4_023-65-BT2-3__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.78*
932891	*AC2-115 2*	*1.78*
932921	*AC2-116*	*0.62*
933411	*AC2-154 C*	*1.74*
933412	*AC2-154 E*	*2.84*
933911	*AD1-013 C*	*1.37*
933912	*AD1-013 E*	*2.19*
933931	*AD1-016 C*	*0.7*
933932	*AD1-016 E*	*1.13*
934101	*AD1-039 1*	*5.2*
934111	*AD1-039 2*	*5.53*
934431	*AD1-067 C*	*0.1*
934432	*AD1-067 E*	*0.41*
934701	*AD1-098 C O1*	*5.12*
934702	*AD1-098 E O1*	*3.74*
934721	*AD1-100 C*	*14.29*
934722	*AD1-100 E*	*66.68*
934871	*AD1-116 C*	*0.68*
934872	*AD1-116 E*	*1.11*
934971	*AD1-129 C*	*0.68*
934972	*AD1-129 E*	*0.45*
935001	*AD1-133 C O1*	*15.18*
935002	*AD1-133 E O1*	*10.12*
936291	*AD2-038 C O1*	*1.71*
936292	*AD2-038 E O1*	*11.47*
936371	*AD2-047 C O1*	*3.12*
936372	*AD2-047 E O1*	*15.21*
936461	*AD2-060*	*1.83*

936511	*AD2-066 C O1*	*6.2*
936512	*AD2-066 E O1*	*4.14*
936791	*AD2-102 C*	*10.56*
936792	*AD2-102 E*	*7.04*
937001	*AD2-134 C*	*1.93*
937002	*AD2-134 E*	*7.7*
937311	*AD2-172 C*	*1.83*
937312	*AD2-172 E*	*2.53*
937401	*AD2-194 1*	*5.94*
937411	*AD2-194 2*	*5.93*
937531	*AD2-214 C*	*3.26*
937532	*AD2-214 E*	*2.17*
938511	*AE1-070 1*	*6.98*
938521	*AE1-070 2*	*6.38*
938851	*AE1-113 C O1*	*6.05*
938852	*AE1-113 E O1*	*21.46*
938861	*AE1-114 C O1*	*2.93*
938862	*AE1-114 E O1*	*9.98*
939051	*AE1-134 1*	*1.01*
939061	*AE1-134 2*	*1.01*
939321	*AE1-163 C O1*	*4.31*
939322	*AE1-163 E O1*	*26.45*
939351	*AE1-166 C O1*	*7.61*
939352	*AE1-166 E O1*	*7.03*
939401	*AE1-172 C O1*	*3.81*
939402	*AE1-172 E O1*	*17.83*
939641	*AE1-194 C*	*18.97*
939642	*AE1-194 E*	*126.92*
939651	*AE1-195 C*	*18.97*
939652	*AE1-195 E*	*126.92*
940101	*AE1-252 C O1*	*7.64*
940102	*AE1-252 E O1*	*5.09*
940501	*AE2-035 C*	*1.83*
940502	*AE2-035 E*	*2.53*
940752	*AE2-062 E*	*0.1*
941131	*AE2-107 C*	*4.89*
941132	*AE2-107 E*	*3.26*
941551	*AE2-152 C O1*	*8.78*
941552	*AE2-152 E O1*	*5.86*
941561	*AE2-153 C O1*	*3.5*
941562	*AE2-153 E O1*	*16.39*
942421	*AE2-255 C O1*	*2.29*
942422	*AE2-255 E O1*	*6.88*
942651	*AE2-281 C O1*	*0.62*
942652	*AE2-281 E O1*	*3.78*

942991	AE2-321 C	6.12
942992	AE2-321 E	3.01
943121	AE2-341 C	9.52
943122	AE2-341 E	4.67
LTF	BLUEG	4.99
274654	BRAIDWOOD;1U	19.26
274655	BRAIDWOOD;2U	18.43
LTF	CALDERWOOD	0.08
LTF	CANNELTON	0.1
LTF	CARR	0.56
LTF	CATAWBA	0.23
274890	CAYUG;1U E	9.76
274891	CAYUG;2U E	9.76
LTF	CBM-S1	0.79
LTF	CBM-W1	20.14
LTF	CBM-W2	37.59
LTF	CHEOAH	0.08
LTF	CHILHOWEE	0.03
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
274751	CRETE EC ;1U	3.4
274752	CRETE EC ;2U	3.4
274753	CRETE EC ;3U	3.4
274754	CRETE EC ;4U	3.4
274859	EASYR;U1 E	8.18
274860	EASYR;U2 E	8.18
LTF	G-007	1.56
LTF	GIBSON	0.06
290051	GSG-6; E	7.79
LTF	HAMLET	0.43
275149	KEMPTON ;1E	12.83
274704	KENDALL ;1C	2.84
274705	KENDALL ;1S	1.9
274706	KENDALL ;2C	2.84
274707	KENDALL ;2S	1.9
274661	LASCO STA;2U	17.79
290108	LEEDK;1U E	18.11
LTF	LGE-0092018	< 0.01
LTF	MEC	27.63
293061	N-015 E	11.63
293516	O-009 E1	6.76
293517	O-009 E2	3.43
293518	O-009 E3	3.78
293715	O-029 E	7.23
293716	O-029 E	3.96

293717	*O-029 E*	*3.64*
LTF	*O-066*	*10.01*
293644	*O22 E1*	*8.51*
293645	*O22 E2*	*16.53*
290021	*O50 E*	*14.67*
294392	*P-010 E*	*14.77*
294763	*P-046 E*	*6.99*
274888	*PILOT HIL;1E*	*12.83*
270859	*PWR VTR EC;R*	*9.05*
LTF	*RENSSELAER*	*0.44*
274722	*S-055 E*	*8.46*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*2.03*
274861	*TOP CROP ;1U*	*0.33*
274862	*TOP CROP ;2U*	*0.64*
LTF	*TRIMBLE*	*0.59*
LTF	*WEC*	*5.98*
295109	*WESTBROOK E*	*4.17*
274687	*WILL CNTY;4U*	*8.11*
910542	*X3-005 E*	*0.45*
915011	*Y3-013 1*	*2.82*
915021	*Y3-013 2*	*2.82*
915031	*Y3-013 3*	*2.82*
916221	*Z1-073 E*	*4.02*
916502	*Z1-106 E1*	*0.95*
916504	*Z1-106 E2*	*0.95*
916512	*Z1-107 E*	*1.85*
916522	*Z1-108 E*	*1.86*
918052	*AA1-018 E*	*11.66*
919221	*AA1-146*	*13.06*
919581	*AA2-030*	*13.06*
920272	*AA2-123 E*	*1.83*
930481	*AB1-089*	*49.11*
930501	*AB1-091 O1*	*50.68*
930741	*AB1-122 1O1*	*53.06*
930751	*AB1-122 2O1*	*56.4*
924471	*AB2-096*	*31.67*
925302	*AB2-191 E*	*1.03*
926311	*AC1-109 1*	*1.42*
926321	*AC1-109 2*	*1.42*
926331	*AC1-110 1*	*1.42*
926341	*AC1-110 2*	*1.42*
926351	*AC1-111 1*	*0.57*
926361	*AC1-111 2*	*0.57*
926371	*AC1-111 3*	*0.57*

926381	*AC1-111 4*	*0.57*
926391	*AC1-111 5*	*0.57*
926401	*AC1-111 6*	*0.57*
927511	*AC1-113 1*	*0.89*
927521	*AC1-113 2*	*0.89*
926431	*AC1-114*	*1.78*
927451	*AC1-142A 1*	*3.2*
927461	*AC1-142A 2*	*3.21*
926821	*AC1-168 C O1*	*0.85*
926822	*AC1-168 E O1*	*5.69*
927091	*AC1-204 1*	*55.26*
927101	*AC1-204 2*	*55.19*
927201	*AC1-214 C O1*	*0.57*
927202	*AC1-214 E O1*	*1.82*

