Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AD1-100

Wilton Center—Loretto 345 kV And Braidwood—Davis Creek 345 kV

Revision 2: May 2022
Revision 1: June 2021
Revision 0: December 2019

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.

Cost allocation rules can be found in PJM Manual 14A, Attachment B.

The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.iv. of Schedule H to the Interconnection Service Agreement.

An Interconnection Customer entering the New Services Queue on or after October 1, 2012 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.

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.

General

Queue AD1-100 project is an Illinois Generation LLC ("Illinois Generation") proposal to connect an 850 MW Energy (150 MW Capacity) Wind facility to be located in Ford County, IL. They will be calling the facility Illinois Generation. It is proposed in the Interconnection Request (Attachment N) that the point of interconnection to be studied as a new interconnecting substation looping in the Wilton Center-Loretto 345kV line and one of the Braidwood-Davis Creek 345kV lines (the Blue). Illinois Wind has proposed a service date for this project of September 30, 2020.

Preliminary impacts on the MISO member transmission systems are included in this analysis, and will be continue in the Facilities Study Phase.

Revision History:

Revision 2: May 2022 – Updated report to include retooled loadflow analysis result
Revision 1: June 2021 – Updated report to include retooled loadflow analysis results.
Revision 0: December 2019

Point of Interconnection

The PJM Queue Position AD1-100, an 850 MW wind farm, proposes to interconnect with the ComEd transmission system by tapping into Wilton Center-Loretto 345kV line 11212 and Braidwood-Davis Creek 345kV line 2002.

Network Upgrade Cost Estimates

The AD1-100 project will be responsible for the following costs.

Description	Cost Estimate
Allocation towards System Network Upgrade Costs (PJM Identified - Summer Peak)*	$6,132,054
Allocation towards System Network Upgrade Costs (PJM Identified - Light Load)*	$50,000,000
Total Costs	$56,132,054

*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

Attachment Facilities

The AD1-100 wind farm generator lead interconnection to a new 345kV Interconnection Substation would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one line diagram.
The cost for the attachment facilities is estimated at $1M.

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

Direct Connection Cost Estimate

In order to accommodate interconnection of AD1-100, a new 345kV Interconnection Substation would need to be built looping in the Wilton Center-Loretto 345kV line 11212 and Braidwood-Davis Creek 345kV line 2002.

The scope of work includes installation of eight (8) 345kV circuit breakers in 'breaker-and-a-half' bus configuration to create five line terminations and tie in the Interconnection Substation to Wilton Center-Loretto 345kV line 11212 and Braidwood-Davis Creek 345kV line 2002, as shown in the one line diagram below.

The Interconnection Customer is responsible for constructing all of the facilities on the Interconnection Customer side of the point of interconnection outside of the substation. It will be Interconnection Customer's responsibility to obtain the site for the Interconnection Substation and right-of-way between the Interconnection Substation and the 345kV transmission lines.
In the event that the IC exercises the option to build the interconnecting substation, the IC will be required to construct all interconnection facilities that will be turned over to ComEd in accordance with ComEd published standards.

ComEd would design, engineer and construct the tie-in of the Interconnection Substation to Wilton Center-Loretto 345kV line 11212 and Braidwood-Davis Creek 345kV line 2002.
The preliminary cost estimate for Direct Connection Network Upgrade is given in the following tables.

For Option to Build Direct Connection cost estimates:

Scope of Work	Cost Estimate
Installation of a new 345kV substation as described above	N/A
Transmission lines tie in work (foundations, structures, conductors)	$6,000,000
ComEd oversight and testing	$2,000,000
Total Cost Estimate (see notes below on cost estimate)	$8,000,000

For ComEd building the interconnecting substation cost estimates:

Scope of Work	Cost Estimate
Installation of a new 345kV substation as described above	$30,000,000
Transmission lines tie in work (foundations, structures, conductors)	$6,000,000
Total Cost Estimate (see notes below on cost estimate)	$36,000,000

ComEd would take approximately 24-months to construct after the ISA / ICSA are signed.

Non-Direct Connection Network Upgrades

The integration of the new 345kV Interconnection Substation would require relay/communications/SCADA upgrades at Wilton Center TSS 112, Loretto TSS 93, Braidwood Station 20 and Davis Creek TSS 86. The ComEd cost is given below:

Scope of Work	Cost Estimate
Relay/communications/SCADA upgrades at Wilton Center TSS 112, Loretto TSS 93, Braidwood Station 20 and Davis Creek TSS 86.	$3,000,000
Total Cost Estimate (see notes below on cost estimate)	$3,000,000

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).

