Generation Interconnection Request
System Impact Study Report
For
PJM Generation Interconnection Request
Queue Position AD2-159

Chestnut 345 kV
187.5 MW Energy / 33 MW Capacity

November 2021

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

Queue AD2-159 project is a proposal to connect a 187.5 MW Energy, 33.0 MW Capacity, wind facility to be located in Macon Counties, IL. It is proposed in the Interconnection Request (Attachment N) that the primary point of interconnection to be studied the 345kV bus at TSS95 Chestnut. The IC has proposed a service date for this project of September 15, 2021.

Point of Interconnection

AD2-159 will interconnect with the ComEd transmission system by connecting to Chestnut TSS 95 345kV bus.

Cost Summary

Description	Cost Estimate
Total Physical Interconnection Costs	$ 4,000,000
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	$ 3,950,000
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	$ 892,000
Allocation towards System Network Upgrade Costs (TO Identified)*	$ 0
Total Costs	$ 8,842,000

*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	$ 1,000,000
Non-Direct Connection Network Upgrades	$ 3,000,000
Direct Connection Network Upgrades	$0
Total Physical Interconnection Costs	$ 4,000,000

Attachment Facilities

The IC AD2-159 generator lead will interconnect to a 345kV Interconnection Substation. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The estimated cost for the attachment facilities is given below.

Scope of Work	Cost Estimate
Installation of one 345kV line MOD, one dead-end structure and one set of revenue metering (see notes below on cost estimate)	$1.0M

Non-Direct Connection Network Upgrades

It is proposed to interconnect developer's generator lead to 345kV bus at Chestnut TSS 95.

The scope of work includes installation of one 345kV circuit breaker at Chestnut TSS 95, to create a line position for IC's generator lead, as shown in the one-line diagram below.

The Interconnection Customer is responsible for constructing all the facilities on the Interconnection Customer side of the point of interconnection outside of the Interconnection.

The estimated cost for Direct Connection Network Upgrade is given below.

Scope of Work	Cost Estimate
Installation of one 345kV circuit breaker at Chestnut TSS 95 and relay/protection work	$3,000,000
Total Cost Estimate (see notes below on cost estimate)	$3,000,000

Normally, it takes about **24-months** to engineer, design, procure material and construct 345kV facilities after ISA/ICSA are signed.

Direct Connection Cost Estimate

None

Notes on Cost Estimate:

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

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

3) These estimates are not a guarantee of the maximum amount payable by the Interconnection Customer and the actual costs of ComEd's work may differ significantly from these estimates. Per the PJM Tariff, Interconnection Customer will be responsible for paying all actual costs of ComEd's work.

4) The Interconnection Customer is responsible for all engineering, procurement, testing and construction of all equipment on the Interconnection Customer’s side of the Point of Interconnection (POI).

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

- Wind speed (meters/second) - (Required)
- Wind direction (decimal degrees from true north) - (Required)
- Ambient air temperature (Fahrenheit) - (Required)
- Air Pressure (Hectopascals) - (Required)
- Humidity (Percent) (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 AD2-159 was evaluated as a 187.5 MW (Capacity 33.0 MW) injection at Chestnut 345 kV substation in the ComEd area. Project AD2-159 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-159 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

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	Facility	Bus			Power	Loading %		Rating		MW	Flowgate
Number	Type	Name	Area	Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution	Appendix
1	LFFB	ADD AD1-100 5	CE - CE	BRAIDWOOD; B-BRAIDWOOD; R 345 kV line	270670	270671	1	AC	110.29	111.91	LDR	1341	21.44	1
2	LFFB	AEP_P4_#3128_05EUGENE 345	MISO AMIL - AEP	7CASEY-05SULLIVAN 345 kV line	346809	247712	1	AC	126.23	128.04	ER	1466	26.27	2

3	LFFB	ADD AD1-100 5	CE - CE	AD1-100 TAP-BRAIDWOOD; B 345 kV line	934730	270670	1	AC	134.3	137.05	LDR	1341	37.13	3

Steady-State Voltage Requirements

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

None

Short Circuit

(Summary of impacted circuit breakers)

No overdutied breakers identified.

Affected System Analysis & Mitigation

MISO Impacts:

April 2020 AF1 Group - Preliminary MISO impacts have been identified. Please refer to the MISO Affected System report for details.

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		Affected	Facility	Bus			Power	Loading %		Rating		MW
Number	Type	Name	Area	Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution
4	N-1	COMED_P1-2_345-L8001___-S_A	CE - CE	BLUEMOUND; B-PONTIAC ; B 345 kV line	270668	270852	1	AC	123	128.27	ER	1528	79.52
5	N-1	COMED_P1-2_345-L8014_T_-S-B	CE - CE	LORETTO ; B-AD1-100 TAP 345 kV line	270704	934720	1	AC	170.55	174.92	ER	1528	64.84
6	Non	Non	CE - CE	LORETTO ; B-AD1-100 TAP 345 kV line	270704	934720	1	AC	126.79	130.08	NR	1364	44.76
7	N-1	COMED_P1-2_345-L8002___-S	CE - MISO AMIL	LATHAM ; T-7LATHAM 345 kV line	270804	348856	1	AC	95.56	106.6	ER	908	103.48
8	N-1	COMED_P1-2_345-L8014_T_-S-B	CE - CE	PONTIAC ; B-LORETTO ; B 345 kV line	270852	270704	1	AC	158.56	162.89	ER	1528	64.89
9	Non	Non	CE - CE	PONTIAC ; B-LORETTO ; B 345 kV line	270852	270704	1	AC	114.14	117.4	NR	1364	44.81
10	N-1	COMED_P1-2_345-L11212_B-S_B	CE - CE	PONTIAC ; R-AD1-133 TAP 345 kV line	270853	935000	1	AC	147.77	151.69	ER	1528	58.82
11	Non	Non	CE - CE	PONTIAC ; R-AD1-133 TAP 345 kV line	270853	935000	1	AC	99.61	102.28	NR	1334	34.79
12	N-1	AEP_P1-2_#286	MISO AMIL - AEP	7CASEY-05SULLIVAN 345 kV line	346809	247712	1	AC	125.34	127.13	NR	1466	26.01
13	Non	Non	MISO AMIL - AEP	7CASEY-05SULLIVAN 345 kV line	346809	247712	1	AC	109.18	110.68	NR	1332	20
14	N-1	COMED_P1-2_345-L8002___-S	MISO AMIL - CE	7BROKAW-AB2-047 TAP 345 kV line	348847	924040	1	AC	137.21	140.04	ER	1528	42.67
15	N-1	COMED_P1-2_345-L8001___-S_A	CE - CE	W4-005 TAP-BLUEMOUND; B 345 kV line	905080	270668	1	AC	121.62	127.57	ER	1334	79.6

