



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF2-027
“ZION ENERGY CENTER 345 KV”**

July 2020

1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is ComEd.

2 Preface

The intent of the Feasibility Study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

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.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

3 General

The Interconnection Customer (IC) has proposed a storage addition to an existing natural gas fueled combustion turbine generating facility located in Lake County, Illinois. This project is an increase to the Interconnection Customer's S55 and Y3-013 projects, and will share the same Point of Interconnection. The AF2-027 queue position is a 50 MW uprate (20 MW Capacity uprate) to the previous projects. The total installed facilities will have a capability of 635 MWs Energy with 605 MWs of this output being recognized by PJM as Capacity. The proposed in-service date for this uprate project is June 01, 2021. This study does not imply a TO commitment to this in-service date.

| Queue Number | AF2-027 |
|---------------------|---------------------------|
| Project Name | ZION ENERGY CENTER 345 KV |
| State | Illinois |
| County | Lake |
| Transmission Owner | ComEd |
| MFO | 635 |
| MWE | 50 |
| MWC | 20 |
| Fuel | Storage |
| Basecase Study Year | 2023 |

A new service customer with a generating facility that could be commercially operable prior to June 1st of the basecase study year is required to request an interim deliverability analysis from PJM.

4 Point of Interconnection

AF2-027 will interconnect with the ComEd transmission system as an uprate to Y3-013 and S55 at the Zion Energy Center 345 kV Substation.

5 Cost Summary

The AF2-027 project will be responsible for the following costs:

| Description | Total Cost |
|--------------------------------------|--------------|
| Total Physical Interconnection Costs | \$200,000 |
| Total System Network Upgrade Costs | \$44,300,000 |
| Total Costs | \$44,500,000 |

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.

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

6 Transmission Owner Scope of Work

Attachment Facilities

To accommodate interconnection of AF2-027; the relaying, SCADA, Communication and metering between Zion Energy Battery Storage and TSS 9754 Zion Energy Center would be reviewed and upgraded if needed.

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

| Description | Total Cost |
|---|------------------|
| The relaying, SCADA, Communication and metering between Zion Energy Battery Storage and TSS 9754 Zion Energy Center would be reviewed and upgraded if needed. | \$200,000 |
| Total Physical Interconnection Costs | \$200,000 |

7 Schedule

ComEd would take approximately 18-months to review and possibly upgrade the relaying, SCADA, Communication and metering after the ISA / ICSA are signed.

8 Transmission Owner Analysis

See Section 6.

9 Interconnection Customer Requirements

The Interconnection Customer is responsible for all design and construction related activities on the Interconnection Customer's side of the Point of Interconnection.

10 Revenue Metering and SCADA Requirements

10.1 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.

10.2 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:

ComEd interconnection requirements can be found at <https://www.pjm.com/planning/design-engineering/to-tech-standards/private-comed.aspx>

To the extent that these Applicable Technical Requirements and Standards may conflict with the terms and conditions of the Tariff, the Tariff shall control.

11 Summer Peak - Load Flow Analysis – (Primary and Secondary POIs)

The Queue Project AF2-027 was evaluated as a 50.1 MW (Capacity 20.0 MW) injection as an uprate to Y3-013 and S55 at the Zion Energy Center 345 kV Substation in the ComEd area. Project AF2-027 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF2-027 was studied with a commercial probability of 53.0 %. Potential network impacts were as follows:

11.1 Generation Deliverability

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|-------------|-------|---------------|---------|----------|-------|-------------|--------|-------------------|--------|------------|-----------------------|------------------------|-------|-----------|
| 96062005 | 274750 | CRETE EC;BP | 345.0 | CE | 255112 | 17STJOHN | 345.0 | NIPS | 1 | COMED_P1-2_695_B2 | single | 1399.0 | 99.95 | 100.03 | DC | 2.6 |

11.2 Multiple Facility Contingency

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

None

11.3 Contribution to Previously Identified Overloads

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|-----------------|-------|---------------|---------|----------------|-------|-------------|--------|---|---------|------------|-----------------------|------------------------|-------|-----------|
| 96062968 | 270942 | ZION STATION;OB | 345.0 | CE | 270915 | WAUKEGAN;R | 345.0 | CE | 1 | COMED_P7_345-L2221_R-N+_345-L2222_B-N-B | tower | 1768.0 | 117.13 | 118.32 | DC | 20.99 |
| 96061672 | 274817 | ZION EC;RP | 345.0 | CE | 270807 | LIBERTYVI;R | 345.0 | CE | 1 | COMED_P4_016-45-BT6-11_ | breaker | 1334.0 | 117.09 | 118.78 | DC | 22.55 |
| 96061737 | 699432 | PLS PR1 | 345.0 | WEC | 270941 | ZION STATION;R | 345.0 | CE | 1 | COMED_P4_974-45-BT1-2_ | breaker | 1824.0 | 110.27 | 112.11 | DC | 33.48 |

11.4 Potential Congestion due to Local Energy Deliverability

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

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

| ID | FROM BUS# | FROM BUS | kV | FROM BUS AREA | TO BUS# | TO BUS | kV | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|-------------|-------|---------------|---------|--------------|-------|-------------|--------|---------------------------|-----------|------------|-----------------------|------------------------|-------|-----------|
| 96062147 | 274817 | ZION EC ;RP | 345.0 | CE | 270941 | ZION STA ; R | 345.0 | CE | 1 | COMED_P1-2_345-L2221__R-N | operation | 1201.0 | 117.94 | 119.96 | DC | 24.02 |

11.5 System Reinforcements - Summer Peak Load Flow - Primary POI

| ID | Idx | Facility | Upgrade Description | Cost |
|----------|-----|---|---|--------------|
| 96062005 | 1 | CRETE EC ;BP 345.0 kV - 17STJOHN 345.0 kV Ckt 1 | <p>ComEd N5253 (860) : L94507 SSTE rating is 1483 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to reconductor the line, upgrade station conductor and upgrade a relay package. A preliminary cost estimate is \$14.9 M with an estimated construction timeline of 30 months. Upon completion of this upgrade the new ratings will be 1754/2246/2297/2488 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : \$14,900,000 Time Estimate : 30.0 Months</p> <p>NIPS NonPJMArea (1659) : The external (i.e. Non-PJM) Transmission Owner, NIPS, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months</p> | \$14,900,000 |
| 96061737 | 4 | PLS PR1 345.0 kV - ZION STA ; R 345.0 kV Ckt 1 | <p>WEC NonPJMArea (1659) : The external (i.e. Non-PJM) Transmission Owner, WEC, will not evaluate this violation until the impact study phase. Project Type : FAC Cost : \$0 Time Estimate : N/A Months</p> | \$0 |
| 96061672 | 3 | ZION EC ;RP 345.0 kV - LIBERTYVI; R 345.0 kV Ckt 1 | <p>ComEd CE_NUN_L15423 (928) : ComEd 345kV L15423 SSTE rating is 1391 MVA. The upgrade will be to re-conductor the line along with station conductor work. A preliminary estimate for the upgrades is \$13.2M with an estimated construction timeline of 30 months. Note the estimate does not include potential tower replacement or upgrades. This tower work will add to the estimate provided. Upon completion of the upgrade the ratings will be 1461/1656/1909/1912 MVA (SN/SLTE/SSTE/SLD). Project Type : FAC Cost : \$13,200,000 Time Estimate : 30.0 Months</p> | \$13,200,000 |

| ID | Idx | Facility | Upgrade Description | Cost |
|----------|-----|--|--|---------------------|
| 96062968 | 2 | ZION STA ;0B 345.0 kV - WAUKEGAN ; R 345.0 kV Ckt 1 | <u>ComEd</u> CE_NUN_L2218 (927) : ComEd 345kV L2228 SLD & ALDR ratings are 1768 MVA & 2033 MVA. The upgrade will be to re-conductor the line, replace 3-345kV Circuit Breakers and associated switching equipment at Station 16 Waukegan, replace 1 section of 138kV GIS bus and 1-138kV line disconnect switch. A preliminary estimate for the upgrade is \$16.2M with an estimated construction timeline of 24-30 months. Upon completion of the upgrade the new ratings will be 1334/1726/1837/2084/2397 MVA (SN/SLTE/SSTE/SLD/ALDR). Note that the re-conductor estimate does not include any transmission tower replacement work. This cost will increase the estimate given. Project Type : FAC Cost : \$16,200,000 Time Estimate : 24-30 Months | \$16,200,000 |
| | | | Total System Network Upgrade Costs | \$44,300,000 |

Cost allocations for any System Upgrades will be provided in the System Impact Study Report.