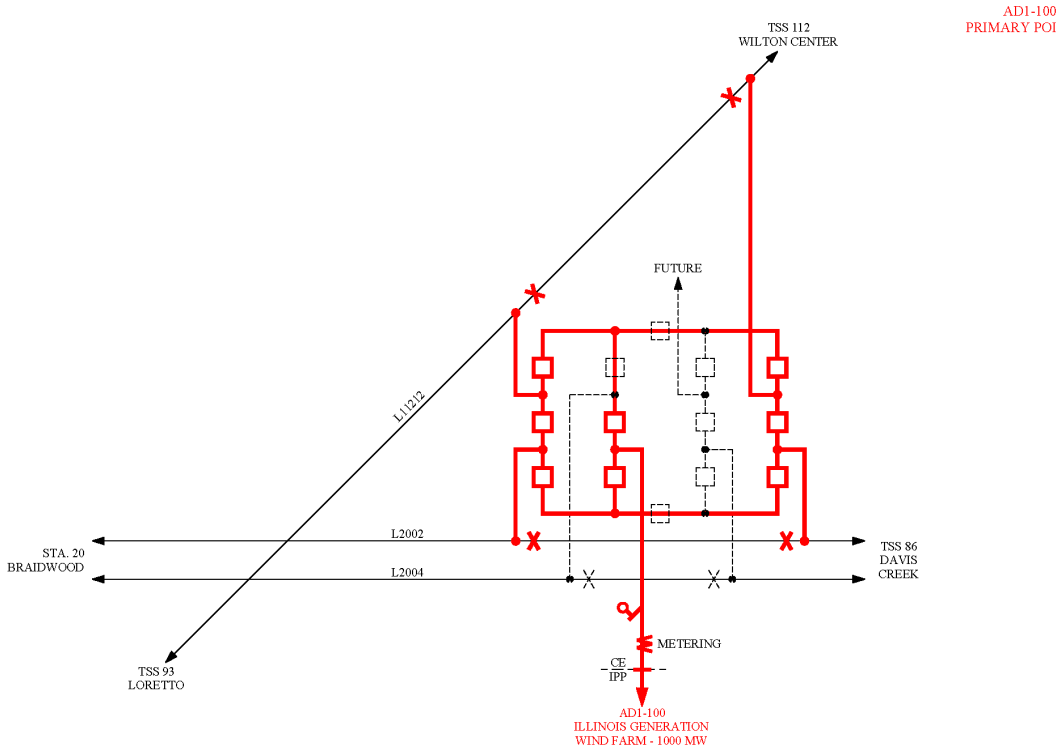

Figure 1. Single Line Diagram 1

Network Impacts

The Queue Project AD1-100 was evaluated as an 850.0 MW (Capacity 150.0 MW) injection tapping both the Wilton Center (Blue) to Loretto 345kV line and the Braidwood (Blue) to Davis Creek (Blue) 345kV line in the ComEd area. Project AD1-100 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-100 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Generator Deliverability

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

None

Multiple Facility Contingency

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

Overload Number	Contingency 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	ADD AD1-100 5	CE - CE	BRAIDWOOD; B-BRAIDWOOD; R 345 kV line	270670	270671	1	AC	82.05	107.26	ER	1341	342.8	1
2	LFFB	ADD AD1-100 5	CE - CE	AD1-100 TAP-BRAIDWOOD; B 345 kV line	934730	270670	1	AC	86.59	128.83	ER	1341	591.2	2

Notes:
Violation 1: ComEd SSTE rating is 1837 MVA (Not a violation)
Violation 2: ComEd SSTE rating is 1837 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 Number	Contingency 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
3	LFFB	AEP_P4_#2978_05DUMONT 765	MISO NIPS - AEP	17STILLWELL-05DUMONT 345 kV line	255113	243219	1	AC	100.31	108.11	ER	1409	128.38	3
4	LFFB	AEP_P4_#3128_05EUGENE 345	MISO AMIL - AEP	7CASEY-05SULLIVAN 345 kV line	346809	247712	1	AC	122.81	125.68	ER	1466	48.55	4

Stability and Steady-State Voltage Requirements

Generator Interconnection Request AD1-100 is for an 850 MW Maximum Facility Output (MFO) wind generating facility consisting of 222 x 3.83 MW General Electric GE3.83-130 wind turbines. AD1-100 has a Point of Interconnection (POI) on a tap of the Braidwood – Davis Creek 345 kV line and Loretto – Wilton Center 345 kV line in the Commonwealth Edison (ComEd) system, Kankakee County, Illinois.

This report describes a dynamic simulation analysis of AD1-100 as part of the overall system impact study.

The load flow scenarios for the analysis were based on the RTEP 2021 summer peak and 2021 RTEP light load cases, modified to include applicable queue projects. AD1-100 has been dispatched online at maximum power output.

AD1-100 was tested for compliance with NERC, PJM, Transmission Owner and other applicable criteria. Steady-state condition and 369 contingencies were studied for each case, each with a 20 second simulation time period. Studied faults included:

a) Steady state operation (20 second);

b) Three-phase faults with normal clearing time during normal operation and during maintenance outages;

c) Three-phase faults with single phase stuck breaker (IPO breakers);

d) Three-phase faults with three phase stuck breaker (GO breakers);

e) Three-phase faults with loss of multi-circuit tower line;

Single-phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end were not considered due to the presence of redundant relays on the ComEd 345 kV transmission network.

No relevant bus or high speed reclosing contingencies were identified.

For all simulations, the queue project under study along with the rest of the PJM system were required to maintain synchronism and with all states returning to an acceptable new condition following the disturbance.