16	N-1	COMED_P1-2_345-L8002___-S	CE - CE	Z2-087 TAP-PONTIAC ; R 345 kV line	917500	270853	1	AC	155.55	158.38	ER	1528	42.67
17	N-1	COMED_P1-2_345-L8002___-S	CE - CE	AB2-047 TAP-Z2-087 TAP 345 kV line	924040	917500	1	AC	137.16	139.99	ER	1528	42.67
18	N-1	AD1-100B	CE - CE	AD1-100 TAP-WILTON ; B 345 kV line	934720	270926	1	AC	131.02	133.41	ER	1528	36.94
19	Non	Non	CE - CE	AD1-100 TAP-WILTON ; B 345 kV line	934720	270926	1	AC	103.54	105.13	NR	1364	21.45
20	N-1	COMED_P1-2_345-L11212_B-S_B	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	158.28	162.22	ER	1528	58.82
21	Non	Non	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	111.77	114.36	NR	1334	34.79

Light Load Analysis 2021

Network Impacts

The Queue Project AD2-159 was evaluated as a 187.5 MW (Capacity 187.5 MW) injection at Chestnut 345 kV substation in the ComEd area. Project AD2-159 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-159 was studied with a commercial probability of 100%. Potential network impacts were as follows:

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 Number	Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
1	LFFB	COMED_P4_112-65-BT5-6__	CE - CE	WILTON ; 765/345 kV transformer	275232	270644	1	DC	99.78	100.95	LDR	1379	16.23	1

Contribution to Previously Identified Overloads

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

Overload Number	Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
2	LFFB	COMED_P4_112-65-BT5-6__	CE - CE	WILTON ; B-WILTON ;3M 345 kV line	270926	275232	1	DC	111.77	112.43		1379	16.23	2

3	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; R-WILTON ;4M 345 kV line	270927	275233	1	DC	114.2	114.87		1379	16.56	3
4	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; 765/345 kV transformer	275233	270644	1	DC	104.16	105.36		1379	16.56	4
5	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S	AREA14 - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	AC	110.87	111.91	ER	1528	17.63	5
6	N-1	COMED_P1-2_765-L11216__-S	AREA14 - CE	AD2-137 TAP-WILTON ; B 345 kV line	937030	270926	1	DC	109.48	110.73	ER	1528	19.15	

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.

Not Applicable

System Reinforcements

A summary of the system reinforcements is provided below:

Facility	Analysis	Network Upgrade Number	Cost Estimate	AD2-159 Cost Allocation
Braidwood – Braidwood 345 kV line	Summer Peak	No Upgrade Required	$0	$0
Casey – Sullivan 345 kV line (Ameren End)	Summer Peak	None	$506,000	$0
Casey – Sullivan 345 kV line (AEP End)	Summer Peak	N5808	$5,000,000	$950,000
AD1-100 Tap – Braidwood 345 kV	Summer Peak	N7206	$3,000,000	$3,000,000
Wilton 765/345 kV transformers	Light Load	N5145	$12,000,000	$892,000
AD2-137 TAP - Wilton 345 kV line	Light Load	No Upgrade Required	$0	$0
Total System Reinforcement Cost Allocation				**$4,842,000**

Summer Peak Load Flow Analysis Reinforcements

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)

1. To resolve the Braidwood – Braidwood 345 kV line segment overload:

The applicable SSTE rating for this line segment is 1837 MVA and is sufficient. No upgrade required.

2. To resolve the Casey – Sullivan 345 kV line overload:

   Ameren-end: Install splice and dead-end shunts on the Ameren-owned portion of the Casey – Sullivan 345 kV line. Cost estimate is $506K.

   This upgrade is presently required for a prior queue cycle and AD2-159 presently has no cost responsibility. As changes to the PJM queue process occur (such as prior queued projects withdrawing from the queue, reducing in size, etc.) AD2-159 could receive cost allocation. Although Queue Project AD2-159 may not presently have cost responsibility for this upgrade, Queue Project AD2-159 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AD2-159 comes into service prior to completion of the upgrade, Queue Project AD2-159 will need an interim study.

   AEP end upgrade: AEP can eliminate the stuck breaker contingency by requiring a new string, expanding the 345 kV buses, add two (2) additional 345 kV circuit breakers, and repositioning the Bunsonville 345 kV line between the two new breakers on the new string.
   Estimated cost is $5M.
   PJM Network Upgrade N5808.

   The cost allocation is as follows:

Queue	MW Contribution	Percentage of cost	Cost ($5 M)
AD1-100	49.3	36.01%	$1.801
AD1-133	23.9	17.46%	$0.873
AD2-100	37.7	27.54%	$1.377
AD2-159	26.0	18.99%	$0.950

3. To resolve the AD1-100 Tap – Braidwood 345 kV line overload:

   The applicable SSTE rating for this line segment is 1837 MVA.

   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.
Time estimate is 24 months.
Estimated cost is $3M.
PJM Network Upgrade N7206.

This project is the driver.

Light Load Load Flow Analysis Reinforcements

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)

1. To resolve the overloads on the Wilton 765/345 kV transformers:

   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).
   Cost Estimate: $12M
   PJM Network Upgrade Number: N5145

   The cost allocation table is as follows:

Queue	MW contribution	Summer/Light Load	Percentage of Cost	$ cost ($ 12 M)	
AD1-100	116.8	Light Load	52.29%	$	6.275
AD2-047	26.4	Light Load	11.82%	$	1.418
AD2-066	17.7	Summer	7.93%	$	0.952
AD2-102	29.7	Summer	13.27%	$	1.593
AD2-134	16.2	Summer	7.25%	$	0.870
AD2-159	16.6	Light Load	7.43%	$	0.892

2. To resolve the AD2-137 TAP - Wilton 345 kV line overload:

   The applicable SSTE rating for this line segment is 1846 MVA and is sufficient. No upgrade required.

Short Circuit

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

None

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

No mitigations were found to be required due to instability. However the reactive power capability of AD2-159 does NOT meet the 0.95 lagging and leading PF requirement at the high side of the main transformer as shown in the table below. It was observed that AD2-159 plant is deficient in lagging power factor requirement by 61.64 MVAr and deficient in leading power factor requirement by 4.172 MVAr.