11.6 Flow Gate Details

The following indices contain additional information about each facility presented in the body of the report. For each index, a description of the flowgate and its contingency was included for convenience. The intent of the indices is to provide more details 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 indices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the indices. 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 are Full MW Impact contributions which are also noted in the indices column named "Full MW Impact", whereas the loading percentages reported in the body of the report, take into consideration the PJM Generator Deliverability Test rules such as commercial probability of each project as well as the ramping impact of "Adder" contributions. The MW Impact found and used in the analysis is shown in the indices column named "Gendeliv MW Impact".

11.6.1 Index 1

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|--------------|---------------|---------|----------|-------------|--------|-------------------|--------|------------|-----------------------|------------------------|-------|-----------|
| 96062005 | 274750 | CRETE EC ;BP | CE | 255112 | 17STJOHN | NIPS | 1 | COMED_P1-2_695_B2 | single | 1399.0 | 99.95 | 100.03 | DC | 2.6 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 274654 | BRAIDWOOD;1U | 29.7621 | 80/20 | 29.7621 |
| 274655 | BRAIDWOOD;2U | 28.9549 | 80/20 | 28.9549 |
| 274660 | LASCO STA;1U | 27.3606 | 80/20 | 27.3606 |
| 274661 | LASCO STA;2U | 27.4620 | 80/20 | 27.4620 |
| 274675 | JOLIET 29;7U | 12.4789 | 80/20 | 12.4789 |
| 274676 | JOLIET 29;8U | 12.4869 | 80/20 | 12.4869 |
| 274687 | WILL CNTY;4U | 12.5606 | 80/20 | 12.5606 |
| 274704 | KENDALL ;1C | 4.4134 | 80/20 | 4.4134 |
| 274705 | KENDALL ;1S | 2.9511 | 80/20 | 2.9511 |
| 274706 | KENDALL ;2C | 4.4134 | 80/20 | 4.4134 |
| 274707 | KENDALL ;2S | 2.9511 | 80/20 | 2.9511 |
| 274732 | ELWOOD EC;7P | 3.5779 | 80/20 | 3.5779 |
| 274734 | ELWOOD EC;8P | 3.5779 | 80/20 | 3.5779 |
| 274736 | ELWOOD EC;9P | 3.5779 | 80/20 | 3.5779 |
| 274751 | CRETE EC ;1U | 6.4740 | 80/20 | 6.4740 |
| 274752 | CRETE EC ;2U | 6.4740 | 80/20 | 6.4740 |
| 274753 | CRETE EC ;3U | 6.4740 | 80/20 | 6.4740 |
| 274754 | CRETE EC ;4U | 6.4740 | 80/20 | 6.4740 |
| 274830 | U3-021 1 | 5.3666 | Adder | 6.31 |
| 274831 | U3-021 2 | 5.3666 | Adder | 6.31 |
| 274861 | TOP CROP ;1U | 0.5273 | 80/20 | 0.5273 |
| 274862 | TOP CROP ;2U | 1.0236 | 80/20 | 1.0236 |
| 915011 | Y3-013 1 | 3.3163 | Adder | 3.9 |
| 915021 | Y3-013 2 | 3.3163 | Adder | 3.9 |
| 915031 | Y3-013 3 | 3.3163 | Adder | 3.9 |
| 919581 | AA2-030 | 15.3774 | Adder | 18.09 |
| 924041 | AB2-047 C O1 | 2.8144 | Adder | 3.31 |
| 924471 | AB2-096 | 37.2678 | Adder | 43.84 |
| 925581 | AC1-033 C | 1.2237 | Adder | 1.44 |
| 926311 | AC1-109 1 | 1.6759 | Adder | 1.97 |
| 926321 | AC1-109 2 | 1.6759 | Adder | 1.97 |
| 926331 | AC1-110 1 | 1.6717 | Adder | 1.97 |
| 926341 | AC1-110 2 | 1.6717 | Adder | 1.97 |
| 926351 | AC1-111 1 | 0.6691 | Adder | 0.79 |
| 926361 | AC1-111 2 | 0.6691 | Adder | 0.79 |
| 926371 | AC1-111 3 | 0.6691 | Adder | 0.79 |
| 926381 | AC1-111 4 | 0.6691 | Adder | 0.79 |
| 926391 | AC1-111 5 | 0.6691 | Adder | 0.79 |
| 926401 | AC1-111 6 | 0.6691 | Adder | 0.79 |
| 926431 | AC1-114 | 2.0900 | Adder | 2.46 |
| 926821 | AC1-168 C O1 | 1.0020 | Adder | 1.18 |
| 926841 | AC1-171 C O1 | 0.8988 | Adder | 1.06 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|--------------|--------------------|-------|----------------|
| 927091 | AC1-204 1 | 13.3085 | 80/20 | 13.3085 |
| 927201 | AC1-214 C O1 | 1.7868 | Adder | 2.1 |
| 927451 | AC1-142A 1 | 4.4691 | 80/20 | 4.4691 |
| 927461 | AC1-142A 2 | 4.4720 | 80/20 | 4.4720 |
| 927511 | AC1-113 1 | 1.0450 | Adder | 1.23 |
| 927521 | AC1-113 2 | 1.0450 | Adder | 1.23 |
| 930481 | AB1-089 | 57.7783 | Adder | 67.97 |
| 930501 | AB1-091 O1 | 56.3898 | Adder | 66.34 |
| 930741 | AB1-122 1O1 | 62.4378 | Adder | 73.46 |
| 930751 | AB1-122 2O1 | 66.7535 | Adder | 78.53 |
| 932881 | AC2-115 1 | 2.0900 | Adder | 2.46 |
| 932891 | AC2-115 2 | 2.0900 | Adder | 2.46 |
| 932921 | AC2-116 | 0.7315 | Adder | 0.86 |
| 932931 | AC2-117 | 3.9968 | Adder | 4.7 |
| 933411 | AC2-154 C | 1.9419 | Adder | 2.28 |
| 933431 | AC2-156 C O1 | 0.8355 | Adder | 0.98 |
| 933911 | AD1-013 C | 1.6276 | Adder | 1.91 |
| 933931 | AD1-016 C | 0.8180 | Adder | 0.96 |
| 934051 | AD1-031 C O1 | 2.4848 | Adder | 2.92 |
| 934101 | AD1-039 1 | 6.1189 | Adder | 7.2 |
| 934111 | AD1-039 2 | 6.5418 | Adder | 7.7 |
| 934431 | AD1-067 C | 0.1157 | Adder | 0.14 |
| 934651 | AD1-096 C | 0.7821 | Adder | 0.92 |
| 934701 | AD1-098 C O1 | 6.0622 | Adder | 7.13 |
| 934721 | AD1-100 C | 16.6897 | Adder | 19.63 |
| 934871 | AD1-116 C | 0.7820 | Adder | 0.92 |
| 934971 | AD1-129 C | 0.7950 | Adder | 0.94 |
| 935001 | AD1-133 C O1 | 17.7404 | Adder | 20.87 |