For all of the fault contingencies tested on the 2021 peak load case:

a) AD1-100 was able to ride through the faults (except for faults where protective action trips a generator(s)),

b) Post-contingency oscillations were positively damped with a damping margin of at least 3%.

c) Following fault clearing, all bus voltages recovered to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).

d) No transmission element tripped, other than those either directly connected or designed to trip as a consequence of that fault.

No mitigations were found to be required due to instability, however it was observed that **AD1-100 is deficient in lagging power factor requirement by 116.0 MVAr**. This may need to be addressed through reactive compensation.

Short Circuit

(Summary of impacted circuit breakers)

No violations, or contributions >3% to previously overdutied breakers were identified.

Affected System Analysis & Mitigation

MISO Impacts:

The Preliminary MISO affected system study identified AD1-100 as needing a contingent MISO facility, specifically, MTEP upgrade 2237 which constructs a new Pana – Mt Zion – Kansas – Sugar Creek 345 kV line. The expected completion date of MTEP upgrade 2237 is December 2020. Final MISO impacts to be determined by MISO during the Facilities Study phase.

Summer Peak 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		MW
Number	Type	Name	Affected Area	Facility Description	From	To	Circuit	Power Flow	Initial	Final	Type	MVA	Contribution
5	N-1	COMED_P1-2_695_B2	MISO NIPS - AEP	17STILLWELL-05DUMONT 345 kV line	255113	243219	1	AC	95.93	103.95	NR	1409	132
6	N-1	AEP_P1-2_#286	MISO AMIL - AEP	7CASEY-05SULLIVAN 345 kV line	346809	247712	1	AC	120.3	123.25	NR	1466	50.2
7	N-1	AD1-100B	CE - CE	AD1-100 TAP-WILTON ; B 345 kV line	934720	270926	1	AC	93.45	127.42	ER	1528	537.61
8	N-1	AD1-100B	CE - CE	AD1-133 TAP-DRESDEN ; R 345 kV line	935000	270717	1	AC	92.69	99.5	ER	1528	109.1

Short Circuit Reinforcements

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

None

Stability and Reactive Power Requirement Reinforcement

(Results of the dynamic studies should be inserted here)

None

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)

<table>
<tr><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocation</th><th>Upgrade Number</th></tr>
<tr><td>7CASEY-05SULLIVAN 345 kV Ckt. 1</td><td>AEP Portion:
Project ID: N5808
Description: AEP can eliminate the Eugene 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.
Cost: $5,000,000
Time Estimate: N/A
Ratings: N/A

The cost allocation is as follows:
<table><tr><th>Queue</th><th>MW Contribution</th><th>Cost %</th><th>Cost ($5M)</th></tr><tr><td>AD1-100</td><td>48.55</td><td>100%</td><td>$5,000,000</td></tr></table>
MISO AMEREN Portion:
MISO end SE rating is 1635 MVA.</td><td>$5,000,000</td><td>$5,000,000</td><td>N5808</td></tr>
<tr><td></td><td>Total Cost</td><td>$5,000,000</td><td>$5,000,000</td><td></td></tr>
</table>

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)

<table>
<tr><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocation</th><th>Upgrade Number</th></tr>
<tr><td>17STILLWELL-05DUMONT 345 kV Ckt. 1</td><td>AEP Portion:
<u>Project ID</u>: N4058
<u>Description</u>: Sag study results from Z1-043 & Z1-070 Facilities Studies To 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.

Based on updated Sag study results, the cost to rebuild the entire 8.6 mile section of line if it is deemed necessary is $20M. Sag study time estimate is 6-12 months and the construction time for the rebuild is 2-3 years after execution of the ISA/CSA. PJM Network Upgrade N4058.
<u>Cost:</u> $1,613,000
<u>Time Estimate</u>: N/A
<u>Ratings</u>: 1718 MVA SE

The cost allocation is as follows:
<table>
<tr><th>Queue</th><th>MW Contribution</th><th>Cost %</th><th>Cost ($1.613M)</th></tr>
<tr><td>AD1-098</td><td>13.9</td><td>7.60%</td><td>$122,551</td></tr>
<tr><td>AD1-100</td><td>128.4</td><td>70.18%</td><td>$1,132,054</td></tr>
<tr><td>AD1-133</td><td>40.65</td><td>22.22%</td><td>$358,395</td></tr>
</table>
MISO Portion:
MISO end SE rating is 1779 MVA. No upgrades required.</td><td>$1,613,000</td><td>$1,132,054</td><td>N4058</td></tr>
<tr><td>BRAIDWOOD; B-BRAIDWOOD; R 345 kV Ckt. 1

&

AD1-100 TAP-BRAIDWOOD; B 345 kV Ckt. 1</td><td>ComEd SSTE rating 1837 MVA is sufficient.</td><td>$0</td><td>$0</td><td></td></tr>
<tr><td></td><td>Total Cost</td><td>$1,613,000</td><td>$1,132,054</td><td></td></tr>
</table>

Summer Peak Load Flow Contingencies

Option 1	
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_#2978_05DUMONT 765	CONTINGENCY 'AEP_P4_#2978_05DUMONT 765' OPEN BRANCH FROM BUS 243206 TO BUS 243207 CKT 1 / 243206 05DUMONT 765 05GRNTWN OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 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_695_B2	CONTINGENCY 'COMED_P1-2_695_B2' OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1 END