AD2-159 Reactive Power Capability Assessment

Generator	MFO	Required Power Factor Range		Maximum Lagging (MVAr)	Minimum Leading (MVAr)
		Lagging	Leading		
AD2-159	187.5	0.95	0.95		
Total Reactive Power Required				61.63	-61.63
Reactive Power from Generators				**Qmax**	**Qmin**
				30.53	-26.918
Customer Planned Compensation				0	0
Reactive Power Losses				-30.54	-30.54
Total Available Reactive Power at High Side of Main transformer				-0.01	-57.458
Deficiency in Reactive Power				61.64	-4.172

Contingencies (Summer Peak)

Contingency Name	Description
AD1-100B	CONTINGENCY 'AD1-100B' OPEN BRANCH FROM BUS 934725 TO BUS 934730 CKT 1 END
ADD AD1-100 5	CONTINGENCY 'ADD AD1-100 5' OPEN BRANCH FROM BUS 934730 TO BUS 270710 CKT 1 / AD1-100 - DAVIS CREEK OPEN BRANCH FROM BUS 934720 TO BUS 270926 CKT 1 / AD1-100 - WILTON END
AEP_P1-2_#286	CONTINGENCY 'AEP_P1-2_#286' OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END
AEP_P4_#3128_05EUGENE 345	CONTINGENCY 'AEP_P4_#3128_05EUGENE 345' OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1 OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1 END

COMED_P1-2_345-L11212_B-S_B	CONTINGENCY 'COMED_P1-2_345-L11212_B-S_B' TRIP BRANCH FROM BUS 934720 TO BUS 270704 CKT 1 / AD1-100 TAP 345 LORET; B 345 END
COMED_P1-2_345-L8001___-S_A	CONTINGENCY 'COMED_P1-2_345-L8001___-S_A' TRIP BRANCH FROM BUS 270853 TO BUS 917500 CKT 1 / PONTI; R 345 Z2-087 TAP 345 END
COMED_P1-2_345-L8002___-S	CONTINGENCY 'COMED_P1-2_345-L8002___-S' TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1 / PONTI; B 345 BLUEM; B 345 END
COMED_P1-2_345-L8014_T_-S-B	CONTINGENCY 'COMED_P1-2_345-L8014_T_-S-B' TRIP BRANCH FROM BUS 935000 TO BUS 270717 CKT 1 / AD1-133 TAP 345 DRESDEN ; R 345 END

Contingencies (Light Load)

Contingency Name	Description
COMED_P1-2_765-L11216__-S	CONTINGENCY 'COMED_P1-2_765-L11216__-S' TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 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-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	CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S' TRIP BRANCH FROM BUS 270670 TO BUS 270728 CKT 1 / BRAID; B 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)

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

(CE - CE) The BRAIDWOOD; B-BRAIDWOOD; R 345 kV line (from bus 270670 to bus 270671 ckt 1) loads from 110.29% to 111.91% (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 21.44 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 270926 CKT 1 / AD1-100 - WILTON
END

Bus Number	*Bus Name*	*Full Contribution*
934721	*AD1-100 C*	*60.5*
934722	*AD1-100 E*	*282.31*
935001	*AD1-133 C O1*	*14.9*
935002	*AD1-133 E O1*	*9.94*
935141	*AD1-148*	*4.54*
936771	*AD2-100 C O1*	*8.28*
936772	*AD2-100 E O1*	*5.52*
936971	*AD2-131 C*	*0.55*
936972	*AD2-131 E*	*2.74*
937211	*AD2-159 C*	*3.77*
937212	*AD2-159 E*	*17.66*
274654	*BRAIDWOOD;1U*	*104.21*
274890	*CAYUG;1U E*	*29.24*
274891	*CAYUG;2U E*	*29.24*
274863	*CAYUGA RI;1U*	*1.35*
274864	*CAYUGA RI;2U*	*1.35*
LTF	*CBM-N*	*0.03*
LTF	*CBM-S1*	*3.46*
LTF	*CBM-S2*	*1.72*
LTF	*CBM-W2*	*34.61*
LTF	*CIN*	*3.5*
LTF	*CPLE*	*0.37*
LTF	*G-007A*	*0.48*
LTF	*IPL*	*2.01*
983101	*J339*	*4.15*
951151	*J474 C*	*2.22*
951152	*J474 E*	*8.89*
981031	*J734*	*0.7*
938841	*J826*	*6.65*

LTF	*LGEE*	*0.38*
LTF	*MEC*	*4.69*
LTF	*NYISO*	*0.47*
290261	*S-027 C*	*1.*
290265	*S-028 C*	*1.*
274853	*TWINGROVE;U1*	*21.74*
274854	*TWINGROVE;U2*	*21.74*
LTF	*VFT*	*1.28*
276150	*W2-048 E*	*1.25*
905081	*W4-005 C*	*0.96*
905082	*W4-005 E*	*29.77*
909052	*X2-022 E*	*17.37*
917501	*Z2-087 C*	*4.32*
917502	*Z2-087 E*	*28.92*
924041	*AB2-047 C O1*	*5.4*
924042	*AB2-047 E O1*	*36.15*
924261	*AB2-070 C O1*	*2.56*
924262	*AB2-070 E O1*	*17.12*
925771	*AC1-053 C*	*2.51*
925772	*AC1-053 E*	*16.8*

Appendix 2

(MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 126.23% to 128.04% (AC power flow) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#3128_05EUGENE 345'. This project contributes approximately 26.27 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#3128_05EUGENE 345'
OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1
OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
END

Bus Number	*Bus Name*	*Full Contribution*
932881	*AC2-115 1*	*1.31*
932891	*AC2-115 2*	*1.31*
932921	*AC2-116*	*0.46*
933911	*AD1-013 C O1*	*1.01*
933912	*AD1-013 E O1*	*1.61*
933931	*AD1-016 C*	*0.47*
933932	*AD1-016 E*	*0.77*
934051	*AD1-031 C O1*	*2.37*
934052	*AD1-031 E O1*	*3.87*
934101	*AD1-039 1*	*3.5*
934431	*AD1-067 C*	*0.07*
934432	*AD1-067 E*	*0.3*
934701	*AD1-098 C O1*	*3.83*
934702	*AD1-098 E O1*	*2.8*
934871	*AD1-116 C*	*0.47*
934872	*AD1-116 E*	*0.77*
934971	*AD1-129 C*	*0.48*
934972	*AD1-129 E*	*0.32*
935001	*AD1-133 C O1*	*14.32*
935002	*AD1-133 E O1*	*9.54*
935141	*AD1-148*	*7.47*
936291	*AD2-038 C O1*	*1.84*
936292	*AD2-038 E O1*	*8.63*
936511	*AD2-066 C O1*	*4.84*
936512	*AD2-066 E O1*	*3.23*
936771	*AD2-100 C O1*	*22.64*
936772	*AD2-100 E O1*	*15.1*
936791	*AD2-102 C*	*7.99*

