

Feasibility Study Report

For

***PJM Generation Interconnection Request
Queue Position AD2-038***

Powerton

July 31, 2018

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.

For Local and Network Upgrades which are required due to overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost less than \$5,000,000, the cost of the Local and Network Upgrades will be shared by all proposed projects which have been assigned a Queue Position in the New Services Queue in which the need for the Local and Network Upgrades was identified. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects.

For Local and Network Upgrades which are required due to the overloads associated with the System Impact Studies of an individual New Services Queue, and have a cost of \$5,000,000 or greater, the cost of the Local and Network Upgrades will be allocated according to the order of the New Service Requests in the New Services Queue and the MW contribution of each individual Interconnection Request for those projects which cause or contribute to the need for the Local or Network Upgrades. The Load Flow Cost Allocation methods discussed in this manual, including cutoffs, still apply to the individual projects.

Cost allocation rules 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.

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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is

contained in Attachment G-2 of Manual 14A. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field.

Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group.

Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a \$10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 2.2.2. of Manual 14A for starting dates) for the Interconnection Request which shall specify the use of the new model. The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment G-1 of Manual 14A) in order to document the request for the study.

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.

General

The Interconnection Customer (“IC”) for Queue **AD2-038 Powerton** project has proposed to connect a 150 MW Energy (26.4 MW Capacity) wind facility to be located in LaSalle County, IL. They have requested two Points of Interconnection be evaluated as described below.

The IC has proposed a service date for this project of December 31, 2021.

Impacts on the MISO member transmission systems are not included in this analysis, but will be included in the System Impact Study Phase. Winter peak analysis will be performed in the System Impact Study phase.

This Generation Interconnection Feasibility Study provides analysis results to aid the IC in assessing the practicality and cost of incorporating the facility into the PJM system. This study was limited to load flow analyses of probable contingencies. If the IC elects to pursue a System Impact Study, a more comprehensive analysis will be performed.

Primary Point of Interconnection (Option-1)

The Interconnection Customer (IC) AD2-038 proposes to interconnect 150 MW windfarm to ComEd transmission system by looping in ‘Powerton Station 3 - Nevada TSS 98’ 345kV line 0303, approximately 49 miles from Powerton Station 3.

Attachment Facilities

The IC AD2-038 generator lead will interconnect to a new 345kV Interconnection Substation. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The estimated cost for the attachment facilities is given below.

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

Direct Connection Network Upgrades

To accommodate interconnection of AD2-038, a new 345kV Interconnection Substation would be built looping in the 345kV line 0303 between Powerton Station 3 and the proposed Nevada TSS 98 (to be built under PJM queue AA1-018), to interconnect developer’s generator lead.

The scope of work includes installation of three 345kV circuit breakers in “breaker-and-a-half” bus configuration and tie in the Interconnection Substation to the 345kV line 0303 between Powerton Station 3 and the proposed Nevada TSS 98 (to be built under PJM queue AA1-018), as shown in the one-line diagram below.

The Interconnection Customer is responsible for constructing all the facilities on the Interconnection Customer side of the point of interconnection outside of the Interconnection Substation. It is assumed for the purposes of this report that the IC will obtain the site for the Interconnection Substation and right-of-way between the Interconnection Substation and the 345kV transmission line.

In the event, that the IC exercises the option to build the interconnecting substation, the IC will be required to construct all interconnection facilities that will be turned over to ComEd in accordance with ComEd published standards and PJM Tariff.

ComEd would design, engineer and construct the tie in of the Interconnection Substation to 345kV line 0303. There are two 345kV lines 1227 and 1202 between the proposed Interconnection Substation and line 0303. Accordingly, this tie-in would require raising these two 345kV lines for line crossing. The estimated cost for Direct Connection Network Upgrade is given below.