| 936291 | AD2-038 C O1 | 1.9968 | Adder | 2.35 |
| 936371 | AD2-047 C O1 | 3.4749 | Adder | 4.09 |
| 936461 | AD2-060 | 2.0441 | Adder | 2.4 |
| 936511 | AD2-066 C O1 | 7.2962 | Adder | 8.58 |
| 936791 | AD2-102 C | 12.4175 | Adder | 14.61 |
| 937001 | AD2-134 C | 2.4090 | Adder | 2.83 |
| 937311 | AD2-172 C | 2.1588 | Adder | 2.54 |
| 937401 | AD2-194 1 | 7.0523 | Adder | 8.3 |
| 937411 | AD2-194 2 | 7.0395 | Adder | 8.28 |
| 937531 | AD2-214 C | 3.8446 | Adder | 4.52 |
| 938511 | AE1-070 1 | 8.2864 | Adder | 9.75 |
| 938521 | AE1-070 2 | 7.5675 | Adder | 8.9 |
| 938851 | AE1-113 C | 7.1494 | Adder | 8.41 |
| 938861 | AE1-114 C O1 | 3.4449 | Adder | 4.05 |
| 939051 | AE1-134 1 | 1.1949 | Adder | 1.41 |
| 939061 | AE1-134 2 | 1.1949 | Adder | 1.41 |
| 939321 | AE1-163 C O1 | 5.0176 | Adder | 5.9 |
| 939351 | AE1-166 C O1 | 8.9319 | Adder | 10.51 |
| 939401 | AE1-172 C O1 | 4.4112 | Adder | 5.19 |
| 939631 | AE1-193 C | 32.4408 | 80/20 | 32.4408 |
| 939641 | AE1-194 C | 32.4408 | 80/20 | 32.4408 |
| 939651 | AE1-195 C | 32.4408 | 80/20 | 32.4408 |
| 939681 | AE1-198 C | 96.3244 | 80/20 | 96.3244 |
| 939741 | AE1-205 C O1 | 7.2742 | Adder | 8.56 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 940101 | AE1-252 C O1 | 8.8618 | Adder | 10.43 |
| 940501 | AE2-035 C | 2.1588 | Adder | 2.54 |
| 941131 | AE2-107 C | 6.4143 | Adder | 7.55 |
| 941551 | AE2-152 C O1 | 10.3061 | Adder | 12.12 |
| 941561 | AE2-153 C O1 | 4.0993 | Adder | 4.82 |
| 941731 | AE2-173 O1 | 4.3299 | Adder | 5.09 |
| 942111 | AE2-223 C | 1.6887 | Adder | 1.99 |
| 942421 | AE2-255 C O1 | 2.7081 | Adder | 3.19 |
| 942651 | AE2-281 C O1 | 0.7168 | Adder | 0.84 |
| 942991 | AE2-321 C | 7.1996 | Adder | 8.47 |
| 943121 | AE2-341 C | 11.1437 | Adder | 13.11 |
| 943381 | AF1-009 C | 0.5244 | Adder | 0.62 |
| 943401 | AF1-011 C | 1.0862 | Adder | 1.28 |
| 943411 | AF1-012 C | 10.5083 | Adder | 12.36 |
| 943591 | AF1-030 C O1 | 7.4106 | Adder | 8.72 |
| 943801 | AF1-048 C | 3.3656 | Adder | 3.96 |
| 943921 | AF1-060 | 1.0629 | Adder | 1.25 |
| 944041 | AF1-072 | 1.8993 | Adder | 2.23 |
| 944911 | AF1-156 C | 10.4813 | Adder | 12.33 |
| 945351 | AF1-200 FTIR | 270.8585 | Merchant Transmission | 270.8585 |
| 946151 | AF1-280 C O1 | 13.6433 | Adder | 16.05 |
| 946161 | AF1-281 C | 0.2988 | Adder | 0.35 |
| 946321 | AF1-296 C O1 | 3.4272 | Adder | 4.03 |
| 946501 | AF1-314 C | 3.8356 | Adder | 4.51 |
| 946531 | AF1-317 C O1 | 2.0016 | Adder | 2.35 |
| 946541 | AF1-318 C O1 | 5.0108 | Adder | 5.9 |
| 946661 | AF1-330 C | 1.7651 | Adder | 2.08 |
| 946671 | AF1-331 | 2.1138 | Adder | 2.49 |
| 957021 | AF2-003 C O1 | 7.4969 | 80/20 | 7.4969 |
| 957331 | AF2-027 C | 1.1718 | Adder | 2.6 |
| 957471 | AF2-041 C | 9.9416 | Adder | 22.07 |
| 957751 | AF2-069 C | 0.1097 | Adder | 0.24 |
| 957761 | AF2-070 C | 0.1545 | Adder | 0.34 |
| 958011 | AF2-095 C O1 | 7.3663 | Adder | 16.35 |
| 958021 | AF2-096 C O1 | 37.1334 | 80/20 | 37.1334 |
| 958341 | AF2-128 C O1 | 0.7052 | Adder | 1.57 |
| 958481 | AF2-142 C | 4.9084 | Adder | 10.9 |
| 958491 | AF2-143 C | 4.8845 | Adder | 10.84 |
| 958911 | AF2-182 | 9.5005 | Adder | 21.09 |
| 958921 | AF2-183 C | 1.6890 | Adder | 3.75 |
| 959081 | AF2-199 C | 3.3139 | Adder | 7.36 |
| 959091 | AF2-200 C | 6.6278 | Adder | 14.71 |
| 959101 | AF2-201 C O1 | 2.8005 | Adder | 6.22 |
| 959341 | AF2-225 C | 2.8915 | Adder | 6.42 |
| 959351 | AF2-226 C | 2.9970 | 80/20 | 2.9970 |
| 959761 | AF2-267 C O1 | 2.0224 | Adder | 4.49 |
| 960281 | AF2-319 C | 2.9970 | 80/20 | 2.9970 |
| 960381 | AF2-329 | 3.0646 | Adder | 6.8 |
| 960551 | AF2-346 C | 2.3869 | Adder | 5.3 |
| 960581 | AF2-349 C | 10.1841 | Adder | 22.61 |
| 960591 | AF2-350 C O1 | 3.2501 | Adder | 7.21 |
| 960601 | AF2-351 C O1 | 0.4333 | Adder | 0.96 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------------|--------------|---------------------------|---------------|-----------------------|
| 960721 | AF2-363 C O1 | 2.7701 | Adder | 6.15 |
| 960731 | AF2-364 C O1 | 2.8678 | Adder | 6.37 |
| 960751 | AF2-366 C O1 | 3.2370 | Adder | 7.19 |
| 961011 | AF2-392 C O1 | 1.8398 | Adder | 4.08 |
| 961021 | AF2-393 O1 | 3.1360 | Adder | 6.96 |
| 961031 | AF2-394 O1 | 2.0907 | Adder | 4.64 |
| WEC | WEC | 3.8956 | Confirmed LTF | 3.8956 |
| CALDERWOOD | CALDERWOOD | 0.1238 | Confirmed LTF | 0.1238 |
| CBM-W2 | CBM-W2 | 17.6003 | Confirmed LTF | 17.6003 |
| NY | NY | 1.1890 | Confirmed LTF | 1.1890 |
| CBM-W1 | CBM-W1 | 53.7805 | Confirmed LTF | 53.7805 |
| TVA | TVA | 1.0276 | Confirmed LTF | 1.0276 |
| CHEOAH | CHEOAH | 0.1346 | Confirmed LTF | 0.1346 |
| CBM-S1 | CBM-S1 | 3.0928 | Confirmed LTF | 3.0928 |
| MADISON | MADISON | 20.2023 | Confirmed LTF | 20.2023 |
| MEC | MEC | 13.1744 | Confirmed LTF | 13.1744 |
| GIBSON | GIBSON | 0.2550 | Confirmed LTF | 0.2550 |
| BLUEG | BLUEG | 2.3002 | Confirmed LTF | 2.3002 |
| TRIMBLE | TRIMBLE | 0.7763 | Confirmed LTF | 0.7763 |
| CATAWBA | CATAWBA | 0.3241 | Confirmed LTF | 0.3241 |