936792	AD2-102 E	5.33
936971	AD2-131 C	1.49
936972	AD2-131 E	7.49
937001	AD2-134 C	1.43
937002	AD2-134 E	5.71
937211	AD2-159 C	4.62
937212	AD2-159 E	21.65
937311	AD2-172 C	1.43
937312	AD2-172 E	1.97
937531	AD2-214 C	3.23
937532	AD2-214 E	2.15
LTF	BIG_CAJUN1 /* 35% REVERSE 4646887 4392735	< 0.01
LTF	BLUEG	5.64
294401	BSHIL;1U E	7.14
294410	BSHIL;2U E	7.14
LTF	CANNELTON	1.2
LTF	CARR	0.33
274890	CAYUG;1U E	10.24
274891	CAYUG;2U E	10.24
LTF	CBM-S1	9.25
LTF	CBM-S2	2.75
LTF	CBM-W1	56.42
LTF	CBM-W2	139.46
LTF	CLIFTY	18.99
LTF	CPLE	0.38
274849	CRESCENT ;1U	3.96
274859	EASYR;U1 E	6.86
274860	EASYR;U2 E	6.86
LTF	ELMERSMITH	3.22
LTF	G-007	0.84
960018	G997 E	-2.87
LTF	GIBSON	1.43
290051	GSG-6; E	5.77
960026	J196 E	5.38
940291	J291	3.22
983101	J339	6.18
940541	J468 C	7.14
940542	J468 E	28.57
951151	J474 C	2.57
951152	J474 E	10.3
951641	J641 C	8.25
951642	J641 E	2.16
951661	J644	9.63
981031	J734	1.04

939811	J750 C	2.73
939812	J750 E	10.94
981361	J756 C	2.99
981362	J756 E	11.98
981581	J757 C	5.24
981582	J757 E	20.96
938391	J808	8.77
938411	J811	17.9
939761	J813	43.37
938791	J815	32.37
938811	J817	10.27
938841	J826	10.78
938941	J845 C	2.26
938942	J845 E	9.04
938971	J848 C	6.8
938972	J848 E	27.22
938451	J853	10.04
939041	J859	9.84
939481	J912	14.34
939741	J949	39.19
274650	KINCAID ;1U	17.77
274651	KINCAID ;2U	17.7
990901	L-005 E	11.23
290108	LEEDK;1U E	12.62
LTF	MEC	44.95
274850	MENDOTA H;RU	2.98
293516	O-009 E1	6.45
293517	O-009 E2	3.27
293518	O-009 E3	3.61
293715	O-029 E	6.89
293716	O-029 E	3.78
293717	O-029 E	3.47
293771	O-035 E	5.23
LTF	O-066	5.39
293644	O22 E1	5.
293645	O22 E2	9.7
290021	O50 E	10.94
294763	P-046 E	5.44
274830	PWR VTREC;1U	3.19
274831	PWR VTREC;2U	3.19
LTF	RENSSELAER	0.26
LTF	ROWAN /* 35% REVERSE 4479078	< 0.01
290261	S-027 C	0.9
290265	S-028 C	0.9
295111	SUBLETTE E	1.5

LTF	*TRIMBLE*	*1.09*
274853	*TWINGROVE;U1*	*19.48*
274854	*TWINGROVE;U2*	*19.48*
276150	*W2-048 E*	*2.06*
905081	*W4-005 C*	*1.18*
905082	*W4-005 E*	*36.49*
274874	*WALNR;2U*	*1.53*
294502	*WALNR;2U E*	*6.11*
LTF	*WEC*	*4.2*
295109	*WESTBROOK E*	*3.09*
909052	*X2-022 E*	*28.6*
915011	*Y3-013 1*	*1.75*
915021	*Y3-013 2*	*1.75*
915031	*Y3-013 3*	*1.75*
916522	*Z1-108 E*	*1.19*
917501	*Z2-087 C*	*2.61*
917502	*Z2-087 E*	*17.48*
918051	*AA1-018 C*	*1.21*
918052	*AA1-018 E*	*8.07*
919221	*AA1-146*	*11.73*
919581	*AA2-030*	*11.73*
920272	*AA2-123 E*	*1.24*
930481	*AB1-089*	*35.77*
930761	*AB1-122 1*	*35.68*
924041	*AB2-047 C O1*	*3.27*
924042	*AB2-047 E O1*	*21.85*
924261	*AB2-070 C O1*	*3.86*
924262	*AB2-070 E O1*	*25.8*
924471	*AB2-096*	*22.14*
925301	*AB2-191 C*	*0.55*
925302	*AB2-191 E*	*0.76*
925581	*AC1-033 C*	*1.17*
925582	*AC1-033 E*	*7.82*
925771	*AC1-053 C*	*3.89*
925772	*AC1-053 E*	*26.04*
927511	*AC1-113 1*	*0.66*
927522	*AC1-113 2*	*0.66*
926431	*AC1-114*	*1.31*
926821	*AC1-168 C*	*0.84*
926822	*AC1-168 E*	*5.66*
926841	*AC1-171 C*	*1.13*
926842	*AC1-171 E*	*7.61*
927531	*AC1-185 1*	*0.43*
927541	*AC1-185 2*	*0.43*
927551	*AC1-185 3*	*0.43*

927561	*AC1-185 4*	*0.43*
927571	*AC1-185 5*	*0.43*
927581	*AC1-185 6*	*0.43*
927591	*AC1-185 7*	*0.43*
927601	*AC1-185 8*	*0.43*
927201	*AC1-214 C*	*1.68*
927202	*AC1-214 E*	*5.34*

Appendix 3

(CE - CE) The AD1-100 TAP-BRAIDWOOD; B 345 kV line (from bus 934730 to bus 270670 ckt 1) loads from 134.3% to 137.05% (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 37.13 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 270926 CKT 1 / AD1-100 - WILTON
END