Appendix 7

(CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 130.82% to 132.27% (AC power flow) of its load dump rating (1379 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT5-6__'. This project contributes approximately 27.96 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT5-6__'
TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345
TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.92*
932891	*AC2-115 2*	*2.92*
932921	*AC2-116*	*1.02*
932931	*AC2-117*	*6.53*
933411	*AC2-154 C*	*3.21*
933412	*AC2-154 E*	*5.23*
933911	*AD1-013 C*	*2.26*
933912	*AD1-013 E*	*3.6*
933931	*AD1-016 C*	*1.14*
933932	*AD1-016 E*	*1.86*
934051	*AD1-031 C O1*	*3.52*
934052	*AD1-031 E O1*	*5.75*
934101	*AD1-039 1*	*8.77*
934111	*AD1-039 2*	*8.86*
934431	*AD1-067 C*	*0.16*
934432	*AD1-067 E*	*0.68*
934701	*AD1-098 C O1*	*8.43*
934702	*AD1-098 E O1*	*6.16*
934721	*AD1-100 C*	*29.46*
934722	*AD1-100 E*	*137.48*
934871	*AD1-116 C*	*1.17*
934872	*AD1-116 E*	*1.91*
934971	*AD1-129 C*	*1.11*
934972	*AD1-129 E*	*0.74*

935001	*AD1-133 C O1*	*27.45*
935002	*AD1-133 E O1*	*18.3*
936291	*AD2-038 C O1*	*2.89*
936292	*AD2-038 E O1*	*19.31*
936371	*AD2-047 C O1*	*5.74*
936372	*AD2-047 E O1*	*28.03*
936461	*AD2-060*	*3.38*
936511	*AD2-066 C O1*	*10.37*
936512	*AD2-066 E O1*	*6.92*
936791	*AD2-102 C*	*17.33*
936792	*AD2-102 E*	*11.55*
937001	*AD2-134 C*	*3.17*
937002	*AD2-134 E*	*12.67*
937311	*AD2-172 C*	*3.02*
937312	*AD2-172 E*	*4.16*
937401	*AD2-194 1*	*9.57*
937411	*AD2-194 2*	*9.57*
937531	*AD2-214 C*	*5.41*
937532	*AD2-214 E*	*3.61*
938511	*AE1-070 1*	*11.25*
938521	*AE1-070 2*	*10.29*
938851	*AE1-113 C O1*	*9.81*
938852	*AE1-113 E O1*	*34.77*
938861	*AE1-114 C O1*	*4.82*
938862	*AE1-114 E O1*	*16.44*
939051	*AE1-134 1*	*1.68*
939061	*AE1-134 2*	*1.68*
939321	*AE1-163 C O1*	*7.25*
939322	*AE1-163 E O1*	*44.54*
939351	*AE1-166 C O1*	*14.54*
939352	*AE1-166 E O1*	*13.42*
939401	*AE1-172 C O1*	*8.1*
939402	*AE1-172 E O1*	*37.92*
939631	*AE1-193 C O1*	*8.6*
939632	*AE1-193 E O1*	*57.58*
939681	*AE1-198 C O1*	*25.55*
939682	*AE1-198 E O1*	*21.71*
939741	*AE1-205 C O1*	*12.49*
939742	*AE1-205 E O1*	*17.25*
940101	*AE1-252 C O1*	*16.24*
940102	*AE1-252 E O1*	*10.83*
940501	*AE2-035 C*	*3.02*
940502	*AE2-035 E*	*4.16*
940752	*AE2-062 E*	*0.16*
941131	*AE2-107 C*	*8.04*

941132	*AE2-107 E*	*5.36*
941551	*AE2-152 C O1*	*16.77*
941552	*AE2-152 E O1*	*11.18*
941561	*AE2-153 C O1*	*6.08*
941562	*AE2-153 E O1*	*28.45*
941731	*AE2-173 O1*	*7.41*
942111	*AE2-223 C*	*2.89*
942112	*AE2-223 E*	*19.34*
942421	*AE2-255 C O1*	*3.71*
942422	*AE2-255 E O1*	*11.14*
942651	*AE2-281 C O1*	*1.04*
942652	*AE2-281 E O1*	*6.36*
942991	*AE2-321 C*	*10.02*
942992	*AE2-321 E*	*4.93*
943121	*AE2-341 C*	*15.66*
943122	*AE2-341 E*	*7.69*
LTF	*BLUEG*	*7.78*
294401	*BSHIL;1U E*	*10.59*
294410	*BSHIL;2U E*	*10.59*
LTF	*CALDERWOOD*	*0.09*
LTF	*CANNELTON*	*0.08*
LTF	*CARR*	*0.95*
LTF	*CATAWBA*	*0.38*
274890	*CAYUG;1U E*	*20.28*
274891	*CAYUG;2U E*	*20.28*
LTF	*CBM-S1*	*1.88*
LTF	*CBM-W1*	*37.47*
LTF	*CBM-W2*	*71.85*
LTF	*CHEOAH*	*0.09*
LTF	*CHILHOWEE*	*0.03*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*< 0.01*
274859	*EASYR;U1 E*	*13.48*
274860	*EASYR;U2 E*	*13.48*
LTF	*G-007*	*2.67*
290051	*GSG-6; E*	*12.82*
LTF	*HAMLET*	*0.71*
275149	*KEMPTON ;1E*	*23.64*
990901	*L-005 E*	*15.57*
290108	*LEEDK;1U E*	*29.77*
LTF	*LGE-0092018*	*< 0.01*
274772	*LINCOLN ;3U*	*3.39*
274773	*LINCOLN ;4U*	*3.39*
274774	*LINCOLN ;5U*	*3.39*

274775	*LINCOLN ;6U*	*3.39*
274776	*LINCOLN ;7U*	*3.39*
274777	*LINCOLN ;8U*	*3.39*
LTF	*MEC*	*46.65*
293061	*N-015 E*	*19.47*
293516	*O-009 E1*	*11.21*
293517	*O-009 E2*	*5.69*
293518	*O-009 E3*	*6.27*
293715	*O-029 E*	*11.98*
293716	*O-029 E*	*6.57*
293717	*O-029 E*	*6.04*
293771	*O-035 E*	*7.93*
LTF	*O-066*	*17.15*
293644	*O22 E1*	*12.57*
293645	*O22 E2*	*24.4*
290021	*O50 E*	*23.78*
294392	*P-010 E*	*24.72*
294763	*P-046 E*	*11.49*
274888	*PILOT HIL;1E*	*23.64*
270859	*PWR VTR EC;R*	*14.83*
LTF	*RENSSELAER*	*0.75*
290265	*S-028 E*	*9.83*
274722	*S-055 E*	*13.77*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*3.34*
LTF	*TRIMBLE*	*0.93*
LTF	*WEC*	*9.76*
295109	*WESTBROOK E*	*6.86*
910542	*X3-005 E*	*0.9*
915011	*Y3-013 1*	*4.59*
915021	*Y3-013 2*	*4.59*
915031	*Y3-013 3*	*4.59*
916211	*Z1-072 E*	*6.*
916221	*Z1-073 E*	*6.61*
916502	*Z1-106 E1*	*1.55*
916504	*Z1-106 E2*	*1.55*
916512	*Z1-107 E*	*3.17*
916522	*Z1-108 E*	*3.05*
917502	*Z2-087 E*	*25.79*
918052	*AA1-018 E*	*20.15*
919221	*AA1-146*	*21.57*
919581	*AA2-030*	*21.57*
920272	*AA2-123 E*	*2.99*
930481	*AB1-089*	*80.59*
930501	*AB1-091 O1*	*94.07*