11.6.2 Index 2

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|--------------|---------------|---------|-------------|-------------|--------|---|-------|------------|-----------------------|------------------------|-------|-----------|
| 96062968 | 270942 | ZION STA ;OB | CE | 270915 | WAUKEGAN ;R | CE | 1 | COMED_P7_345-L2221__R-N+_345-L2222__B-N-B | tower | 1768.0 | 117.13 | 118.32 | DC | 20.99 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|--------------|--------------------|---------------------|----------------|
| 274725 | ZION EC ;1P | 11.9461 | 50/50 | 11.9461 |
| 274726 | ZION EC ;2P | 11.9461 | 50/50 | 11.9461 |
| 274727 | ZION EC ;3P | 11.9461 | 50/50 | 11.9461 |
| 274830 | U3-021 1 | 2.8493 | Adder | 3.35 |
| 274831 | U3-021 2 | 2.8493 | Adder | 3.35 |
| 294763 | P-046 E | 4.2548 | Adder | 5.01 |
| 915011 | Y3-013 1 | 12.5919 | 50/50 | 12.5919 |
| 915021 | Y3-013 2 | 12.5919 | 50/50 | 12.5919 |
| 915031 | Y3-013 3 | 12.5919 | 50/50 | 12.5919 |
| 920272 | AA2-123 E | 0.8770 | Adder | 1.03 |
| 924471 | AB2-096 | 19.7867 | Adder | 23.28 |
| 926431 | AC1-114 | 1.1203 | Adder | 1.32 |
| 927511 | AC1-113 1 | 0.5604 | Adder | 0.66 |
| 927521 | AC1-113 2 | 0.5604 | Adder | 0.66 |
| 932881 | AC2-115 1 | 1.1208 | Adder | 1.32 |
| 932891 | AC2-115 2 | 1.1208 | Adder | 1.32 |
| 932921 | AC2-116 | 0.3921 | Adder | 0.46 |
| 933931 | AD1-016 C | 0.3333 | Adder | 0.39 |
| 933932 | AD1-016 E | 0.5439 | Adder | 0.64 |
| 934651 | AD1-096 C | 0.3421 | Adder | 0.4 |
| 934652 | AD1-096 E | 0.5582 | Adder | 0.66 |
| 934971 | AD1-129 C | 0.3729 | Adder | 0.44 |
| 934972 | AD1-129 E | 0.2486 | Adder | 0.29 |
| 936791 | AD2-102 C | 8.7873 | Adder | 10.34 |
| 936792 | AD2-102 E | 5.8582 | Adder | 6.89 |
| 937311 | AD2-172 C | 1.1169 | Adder | 1.31 |
| 937312 | AD2-172 E | 1.5424 | Adder | 1.81 |
| 938861 | AE1-114 C O1 | 1.5233 | Adder | 1.79 |
| 938862 | AE1-114 E O1 | 5.1972 | Adder | 6.11 |
| 940501 | AE2-035 C | 1.1169 | Adder | 1.31 |
| 940502 | AE2-035 E | 1.5424 | Adder | 1.81 |
| 942991 | AE2-321 C | 2.9688 | Adder | 3.49 |
| 942992 | AE2-321 E | 1.4622 | Adder | 1.72 |
| 943801 | AF1-048 C | 1.3878 | Adder | 1.63 |
| 943802 | AF1-048 E | 0.9252 | Adder | 1.09 |
| 943921 | AF1-060 | 0.5499 | Adder | 0.65 |
| 946501 | AF1-314 C | 1.9844 | Adder | 2.33 |
| 946502 | AF1-314 E | 9.2907 | Adder | 10.93 |
| 946661 | AF1-330 C | 0.7192 | Adder | 0.85 |
| 946662 | AF1-330 E | 0.1579 | Adder | 0.19 |
| 950101 | J390 | 70.1509 | PJM External (MISO) | 70.1509 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|-----------|--------------------|---------------------|----------------|
| 951391 | J505 | 17.7990 | PJM External (MISO) | 17.7990 |
| 952381 | J703 | 20.6177 | PJM External (MISO) | 20.6177 |
| 952391 | J704 | 8.7873 | PJM External (MISO) | 8.7873 |
| 952431 | J760 | 1.6584 | PJM External (MISO) | 1.6584 |
| 952511 | J584 C | 0.8011 | PJM External (MISO) | 0.8011 |
| 952512 | J584 E | 4.3343 | PJM External (MISO) | 4.3343 |
| 953111 | J807 C | 0.7997 | PJM External (MISO) | 0.7997 |
| 953112 | J807 E | 4.3267 | PJM External (MISO) | 4.3267 |
| 953151 | J831 | 8.7160 | PJM External (MISO) | 8.7160 |
| 953331 | J801 | 4.7382 | PJM External (MISO) | 4.7382 |
| 953491 | J947 | 52.1740 | PJM External (MISO) | 52.1740 |
| 953681 | J818 | 17.9381 | PJM External (MISO) | 17.9381 |
| 953691 | J819 C | 1.0668 | PJM External (MISO) | 1.0668 |
| 953692 | J819 E | 5.7714 | PJM External (MISO) | 5.7714 |
| 953701 | J821 C | 1.7825 | PJM External (MISO) | 1.7825 |
| 953702 | J821 E | 9.6440 | PJM External (MISO) | 9.6440 |
| 953891 | J849 | 20.1675 | PJM External (MISO) | 20.1675 |
| 953901 | J850 | 30.1525 | PJM External (MISO) | 30.1525 |
| 953921 | J855 C | 0.8215 | PJM External (MISO) | 0.8215 |
| 953922 | J855 E | 4.4445 | PJM External (MISO) | 4.4445 |
| 954001 | J864 | 3.6620 | PJM External (MISO) | 3.6620 |
| 954061 | J870 | 10.5320 | PJM External (MISO) | 10.5320 |
| 954071 | J871 | 5.2660 | PJM External (MISO) | 5.2660 |
| 954141 | J878 | 44.5540 | PJM External (MISO) | 44.5540 |
| 954191 | J886 | 26.6700 | PJM External (MISO) | 26.6700 |
| 954511 | J926 C | 1.0436 | PJM External (MISO) | 1.0436 |
| 954512 | J926 E | 5.6460 | PJM External (MISO) | 5.6460 |
| 954691 | J732 | 48.5080 | PJM External (MISO) | 48.5080 |
| 954741 | J928 C | 2.0131 | PJM External (MISO) | 2.0131 |
| 954742 | J928 E | 10.8916 | PJM External (MISO) | 10.8916 |
| 955091 | J986 | 18.1898 | PJM External (MISO) | 18.1898 |
| 955241 | J1002 | 12.5829 | PJM External (MISO) | 12.5829 |
| 955251 | J1003 | 6.8830 | PJM External (MISO) | 6.8830 |
| 955301 | J1009 | 131.9520 | PJM External (MISO) | 131.9520 |
| 955311 | J1010 | 213.1040 | PJM External (MISO) | 213.1040 |
| 955321 | J1011 | 213.1040 | PJM External (MISO) | 213.1040 |
| 955581 | J1042 C | 5.0181 | PJM External (MISO) | 5.0181 |
| 955582 | J1042 E | 28.4359 | PJM External (MISO) | 28.4359 |
| 955671 | J1051 | 8.7655 | PJM External (MISO) | 8.7655 |
| 955691 | J1053 | 35.9480 | PJM External (MISO) | 35.9480 |
| 955981 | J1085 C | 4.4343 | PJM External (MISO) | 4.4343 |
| 955982 | J1085 E | 23.9907 | PJM External (MISO) | 23.9907 |
| 956051 | J1092 | 5.9800 | PJM External (MISO) | 5.9800 |
| 956141 | J1101 | 3.5560 | PJM External (MISO) | 3.5560 |
| 956321 | J1121 | 26.8020 | PJM External (MISO) | 26.8020 |
| 956571 | J1153 | 31.2495 | PJM External (MISO) | 31.2495 |
| 956581 | J1154 | 9.0247 | PJM External (MISO) | 9.0247 |
| 956731 | J1171 | 17.2400 | PJM External (MISO) | 17.2400 |
| 956852 | J1183 E | 0.2178 | PJM External (MISO) | 0.2178 |
| 956901 | J1188 | 4.7880 | PJM External (MISO) | 4.7880 |
| 957331 | AF2-027 C | 8.3946 | 50/50 | 8.3946 |
| 957332 | AF2-027 E | 12.5919 | 50/50 | 12.5919 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------------|--------------|---------------------------|---------------|-----------------------|
| 959101 | AF2-201 C O1 | 1.4489 | Adder | 3.22 |
| 959102 | AF2-201 E O1 | 4.1605 | Adder | 9.24 |
| 959761 | AF2-267 C O1 | 1.0460 | Adder | 2.32 |
| 959762 | AF2-267 E O1 | 4.8969 | Adder | 10.87 |
| 960581 | AF2-349 C | 5.4136 | Adder | 12.02 |
| 960582 | AF2-349 E | 3.6090 | Adder | 8.01 |
| WEC | WEC | 8.9051 | Confirmed LTF | 8.9051 |
| CPL | CPL | 0.1118 | Confirmed LTF | 0.1118 |
| CBM-W2 | CBM-W2 | 8.6978 | Confirmed LTF | 8.6978 |
| NY | NY | 0.0735 | Confirmed LTF | 0.0735 |
| CBM-W1 | CBM-W1 | 94.5631 | Confirmed LTF | 94.5631 |
| TVA | TVA | 1.0836 | Confirmed LTF | 1.0836 |
| O-066 | O-066 | 0.8131 | Confirmed LTF | 0.8131 |
| CBM-S2 | CBM-S2 | 1.4970 | Confirmed LTF | 1.4970 |
| CBM-S1 | CBM-S1 | 5.3506 | Confirmed LTF | 5.3506 |
| TILTON | TILTON | 0.0239 | Confirmed LTF | 0.0239 |
| G-007 | G-007 | 0.1248 | Confirmed LTF | 0.1248 |
| MADISON | MADISON | 15.6684 | Confirmed LTF | 15.6684 |
| MEC | MEC | 8.5917 | Confirmed LTF | 8.5917 |
| BLUEG | BLUEG | 0.0660 | Confirmed LTF | 0.0660 |
| TRIMBLE | TRIMBLE | 0.0301 | Confirmed LTF | 0.0301 |