Bus Number	*Bus Name*	*Full Contribution*
934721	*AD1-100 C*	*104.33*
934722	*AD1-100 E*	*486.86*
935001	*AD1-133 C O1*	*26.18*
935002	*AD1-133 E O1*	*17.45*
935141	*AD1-148*	*7.86*
936771	*AD2-100 C O1*	*14.35*
936772	*AD2-100 E O1*	*9.57*
936971	*AD2-131 C*	*0.95*
936972	*AD2-131 E*	*4.75*
937211	*AD2-159 C*	*6.53*
937212	*AD2-159 E*	*30.59*
LTF	*BIG_CAJUN1 /* 35% REVERSE 4646887 4392735*	*< 0.01*
274890	*CAYUG;1U E*	*50.52*
274891	*CAYUG;2U E*	*50.52*
274863	*CAYUGA RI;1U*	*2.33*
274864	*CAYUGA RI;2U*	*2.33*
LTF	*CBM-N*	*0.11*
LTF	*CBM-S1*	*6.45*
LTF	*CBM-S2*	*3.53*
LTF	*CBM-W2*	*61.44*
LTF	*CIN*	*6.52*
LTF	*CPLE*	*0.78*
LTF	*G-007A*	*1.44*
LTF	*IPL*	*3.79*
983101	*J339*	*7.23*
951151	*J474 C*	*3.85*
951152	*J474 E*	*15.39*

951661	*J644*	*7.94*
981031	*J734*	*1.22*
939811	*J750 C*	*2.7*
939812	*J750 E*	*10.81*
981361	*J756 C*	*3.23*
981362	*J756 E*	*12.91*
981581	*J757 C*	*4.34*
981582	*J757 E*	*17.34*
938791	*J815*	*21.48*
938841	*J826*	*11.58*
938941	*J845 C*	*2.25*
938942	*J845 E*	*9.*
938971	*J848 C*	*4.23*
938972	*J848 E*	*16.9*
939481	*J912*	*8.12*
274650	*KINCAID ;1U*	*12.28*
274651	*KINCAID ;2U*	*12.23*
LTF	*LGEE*	*0.78*
LTF	*MEC*	*7.01*
LTF	*NYISO*	*1.67*
LTF	*ROWAN /* 35% REVERSE 4479078*	*< 0.01*
290261	*S-027 C*	*1.73*
290265	*S-028 C*	*1.73*
274853	*TWINGROVE;U1*	*37.65*
274854	*TWINGROVE;U2*	*37.65*
LTF	*VFT*	*3.88*
276150	*W2-048 E*	*2.16*
905081	*W4-005 C*	*1.66*
905082	*W4-005 E*	*51.56*
909052	*X2-022 E*	*30.06*
917501	*Z2-087 C*	*7.48*
917502	*Z2-087 E*	*50.08*
924041	*AB2-047 C O1*	*9.35*
924042	*AB2-047 E O1*	*62.6*
924261	*AB2-070 C O1*	*4.43*
924262	*AB2-070 E O1*	*29.64*
925771	*AC1-053 C*	*4.35*
925772	*AC1-053 E*	*29.08*

Appendices (Light Load)

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

(CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 99.78% to 100.95% (**DC 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 16.23 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*
934431	*AD1-067 C*	*0.12*
934432	*AD1-067 E*	*0.52*
934721	*AD1-100 C*	*26.88*
934722	*AD1-100 E*	*125.84*
936291	*AD2-038 C O1*	*2.22*
936292	*AD2-038 E O1*	*14.82*
936371	*AD2-047 C O1*	*2.2*
936372	*AD2-047 E O1*	*23.63*
937001	*AD2-134 C*	*2.43*
937002	*AD2-134 E*	*9.71*
937211	*AD2-159 C*	*2.86*
937212	*AD2-159 E*	*13.38*
274857	*BIG SKY ;U1*	*1.29*
274858	*BIG SKY ;U2*	*1.29*
274877	*BISHOP HL;1U*	*1.01*
274878	*BISHOP HL;2U*	*1.01*
294401	*BSHIL;1U E*	*4.04*
294410	*BSHIL;2U E*	*4.04*
274848	*CAMPGROVE;RU*	*1.49*
274890	*CAYUG;1U E*	*7.83*
274891	*CAYUG;2U E*	*7.83*
274863	*CAYUGA RI;1U*	*1.96*
274864	*CAYUGA RI;2U*	*1.96*
274849	*CRESCENT ;1U*	*2.78*
274859	*EASYR;U1 E*	*5.15*

274860	*EASYR;U2 E*	*5.15*
274856	*ECOGROVE ;U1*	*1.1*
274871	*GR RIDGE ;2U*	*2.38*
274847	*GR RIDGE ;BU*	*1.87*
274855	*GSG-6 ;RU*	*1.23*
290051	*GSG-6; E*	*4.91*
275149	*KEMPTON ;1E*	*9.04*
990901	*L-005 E*	*5.95*
274872	*LEE DEKAL;1U*	*2.74*
290108	*LEEDK;1U E*	*11.41*
274850	*MENDOTA H;RU*	*2.82*
274879	*MINONK ;1U*	*2.28*
293061	*N-015 E*	*7.5*
293513	*O-009 C1*	*1.07*
293514	*O-009 C2*	*0.54*
293515	*O-009 C3*	*0.6*
293516	*O-009 E1*	*4.29*
293517	*O-009 E2*	*2.18*
293518	*O-009 E3*	*2.4*
293712	*O-029 C*	*1.14*
293713	*O-029 C*	*0.63*
293714	*O-029 C*	*0.58*
293715	*O-029 E*	*4.58*
293716	*O-029 E*	*2.51*
293717	*O-029 E*	*2.31*
293771	*O-035 E*	*3.03*
293644	*O22 E1*	*4.83*
293645	*O22 E2*	*9.37*
290021	*O50 E*	*9.1*
294392	*P-010 E*	*9.52*
294763	*P-046 E*	*4.38*
274888	*PILOT HIL;1E*	*9.04*
274887	*PILOT HIL;1U*	*2.26*
274881	*PLEAS RDG;2U*	*2.26*
274851	*PROVIDENC;RU*	*0.76*
274662	*QUAD CITI;1U*	*115.18*
274663	*QUAD CITI;2U*	*115.24*
290261	*S-027 C*	*1.95*
290265	*S-028 C*	*1.95*
295110	*SUBLETTE C*	*0.18*
295111	*SUBLETTE E*	*1.28*
274861	*TOP CROP ;1U*	*1.21*
274862	*TOP CROP ;2U*	*2.34*
274853	*TWINGROVE;U1*	*7.8*
274854	*TWINGROVE;U2*	*7.8*

905082	*W4-005 E*	*22.54*
274874	*WALNR;2U*	*2.24*
294502	*WALNR;2U E*	*8.96*
295108	*WESTBROOK C*	*0.4*
295109	*WESTBROOK E*	*2.63*
916211	*Z1-072*	*0.51*
916221	*Z1-073*	*0.34*
917501	*Z2-087 C*	*1.48*
917502	*Z2-087 E*	*19.81*
918051	*AA1-018 C*	*2.32*
918052	*AA1-018 E*	*15.49*
920272	*AA2-123 E*	*2.86*
924041	*AB2-047 C O1*	*3.65*
924042	*AB2-047 E O1*	*24.43*
925301	*AB2-191 C*	*1.18*
925302	*AB2-191 E*	*1.62*
925581	*AC1-033 C*	*1.32*
925582	*AC1-033 E*	*8.87*
926821	*AC1-168 C O1*	*1.09*
926822	*AC1-168 E O1*	*7.34*
926841	*AC1-171 C O1*	*0.94*
926842	*AC1-171 E O1*	*6.3*
927202	*AC1-214 E O1*	*6.18*