Summer Peak Load Flow Appendices

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 82.05% to 107.26% (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 342.8 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*
932931	*AC2-117*	*-6.8*
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*	*3.36*
274654	*BRAIDWOOD;1U*	*104.01*
274890	*CAYUG;1U E*	*29.24*
274891	*CAYUG;2U E*	*29.24*
274863	*CAYUGA RI;1U*	*1.34*
274864	*CAYUGA RI;2U*	*1.34*
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*	*2.2*
951152	*J474 E*	*8.78*
981031	*J734*	*0.7*
938841	*J826*	*6.65*
LTF	*LGEE*	*0.38*
LTF	*MEC*	*4.69*
LTF	*NYISO*	*0.46*
LTF	*O-066A*	*0.22*
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*	*2.43*
905081	*W4-005 C*	*0.96*
905082	*W4-005 E*	*29.77*
909052	*X2-022 E*	*17.37*
916512	*Z1-107 E*	*1.18*
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

(CE - CE) The AD1-100 TAP-BRAIDWOOD; B 345 kV line (from bus 934730 to bus 270670 ckt 1) loads from 86.59% to 128.83% (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 591.19 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*
LTF	*AA3-800 /* Q458 (HVDC) /*WITHDRAWN*	*< 0.01*
932931	*AC2-117*	*-3.15*
934721	*AD1-100 C*	*104.33*
934722	*AD1-100 E*	*486.86*
935001	*AD1-133 C O1*	*26.17*
935002	*AD1-133 E O1*	*17.45*
935141	*AD1-148*	*5.82*
274890	*CAYUG;1U E*	*50.52*
274891	*CAYUG;2U E*	*50.52*
274863	*CAYUGA RI;1U*	*2.32*
274864	*CAYUGA RI;2U*	*2.32*
LTF	*CBM-N*	*0.11*
LTF	*CBM-S1*	*6.45*
LTF	*CBM-S2*	*3.53*
LTF	*CBM-W2*	*61.45*
LTF	*CIN*	*6.52*
LTF	*CPLE*	*0.78*
LTF	*G-007A*	*1.44*
LTF	*IPL*	*3.79*
983101	*J339*	*7.23*
951151	*J474 C*	*3.8*
951152	*J474 E*	*15.22*
951661	*J644*	*7.94*
981031	*J734*	*1.22*
939811	*J750 C*	*2.7*
939812	*J750 E*	*10.81*
981361	*J756 C*	*3.59*
981362	*J756 E*	*14.37*

981581	J757 C	4.34
981582	J757 E	17.35
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	12.26
274651	KINCAID ;2U	12.21
LTF	LGEE	0.78
LTF	MEC	7.01
LTF	NYISO	1.67
LTF	O-066A	0.67
290261	S-027 C	1.73
290265	S-028 C	1.73
274853	TWINGROVE;U1	37.64
274854	TWINGROVE;U2	37.64
LTF	VFT	3.88
276150	W2-048 E	4.2
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	29.63
925771	AC1-053 C	4.34
925772	AC1-053 E	29.08

Appendix 3

(MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 100.31% to 108.11% (AC power flow) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 128.4 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
LTF	*AA3-800 /* Q458 (HVDC) /*WITHDRAWN*	*< 0.01*
932881	*AC2-115 1*	*2.77*
932891	*AC2-115 2*	*2.77*
932921	*AC2-116*	*0.97*
932931	*AC2-117*	*5.88*
933411	*AC2-154 C*	*3.06*
933412	*AC2-154 E*	*4.99*
933911	*AD1-013 C O1*	*2.14*
933912	*AD1-013 E O1*	*3.42*
933931	*AD1-016 C*	*1.08*
933932	*AD1-016 E*	*1.76*
934051	*AD1-031 C O1*	*3.32*
934052	*AD1-031 E O1*	*5.42*
934431	*AD1-067 C*	*0.15*
934432	*AD1-067 E*	*0.64*
934701	*AD1-098 C O1*	*8.01*
934702	*AD1-098 E O1*	*5.85*
934721	*AD1-100 C*	*22.66*
934722	*AD1-100 E*	*105.74*
934871	*AD1-116 C*	*1.1*
934872	*AD1-116 E*	*1.8*
934971	*AD1-129 C*	*1.05*
934972	*AD1-129 E*	*0.7*
935001	*AD1-133 C O1*	*24.39*
935002	*AD1-133 E O1*	*16.26*
LTF	*BLUEG*	*0.18*
294401	*BSHIL;1U E*	*10.*