930741	*AB1-122 1O1*	*89.45*
930751	*AB1-122 2O1*	*90.41*
924041	*AB2-047 C O1*	*4.82*
924042	*AB2-047 E O1*	*32.24*
924471	*AB2-096*	*51.89*
925302	*AB2-191 E*	*1.7*
925581	*AC1-033 C*	*1.73*
925582	*AC1-033 E*	*11.61*
926311	*AC1-109 1*	*2.34*
926321	*AC1-109 2*	*2.34*
926331	*AC1-110 1*	*2.33*
926341	*AC1-110 2*	*2.33*
926351	*AC1-111 1*	*0.94*
926361	*AC1-111 2*	*0.94*
926371	*AC1-111 3*	*0.94*
926381	*AC1-111 4*	*0.94*
926391	*AC1-111 5*	*0.94*
926401	*AC1-111 6*	*0.94*
927511	*AC1-113 1*	*1.46*
927521	*AC1-113 2*	*1.46*
926431	*AC1-114*	*2.92*
927451	*AC1-142A 1*	*5.13*
927461	*AC1-142A 2*	*5.13*
926821	*AC1-168 C O1*	*1.43*
926822	*AC1-168 E O1*	*9.61*
927091	*AC1-204 1*	*89.02*
927101	*AC1-204 2*	*89.02*
927201	*AC1-214 C O1*	*2.54*
927202	*AC1-214 E O1*	*8.09*

Appendix 8

(CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 133.53% to 135.01% (AC power flow) of its load dump rating (1379 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT2-3__'. This project contributes approximately 28.52 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT2-3__'
TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345
TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.98*
932891	*AC2-115 2*	*2.98*
932921	*AC2-116*	*1.04*
932931	*AC2-117*	*6.67*
933411	*AC2-154 C*	*3.28*
933412	*AC2-154 E*	*5.34*
933911	*AD1-013 C*	*2.3*
933912	*AD1-013 E*	*3.68*
933931	*AD1-016 C*	*1.16*
933932	*AD1-016 E*	*1.9*
934051	*AD1-031 C O1*	*3.6*
934052	*AD1-031 E O1*	*5.87*
934101	*AD1-039 1*	*8.95*
934111	*AD1-039 2*	*9.05*
934431	*AD1-067 C*	*0.16*
934432	*AD1-067 E*	*0.69*
934701	*AD1-098 C O1*	*8.61*
934702	*AD1-098 E O1*	*6.29*
934721	*AD1-100 C*	*30.04*
934722	*AD1-100 E*	*140.21*
934871	*AD1-116 C*	*1.2*
934872	*AD1-116 E*	*1.96*
934971	*AD1-129 C*	*1.13*
934972	*AD1-129 E*	*0.75*

935001	*AD1-133 C O1*	*28.02*
935002	*AD1-133 E O1*	*18.68*
936291	*AD2-038 C O1*	*2.95*
936292	*AD2-038 E O1*	*19.73*
936371	*AD2-047 C O1*	*5.86*
936372	*AD2-047 E O1*	*28.62*
936461	*AD2-060*	*3.45*
936511	*AD2-066 C O1*	*10.59*
936512	*AD2-066 E O1*	*7.06*
936791	*AD2-102 C*	*17.7*
936792	*AD2-102 E*	*11.8*
937001	*AD2-134 C*	*3.24*
937002	*AD2-134 E*	*12.94*
937311	*AD2-172 C*	*3.08*
937312	*AD2-172 E*	*4.25*
937401	*AD2-194 1*	*9.78*
937411	*AD2-194 2*	*9.78*
937531	*AD2-214 C*	*5.53*
937532	*AD2-214 E*	*3.68*
938511	*AE1-070 1*	*11.49*
938521	*AE1-070 2*	*10.51*
938851	*AE1-113 C O1*	*10.02*
938852	*AE1-113 E O1*	*35.51*
938861	*AE1-114 C O1*	*4.92*
938862	*AE1-114 E O1*	*16.79*
939051	*AE1-134 1*	*1.71*
939061	*AE1-134 2*	*1.71*
939321	*AE1-163 C O1*	*7.41*
939322	*AE1-163 E O1*	*45.5*
939351	*AE1-166 C O1*	*14.83*
939352	*AE1-166 E O1*	*13.69*
939401	*AE1-172 C O1*	*8.26*
939402	*AE1-172 E O1*	*38.67*
939631	*AE1-193 C O1*	*8.79*
939632	*AE1-193 E O1*	*58.79*
939681	*AE1-198 C O1*	*26.09*
939682	*AE1-198 E O1*	*22.17*
939741	*AE1-205 C O1*	*12.74*
939742	*AE1-205 E O1*	*17.6*
940101	*AE1-252 C O1*	*16.56*
940102	*AE1-252 E O1*	*11.04*
940501	*AE2-035 C*	*3.08*
940502	*AE2-035 E*	*4.25*
940752	*AE2-062 E*	*0.16*
941131	*AE2-107 C*	*8.21*

941132	*AE2-107 E*	*5.47*
941551	*AE2-152 C O1*	*17.11*
941552	*AE2-152 E O1*	*11.41*
941561	*AE2-153 C O1*	*6.2*
941562	*AE2-153 E O1*	*29.03*
941731	*AE2-173 O1*	*7.56*
942111	*AE2-223 C*	*2.95*
942112	*AE2-223 E*	*19.73*
942421	*AE2-255 C O1*	*3.79*
942422	*AE2-255 E O1*	*11.38*
942651	*AE2-281 C O1*	*1.06*
942652	*AE2-281 E O1*	*6.5*
942991	*AE2-321 C*	*10.23*
942992	*AE2-321 E*	*5.04*
943121	*AE2-341 C*	*15.99*
943122	*AE2-341 E*	*7.85*
LTF	*BLUEG*	*7.95*
294401	*BSHIL;1U E*	*10.81*
294410	*BSHIL;2U E*	*10.81*
LTF	*CALDERWOOD*	*0.09*
LTF	*CANNELTON*	*0.09*
LTF	*CARR*	*0.97*
LTF	*CATAWBA*	*0.39*
274890	*CAYUG;1U E*	*20.68*
274891	*CAYUG;2U E*	*20.68*
LTF	*CBM-S1*	*1.91*
LTF	*CBM-W1*	*38.27*
LTF	*CBM-W2*	*73.31*
LTF	*CHEOAH*	*0.1*
LTF	*CHILHOWEE*	*0.03*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*< 0.01*
274859	*EASYR;U1 E*	*13.76*
274860	*EASYR;U2 E*	*13.76*
LTF	*G-007*	*2.73*
290051	*GSG-6; E*	*13.09*
LTF	*HAMLET*	*0.73*
275149	*KEMPTON ;1E*	*24.13*
990901	*L-005 E*	*15.9*
290108	*LEEDK;1U E*	*30.41*
LTF	*LGE-0092018*	*< 0.01*
274772	*LINCOLN ;3U*	*3.49*
274773	*LINCOLN ;4U*	*3.49*
274774	*LINCOLN ;5U*	*3.49*