11.6.3 Index 3

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|-------------|---------------|---------|--------------|-------------|--------|-------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 96061672 | 274817 | ZION EC ;RP | CE | 270807 | LIBERTYVI; R | CE | 1 | COMED_P4_016-45-BT6-11_ | breaker | 1334.0 | 117.09 | 118.78 | DC | 22.55 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|--------------|--------------------|-----------------------|----------------|
| 274683 | WAUKEGAN ;8U | 10.0922 | 50/50 | 10.0922 |
| 274725 | ZION EC ;1P | 12.8381 | 50/50 | 12.8381 |
| 274726 | ZION EC ;2P | 12.8381 | 50/50 | 12.8381 |
| 274727 | ZION EC ;3P | 12.8381 | 50/50 | 12.8381 |
| 274828 | WAUKEGAN ;BP | 2.8705 | 50/50 | 2.8705 |
| 276172 | Z1-108 BAT | 1.0630 | Merchant Transmission | 1.0630 |
| 915011 | Y3-013 1 | 13.5321 | 50/50 | 13.5321 |
| 915021 | Y3-013 2 | 13.5321 | 50/50 | 13.5321 |
| 915031 | Y3-013 3 | 13.5321 | 50/50 | 13.5321 |
| 950101 | J390 | 59.8034 | PJM External (MISO) | 59.8034 |
| 951391 | J505 | 18.5970 | PJM External (MISO) | 18.5970 |
| 952381 | J703 | 21.3133 | PJM External (MISO) | 21.3133 |
| 952391 | J704 | 9.0805 | PJM External (MISO) | 9.0805 |
| 952511 | J584 C | 0.6550 | PJM External (MISO) | 0.6550 |
| 952512 | J584 E | 3.5438 | PJM External (MISO) | 3.5438 |
| 953151 | J831 | 9.2804 | PJM External (MISO) | 9.2804 |
| 953331 | J801 | 4.3808 | PJM External (MISO) | 4.3808 |
| 953491 | J947 | 56.2680 | PJM External (MISO) | 56.2680 |
| 953681 | J818 | 16.2872 | PJM External (MISO) | 16.2872 |
| 953691 | J819 C | 0.8520 | PJM External (MISO) | 0.8520 |
| 953692 | J819 E | 4.6095 | PJM External (MISO) | 4.6095 |
| 953701 | J821 C | 1.7906 | PJM External (MISO) | 1.7906 |
| 953702 | J821 E | 9.6879 | PJM External (MISO) | 9.6879 |
| 953891 | J849 | 20.8538 | PJM External (MISO) | 20.8538 |
| 953901 | J850 | 27.9075 | PJM External (MISO) | 27.9075 |
| 954001 | J864 | 3.0183 | PJM External (MISO) | 3.0183 |
| 954141 | J878 | 51.5360 | PJM External (MISO) | 51.5360 |
| 954191 | J886 | 27.8640 | PJM External (MISO) | 27.8640 |
| 954511 | J926 C | 0.9729 | PJM External (MISO) | 0.9729 |
| 954512 | J926 E | 5.2639 | PJM External (MISO) | 5.2639 |
| 954691 | J732 | 47.3401 | PJM External (MISO) | 47.3401 |
| 954741 | J928 C | 2.0815 | PJM External (MISO) | 2.0815 |
| 954742 | J928 E | 11.2616 | PJM External (MISO) | 11.2616 |
| 955091 | J986 | 18.1030 | PJM External (MISO) | 18.1030 |
| 955241 | J1002 | 12.2928 | PJM External (MISO) | 12.2928 |
| 955251 | J1003 | 6.6695 | PJM External (MISO) | 6.6695 |
| 955301 | J1009 | 140.7000 | PJM External (MISO) | 140.7000 |
| 955311 | J1010 | 117.1280 | PJM External (MISO) | 117.1280 |
| 955321 | J1011 | 117.1280 | PJM External (MISO) | 117.1280 |
| 955581 | J1042 C | 5.3934 | PJM External (MISO) | 5.3934 |
| 955582 | J1042 E | 30.5626 | PJM External (MISO) | 30.5626 |
| 955671 | J1051 | 8.9305 | PJM External (MISO) | 8.9305 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------------|------------|---------------------------|---------------------|-----------------------|
| 955691 | J1053 | 36.8660 | PJM External (MISO) | 36.8660 |
| 955981 | J1085 C | 4.3711 | PJM External (MISO) | 4.3711 |
| 955982 | J1085 E | 23.6489 | PJM External (MISO) | 23.6489 |
| 956051 | J1092 | 5.4920 | PJM External (MISO) | 5.4920 |
| 956141 | J1101 | 3.7152 | PJM External (MISO) | 3.7152 |
| 956321 | J1121 | 27.2780 | PJM External (MISO) | 27.2780 |
| 956571 | J1153 | 33.1365 | PJM External (MISO) | 33.1365 |
| 956581 | J1154 | 8.1930 | PJM External (MISO) | 8.1930 |
| 956731 | J1171 | 17.6770 | PJM External (MISO) | 17.6770 |
| 956852 | J1183 E | 0.2252 | PJM External (MISO) | 0.2252 |
| 956901 | J1188 | 4.0055 | PJM External (MISO) | 4.0055 |
| 957331 | AF2-027 C | 9.0214 | 50/50 | 9.0214 |
| 957332 | AF2-027 E | 13.5321 | 50/50 | 13.5321 |
| WEC | WEC | 9.3382 | Confirmed LTF | 9.3382 |