For Option to Build Direct Connection cost estimates:

| Scope of Work | Cost Estimate |
|---|----------------------|
| Installation of a new 345kV substation as described above | N/A |
| Transmission line tie in work (foundations, structures, conductors) | \$3,500,000 |
| ComEd oversight and testing | \$1,500,000 |
| Total Cost Estimate (see notes below on cost estimate) | \$5,000,000 |

For ComEd building the interconnecting substation cost estimates:

| Scope of Work | Cost Estimate |
|---|----------------------|
| Installation of a new 345kV substation as described above | \$20,000,000 |
| Transmission line tie in work (foundations, structures, conductors) | \$3,500,000 |
| Total Cost Estimate (see notes below on cost estimate) | \$23,500,000 |

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

Non-Direct Connection Cost Estimate

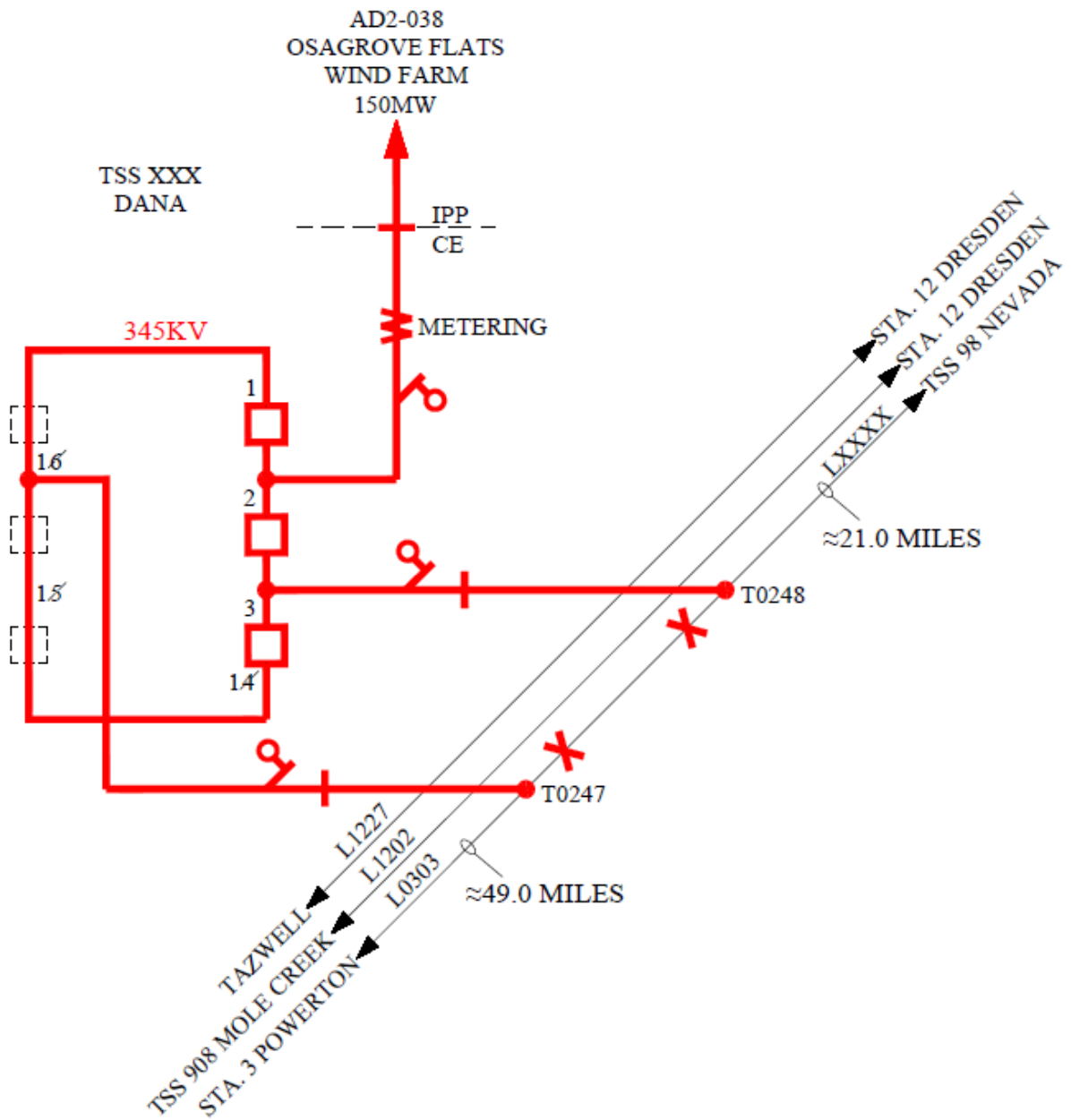
The estimated cost for Non-Direct Connection work is given below:

| Scope of Work | Cost Estimate |
|--|----------------------|
| Relay/communications/SCADA upgrades at Powerton Station 3 | \$1,000,000 |
| Relay/communications/SCADA upgrades at Nevada TSS 98 or Goodings Grove TSS 116 if Nevada TSS 98 is not built | \$1,000,000 |
| Total Cost Estimate (see notes below on cost estimate) | \$2,000,000 |

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) These cost estimates do not include cost of acquiring right-of-way for the transmission line and purchasing any additional land, if needed, for the line terminations. The need and cost of acquiring property and associated legal costs will be investigated during Facilities Study for this project.
- 3) 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.
- 4) 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.
- 5) 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).

AD2-038
PRIMARY POI



Network Impacts for Primary POI

The Queue Project AD2-038 was evaluated as a 150.0 MW (Capacity 19.5 MW) injection at the tap of the Powerton – Nevada (AA1-018) 345 kV line in the ComEd area. Project AD2-038 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-038 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

1. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 109.19% to 109.26% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.16 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

2. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.24 MW to the thermal violation.

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

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091

MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.25 MW to the thermal violation.

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CONTINGENCY 'COMED_P4_112-65-BT4-5__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1      / WILTO;4M 345 WILTO; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1      / WILTO;4M 345 WILTO; R 345
TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1      / WILTO;4M 345 WILTO;4C 33
END
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4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.25 MW to the thermal violation.

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CONTINGENCY 'COMED_P4_112-65-BT3-4__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1      / WILTO;3M 345 WILTO; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1      / WILTO;3M 345 WILTO; B 345
TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1      / WILTO;3M 345 WILTO;3C 33
END
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5. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 163.5% to 163.63% (**DC 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 21.0 MW to the thermal violation.

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CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
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6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 129.05% to 129.2% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.07 MW to the thermal violation.

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CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
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7. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.69% to 108.76% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.57 MW to the thermal violation.

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CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
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8. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.19% to 108.25% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.65 MW to the thermal violation.

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

9. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.14% to 108.21% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.66 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33
 END

10. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.13% to 108.2% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.66 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33
 END

11. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 109.18% to 109.25% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.16 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

12. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.24 MW to the thermal violation.

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

13. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.25 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 | / WILTO;4M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 | / WILTO;4M 345 WILTO; R 345 |
| TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 | / WILTO;4M 345 WILTO;4C 33 |

END

14. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.25 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 | / WILTO;3M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 | / WILTO;3M 345 WILTO; B 345 |
| TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 | / WILTO;3M 345 WILTO;3C 33 |

END

15. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 144.41% to 144.68% (**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 22.26 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

16. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 147.47% to 147.7% (**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 22.74 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

17. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 126.24% to 126.31% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.34 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

18. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.76% to 125.83% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.42 MW to the thermal violation.

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

19. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.71% to 125.78% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.42 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33
 END

20. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.7% to 125.77% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.42 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33
 END

21. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 132.75% to 132.88% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 15.35 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

22. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT4-5__'. This project contributes approximately 15.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_023-65-BT4-5__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 | / COLLI;2M 345 COLLI; 765 |
| TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 | / COLLI;2M 345 COLLI; R 345 |
| TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 | / COLLI;2M 345 COLLI;2C 33 |
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |

END

23. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 15.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 | / WILTO;4M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 | / WILTO;4M 345 WILTO; R 345 |
| TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 | / WILTO;4M 345 WILTO;4C 33 |

END

24. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 15.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 | / WILTO;3M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 | / WILTO;3M 345 WILTO; B 345 |
| TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 | / WILTO;3M 345 WILTO;3C 33 |

END

25. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.58% to 131.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 15.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_023-65-BT2-3__'

| | |
|---|--------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 |
|---|--------------|

05DUMONT 765

| | |
|---|--------------|
| TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 | / COLLI; 765 |
|---|--------------|

PLANO; 765

END

26. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 144.41% to 144.68% (**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 22.26 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

27. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 147.47% to 147.7% (**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 22.74 MW to the thermal violation.