274775	*LINCOLN ;6U*	*3.49*
274776	*LINCOLN ;7U*	*3.49*
274777	*LINCOLN ;8U*	*3.49*
LTF	*MEC*	*47.64*
293061	*N-015 E*	*19.87*
293516	*O-009 E1*	*11.44*
293517	*O-009 E2*	*5.81*
293518	*O-009 E3*	*6.4*
293715	*O-029 E*	*12.24*
293716	*O-029 E*	*6.71*
293717	*O-029 E*	*6.17*
293771	*O-035 E*	*8.09*
LTF	*O-066*	*17.52*
293644	*O22 E1*	*12.83*
293645	*O22 E2*	*24.91*
290021	*O50 E*	*24.28*
294392	*P-010 E*	*25.24*
294763	*P-046 E*	*11.73*
274888	*PILOT HIL;1E*	*24.13*
270859	*PWR VTR EC;R*	*15.14*
LTF	*RENSSELAER*	*0.77*
290265	*S-028 E*	*10.03*
274722	*S-055 E*	*14.06*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*3.41*
LTF	*TRIMBLE*	*0.95*
LTF	*WEC*	*9.97*
295109	*WESTBROOK E*	*7.01*
910542	*X3-005 E*	*0.92*
915011	*Y3-013 1*	*4.69*
915021	*Y3-013 2*	*4.69*
915031	*Y3-013 3*	*4.69*
916211	*Z1-072 E*	*6.13*
916221	*Z1-073 E*	*6.75*
916502	*Z1-106 E1*	*1.58*
916504	*Z1-106 E2*	*1.58*
916512	*Z1-107 E*	*3.24*
916522	*Z1-108 E*	*3.11*
917502	*Z2-087 E*	*26.31*
918052	*AA1-018 E*	*20.59*
919221	*AA1-146*	*22.03*
919581	*AA2-030*	*22.03*
920272	*AA2-123 E*	*3.06*
930481	*AB1-089*	*82.3*
930501	*AB1-091 O1*	*96.01*

930741	*AB1-122 1O1*	*91.35*
930751	*AB1-122 2O1*	*92.33*
924041	*AB2-047 C O1*	*4.91*
924042	*AB2-047 E O1*	*32.89*
924471	*AB2-096*	*53.*
925302	*AB2-191 E*	*1.73*
925581	*AC1-033 C*	*1.77*
925582	*AC1-033 E*	*11.85*
926311	*AC1-109 1*	*2.39*
926321	*AC1-109 2*	*2.39*
926331	*AC1-110 1*	*2.38*
926341	*AC1-110 2*	*2.38*
926351	*AC1-111 1*	*0.96*
926361	*AC1-111 2*	*0.96*
926371	*AC1-111 3*	*0.96*
926381	*AC1-111 4*	*0.96*
926391	*AC1-111 5*	*0.96*
926401	*AC1-111 6*	*0.96*
927511	*AC1-113 1*	*1.49*
927521	*AC1-113 2*	*1.49*
926431	*AC1-114*	*2.98*
927451	*AC1-142A 1*	*5.24*
927461	*AC1-142A 2*	*5.24*
926821	*AC1-168 C O1*	*1.46*
926822	*AC1-168 E O1*	*9.81*
927091	*AC1-204 1*	*90.93*
927101	*AC1-204 2*	*90.93*
927201	*AC1-214 C O1*	*2.6*
927202	*AC1-214 E O1*	*8.26*

Appendix 9

(CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 145.09% to 145.29% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765_B'. This project contributes approximately 20.3 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B'
OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.47*
932891	*AC2-115 2*	*2.47*
932921	*AC2-116*	*0.87*
933411	*AC2-154 C*	*2.29*
933412	*AC2-154 E*	*3.74*
933911	*AD1-013 C*	*1.9*
933912	*AD1-013 E*	*3.04*
933931	*AD1-016 C*	*0.97*
933932	*AD1-016 E*	*1.58*
934101	*AD1-039 1*	*7.24*
934111	*AD1-039 2*	*7.75*
934431	*AD1-067 C*	*0.14*
934432	*AD1-067 E*	*0.57*
934701	*AD1-098 C O1*	*7.12*
934702	*AD1-098 E O1*	*5.2*
934721	*AD1-100 C*	*19.74*
934722	*AD1-100 E*	*92.12*
934871	*AD1-116 C*	*0.93*
934872	*AD1-116 E*	*1.52*
934971	*AD1-129 C*	*0.94*
934972	*AD1-129 E*	*0.63*
935001	*AD1-133 C O1*	*21.08*
935002	*AD1-133 E O1*	*14.06*
936291	*AD2-038 C O1*	*2.38*
936292	*AD2-038 E O1*	*15.91*
936371	*AD2-047 C O1*	*4.11*
936372	*AD2-047 E O1*	*20.04*

936461	*AD2-060*	*2.42*
936511	*AD2-066 C O1*	*8.62*
936512	*AD2-066 E O1*	*5.75*
936791	*AD2-102 C*	*14.69*
936792	*AD2-102 E*	*9.79*
937001	*AD2-134 C*	*2.68*
937002	*AD2-134 E*	*10.7*
937311	*AD2-172 C*	*2.55*
937312	*AD2-172 E*	*3.52*
937401	*AD2-194 1*	*8.34*
937411	*AD2-194 2*	*8.32*
937531	*AD2-214 C*	*4.54*
937532	*AD2-214 E*	*3.03*
938511	*AE1-070 1*	*9.8*
938521	*AE1-070 2*	*8.95*
938851	*AE1-113 C O1*	*8.48*
938852	*AE1-113 E O1*	*30.08*
938861	*AE1-114 C O1*	*4.07*
938862	*AE1-114 E O1*	*13.89*
939051	*AE1-134 1*	*1.41*
939061	*AE1-134 2*	*1.41*
939321	*AE1-163 C O1*	*5.97*
939322	*AE1-163 E O1*	*36.7*
939351	*AE1-166 C O1*	*10.56*
939352	*AE1-166 E O1*	*9.74*
939401	*AE1-172 C O1*	*5.25*
939402	*AE1-172 E O1*	*24.59*
939641	*AE1-194 C*	*32.4*
939642	*AE1-194 E*	*216.8*
939651	*AE1-195 C*	*32.4*
939652	*AE1-195 E*	*216.8*
940101	*AE1-252 C O1*	*10.53*
940102	*AE1-252 E O1*	*7.02*
940501	*AE2-035 C*	*2.55*
940502	*AE2-035 E*	*3.52*
940752	*AE2-062 E*	*0.14*
941131	*AE2-107 C*	*6.79*
941132	*AE2-107 E*	*4.53*
941551	*AE2-152 C O1*	*12.18*
941552	*AE2-152 E O1*	*8.12*
941561	*AE2-153 C O1*	*4.84*
941562	*AE2-153 E O1*	*22.66*
942421	*AE2-255 C O1*	*3.21*
942422	*AE2-255 E O1*	*9.64*
942651	*AE2-281 C O1*	*0.85*

942652	AE2-281 E O1	5.24
942991	AE2-321 C	8.51
942992	AE2-321 E	4.19
943121	AE2-341 C	13.17
943122	AE2-341 E	6.47
LTF	BLUEG	6.58
274654	BRAIDWOOD;1U	27.26
274655	BRAIDWOOD;2U	26.08
LTF	CALDERWOOD	0.11
LTF	CANNELTON	0.13
LTF	CARR	0.79
LTF	CATAWBA	0.32
274890	CAYUG;1U E	13.47
274891	CAYUG;2U E	13.47
LTF	CBM-S1	1.17
LTF	CBM-W1	25.69
LTF	CBM-W2	52.63
LTF	CHEOAH	0.11
LTF	CHILHOWEE	0.03
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
274751	CRETE EC ;1U	5.8
274752	CRETE EC ;2U	5.8
274753	CRETE EC ;3U	5.8
274754	CRETE EC ;4U	5.8
274859	EASYR;U1 E	11.38
274860	EASYR;U2 E	11.38
LTF	G-007	2.21
LTF	GIBSON	0.08
290051	GSG-6; E	10.82
LTF	HAMLET	0.59
275149	KEMPTON ;1E	16.91
274704	KENDALL ;1C	4.
274705	KENDALL ;1S	2.67
274706	KENDALL ;2C	4.
274707	KENDALL ;2S	2.67
274661	LASCO STA;2U	24.92
290108	LEEDK;1U E	25.14
LTF	LGE-0092018	< 0.01
LTF	MEC	38.52
293061	N-015 E	16.26
293516	O-009 E1	9.41
293517	O-009 E2	4.78
293518	O-009 E3	5.26
293715	O-029 E	10.07