| CPL | CPL | 0.0794 | Confirmed LTF | 0.0794 |
| CBM-W2 | CBM-W2 | 6.8468 | Confirmed LTF | 6.8468 |
| NY | NY | 0.0691 | Confirmed LTF | 0.0691 |
| CBM-W1 | CBM-W1 | 91.7859 | Confirmed LTF | 91.7859 |
| TVA | TVA | 0.8582 | Confirmed LTF | 0.8582 |
| O-066 | O-066 | 0.7728 | Confirmed LTF | 0.7728 |
| CBM-S2 | CBM-S2 | 1.1213 | Confirmed LTF | 1.1213 |
| CBM-S1 | CBM-S1 | 4.2004 | Confirmed LTF | 4.2004 |
| TILTON | TILTON | 0.0561 | Confirmed LTF | 0.0561 |
| G-007 | G-007 | 0.1196 | Confirmed LTF | 0.1196 |
| MADISON | MADISON | 14.3801 | Confirmed LTF | 14.3801 |
| MEC | MEC | 7.1171 | Confirmed LTF | 7.1171 |
| BLUEG | BLUEG | 0.0972 | Confirmed LTF | 0.0972 |
| TRIMBLE | TRIMBLE | 0.0378 | Confirmed LTF | 0.0378 |

11.6.4 Index 4

| ID | FROM BUS# | FROM BUS | FROM BUS AREA | TO BUS# | TO BUS | TO BUS AREA | CKT ID | CONT NAME | Type | Rating MVA | PRE PROJECT LOADING % | POST PROJECT LOADING % | AC DC | MW IMPACT |
|----------|-----------|----------|---------------|---------|--------------|-------------|--------|-------------------------|---------|------------|-----------------------|------------------------|-------|-----------|
| 96061737 | 699432 | PLS PR1 | WEC | 270941 | ZION STA ; R | CE | 1 | COMED_P4_974-45-BT1-2__ | breaker | 1824.0 | 110.27 | 112.11 | DC | 33.48 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------|-------------|--------------------|---------------------|----------------|
| 274725 | ZION EC ;1P | 19.0603 | 50/50 | 19.0603 |
| 274726 | ZION EC ;2P | 19.0603 | 50/50 | 19.0603 |
| 274727 | ZION EC ;3P | 19.0603 | 50/50 | 19.0603 |
| 915011 | Y3-013 1 | 20.0907 | 50/50 | 20.0907 |
| 915021 | Y3-013 2 | 20.0907 | 50/50 | 20.0907 |
| 915031 | Y3-013 3 | 20.0907 | 50/50 | 20.0907 |
| 936791 | AD2-102 C | 8.8995 | Adder | 10.47 |
| 936792 | AD2-102 E | 5.9330 | Adder | 6.98 |
| 950101 | J390 | 96.5180 | PJM External (MISO) | 96.5180 |
| 951391 | J505 | 22.6600 | PJM External (MISO) | 22.6600 |
| 952381 | J703 | 26.1542 | PJM External (MISO) | 26.1542 |
| 952391 | J704 | 11.1452 | PJM External (MISO) | 11.1452 |
| 952511 | J584 C | 1.0507 | PJM External (MISO) | 1.0507 |
| 952512 | J584 E | 5.6843 | PJM External (MISO) | 5.6843 |
| 953111 | J807 C | 0.9806 | PJM External (MISO) | 0.9806 |
| 953112 | J807 E | 5.3050 | PJM External (MISO) | 5.3050 |
| 953151 | J831 | 11.5944 | PJM External (MISO) | 11.5944 |
| 953331 | J801 | 5.6847 | PJM External (MISO) | 5.6847 |
| 953491 | J947 | 77.9520 | PJM External (MISO) | 77.9520 |
| 953681 | J818 | 22.6316 | PJM External (MISO) | 22.6316 |
| 953691 | J819 C | 1.3533 | PJM External (MISO) | 1.3533 |
| 953692 | J819 E | 7.3220 | PJM External (MISO) | 7.3220 |
| 953701 | J821 C | 2.2289 | PJM External (MISO) | 2.2289 |
| 953702 | J821 E | 12.0588 | PJM External (MISO) | 12.0588 |
| 953891 | J849 | 25.5875 | PJM External (MISO) | 25.5875 |
| 953901 | J850 | 37.7025 | PJM External (MISO) | 37.7025 |
| 954001 | J864 | 4.3957 | PJM External (MISO) | 4.3957 |
| 954141 | J878 | 76.6080 | PJM External (MISO) | 76.6080 |
| 954191 | J886 | 33.9420 | PJM External (MISO) | 33.9420 |
| 954511 | J926 C | 1.2564 | PJM External (MISO) | 1.2564 |
| 954512 | J926 E | 6.7974 | PJM External (MISO) | 6.7974 |
| 954691 | J732 | 59.6931 | PJM External (MISO) | 59.6931 |
| 954741 | J928 C | 2.5540 | PJM External (MISO) | 2.5540 |
| 954742 | J928 E | 13.8178 | PJM External (MISO) | 13.8178 |
| 955091 | J986 | 22.7920 | PJM External (MISO) | 22.7920 |
| 955241 | J1002 | 15.8044 | PJM External (MISO) | 15.8044 |
| 955251 | J1003 | 8.7275 | PJM External (MISO) | 8.7275 |
| 955301 | J1009 | 240.3120 | PJM External (MISO) | 240.3120 |
| 955581 | J1042 C | 8.2596 | PJM External (MISO) | 8.2596 |
| 955582 | J1042 E | 46.8044 | PJM External (MISO) | 46.8044 |
| 955671 | J1051 | 11.5345 | PJM External (MISO) | 11.5345 |
| 955691 | J1053 | 47.2940 | PJM External (MISO) | 47.2940 |