294410	*BSHIL;2U E*	*10.*
LTF	*CARR*	*0.91*
LTF	*CATAWBA*	*0.18*
274890	*CAYUG;1U E*	*16.*
274891	*CAYUG;2U E*	*16.*
LTF	*CBM-S1*	*4.07*
LTF	*CBM-W1*	*73.49*
LTF	*CBM-W2*	*62.85*
LTF	*CIN*	*3.06*
LTF	*CLIFTY*	*8.11*
274849	*CRESCENT ;1U*	*5.64*
274859	*EASYR;U1 E*	*12.83*
274860	*EASYR;U2 E*	*12.83*
LTF	*G-007*	*2.38*
290051	*GSG-6; E*	*12.17*
LTF	*HAMLET*	*0.4*
LTF	*IPL*	*1.31*
940531	*J351*	*434.19*
951131	*J643*	*25.8*
938961	*J847*	*13.13*
275149	*KEMPTON ;1E*	*22.55*
990901	*L-005 E*	*14.7*
290108	*LEEDK;1U E*	*28.26*
LTF	*MEC*	*45.44*
274850	*MENDOTA H;RU*	*6.28*
293061	*N-015 E*	*17.75*
293516	*O-009 E1*	*10.63*
293517	*O-009 E2*	*5.4*
293518	*O-009 E3*	*5.95*
293715	*O-029 E*	*11.37*
293716	*O-029 E*	*6.23*
293717	*O-029 E*	*5.73*
293771	*O-035 E*	*7.46*
LTF	*O-066*	*8.*
293644	*O22 E1*	*12.11*
293645	*O22 E2*	*23.51*
290021	*O50 E*	*22.61*
294392	*P-010 E*	*22.55*
294763	*P-046 E*	*10.94*
274888	*PILOT HIL;1E*	*22.55*
274830	*PWR VTREC;1U*	*7.11*
274831	*PWR VTREC;2U*	*7.11*
LTF	*RENSSELAER*	*0.72*
274789	*SE CHICAG;6U*	*1.38*
274790	*SE CHICAG;7U*	*1.38*

274791	SE CHICAG;8U	1.38
295111	SUBLETTE E	3.17
LTF	TRIMBLE	0.06
274853	TWINGROVE;U1	17.57
274854	TWINGROVE;U2	17.57
299993	U3-031C	6.31
274874	WALNR;2U	2.78
294502	WALNR;2U E	11.14
LTF	WEC	9.33
295109	WESTBROOK E	6.51
910542	X3-005 E	1.01
915011	Y3-013 1	4.37
915021	Y3-013 2	4.37
915031	Y3-013 3	4.37
916502	Z1-106 E1	1.47
916504	Z1-106 E2	1.47
916512	Z1-107 E	3.06
916522	Z1-108 E	2.9
917501	Z2-087 C	3.22
917502	Z2-087 E	21.55
918051	AA1-018 C	2.83
918052	AA1-018 E	18.96
919221	AA1-146	20.53
919581	AA2-030	20.53
920272	AA2-123 E	2.84
930481	AB1-089	76.63
930761	AB1-122 1	83.48
930771	AB1-122 2	86.03
924041	AB2-047 C O1	4.03
924042	AB2-047 E O1	26.94
924471	AB2-096	49.35
925301	AB2-191 C	1.17
925302	AB2-191 E	1.61
925581	AC1-033 C	1.64
925582	AC1-033 E	10.96
926311	AC1-109 1	2.22
926321	AC1-109 2	2.22
926331	AC1-110 1	2.21
926341	AC1-110 2	2.21
926351	AC1-111 1	0.89
926361	AC1-111 2	0.89
926371	AC1-111 3	0.89
926381	AC1-111 4	0.89
926391	AC1-111 5	0.89
926401	AC1-111 6	0.89

927511	*AC1-113 1*	*1.39*
927522	*AC1-113 2*	*1.39*
926431	*AC1-114*	*2.77*
927451	*AC1-142A 1*	*4.89*
927461	*AC1-142A 2*	*4.89*
926821	*AC1-168 C*	*1.35*
926822	*AC1-168 E*	*9.06*
926841	*AC1-171 C*	*1.17*
926842	*AC1-171 E*	*7.83*
927531	*AC1-185 1*	*0.8*
927541	*AC1-185 2*	*0.8*
927551	*AC1-185 3*	*0.8*
927561	*AC1-185 4*	*0.8*
927571	*AC1-185 5*	*0.8*
927581	*AC1-185 6*	*0.8*
927591	*AC1-185 7*	*0.8*
927601	*AC1-185 8*	*0.8*
927091	*AC1-204 1*	*84.29*
927101	*AC1-204 2*	*84.26*
927201	*AC1-214 C*	*2.4*
927202	*AC1-214 E*	*6.37*

Appendix 4

(MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 122.81% to 125.68% (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 48.55 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*
LTF	*AA3-800 /* Q458 (HVDC) /*WITHDRAWN*	*< 0.01*
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*
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*
934721	*AD1-100 C*	*8.57*
934722	*AD1-100 E*	*39.98*
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*	*5.54*
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	9.26
LTF	CBM-S2	2.75
LTF	CBM-W1	56.36
LTF	CBM-W2	139.49
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	3.23
983101	J339	6.18
940541	J468 C	7.14
940542	J468 E	28.58
951151	J474 C	2.63
951152	J474 E	10.51
951641	J641 C	8.26
951642	J641 E	2.16
951661	J644	9.64
981031	J734	1.05
939811	J750 C	2.74
939812	J750 E	10.94
981361	J756 C	3.2
981362	J756 E	12.8
981581	J757 C	5.24
981582	J757 E	20.97
938391	J808	8.77
938411	J811	17.9
939761	J813	39.44
938791	J815	32.38
938811	J817	10.27
938841	J826	10.79
938941	J845 C	2.26
938942	J845 E	9.05
938971	J848 C	6.81
938972	J848 E	27.23
938451	J853	10.05
939041	J859	9.85