293716	*O-029 E*	*5.52*
293717	*O-029 E*	*5.07*
LTF	*O-066*	*14.15*
293644	*O22 E1*	*12.23*
293645	*O22 E2*	*23.74*
290021	*O50 E*	*20.57*
294392	*P-010 E*	*20.65*
294763	*P-046 E*	*9.72*
274888	*PILOT HIL;1E*	*16.91*
270859	*PWR VTR EC;R*	*12.59*
LTF	*RENSSELAER*	*0.62*
274722	*S-055 E*	*11.78*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*2.82*
274861	*TOP CROP ;1U*	*0.47*
274862	*TOP CROP ;2U*	*0.92*
LTF	*TRIMBLE*	*0.77*
LTF	*WEC*	*8.33*
295109	*WESTBROOK E*	*5.79*
274687	*WILL CNTY;4U*	*11.36*
915011	*Y3-013 1*	*3.93*
915021	*Y3-013 2*	*3.93*
915031	*Y3-013 3*	*3.93*
916221	*Z1-073 E*	*5.58*
916502	*Z1-106 E1*	*1.31*
916504	*Z1-106 E2*	*1.31*
916512	*Z1-107 E*	*2.52*
916522	*Z1-108 E*	*2.59*
918052	*AA1-018 E*	*16.01*
919221	*AA1-146*	*18.18*
919581	*AA2-030*	*18.18*
920272	*AA2-123 E*	*2.54*
930481	*AB1-089*	*68.31*
930501	*AB1-091 O1*	*66.61*
930741	*AB1-122 1O1*	*73.86*
930751	*AB1-122 2O1*	*79.05*
924471	*AB2-096*	*44.05*
925302	*AB2-191 E*	*1.43*
926311	*AC1-109 1*	*1.98*
926321	*AC1-109 2*	*1.98*
926331	*AC1-110 1*	*1.98*
926341	*AC1-110 2*	*1.98*
926351	*AC1-111 1*	*0.79*
926361	*AC1-111 2*	*0.79*
926371	*AC1-111 3*	*0.79*

926381	*AC1-111 4*	*0.79*
926391	*AC1-111 5*	*0.79*
926401	*AC1-111 6*	*0.79*
927511	*AC1-113 1*	*1.24*
927521	*AC1-113 2*	*1.24*
926431	*AC1-114*	*2.47*
927451	*AC1-142A 1*	*4.49*
927461	*AC1-142A 2*	*4.49*
926821	*AC1-168 C O1*	*1.18*
926822	*AC1-168 E O1*	*7.94*
927091	*AC1-204 1*	*77.52*
927101	*AC1-204 2*	*77.39*
927201	*AC1-214 C O1*	*0.95*
927202	*AC1-214 E O1*	*3.*

Appendix 10

(CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 113.3% to 114.77% (AC power flow) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765_B'. This project contributes approximately 15.94 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765_B'
OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 243207 05GRNTWN 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.92*
932891	*AC2-115 2*	*1.92*
932921	*AC2-116*	*0.67*
932931	*AC2-117*	*10.4*
933411	*AC2-154 C*	*2.02*
933412	*AC2-154 E*	*3.29*
933911	*AD1-013 C*	*1.49*
933912	*AD1-013 E*	*2.37*
933931	*AD1-016 C*	*0.75*
933932	*AD1-016 E*	*1.23*
934051	*AD1-031 C O1*	*2.27*
934052	*AD1-031 E O1*	*3.7*
934101	*AD1-039 1*	*5.71*
934111	*AD1-039 2*	*5.86*
934431	*AD1-067 C*	*0.11*
934432	*AD1-067 E*	*0.45*
934701	*AD1-098 C O1*	*5.55*
934702	*AD1-098 E O1*	*4.05*
934721	*AD1-100 C*	*15.6*
934722	*AD1-100 E*	*72.8*
934871	*AD1-116 C*	*0.83*
934872	*AD1-116 E*	*1.36*
934971	*AD1-129 C*	*0.73*
934972	*AD1-129 E*	*0.49*
935001	*AD1-133 C O1*	*16.69*
935002	*AD1-133 E O1*	*11.13*
936291	*AD2-038 C O1*	*1.97*
936292	*AD2-038 E O1*	*13.21*

936371	*AD2-047 C O1*	*3.61*
936372	*AD2-047 E O1*	*17.64*
936461	*AD2-060*	*2.13*
936511	*AD2-066 C O1*	*6.84*
936512	*AD2-066 E O1*	*4.56*
936791	*AD2-102 C*	*11.44*
936792	*AD2-102 E*	*7.62*
937001	*AD2-134 C*	*2.09*
937002	*AD2-134 E*	*8.34*
937311	*AD2-172 C*	*1.99*
937312	*AD2-172 E*	*2.74*
937401	*AD2-194 1*	*6.37*
937411	*AD2-194 2*	*6.38*
937531	*AD2-214 C*	*3.53*
937532	*AD2-214 E*	*2.36*
938511	*AE1-070 1*	*7.49*
938521	*AE1-070 2*	*6.85*
938851	*AE1-113 C O1*	*6.45*
938852	*AE1-113 E O1*	*22.88*
938861	*AE1-114 C O1*	*3.17*
938862	*AE1-114 E O1*	*10.81*
939051	*AE1-134 1*	*1.1*
939061	*AE1-134 2*	*1.1*
939321	*AE1-163 C O1*	*4.96*
939322	*AE1-163 E O1*	*30.46*
939351	*AE1-166 C O1*	*8.29*
939352	*AE1-166 E O1*	*7.65*
939401	*AE1-172 C O1*	*4.18*
939402	*AE1-172 E O1*	*19.56*
939631	*AE1-193 C O1*	*5.54*
939632	*AE1-193 E O1*	*37.1*
939681	*AE1-198 C O1*	*16.46*
939682	*AE1-198 E O1*	*13.99*
939741	*AE1-205 C O1*	*6.94*
939742	*AE1-205 E O1*	*9.58*
940101	*AE1-252 C O1*	*8.38*
940102	*AE1-252 E O1*	*5.59*
940501	*AE2-035 C*	*1.99*
940502	*AE2-035 E*	*2.74*
940752	*AE2-062 E*	*0.1*
941131	*AE2-107 C*	*5.3*
941132	*AE2-107 E*	*3.53*
941551	*AE2-152 C O1*	*9.57*
941552	*AE2-152 E O1*	*6.38*
941561	*AE2-153 C O1*	*3.83*