Appendix 2

(CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 111.77% to 112.43% (**DC 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 16.23 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*
934431	*AD1-067 C*	*0.12*
934432	*AD1-067 E*	*0.52*
934721	*AD1-100 C*	*26.88*
934722	*AD1-100 E*	*125.84*
935141	*AD1-148*	*3.78*
936291	*AD2-038 C O1*	*2.22*
936292	*AD2-038 E O1*	*14.82*
936371	*AD2-047 C O1*	*2.2*
936372	*AD2-047 E O1*	*23.63*
936972	*AD2-131 E O1*	*3.92*
937001	*AD2-134 C*	*2.43*
937002	*AD2-134 E*	*9.71*
937211	*AD2-159 C*	*2.86*
937212	*AD2-159 E*	*13.38*
274857	*BIG SKY ;U1*	*1.29*
274858	*BIG SKY ;U2*	*1.29*
274877	*BISHOP HL;1U*	*1.01*
274878	*BISHOP HL;2U*	*1.01*
294401	*BSHIL;1U E*	*4.04*
294410	*BSHIL;2U E*	*4.04*
274848	*CAMPGROVE;RU*	*1.49*
274890	*CAYUG;1U E*	*7.83*
274891	*CAYUG;2U E*	*7.83*
274863	*CAYUGA RI;1U*	*1.96*
274864	*CAYUGA RI;2U*	*1.96*

274849	*CRESCENT ;1U*	*2.78*
274859	*EASYR;U1 E*	*5.15*
274860	*EASYR;U2 E*	*5.15*
274856	*ECOGROVE ;U1*	*1.1*
274871	*GR RIDGE ;2U*	*2.38*
274847	*GR RIDGE ;BU*	*1.87*
274855	*GSG-6 ;RU*	*1.23*
290051	*GSG-6; E*	*4.91*
937751	*H008*	*2.36*
937881	*H071*	*0.34*
937801	*J112*	*0.33*
938091	*J395*	*7.79*
938111	*J407*	*12.06*
938131	*J416*	*12.24*
938231	*J443*	*2.71*
938241	*J449*	*12.89*
938691	*J614*	*4.23*
939261	*J715*	*1.67*
939262	*J715 E*	*6.66*
939861	*J844*	*4.33*
939862	*J844 E*	*17.31*
939571	*J855*	*1.24*
939572	*J855 E*	*4.98*
939721	*J898*	*1.28*
939722	*J898 E*	*5.13*
939771	*J926*	*1.36*
939772	*J926 E*	*5.45*
939791	*J928*	*1.34*
939792	*J928 E*	*5.34*
275149	*KEMPTON ;1E*	*9.04*
990901	*L-005 E*	*5.95*
274872	*LEE DEKAL;1U*	*2.74*
290108	*LEEDK;1U E*	*11.41*
274850	*MENDOTA H;RU*	*2.82*
274879	*MINONK ;1U*	*2.28*
293061	*N-015 E*	*7.5*
293513	*O-009 C1*	*1.07*
293514	*O-009 C2*	*0.54*
293515	*O-009 C3*	*0.6*
293516	*O-009 E1*	*4.29*
293517	*O-009 E2*	*2.18*
293518	*O-009 E3*	*2.4*
293712	*O-029 C*	*1.14*
293713	*O-029 C*	*0.63*
293714	*O-029 C*	*0.58*

293715	*O-029 E*	*4.58*
293716	*O-029 E*	*2.51*
293717	*O-029 E*	*2.31*
293771	*O-035 E*	*3.03*
293644	*O22 E1*	*4.83*
293645	*O22 E2*	*9.37*
290021	*O50 E*	*9.1*
294392	*P-010 E*	*9.52*
294763	*P-046 E*	*4.38*
274888	*PILOT HIL;1E*	*9.04*
274887	*PILOT HIL;1U*	*2.26*
274881	*PLEAS RDG;2U*	*2.26*
274851	*PROVIDENC;RU*	*0.76*
274662	*QUAD CITI;1U*	*115.18*
274663	*QUAD CITI;2U*	*115.24*
290261	*S-027 C*	*1.95*
290265	*S-028 C*	*1.95*
295110	*SUBLETTE C*	*0.18*
295111	*SUBLETTE E*	*1.28*
274861	*TOP CROP ;1U*	*1.21*
274862	*TOP CROP ;2U*	*2.34*
274853	*TWINGROVE;U1*	*7.8*
274854	*TWINGROVE;U2*	*7.8*
276150	*W2-048 E*	*1.04*
905082	*W4-005 E*	*22.54*
274874	*WALNR;2U*	*2.24*
294502	*WALNR;2U E*	*8.96*
295108	*WESTBROOK C*	*0.4*
295109	*WESTBROOK E*	*2.63*
909052	*X2-022 E*	*14.46*
916211	*Z1-072*	*0.51*
916221	*Z1-073*	*0.34*
917501	*Z2-087 C*	*1.48*
917502	*Z2-087 E*	*19.81*
918051	*AA1-018 C*	*2.32*
918052	*AA1-018 E*	*15.49*
920272	*AA2-123 E*	*2.86*
924041	*AB2-047 C O1*	*3.65*
924042	*AB2-047 E O1*	*24.43*
924261	*AB2-070 C O1*	*2.07*
924262	*AB2-070 E O1*	*13.84*
925301	*AB2-191 C*	*1.18*
925302	*AB2-191 E*	*1.62*
925581	*AC1-033 C*	*1.32*
925582	*AC1-033 E*	*8.87*

925771	*AC1-053 C*	*2.05*
925772	*AC1-053 E*	*13.71*
926821	*AC1-168 C O1*	*1.09*
926822	*AC1-168 E O1*	*7.34*
926841	*AC1-171 C O1*	*0.94*
926842	*AC1-171 E O1*	*6.3*
927202	*AC1-214 E O1*	*6.18*