939481	J912	14.35
939741	J949	39.2
274650	KINCAID ;1U	17.74
274651	KINCAID ;2U	17.67
990901	L-005 E	11.23
290108	LEEDK;1U E	12.62
LTF	MEC	44.95
274850	MENDOTA H;RU	2.98
293061	N-015 E	6.84
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	2.83
293644	O22 E1	5.
293645	O22 E2	9.7
290021	O50 E	10.94
294392	P-010 E	8.69
294763	P-046 E	5.44
274830	PWR VTREC;1U	3.19
274831	PWR VTREC;2U	3.19
LTF	RENSSELAER	0.26
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	4.
905081	W4-005 C	1.17
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
916502	Z1-106 E1	0.57
916504	Z1-106 E2	0.57
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
930771	AB1-122 2	32.67
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
926311	AC1-109 1	0.84
926321	AC1-109 2	0.84
926331	AC1-110 1	0.85
926341	AC1-110 2	0.85
926351	AC1-111 1	0.34
926361	AC1-111 2	0.34
926371	AC1-111 3	0.34
926381	AC1-111 4	0.34
926391	AC1-111 5	0.34
926401	AC1-111 6	0.34
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*	*4.46*

Light Load Analysis

Network Impacts

The Queue Project AD1-100 was evaluated as an 850.0 MW injection tapping both the Wilton Center (Blue) to Loretto 345kV line and the Braidwood (Blue) to Davis Creek (Blue) 345kV line in the ComEd area. Project AD1-100 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-100 was studied with a commercial probability of 1.0. Potential network impacts were as follows:

Generation Deliverability

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

Overload Number	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
1	N-1	COMED_P1-2_765-L11216__-S	AREA14 - CE	AD1-100 TAP-WILTON; B 345 kV line	934720	270926	1	DC	93.76	107.59	ER	1528	211.32

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
2	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; 765/345 kV transformer	275233	270644	1	DC	93.46	103.05		1379	132.36	1
3	DCTL	COMED_P7_345-L2001__B-S_+_345-L2003__R-S	AREA14 - CE	AD1-100 TAP-WILTON ; B 345 kV line	934720	270926	1	AC	93.25	108.09	ER	1528	231.05	2

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	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
4	DCTL	ATSI-P7-1-TE-138-025T_1	MISO ITCT - FE	19MON12-02LALLENDORF 345 kV line	264612	241901	1	AC	110.49	112.83	ER	1494	41.11	3
5	N-1	ATSI-P1-2-TE-345-605T	MISO ITCT - FE	19MON12-02LALLENDORF 345 kV line	264612	241901	1	AC	101.65	108.15	ER	1494	37.96	
6	LFFB	COMED_P4_112-65-BT5-6__	CE - CE	WILTON ; B-WILTON ;3M 345 kV line	270926	275232	1	DC	105.67	112.25		1379	129.79	4
7	LFFB	COMED_P4_112-65-BT2-3__	CE - CE	WILTON ; R-WILTON ;4M 345 kV line	270927	275233	1	DC	108.0	114.71		1379	132.36	5

Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

None.

System Reinforcements

<table>
<tr><th>Facility</th><th>Upgrade Description</th><th>Cost</th><th>Cost Allocation</th><th>Upgrade Number</th></tr>
<tr><td>AD1-100 TAP-WILTON ; B 345 kV Ckt. 1</td><td>ComEd ratings are sufficient. No upgrades are required.
Com Ed SSTE: 1846 MVA
ComEd ALDR: 2554 MVA</td><td>$0</td><td>$0</td><td></td></tr>
<tr><td>19MON12-02LALLENDORF 345 kV Ckt. 1</td><td><u>ATSI Upgrades:</u>
ATSI end SE rating is 1824 MVA with PJM baseline B2972 (now in service).

<u>MISO Upgrades:</u>
1. MISO end SE Rating is 1348 MVA
2. MISO MTEP Project #13814 (In service 5/1/2020). New ratings. 2000 MVA.

<u>Note:</u> MISO MTEP Project #13814 is a contingent facility for AD1-100 and the status of this MISO project will need to be tracked during the Facilities Study and post ISA (if needed). MISO MTEP #13814 indicated 2000 MVA SE rating.</td><td>$0</td><td>$0</td><td></td></tr>
<tr><td>WILTON ; B-WILTON ;3M 345 kV Ckt. 1

&

WILTON ; R-WILTON ;4M 345 kV Ckt. 1</td><td><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>Cost:</u> $50,000,000 (ComEd increased cost from $12M to $50M).
<u>Time Estimate</u>: 30 Months
<u>Ratings</u>: This will eliminate the stuck breaker contingencies '112-65-BT2-3__' & '112-65- BT5-6__'. No other contingency updates needed.