941562	AE2-153 E O1	17.94
941731	AE2-173 O1	4.12
942111	AE2-223 C	1.61
942112	AE2-223 E	10.75
942421	AE2-255 C O1	2.44
942422	AE2-255 E O1	7.33
942651	AE2-281 C O1	0.71
942652	AE2-281 E O1	4.35
942991	AE2-321 C	6.63
942992	AE2-321 E	3.27
943121	AE2-341 C	10.34
943122	AE2-341 E	5.08
LTF	BLUEG	4.34
294401	BSHIL;1U E	6.82
294410	BSHIL;2U E	6.82
LTF	CALDERWOOD	0.04
LTF	CANNELTON	0.06
LTF	CARR	0.61
LTF	CATAWBA	0.22
274890	CAYUG;1U E	10.71
274891	CAYUG;2U E	10.71
LTF	CBM-S1	1.25
LTF	CBM-W1	22.03
LTF	CBM-W2	43.76
LTF	CHEOAH	0.04
LTF	CHILHOWEE	0.01
LTF	CHOCTAW /* 35% REVERSE 4566958 4511400	< 0.01
274859	EASYR;U1 E	8.86
274860	EASYR;U2 E	8.86
LTF	G-007	1.7
LTF	GIBSON	0.02
290051	GSG-6; E	8.44
LTF	HAMLET	0.43
275149	KEMPTON ;1E	14.88
990901	L-005 E	9.98
290108	LEEDK;1U E	19.63
LTF	LGE-0092018	< 0.01
LTF	MEC	30.15
293061	N-015 E	12.62
293516	O-009 E1	7.32
293517	O-009 E2	3.72
293518	O-009 E3	4.1
293715	O-029 E	7.83
293716	O-029 E	4.29

293717	*O-029 E*	*3.95*
293771	*O-035 E*	*5.1*
LTF	*O-066*	*10.89*
293644	*O22 E1*	*7.89*
293645	*O22 E2*	*15.32*
290021	*O50 E*	*15.64*
294392	*P-010 E*	*16.03*
294763	*P-046 E*	*7.57*
274888	*PILOT HIL;1E*	*14.88*
270859	*PWR VTR EC;R*	*9.81*
LTF	*RENSSELAER*	*0.48*
274722	*S-055 E*	*9.16*
LTF	*SANTEETLA*	*0.01*
295111	*SUBLETTE E*	*2.2*
LTF	*TRIMBLE*	*0.51*
274814	*UNIV PK N;0U*	*1.63*
274808	*UNIV PK N;4U*	*1.63*
274809	*UNIV PK N;5U*	*1.63*
274811	*UNIV PK N;7U*	*1.63*
274812	*UNIV PK N;8U*	*1.63*
274815	*UNIV PK N;XU*	*1.63*
LTF	*WEC*	*6.47*
295109	*WESTBROOK E*	*4.52*
910542	*X3-005 E*	*0.51*
915011	*Y3-013 1*	*3.05*
915021	*Y3-013 2*	*3.05*
915031	*Y3-013 3*	*3.05*
916211	*Z1-072 E*	*3.86*
916221	*Z1-073 E*	*4.35*
916502	*Z1-106 E1*	*1.03*
916504	*Z1-106 E2*	*1.03*
916512	*Z1-107 E*	*2.18*
916522	*Z1-108 E*	*2.02*
917502	*Z2-087 E*	*14.33*
918052	*AA1-018 E*	*14.31*
919221	*AA1-146*	*14.14*
919581	*AA2-030*	*14.14*
920272	*AA2-123 E*	*1.98*
930481	*AB1-089*	*53.19*
930501	*AB1-091 O1*	*57.2*
930741	*AB1-122 1O1*	*58.29*
930751	*AB1-122 2O1*	*59.77*
924041	*AB2-047 C O1*	*2.68*
924042	*AB2-047 E O1*	*17.92*
924471	*AB2-096*	*34.32*

925302	*AB2-191 E*	*1.12*
925581	*AC1-033 C*	*1.12*
925582	*AC1-033 E*	*7.48*
926311	*AC1-109 1*	*1.55*
926321	*AC1-109 2*	*1.55*
926331	*AC1-110 1*	*1.54*
926341	*AC1-110 2*	*1.54*
926351	*AC1-111 1*	*0.62*
926361	*AC1-111 2*	*0.62*
926371	*AC1-111 3*	*0.62*
926381	*AC1-111 4*	*0.62*
926391	*AC1-111 5*	*0.62*
926401	*AC1-111 6*	*0.62*
927511	*AC1-113 1*	*0.96*
927521	*AC1-113 2*	*0.96*
926431	*AC1-114*	*1.92*
927451	*AC1-142A 1*	*3.46*
927461	*AC1-142A 2*	*3.46*
926821	*AC1-168 C O1*	*0.92*
926822	*AC1-168 E O1*	*6.19*
927091	*AC1-204 1*	*59.25*
927101	*AC1-204 2*	*59.29*
927201	*AC1-214 C O1*	*1.64*
927202	*AC1-214 E O1*	*5.21*

Appendix 11

(CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 130.61% to 132.06% (AC power flow) of its load dump rating (1379 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT5-6__'. This project contributes approximately 27.96 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT5-6__'
TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345
TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.92*
932891	*AC2-115 2*	*2.92*
932921	*AC2-116*	*1.02*
932931	*AC2-117*	*6.53*
933411	*AC2-154 C*	*3.21*
933412	*AC2-154 E*	*5.23*
933911	*AD1-013 C*	*2.26*
933912	*AD1-013 E*	*3.6*
933931	*AD1-016 C*	*1.14*
933932	*AD1-016 E*	*1.86*
934051	*AD1-031 C O1*	*3.52*
934052	*AD1-031 E O1*	*5.75*
934101	*AD1-039 1*	*8.77*
934111	*AD1-039 2*	*8.86*
934431	*AD1-067 C*	*0.16*
934432	*AD1-067 E*	*0.68*
934701	*AD1-098 C O1*	*8.43*
934702	*AD1-098 E O1*	*6.16*
934721	*AD1-100 C*	*29.46*
934722	*AD1-100 E*	*137.48*
934871	*AD1-116 C*	*1.17*
934872	*AD1-116 E*	*1.91*
934971	*AD1-129 C*	*1.11*
934972	*AD1-129 E*	*0.74*

935001	*AD1-133 C O1*	*27.45*
935002	*AD1-133 E O1*	*18.3*
936291	*AD2-038 C O1*	*2.89*
936292	*AD2-038 E O1*	*19.31*
936371	*AD2-047 C O1*	*5.74*
936372	*AD2-047 E O1*	*28.03*
936461	*AD2-060*	*3.38*
936511	*AD2-066 C O1*	*10.37*
936512	*AD2-066 E O1*	*6.92*
936791	*AD2-102 C*	*17.33*
936792	*AD2-102 E*	*11.55*
937001	*AD2-134 C*	*3.17*
937002	*AD2-134 E*	*12.67*
937311	*AD2-172 C*	*3.02*
937312	*AD2-172 E*	*4.16*
937401	*AD2-194 1*	*9.57*
937411	*AD2-194 2*	*9.57*
937531	*AD2-214 C*	*5.41*
937532	*AD2-214 E*	*3.61*
938511	*AE1-070 1*	*11.25*
938521	*AE1-070 2*	*10.29*
938851	*AE1-113 C O1*	*9.81*
938852	*AE1-113 E O1*	*34.77*
938861	*AE1-114 C O1*	*4.82*
938862	*AE1-114 E O1*	*16.44*
939051	*AE1-134 1*	*1.68*
939061	*AE1-134 2*	*1.68*
939321	*AE1-163 C O1*	*7.25*
939322	*AE1-163 E O1*	*44.54*
939351	*AE1-166 C O1*	*14.54*
939352	*AE1-166 E O1*	*13.42*
939401	*AE1-172 C O1*	*8.1*
939402	*AE1-172 E O1*	*37.92*
939631	*AE1-193 C O1*	*8.6*
939632	*AE1-193 E O1*	*57.58*
939681	*AE1-198 C O1*	*25.55*
939682	*AE1-198 E O1*	*21.71*
939741	*AE1-205 C O1*	*12.49*
939742	*AE1-205 E O1*	*17.25*
940101	*AE1-252 C O1*	*16.24*
940102	*AE1-252 E O1*	*10.83*
940501	*AE2-035 C*	*3.02*
940502	*AE2-035 E*	*4.16*
940752	*AE2-062 E*	*0.16*
941131	*AE2-107 C*	*8.04*