| Bus # | Bus | Gendeliv MW Impact | Type | Full MW Impact |
|--------------|------------|---------------------------|---------------------|-----------------------|
| 955981 | J1085 C | 5.4882 | PJM External (MISO) | 5.4882 |
| 955982 | J1085 E | 29.6928 | PJM External (MISO) | 29.6928 |
| 956051 | J1092 | 7.1350 | PJM External (MISO) | 7.1350 |
| 956141 | J1101 | 4.5256 | PJM External (MISO) | 4.5256 |
| 956321 | J1121 | 33.7540 | PJM External (MISO) | 33.7540 |
| 956571 | J1153 | 41.1675 | PJM External (MISO) | 41.1675 |
| 956581 | J1154 | 11.3850 | PJM External (MISO) | 11.3850 |
| 956731 | J1171 | 22.2770 | PJM External (MISO) | 22.2770 |
| 956852 | J1183 E | 0.2763 | PJM External (MISO) | 0.2763 |
| 956901 | J1188 | 6.2435 | PJM External (MISO) | 6.2435 |
| 957331 | AF2-027 C | 13.3938 | 50/50 | 13.3938 |
| 957332 | AF2-027 E | 20.0907 | 50/50 | 20.0907 |
| WEC | WEC | 12.7257 | Confirmed LTF | 12.7257 |
| CPL | CPL | 0.1078 | Confirmed LTF | 0.1078 |
| CBM-W2 | CBM-W2 | 9.8444 | Confirmed LTF | 9.8444 |
| NY | NY | 0.1056 | Confirmed LTF | 0.1056 |
| CBM-W1 | CBM-W1 | 123.1735 | Confirmed LTF | 123.1735 |
| TVA | TVA | 1.2208 | Confirmed LTF | 1.2208 |
| O-066 | O-066 | 1.1827 | Confirmed LTF | 1.1827 |
| CBM-S2 | CBM-S2 | 1.5490 | Confirmed LTF | 1.5490 |
| CBM-S1 | CBM-S1 | 5.9640 | Confirmed LTF | 5.9640 |
| TILTON | TILTON | 0.0661 | Confirmed LTF | 0.0661 |
| G-007 | G-007 | 0.1830 | Confirmed LTF | 0.1830 |
| MADISON | MADISON | 19.3576 | Confirmed LTF | 19.3576 |
| MEC | MEC | 10.1060 | Confirmed LTF | 10.1060 |
| BLUEG | BLUEG | 0.1458 | Confirmed LTF | 0.1458 |
| TRIMBLE | TRIMBLE | 0.0568 | Confirmed LTF | 0.0568 |

11.7 Queue Dependencies

The Queue Projects below are listed in one or more indices for the overloads identified in your report. These projects contribute to the loading of the overloaded facilities identified in your report. The percent overload of a facility and cost allocation you may have towards a particular reinforcement could vary depending on the action of these earlier projects. The status of each project at the time of the analysis is presented in the table. This list may change as earlier projects withdraw or modify their requests.

| Queue Number | Project Name | Status |
|--------------|--|-----------------------------|
| AA2-030 | Nelson | Active |
| AA2-123 | Marengo 34kV | In Service |
| AB1-089 | Byron-Wayne 345kV #1 | Active |
| AB1-091 | Davis Creek 345kV | Active |
| AB1-122 | Kendall-Tazewell & Dresden-Mole Creek | Active |
| AB2-047 | Brokaw-Pontiac Midpoint | Engineering and Procurement |
| AB2-096 | Silver Lake-Cherry Valley | Active |
| AC1-033 | Kewanee | Active |
| AC1-109 | Aurora 345kV | Active |
| AC1-110 | Aurora 138kV | Active |
| AC1-111 | Aurora 138kV | Active |
| AC1-113 | Rockford | Active |
| AC1-114 | Rockford II | Active |
| AC1-142A | Joliet | Active |
| AC1-168 | Kewanee-Streator | Active |
| AC1-171 | Powerton | Active |
| AC1-204 | Elwood | Under Construction |
| AC1-214 | Crescent Ridge | Engineering and Procurement |
| AC2-115 | Rockford | Active |
| AC2-116 | Rockford II | Active |
| AC2-117 | University Park North | Engineering and Procurement |
| AC2-154 | Davis Creek 138kV | Active |
| AC2-156 | Sandwich 34.5kV | Active |
| AD1-013 | Twombly Road 138kV | Active |
| AD1-016 | Marengo | Active |
| AD1-031 | Kewanee 138 kV | Active |
| AD1-039 | Kendall-Tazewell & Dresden-Mole Creek | Active |
| AD1-067 | Mendota Hills | Active |
| AD1-096 | Stillman Valley 34 kV | Active |
| AD1-098 | Dixon-McGirr | Active |
| AD1-100 | Loretto-Wilton & Braidwood-Davis Creek | Active |
| AD1-116 | Nevada 345 kV | Active |
| AD1-129 | Belvidere 34 kV | Active |
| AD1-133 | Pontiac MidPoint-Dresden | Active |
| AD2-038 | Powerton | Active |
| AD2-047 | Davis Creek 138 kV | Active |
| AD2-060 | Davis Creek 138kV | Active |
| AD2-066 | Mazon-Crescent Ridge | Active |
| AD2-102 | Wempletown 345 kV | Active |

| Queue Number | Project Name | Status |
|--------------|--|--------|
| AD2-134 | Shady Oaks | Active |
| AD2-172 | Lena 138kV | Active |
| AD2-194 | Elwood | Active |
| AD2-214 | Rock Falls-Garden Plains | Active |
| AE1-070 | Elwood 345 kV | Active |
| AE1-113 | Mole Creek 345 kV | Active |
| AE1-114 | Maryland-Lancaster 138 kV | Active |
| AE1-134 | Nelson 345 kV | Active |
| AE1-163 | Powerton-Nevada 345 kV | Active |
| AE1-166 | Loretto-Wilton & Braidwood-Davis Creek | Active |
| AE1-172 | Loretto-Wilton Center | Active |
| AE1-193 | Crete 345 kV | Active |
| AE1-194 | Crete 345 kV | Active |
| AE1-195 | Crete 345 kV | Active |
| AE1-198 | Crete 345 kV | Active |
| AE1-205 | McLean 345 kV | Active |
| AE1-252 | Loretto-Wilton Center | Active |
| AE2-035 | Lena 138 kV | Active |
| AE2-107 | Haumesser Road 138 kV | Active |
| AE2-152 | Loretto-Wilton & Braidwood-Davis Creek | Active |
| AE2-153 | Braidwood-Davis Creek | Active |
| AE2-173 | McLean 345 kV | Active |
| AE2-223 | McLean 345 kV | Active |
| AE2-255 | Molecreek 345 kV | Active |
| AE2-281 | Powerton-Nevada 345 kV | Active |
| AE2-321 | Belvidere-Marengo 138 kV | Active |
| AE2-341 | Sandwich-Plano | Active |
| AF1-009 | Dixon-McGirr | Active |
| AF1-011 | Schauff Road | Active |
| AF1-012 | Electric Junc-Nelson | Active |
| AF1-030 | Plano-R 138 kV | Active |
| AF1-048 | Belvidere-Marengo | Active |
| AF1-060 | Lena 138 kV | Active |
| AF1-072 | Rocky Road | Active |
| AF1-156 | Braidwood-Davis Creek | Active |
| AF1-200 | Plano 345 kV | Active |
| AF1-280 | Nelson-Lee County | Active |
| AF1-281 | Nelson-Lee County | Active |
| AF1-296 | Garden Plain 138 kV | Active |
| AF1-314 | Lena 138 kV | Active |
| AF1-317 | Electric Jct-Nelson | Active |
| AF1-318 | Crescent Ridge-Corbin | Active |
| AF1-330 | Marengo | Active |
| AF1-331 | Twombly Road | Active |
| AF2-003 | Powerton-Mole Creek | Active |
| AF2-027 | Zion Energy Center 345 kV | Active |
| AF2-041 | Nelson-Electric Junction 345 kV | Active |
| AF2-069 | Crescent Ridge 138 kV | Active |
| AF2-070 | Crescent Ridge 138 kV | Active |
| AF2-095 | Wilmington-Davis Creek | Active |
| AF2-096 | Braidwood-East Frankfort 345 kV | Active |
| AF2-128 | Crescent Ridge-Corbin 138 kV | Active |