Appendix 3

(CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 114.2% to 114.87% (**DC 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 16.56 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*
934431	*AD1-067 C*	*0.13*
934432	*AD1-067 E*	*0.53*
934721	*AD1-100 C*	*27.41*
934722	*AD1-100 E*	*128.33*
935141	*AD1-148*	*3.85*
936291	*AD2-038 C O1*	*2.26*
936292	*AD2-038 E O1*	*15.15*
936371	*AD2-047 C O1*	*2.24*
936372	*AD2-047 E O1*	*24.13*
936972	*AD2-131 E O1*	*4.*
937001	*AD2-134 C*	*2.48*
937002	*AD2-134 E*	*9.91*
937211	*AD2-159 C*	*2.92*
937212	*AD2-159 E*	*13.65*
274857	*BIG SKY ;U1*	*1.32*
274858	*BIG SKY ;U2*	*1.32*
274877	*BISHOP HL;1U*	*1.03*
274878	*BISHOP HL;2U*	*1.03*
294401	*BSHIL;1U E*	*4.13*
294410	*BSHIL;2U E*	*4.13*
274848	*CAMPGROVE;RU*	*1.52*
274890	*CAYUG;1U E*	*7.99*
274891	*CAYUG;2U E*	*7.99*
274863	*CAYUGA RI;1U*	*2.*
274864	*CAYUGA RI;2U*	*2.*

274849	*CRESCENT ;1U*	*2.84*
274859	*EASYR;U1 E*	*5.26*
274860	*EASYR;U2 E*	*5.26*
274856	*ECOGROVE ;U1*	*1.12*
274871	*GR RIDGE ;2U*	*2.43*
274847	*GR RIDGE ;BU*	*1.91*
274855	*GSG-6 ;RU*	*1.25*
290051	*GSG-6; E*	*5.01*
937751	*H008*	*2.41*
937801	*J112*	*0.33*
938091	*J395*	*7.96*
938111	*J407*	*9.71*
938131	*J416*	*12.5*
938231	*J443*	*2.77*
938241	*J449*	*13.16*
938691	*J614*	*4.32*
939261	*J715*	*1.7*
939262	*J715 E*	*6.8*
939861	*J844*	*4.42*
939862	*J844 E*	*17.68*
939571	*J855*	*1.27*
939572	*J855 E*	*5.08*
939721	*J898*	*1.31*
939722	*J898 E*	*5.24*
939771	*J926*	*1.39*
939772	*J926 E*	*5.57*
939791	*J928*	*1.36*
939792	*J928 E*	*5.45*
275149	*KEMPTON ;1E*	*9.23*
990901	*L-005 E*	*6.07*
274872	*LEE DEKAL;1U*	*2.8*
290108	*LEEDK;1U E*	*11.65*
274850	*MENDOTA H;RU*	*2.88*
274879	*MINONK ;1U*	*2.32*
293061	*N-015 E*	*7.65*
293513	*O-009 C1*	*1.09*
293514	*O-009 C2*	*0.55*
293515	*O-009 C3*	*0.61*
293516	*O-009 E1*	*4.38*
293517	*O-009 E2*	*2.22*
293518	*O-009 E3*	*2.45*
293712	*O-029 C*	*1.17*
293713	*O-029 C*	*0.64*
293714	*O-029 C*	*0.59*
293715	*O-029 E*	*4.68*

293716	*O-029 E*	*2.57*
293717	*O-029 E*	*2.36*
293771	*O-035 E*	*3.09*
293644	*O22 E1*	*4.93*
293645	*O22 E2*	*9.57*
290021	*O50 E*	*9.3*
294392	*P-010 E*	*9.72*
294763	*P-046 E*	*4.48*
274888	*PILOT HIL;1E*	*9.23*
274887	*PILOT HIL;1U*	*2.31*
274881	*PLEAS RDG;2U*	*2.31*
274851	*PROVIDENC;RU*	*0.77*
274662	*QUAD CITI;1U*	*117.62*
274663	*QUAD CITI;2U*	*117.69*
290261	*S-027 C*	*1.99*
290265	*S-028 C*	*1.99*
295110	*SUBLETTE C*	*0.18*
295111	*SUBLETTE E*	*1.3*
274861	*TOP CROP ;1U*	*1.23*
274862	*TOP CROP ;2U*	*2.39*
274853	*TWINGROVE;U1*	*7.95*
274854	*TWINGROVE;U2*	*7.95*
276150	*W2-048 E*	*1.06*
905082	*W4-005 E*	*23.*
274874	*WALNR;2U*	*2.29*
294502	*WALNR;2U E*	*9.15*
295108	*WESTBROOK C*	*0.41*
295109	*WESTBROOK E*	*2.68*
909052	*X2-022 E*	*14.75*
916211	*Z1-072*	*0.52*
916221	*Z1-073*	*0.34*
917501	*Z2-087 C*	*1.51*
917502	*Z2-087 E*	*20.21*
918051	*AA1-018 C*	*2.37*
918052	*AA1-018 E*	*15.83*
920272	*AA2-123 E*	*2.92*
924041	*AB2-047 C O1*	*3.72*
924042	*AB2-047 E O1*	*24.92*
924261	*AB2-070 C O1*	*2.11*
924262	*AB2-070 E O1*	*14.13*
925301	*AB2-191 C*	*1.2*
925302	*AB2-191 E*	*1.66*
925581	*AC1-033 C*	*1.35*
925582	*AC1-033 E*	*9.06*
925771	*AC1-053 C*	*2.09*

925772	*AC1-053 E*	*13.99*
926821	*AC1-168 C O1*	*1.12*
926822	*AC1-168 E O1*	*7.49*
926841	*AC1-171 C O1*	*0.96*
926842	*AC1-171 E O1*	*6.43*
927202	*AC1-214 E O1*	*6.31*

Appendix 4

(CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 104.16% to 105.36% (**DC 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 16.56 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*
934431	*AD1-067 C*	*0.13*
934432	*AD1-067 E*	*0.53*
934721	*AD1-100 C*	*27.41*
934722	*AD1-100 E*	*128.33*
936291	*AD2-038 C O1*	*2.26*
936292	*AD2-038 E O1*	*15.15*
936371	*AD2-047 C O1*	*2.24*
936372	*AD2-047 E O1*	*24.13*
937001	*AD2-134 C*	*2.48*
937002	*AD2-134 E*	*9.91*
937211	*AD2-159 C*	*2.92*
937212	*AD2-159 E*	*13.65*
274857	*BIG SKY ;U1*	*1.32*
274858	*BIG SKY ;U2*	*1.32*
274877	*BISHOP HL;1U*	*1.03*
274878	*BISHOP HL;2U*	*1.03*
294401	*BSHIL;1U E*	*4.13*
294410	*BSHIL;2U E*	*4.13*
274848	*CAMPGROVE;RU*	*1.52*
274890	*CAYUG;1U E*	*7.99*
274891	*CAYUG;2U E*	*7.99*
274863	*CAYUGA RI;1U*	*2.*
274864	*CAYUGA RI;2U*	*2.*
274849	*CRESCENT ;1U*	*2.84*
274859	*EASYR;U1 E*	*5.26*