941132	*AE2-107 E*	*5.36*
941551	*AE2-152 C O1*	*16.77*
941552	*AE2-152 E O1*	*11.18*
941561	*AE2-153 C O1*	*6.08*
941562	*AE2-153 E O1*	*28.45*
941731	*AE2-173 O1*	*7.41*
942111	*AE2-223 C*	*2.89*
942112	*AE2-223 E*	*19.34*
942421	*AE2-255 C O1*	*3.71*
942422	*AE2-255 E O1*	*11.14*
942651	*AE2-281 C O1*	*1.04*
942652	*AE2-281 E O1*	*6.36*
942991	*AE2-321 C*	*10.02*
942992	*AE2-321 E*	*4.93*
943121	*AE2-341 C*	*15.66*
943122	*AE2-341 E*	*7.69*
LTF	*BLUEG*	*7.78*
294401	*BSHIL;1U E*	*10.59*
294410	*BSHIL;2U E*	*10.59*
LTF	*CALDERWOOD*	*0.09*
LTF	*CANNELTON*	*0.08*
LTF	*CARR*	*0.95*
LTF	*CATAWBA*	*0.38*
274890	*CAYUG;1U E*	*20.28*
274891	*CAYUG;2U E*	*20.28*
LTF	*CBM-S1*	*1.88*
LTF	*CBM-W1*	*37.47*
LTF	*CBM-W2*	*71.85*
LTF	*CHEOAH*	*0.09*
LTF	*CHILHOWEE*	*0.03*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*< 0.01*
274859	*EASYR;U1 E*	*13.48*
274860	*EASYR;U2 E*	*13.48*
LTF	*G-007*	*2.67*
290051	*GSG-6; E*	*12.82*
LTF	*HAMLET*	*0.71*
275149	*KEMPTON ;1E*	*23.64*
990901	*L-005 E*	*15.57*
290108	*LEEDK;1U E*	*29.77*
LTF	*LGE-0092018*	*< 0.01*
274772	*LINCOLN ;3U*	*3.39*
274773	*LINCOLN ;4U*	*3.39*
274774	*LINCOLN ;5U*	*3.39*

274775	*LINCOLN ;6U*	*3.39*
274776	*LINCOLN ;7U*	*3.39*
274777	*LINCOLN ;8U*	*3.39*
LTF	*MEC*	*46.65*
293061	*N-015 E*	*19.47*
293516	*O-009 E1*	*11.21*
293517	*O-009 E2*	*5.69*
293518	*O-009 E3*	*6.27*
293715	*O-029 E*	*11.98*
293716	*O-029 E*	*6.57*
293717	*O-029 E*	*6.04*
293771	*O-035 E*	*7.93*
LTF	*O-066*	*17.15*
293644	*O22 E1*	*12.57*
293645	*O22 E2*	*24.4*
290021	*O50 E*	*23.78*
294392	*P-010 E*	*24.72*
294763	*P-046 E*	*11.49*
274888	*PILOT HIL;1E*	*23.64*
270859	*PWR VTR EC;R*	*14.83*
LTF	*RENSSELAER*	*0.75*
290265	*S-028 E*	*9.83*
274722	*S-055 E*	*13.77*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*3.34*
LTF	*TRIMBLE*	*0.93*
LTF	*WEC*	*9.76*
295109	*WESTBROOK E*	*6.86*
910542	*X3-005 E*	*0.9*
915011	*Y3-013 1*	*4.59*
915021	*Y3-013 2*	*4.59*
915031	*Y3-013 3*	*4.59*
916211	*Z1-072 E*	*6.*
916221	*Z1-073 E*	*6.61*
916502	*Z1-106 E1*	*1.55*
916504	*Z1-106 E2*	*1.55*
916512	*Z1-107 E*	*3.17*
916522	*Z1-108 E*	*3.05*
917502	*Z2-087 E*	*25.79*
918052	*AA1-018 E*	*20.15*
919221	*AA1-146*	*21.57*
919581	*AA2-030*	*21.57*
920272	*AA2-123 E*	*2.99*
930481	*AB1-089*	*80.59*
930501	*AB1-091 O1*	*94.07*

930741	*AB1-122 1O1*	*89.45*
930751	*AB1-122 2O1*	*90.41*
924041	*AB2-047 C O1*	*4.82*
924042	*AB2-047 E O1*	*32.24*
924471	*AB2-096*	*51.89*
925302	*AB2-191 E*	*1.7*
925581	*AC1-033 C*	*1.73*
925582	*AC1-033 E*	*11.61*
926311	*AC1-109 1*	*2.34*
926321	*AC1-109 2*	*2.34*
926331	*AC1-110 1*	*2.33*
926341	*AC1-110 2*	*2.33*
926351	*AC1-111 1*	*0.94*
926361	*AC1-111 2*	*0.94*
926371	*AC1-111 3*	*0.94*
926381	*AC1-111 4*	*0.94*
926391	*AC1-111 5*	*0.94*
926401	*AC1-111 6*	*0.94*
927511	*AC1-113 1*	*1.46*
927521	*AC1-113 2*	*1.46*
926431	*AC1-114*	*2.92*
927451	*AC1-142A 1*	*5.13*
927461	*AC1-142A 2*	*5.13*
926821	*AC1-168 C O1*	*1.43*
926822	*AC1-168 E O1*	*9.61*
927091	*AC1-204 1*	*89.02*
927101	*AC1-204 2*	*89.02*
927201	*AC1-214 C O1*	*2.54*
927202	*AC1-214 E O1*	*8.09*

Appendix 12

(CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 133.32% to 134.8% (AC power flow) of its load dump rating (1379 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT2-3__'. This project contributes approximately 28.52 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT2-3__'
TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345
TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*2.98*
932891	*AC2-115 2*	*2.98*
932921	*AC2-116*	*1.04*
932931	*AC2-117*	*6.67*
933411	*AC2-154 C*	*3.28*
933412	*AC2-154 E*	*5.34*
933911	*AD1-013 C*	*2.3*
933912	*AD1-013 E*	*3.68*
933931	*AD1-016 C*	*1.16*
933932	*AD1-016 E*	*1.9*
934051	*AD1-031 C O1*	*3.6*
934052	*AD1-031 E O1*	*5.87*
934101	*AD1-039 1*	*8.95*
934111	*AD1-039 2*	*9.05*
934431	*AD1-067 C*	*0.16*
934432	*AD1-067 E*	*0.69*
934701	*AD1-098 C O1*	*8.61*
934702	*AD1-098 E O1*	*6.29*
934721	*AD1-100 C*	*30.04*
934722	*AD1-100 E*	*140.21*
934871	*AD1-116 C*	*1.2*
934872	*AD1-116 E*	*1.96*
934971	*AD1-129 C*	*1.13*
934972	*AD1-129 E*	*0.75*