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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
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28. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 121.74% to 125.24% (**DC power flow**) of its load dump rating (1768 MVA) for the tower line contingency outage of 'COMED_P7_345-L0301__B-S+_345-L0303__R-S_W3-046-FSA_B'. This project contributes approximately 39.13 MW to the thermal violation.

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CONTINGENCY 'COMED_P7_345-L0301__B-S+_345-L0303__R-S_W3-046-FSA_B'  
TRIP BRANCH FROM BUS 270854 TO BUS 270790 CKT 1      / POWER; B 345 KATYDID;B 345  
TRIP BRANCH FROM BUS 918050 TO BUS 270769 CKT 1      / POWERTON ; R 345 AA1-018 TAP 345  
END
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Steady-State Voltage Requirements

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

To be determined

Short Circuit

(Summary of impacted circuit breakers)

None

Affected System Analysis & Mitigation

MISO Impacts:

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

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.

1. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.32% to 108.4% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 13.24 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 160.1% to 160.23% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 21.5 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

3. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 128.09% to 128.23% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 18.17 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

4. (CE - CE) The COLLINS ; R-COLLINS ;2M 345 kV line (from bus 270697 to bus 275168 ckt 1) loads from 112.47% to 112.93% (**DC power flow**) of its emergency rating (1379 MVA) for the single line contingency outage of 'COMED_P1-2_765-L2315___-S'. This project contributes approximately 14.0 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_765-L2315___-S'
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765
END

5. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.03% to 108.1% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 18.65 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

6. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 110.26% to 110.37% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 12.11 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206
05DUMONT 765 270644 WILTO; 765 1
END

7. (CE - MISO AMIL) The POWERTON ; R-7TAZEWELL 345 kV line (from bus 270855 to bus 349662 ckt 1) loads from 121.44% to 126.11% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1202__B-S-A'. This project contributes approximately 68.97 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L1202__B-S-A'
TRIP BRANCH FROM BUS 270716 TO BUS 930770 CKT 1 / DRESDEN ; B 345 AB1-122 TAP 345
END

8. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.31% to 108.39% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 13.24 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

9. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.61% to 125.68% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 18.42 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

10. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.56% to 131.69% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 15.45 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

11. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 172.48% to 174.95% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1202__B-S-A'. This project contributes approximately 19.51 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L1202__B-S-A'
TRIP BRANCH FROM BUS 270716 TO BUS 930770 CKT 1 / DRESDEN ; B 345 AB1-122 TAP 345
END

12. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 135.54% to 137.22% (**DC power flow**) of its normal rating (1195 MVA) for

'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.16 MW to the thermal violation.

COMED:

SSTE rating is 1134 MVA. The post contingency load exceeds the SSTE rating therefore an upgrade is required. The upgrade will be to mitigate the sag on the line. A preliminary estimate for the upgrade is \$2.8 million with a construction estimated timeline of 30 months. Upon completion of this work the new line ratings will be 1091/1399/1483/1674 MVA (SN/SLTE/SSTE/SLD).

MISO:

The external (i.e. Non-PJM) Transmission Owner, MISO, will not evaluate this violation until the impact study phase.

2. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.24 MW to the thermal violation.

Same as Contribution to Previously Identified #1

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.25 MW to the thermal violation.

Same as Contribution to Previously Identified #1

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.25 MW to the thermal violation.

Same as Contribution to Previously Identified #1

5. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 163.5% to 163.63% (**DC 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 21.0 MW to the thermal violation.

AEP / MISO:

- 1) (N4058) Sag study results: Stillwell - Dumont 345 kV line 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 \$1.613 million. New SE rating will be 1718 MVA limited by a Dumont

wavetrap and possibly the conductor. This upgrade is driven by a prior queue. Per PJM cost allocation rules, AC1-002 LTF presently does not receive cost allocation for this upgrade. Note: as changes to the interconnection process occur, such as prior queued projects withdrawing from the queue, AC1-002 LTF could receive cost allocation.