274860	*EASYR;U2 E*	*5.26*
274856	*ECOGROVE ;U1*	*1.12*
274871	*GR RIDGE ;2U*	*2.43*
274847	*GR RIDGE ;BU*	*1.91*
274855	*GSG-6 ;RU*	*1.25*
290051	*GSG-6; E*	*5.01*
275149	*KEMPTON ;1E*	*9.23*
990901	*L-005 E*	*6.07*
274872	*LEE DEKAL;1U*	*2.8*
290108	*LEEDK;1U E*	*11.65*
274850	*MENDOTA H;RU*	*2.88*
274879	*MINONK ;1U*	*2.32*
293061	*N-015 E*	*7.65*
293513	*O-009 C1*	*1.09*
293514	*O-009 C2*	*0.55*
293515	*O-009 C3*	*0.61*
293516	*O-009 E1*	*4.38*
293517	*O-009 E2*	*2.22*
293518	*O-009 E3*	*2.45*
293712	*O-029 C*	*1.17*
293713	*O-029 C*	*0.64*
293714	*O-029 C*	*0.59*
293715	*O-029 E*	*4.68*
293716	*O-029 E*	*2.57*
293717	*O-029 E*	*2.36*
293771	*O-035 E*	*3.09*
293644	*O22 E1*	*4.93*
293645	*O22 E2*	*9.57*
290021	*O50 E*	*9.3*
294392	*P-010 E*	*9.72*
294763	*P-046 E*	*4.48*
274888	*PILOT HIL;1E*	*9.23*
274887	*PILOT HIL;1U*	*2.31*
274881	*PLEAS RDG;2U*	*2.31*
274851	*PROVIDENC;RU*	*0.77*
274662	*QUAD CITI;1U*	*117.62*
274663	*QUAD CITI;2U*	*117.69*
290261	*S-027 C*	*1.99*
290265	*S-028 C*	*1.99*
295110	*SUBLETTE C*	*0.18*
295111	*SUBLETTE E*	*1.3*
274861	*TOP CROP ;1U*	*1.23*
274862	*TOP CROP ;2U*	*2.39*
274853	*TWINGROVE;U1*	*7.95*
274854	*TWINGROVE;U2*	*7.95*

905082	*W4-005 E*	*23.*
274874	*WALNR;2U*	*2.29*
294502	*WALNR;2U E*	*9.15*
295108	*WESTBROOK C*	*0.41*
295109	*WESTBROOK E*	*2.68*
916211	*Z1-072*	*0.52*
916221	*Z1-073*	*0.34*
917501	*Z2-087 C*	*1.51*
917502	*Z2-087 E*	*20.21*
918051	*AA1-018 C*	*2.37*
918052	*AA1-018 E*	*15.83*
920272	*AA2-123 E*	*2.92*
924041	*AB2-047 C O1*	*3.72*
924042	*AB2-047 E O1*	*24.92*
924261	*AB2-070 C O1*	*2.11*
924262	*AB2-070 E O1*	*14.13*
925301	*AB2-191 C*	*1.2*
925302	*AB2-191 E*	*1.66*
925581	*AC1-033 C*	*1.35*
925582	*AC1-033 E*	*9.06*
925771	*AC1-053 C*	*2.09*
925772	*AC1-053 E*	*13.99*
926821	*AC1-168 C O1*	*1.12*
926822	*AC1-168 E O1*	*7.49*
926841	*AC1-171 C O1*	*0.96*
926842	*AC1-171 E O1*	*6.43*
927202	*AC1-214 E O1*	*6.31*

Appendix 5

(AREA14 - CE) The AD2-137 TAP-WILTON ; B 345 kV line (from bus 937030 to bus 270926 ckt 1) loads from 110.87% to 111.91% (AC power flow) of its emergency rating (1528 MVA) for the tower line contingency outage of 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S'. This project contributes approximately 17.63 MW to the thermal violation.

CONTINGENCY 'COMED_P7_345-L2001__B-S_+_345-L2003__R-S'
TRIP BRANCH FROM BUS 270670 TO BUS 270728 CKT 1 / BRAID; B 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*
934721	*AD1-100 C*	*47.83*
934722	*AD1-100 E*	*223.91*
935141	*AD1-148*	*3.74*
936371	*AD2-047 C O1*	*1.78*
936372	*AD2-047 E O1*	*19.12*
936972	*AD2-131 E O1*	*3.33*
937211	*AD2-159 C*	*3.1*
937212	*AD2-159 E*	*14.53*
274890	*CAYUG;1U E*	*12.06*
274891	*CAYUG;2U E*	*12.06*
274863	*CAYUGA RI;1U*	*3.01*
274864	*CAYUGA RI;2U*	*3.01*
274871	*GR RIDGE ;2U*	*1.81*
274847	*GR RIDGE ;BU*	*1.42*
938541	*J474*	*11.63*
939891	*J750*	*1.71*
939892	*J750 E*	*6.82*
939031	*J756*	*2.15*
939032	*J756 E*	*8.58*
939501	*J826*	*6.71*
939551	*J845*	*1.25*
939552	*J845 E*	*5.*
275149	*KEMPTON ;1E*	*7.32*
293061	*N-015 E*	*5.69*

294392	*P-010 E*	*7.23*
274888	*PILOT HIL;1E*	*7.32*
274887	*PILOT HIL;1U*	*1.83*
274881	*PLEAS RDG;2U*	*1.83*
290261	*S-027 C*	*2.24*
290265	*S-028 C*	*2.24*
274853	*TWINGROVE;U1*	*8.98*
274854	*TWINGROVE;U2*	*8.98*
276150	*W2-048 E*	*1.03*
905082	*W4-005 E*	*24.49*
909052	*X2-022 E*	*14.3*
917501	*Z2-087 C*	*1.79*
917502	*Z2-087 E*	*23.98*
924041	*AB2-047 C O1*	*4.4*
924042	*AB2-047 E O1*	*29.44*
924261	*AB2-070 C O1*	*2.11*
924262	*AB2-070 E O1*	*14.11*
925771	*AC1-053 C*	*2.07*
925772	*AC1-053 E*	*13.84*
926821	*AC1-168 C O1*	*0.49*
926822	*AC1-168 E O1*	*3.28*

Attachment 1: Single Line Diagram