| Queue Number | Project Name | Status |
|--------------|-----------------------------------|------------|
| AF2-142 | Nevada 345 kV | Active |
| AF2-143 | Powerton-Nevada 345 kV | Active |
| AF2-182 | Nelson-Lee County 345 kV II | Active |
| AF2-183 | Nelson-Lee County 345 kV | Active |
| AF2-199 | Nelson-Electric Junction 345 kV | Active |
| AF2-200 | Nelson-Electric Junction 345 kV | Active |
| AF2-201 | Lena-Ecogrove 138 kV | Active |
| AF2-225 | McLean 345 kV | Active |
| AF2-226 | Katydid Road 345 kV | Active |
| AF2-267 | Lancaster 138 kV | Active |
| AF2-319 | Katydid Road 345 kV | Active |
| AF2-329 | Sandwich-Plano 138 kV | Active |
| AF2-346 | Electric Junction-Nelson 345 kV | Active |
| AF2-349 | Garden Prairie-Silver Lake 345 kV | Active |
| AF2-350 | Kensington 138 kV | Active |
| AF2-351 | Kensington 138 kV | Active |
| AF2-363 | Glidden 138 kV | Active |
| AF2-364 | Wayne Red 138 kV | Active |
| AF2-366 | Glidden-Waterman 345 kV | Active |
| AF2-392 | Nelson-Dixon 138 kV | Active |
| AF2-393 | Nelson-Dixon 138 kV | Active |
| AF2-394 | Nelson-Dixon 138 kV | Active |
| U3-021 | Silver Lake-Cherry Valley | Active |
| Y3-013 | Zion Energy Center | Active |
| Z1-108 | McHenry 34kV | In Service |
| J1002 | MISO | MISO |
| J1003 | MISO | MISO |
| J1009 | MISO | MISO |
| J1010 | MISO | MISO |
| J1011 | MISO | MISO |
| J1042 | MISO | MISO |
| J1051 | MISO | MISO |
| J1053 | MISO | MISO |
| J1085 | MISO | MISO |
| J1092 | MISO | MISO |
| J1101 | MISO | MISO |
| J1121 | MISO | MISO |
| J1153 | MISO | MISO |
| J1154 | MISO | MISO |
| J1171 | MISO | MISO |
| J1183 | MISO | MISO |
| J1188 | MISO | MISO |
| J390 | MISO | MISO |
| J505 | MISO | MISO |
| J584 | MISO | MISO |
| J703 | MISO | MISO |
| J704 | MISO | MISO |
| J732 | MISO | MISO |
| J760 | MISO | MISO |
| J801 | MISO | MISO |
| J807 | MISO | MISO |
| J818 | MISO | MISO |

| Queue Number | Project Name | Status |
|--------------|--------------|--------|
| J819 | MISO | MISO |
| J821 | MISO | MISO |
| J831 | MISO | MISO |
| J849 | MISO | MISO |
| J850 | MISO | MISO |
| J855 | MISO | MISO |
| J864 | MISO | MISO |
| J870 | MISO | MISO |
| J871 | MISO | MISO |
| J878 | MISO | MISO |
| J886 | MISO | MISO |
| J926 | MISO | MISO |
| J928 | MISO | MISO |
| J947 | MISO | MISO |
| J986 | MISO | MISO |

11.8 Contingency Descriptions

| Contingency Name | Contingency Definition |
|--|---|
| 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 |
| COMED_P1-2_345-L2221__R-N | CONTINGENCY 'COMED_P1-2_345-L2221__R-N' TRIP BRANCH FROM BUS 270941 TO BUS 699432 CKT 1 / ZION ; R 345 PLS PR2 345 END |
| COMED_P4_016-45-BT6-11__ | CONTINGENCY 'COMED_P4_016-45-BT6-11__' TRIP BRANCH FROM BUS 270914 TO BUS 270830 CKT 1 / WAUKEGAN ; B 345 NBROOK159; B 345 TRIP BRANCH FROM BUS 270915 TO BUS 270914 CKT 1 / WAUKEGAN ; R 345 WAUKEGAN ; B 345 TRIP BRANCH FROM BUS 275206 TO BUS 270830 CKT 1 / NBROOK159;2M 138 NBROOK159; B 345 TRIP BRANCH FROM BUS 275206 TO BUS 272120 CKT 1 / NBROOK159;2M 138 NBROOK159; B 138 TRIP BRANCH FROM BUS 275206 TO BUS 275306 CKT 1 / NBROOK159;2M 138 NBROOK159;2C 34.5 CLOSE BRANCH FROM BUS 272120 TO BUS 272121 CKT 1 / NBROOK159; B 138 NBROOK159; R 138 TRIP BRANCH FROM BUS 270942 TO BUS 270915 CKT 1 / ZION STA ;0B 345 WAUKEGAN ; R 345 END |
| COMED_P7_345-L2221__R-N+_345-L2222__B-N-B | CONTINGENCY 'COMED_P7_345-L2221__R-N+_345-L2222__B-N-B' TRIP BRANCH FROM BUS 270940 TO BUS 270941 CKT 1 / ZION ; B 345 ZION ; R 345 TRIP BRANCH FROM BUS 270940 TO BUS 270942 CKT 1 / ZION ; B 345 ZION ;0B 345 TRIP BRANCH FROM BUS 270941 TO BUS 699432 CKT 1 / ZION ; R 345 PLS PR2 345 TRIP BRANCH FROM BUS 955310 TO BUS 699247 CKT 1 / J1010 TAP 345 ARCADN3 345 CLOSE BRANCH FROM BUS 270941 TO BUS 270942 CKT 1 / ZION ; R 345 ZION ;0B 345 END |
| COMED_P4_974-45-BT1-2__ | CONTINGENCY 'COMED_P4_974-45-BT1-2__' TRIP BRANCH FROM BUS 270941 TO BUS 274817 CKT 1 / ZION ; R 345 ZIONE;RP 345 TRIP BRANCH FROM BUS 274817 TO BUS 270807 CKT 1 / ZIONE;RP 345 LIBER; R 345 END |

12 Short Circuit Analysis

The following breakers are overdutied:

None

12.1 System Reinforcements - Short Circuit

None

13 Affected Systems

13.1 MISO

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