<table><tr><th>Queue</th><th>MW Contribution</th><th>Cost %</th><th>Cost ($50M)</th></tr><tr><td>AD1-100</td><td>82.2</td><td>100%</td><td>$50,000,000</td></tr></table></td><td>$50,000,000</td><td>$50,000,000</td><td>N5145</td></tr>
<tr><td></td><td>Total Cost</td><td>$50,000,000</td><td>$50,000,000</td><td></td></tr>
</table>

Light Load Contingencies

Contingency Name	Contingency Definition
ATSI-P1-2-TE-345-605T	CONTINGENCY 'ATSI-P1-2-TE-345-605T' /* LINE 02ALLEN-18LENAWEE 345 CK 1 DISCONNECT BRANCH FROM BUS 238530 TO BUS 256583 CKT 1 /* 02ALLEN 345 18LENAWEE 345 END
ATSI-P7-1-TE-138-025T_1	CONTINGENCY 'ATSI-P7-1-TE-138-025T_1' /* ALLEN-MAJ-MONROE & LEMO-MAJESTIC 345KV DISCONNECT BRANCH FROM BUS 264594 TO BUS 256583 CKT 1 /* 19LULU 345 18LENAWEE 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1 /* 19LULU 345 19MILAN 345 DISCONNECT BRANCH FROM BUS 264594 TO BUS 264613 CKT 1 /* 19LULU 345 19MON34 345 DISCONNECT BRANCH FROM BUS 238889 TO BUS 264599 CKT 1 /* 02LEMOYN 345 19MAJTC 345 END
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

Light Load Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 93.46% to 103.05% (**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 132.36 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*	*23.36*
934722	*AD1-100 E*	*109.*
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*	*2.79*
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*	*9.29*
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*	*117.61*
274663	*QUAD CITI;2U*	*117.68*
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*	*7.96*
274854	*TWINGROVE;U2*	*7.96*
905082	*W4-005 E*	*26.98*
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*	*24.93*

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*	*6.44*
927202	*AC1-214 E O1*	*6.31*

Appendix 2

(AREA14 - CE) The AD1-100 TAP-WILTON ; B 345 kV line (from bus 934720 to bus 270926 ckt 1) loads from 93.25% to 108.09% (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 231.05 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*	*40.77*
934722	*AD1-100 E*	*190.28*
935141	*AD1-148*	*3.74*
274890	*CAYUG;1U E*	*12.07*
274891	*CAYUG;2U E*	*12.07*
274863	*CAYUGA RI;1U*	*3.02*
274864	*CAYUGA RI;2U*	*3.02*
274871	*GR RIDGE ;2U*	*1.81*
274847	*GR RIDGE ;BU*	*1.42*
938541	*J474*	*11.61*
939891	*J750*	*1.7*
939892	*J750 E*	*6.78*
939031	*J756*	*2.3*
939032	*J756 E*	*9.2*
939501	*J826*	*6.7*
939551	*J845*	*1.25*
939552	*J845 E*	*4.98*
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*	*2.25*
290265	*S-028 C*	*2.25*
274853	*TWINGROVE;U1*	*9.*
274854	*TWINGROVE;U2*	*9.*
276150	*W2-048 E*	*1.03*
905082	*W4-005 E*	*28.78*
909052	*X2-022 E*	*14.32*
917501	*Z2-087 C*	*1.8*

917502	*Z2-087 E*	*24.06*
924041	*AB2-047 C O1*	*4.41*
924042	*AB2-047 E O1*	*29.53*
924261	*AB2-070 C O1*	*2.11*
924262	*AB2-070 E O1*	*14.14*
925771	*AC1-053 C*	*2.07*
925772	*AC1-053 E*	*13.87*
926821	*AC1-168 C O1*	*0.48*
926822	*AC1-168 E O1*	*3.25*

Appendix 3

(MISO ITCT - FE) The 19MON12-02LALLENDORF 345 kV line (from bus 264612 to bus 241901 ckt 1) loads from 110.49% to 112.83% (AC power flow) of its emergency rating (1494 MVA) for the tower line contingency outage of 'ATSI-P7-1-TE-138-025T_1'. This project contributes approximately 41.11 MW to the thermal violation.

CONTINGENCY 'ATSI-P7-1-TE-138-025T_1' /* ALLEN-MAJ-MONROE & LEMO-MAJESTIC 345KV
DISCONNECT BRANCH FROM BUS 264594 TO BUS 256583 CKT 1 /* 19LULU 345 18LENAWEE 345
DISCONNECT BRANCH FROM BUS 264594 TO BUS 264839 CKT 1 /* 19LULU 345 19MILAN 345
DISCONNECT BRANCH FROM BUS 264594 TO BUS 264613 CKT 1 /* 19LULU 345 19MON34 345
DISCONNECT BRANCH FROM BUS 238889 TO BUS 264599 CKT 1 /* 02LEMOYN 345 19MAJTC 345
END