935001	*AD1-133 C O1*	*28.02*
935002	*AD1-133 E O1*	*18.68*
936291	*AD2-038 C O1*	*2.95*
936292	*AD2-038 E O1*	*19.73*
936371	*AD2-047 C O1*	*5.86*
936372	*AD2-047 E O1*	*28.62*
936461	*AD2-060*	*3.45*
936511	*AD2-066 C O1*	*10.59*
936512	*AD2-066 E O1*	*7.06*
936791	*AD2-102 C*	*17.7*
936792	*AD2-102 E*	*11.8*
937001	*AD2-134 C*	*3.24*
937002	*AD2-134 E*	*12.94*
937311	*AD2-172 C*	*3.08*
937312	*AD2-172 E*	*4.25*
937401	*AD2-194 1*	*9.78*
937411	*AD2-194 2*	*9.78*
937531	*AD2-214 C*	*5.53*
937532	*AD2-214 E*	*3.68*
938511	*AE1-070 1*	*11.49*
938521	*AE1-070 2*	*10.51*
938851	*AE1-113 C O1*	*10.02*
938852	*AE1-113 E O1*	*35.51*
938861	*AE1-114 C O1*	*4.92*
938862	*AE1-114 E O1*	*16.79*
939051	*AE1-134 1*	*1.71*
939061	*AE1-134 2*	*1.71*
939321	*AE1-163 C O1*	*7.41*
939322	*AE1-163 E O1*	*45.5*
939351	*AE1-166 C O1*	*14.83*
939352	*AE1-166 E O1*	*13.69*
939401	*AE1-172 C O1*	*8.26*
939402	*AE1-172 E O1*	*38.67*
939631	*AE1-193 C O1*	*8.79*
939632	*AE1-193 E O1*	*58.79*
939681	*AE1-198 C O1*	*26.09*
939682	*AE1-198 E O1*	*22.17*
939741	*AE1-205 C O1*	*12.74*
939742	*AE1-205 E O1*	*17.6*
940101	*AE1-252 C O1*	*16.56*
940102	*AE1-252 E O1*	*11.04*
940501	*AE2-035 C*	*3.08*
940502	*AE2-035 E*	*4.25*
940752	*AE2-062 E*	*0.16*
941131	*AE2-107 C*	*8.21*

941132	*AE2-107 E*	*5.47*
941551	*AE2-152 C O1*	*17.11*
941552	*AE2-152 E O1*	*11.41*
941561	*AE2-153 C O1*	*6.2*
941562	*AE2-153 E O1*	*29.03*
941731	*AE2-173 O1*	*7.56*
942111	*AE2-223 C*	*2.95*
942112	*AE2-223 E*	*19.73*
942421	*AE2-255 C O1*	*3.79*
942422	*AE2-255 E O1*	*11.38*
942651	*AE2-281 C O1*	*1.06*
942652	*AE2-281 E O1*	*6.5*
942991	*AE2-321 C*	*10.23*
942992	*AE2-321 E*	*5.04*
943121	*AE2-341 C*	*15.99*
943122	*AE2-341 E*	*7.85*
LTF	*BLUEG*	*7.95*
294401	*BSHIL;1U E*	*10.81*
294410	*BSHIL;2U E*	*10.81*
LTF	*CALDERWOOD*	*0.09*
LTF	*CANNELTON*	*0.09*
LTF	*CARR*	*0.97*
LTF	*CATAWBA*	*0.39*
274890	*CAYUG;1U E*	*20.68*
274891	*CAYUG;2U E*	*20.68*
LTF	*CBM-S1*	*1.91*
LTF	*CBM-W1*	*38.27*
LTF	*CBM-W2*	*73.31*
LTF	*CHEOAH*	*0.1*
LTF	*CHILHOWEE*	*0.03*
LTF	*CHOCTAW /* 35% REVERSE 4566958 4511400*	*< 0.01*
LTF	*CIN*	*< 0.01*
274859	*EASYR;U1 E*	*13.76*
274860	*EASYR;U2 E*	*13.76*
LTF	*G-007*	*2.73*
290051	*GSG-6; E*	*13.09*
LTF	*HAMLET*	*0.73*
275149	*KEMPTON ;1E*	*24.13*
990901	*L-005 E*	*15.9*
290108	*LEEDK;1U E*	*30.41*
LTF	*LGE-0092018*	*< 0.01*
274772	*LINCOLN ;3U*	*3.49*
274773	*LINCOLN ;4U*	*3.49*
274774	*LINCOLN ;5U*	*3.49*

274775	*LINCOLN ;6U*	*3.49*
274776	*LINCOLN ;7U*	*3.49*
274777	*LINCOLN ;8U*	*3.49*
LTF	*MEC*	*47.64*
293061	*N-015 E*	*19.87*
293516	*O-009 E1*	*11.44*
293517	*O-009 E2*	*5.81*
293518	*O-009 E3*	*6.4*
293715	*O-029 E*	*12.24*
293716	*O-029 E*	*6.71*
293717	*O-029 E*	*6.17*
293771	*O-035 E*	*8.09*
LTF	*O-066*	*17.52*
293644	*O22 E1*	*12.83*
293645	*O22 E2*	*24.91*
290021	*O50 E*	*24.28*
294392	*P-010 E*	*25.24*
294763	*P-046 E*	*11.73*
274888	*PILOT HIL;1E*	*24.13*
270859	*PWR VTR EC;R*	*15.14*
LTF	*RENSSELAER*	*0.77*
290265	*S-028 E*	*10.03*
274722	*S-055 E*	*14.06*
LTF	*SANTEETLA*	*0.03*
295111	*SUBLETTE E*	*3.41*
LTF	*TRIMBLE*	*0.95*
LTF	*WEC*	*9.97*
295109	*WESTBROOK E*	*7.01*
910542	*X3-005 E*	*0.92*
915011	*Y3-013 1*	*4.69*
915021	*Y3-013 2*	*4.69*
915031	*Y3-013 3*	*4.69*
916211	*Z1-072 E*	*6.13*
916221	*Z1-073 E*	*6.75*
916502	*Z1-106 E1*	*1.58*
916504	*Z1-106 E2*	*1.58*
916512	*Z1-107 E*	*3.24*
916522	*Z1-108 E*	*3.11*
917502	*Z2-087 E*	*26.31*
918052	*AA1-018 E*	*20.59*
919221	*AA1-146*	*22.03*
919581	*AA2-030*	*22.03*
920272	*AA2-123 E*	*3.06*
930481	*AB1-089*	*82.3*
930501	*AB1-091 O1*	*96.01*

930741	*AB1-122 1O1*	*91.35*
930751	*AB1-122 2O1*	*92.33*
924041	*AB2-047 C O1*	*4.91*
924042	*AB2-047 E O1*	*32.89*
924471	*AB2-096*	*53.*
925302	*AB2-191 E*	*1.73*
925581	*AC1-033 C*	*1.77*
925582	*AC1-033 E*	*11.85*
926311	*AC1-109 1*	*2.39*
926321	*AC1-109 2*	*2.39*
926331	*AC1-110 1*	*2.38*
926341	*AC1-110 2*	*2.38*
926351	*AC1-111 1*	*0.96*
926361	*AC1-111 2*	*0.96*
926371	*AC1-111 3*	*0.96*
926381	*AC1-111 4*	*0.96*
926391	*AC1-111 5*	*0.96*
926401	*AC1-111 6*	*0.96*
927511	*AC1-113 1*	*1.49*
927521	*AC1-113 2*	*1.49*
926431	*AC1-114*	*2.98*
927451	*AC1-142A 1*	*5.24*
927461	*AC1-142A 2*	*5.24*
926821	*AC1-168 C O1*	*1.46*
926822	*AC1-168 E O1*	*9.81*
927091	*AC1-204 1*	*90.93*
927101	*AC1-204 2*	*90.93*
927201	*AC1-214 C O1*	*2.6*
927202	*AC1-214 E O1*	*8.26*

Appendix 13

(CE - CE) The AD1-100 TAP-AD2-137 TAP 345 kV line (from bus 934720 to bus 937030 ckt 1) loads from 127.77% to 130.15% (**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 43.49 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*

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*

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*

Appendix 14

(CE - CE) The AD1-100 TAP-BRAIDWOOD; B 345 kV line (from bus 934730 to bus 270670 ckt 1) loads from 142.07% to 149.24% (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 112.29 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*

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*

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*

Appendix 15

(CE - CE) The AD2-137 TAP-WILTON ; B 345 kV line (from bus 937030 to bus 270926 ckt 1) loads from 127.68% to 130.06% (**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 43.49 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*

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*

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*

Attachment 1: Single Line Diagram