Bus Number	*Bus Name*	*Full Contribution*
933281	*AC2-140 C*	*2.73*
933282	*AC2-140 E*	*0.14*
934431	*AD1-067 C*	*0.05*
934432	*AD1-067 E*	*0.21*
934721	*AD1-100 C*	*7.25*
934722	*AD1-100 E*	*33.85*
935141	*AD1-148*	*1.97*
938161	*G934*	*22.15*
937891	*J201*	*4.35*
937961	*J246*	*1.41*
938071	*J301*	*25.63*
938001	*J325*	*1.02*
938011	*J327*	*38.09*
938021	*J340*	*25.39*
938051	*J354*	*13.19*
938261	*J466*	*7.36*
938451	*J533*	*32.41*
938781	*J589*	*26.37*
939331	*J701*	*2.31*
939332	*J701 E*	*9.26*
938991	*J717*	*7.79*
938992	*J717 E*	*31.15*
939101	*J728*	*7.79*
939102	*J728*	*31.15*
938851	*J752*	*4.8*
938852	*J752 E*	*19.18*

939241	*J794*	*0.46*
939242	*J794 E*	*1.86*
274662	*QUAD CITI;1U*	*50.67*
274663	*QUAD CITI;2U*	*50.69*
276150	*W2-048 E*	*0.54*
905082	*W4-005 E*	*12.63*
274874	*WALNR;2U*	*0.95*
294502	*WALNR;2U E*	*3.78*
909052	*X2-022 E*	*7.55*
917502	*Z2-087 E*	*7.76*
918051	*AA1-018 C*	*0.93*
918052	*AA1-018 E*	*6.21*
920272	*AA2-123 E*	*1.16*
924041	*AB2-047 C O1*	*1.44*
924042	*AB2-047 E O1*	*9.66*
924261	*AB2-070 C O1*	*1.06*
924262	*AB2-070 E O1*	*7.07*
925301	*AB2-191 C*	*0.48*
925302	*AB2-191 E*	*0.67*
925581	*AC1-033 C*	*0.58*
925582	*AC1-033 E*	*3.87*
925771	*AC1-053 C*	*1.05*
925772	*AC1-053 E*	*7.05*
926821	*AC1-168 C O1*	*0.46*
926822	*AC1-168 E O1*	*3.1*
926841	*AC1-171 C O1*	*0.44*
926842	*AC1-171 E O1*	*2.93*
927202	*AC1-214 E O1*	*2.68*

Appendix 4

(CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 105.67% to 112.25% (**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 129.79 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*	*22.9*
934722	*AD1-100 E*	*106.89*
935141	*AD1-148*	*3.78*
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*
937871	*G858*	*2.23*
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*	*2.33*
937881	*H071*	*2.35*
937801	*J112*	*0.32*
938091	*J395*	*7.69*
938111	*J407*	*11.85*
938131	*J416*	*12.03*

938231	*J443*	*2.67*
938241	*J449*	*12.68*
938691	*J614*	*4.16*
939211	*J628*	*4.3*
939212	*J628 E*	*17.21*
939261	*J715*	*1.65*
939262	*J715 E*	*6.58*
939861	*J844*	*4.27*
939862	*J844 E*	*17.07*
939571	*J855*	*1.22*
939572	*J855 E*	*4.89*
939711	*J897*	*2.15*
939712	*J897 E*	*8.59*
939721	*J898*	*1.26*
939722	*J898 E*	*5.05*
939771	*J926*	*1.34*
939772	*J926 E*	*5.36*
939791	*J928*	*1.32*
939792	*J928 E*	*5.27*
275149	*KEMPTON ;1E*	*9.04*
990901	*L-005 E*	*5.95*
274872	*LEE DEKAL;1U*	*2.74*
290108	*LEEDK;1U E*	*11.4*
274850	*MENDOTA H;RU*	*2.82*
274879	*MINONK ;1U*	*2.27*
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*	*4.28*
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*	*9.09*
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*	*115.16*
274663	*QUAD CITI;2U*	*115.22*
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*	*26.45*
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*	*13.85*
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 5

(CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 108.0% to 114.71% (**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 132.36 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*	*23.36*
934722	*AD1-100 E*	*109.*
935141	*AD1-148*	*3.86*
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*
937871	*G858*	*2.28*
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*	*2.38*
937881	*H071*	*2.4*
937801	*J112*	*0.33*
938091	*J395*	*7.85*
938111	*J407*	*12.1*
938131	*J416*	*12.29*

938231	*J443*	*2.73*
938241	*J449*	*12.95*
938691	*J614*	*4.25*
939211	*J628*	*3.84*
939212	*J628 E*	*15.36*
939261	*J715*	*1.68*
939262	*J715 E*	*6.72*
939861	*J844*	*4.36*
939862	*J844 E*	*17.43*
939571	*J855*	*1.25*
939572	*J855 E*	*4.99*
939711	*J897*	*2.19*
939712	*J897 E*	*8.78*
939721	*J898*	*1.29*
939722	*J898 E*	*5.16*
939771	*J926*	*1.37*
939772	*J926 E*	*5.48*
939791	*J928*	*1.35*
939792	*J928 E*	*5.38*
275149	*KEMPTON ;1E*	*9.23*
990901	*L-005 E*	*6.07*
274872	*LEE DEKAL;1U*	*2.79*
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*	*9.29*
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*	*117.61*
274663	*QUAD CITI;2U*	*117.68*
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*	*7.96*
274854	*TWINGROVE;U2*	*7.96*
276150	*W2-048 E*	*1.06*
905082	*W4-005 E*	*26.98*
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*	*24.93*
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*	*6.44*
927202	*AC1-214 E O1*	*6.31*