- 2) **Additional AEP-end upgrade: Rebuild 8.6 miles of the AEP owned line and upgrade necessary Dumont terminal equipment (wavetrap) at a cost of \$20 million. PJM Network Upgrade N4790. New AEP-end ratings to be 1409/2045 MVA (SN/SE). Limited by Dumont risers.**
- 3) **Additional AEP-end upgrade: In addition to upgrading the Dumont risers, a different conductor (compared to the prior upgrade) will need to be selected to achieve the desired rating. The new conductor would be 1272 dual ACSR conductor. The additional cost for this work scope is \$2 million. The new AEP-end ratings to be 1690/2278 MVA SN/SE (limited by the conductor). PJM Network Upgrade N5064.**
- 4) **Additional AEP-end upgrade: AEP said it would cost \$4.8 million to string a second Stillwell- Dumont 345 kV line on the existing tower. The \$4.8 million is for 8.5 miles of the AEP portion. Would need a NIPSCO portion (2.87 miles) cost estimate.**
- 5) **MISO end – ratings are 1409/1779 MVA. MISO end upgrade: Rebuild NIPSCO portion of line (2.87 miles) at a cost of \$6.5 million and upgrade Stillwell substation equipment at a cost of \$1.5 million. Total cost is \$8.0 million. New expected MISO end ratings will be 1582/1898 MVA SN/SE.**
- 6) **Additional MISO-end upgrade: Reconductor 2.87 miles of transmission conductor to bundled 954 ACSS, replace substation conductor to bundled 2500 AL, and replace wavetrap. \$12 million. New MISO-end ratings to be 2550/2923 MVA SN/SE.**

6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 129.05% to 129.2% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.07 MW to the thermal violation.

COMED:

ComEd L17703 SSTE rating is 1251 MVA. The post contingency flow exceeds the rating therefore an upgrade is required. Upgrades include line reconductoring and station conductor work at Burnham. A preliminary estimate for the upgrades is \$8.1

million with a preliminary construction timeline of 30 months. Upon completion the new ratings will be 1248/1441/1667/1982 MVA (SN/SLTE/SSTE/SLD)

7. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.69% to 108.76% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.57 MW to the thermal violation.

COMED:

ComEd 345kV L6607 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. A preliminary estimate for this upgrade is \$11.2 million with a preliminary construction timeline of 30-36 months. Upon completion of this upgrade the new ratings will be 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD)

8. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.19% to 108.25% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.65 MW to the thermal violation.

Same as Contribution to Previously Identified #7

9. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.14% to 108.21% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.66 MW to the thermal violation.

Same as Contribution to Previously Identified #7

10. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.13% to 108.2% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.66 MW to the thermal violation.

Same as Contribution to Previously Identified #7

11. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 109.18% to 109.25% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.16 MW to the thermal violation.

Same as Contribution to Previously Identified #1

12. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating

(1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.24 MW to the thermal violation.

Same as Contribution to Previously Identified #1

13. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.25 MW to the thermal violation.

Same as Contribution to Previously Identified #1

14. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.25 MW to the thermal violation.

Same as Contribution to Previously Identified #1

15. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 144.41% to 144.68% (**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 22.26 MW to the thermal violation.

COMED:

ComEd post contingency facility overloaded by this event is Tr. 93 @ Station 112 Wilton Center. The upgrade will be to build out the 765kV ring bus at Wilton Center, installation of two 765 kV Bus Tie Circuit Breakers (BT 6-8 & 8-2) along with a relocation of 765kV L11216 from bus 6 to bus 8. Preliminary estimate for upgrade is \$12 million with an estimated construction time line of 30 months. Note, the rating for Tr. 93 at Wilton Center will remain current however with this upgrade the 112-65-BT5-6 contingency file will no longer include the Wilton Center Tr. 94 and will allow both transformers to remain in service eliminating the overload.

16. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 147.47% to 147.7% (**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 22.74 MW to the thermal violation.

Same as Contribution to Previously Identified #15

17. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 126.24% to 126.31% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of

'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.34 MW to the thermal violation.

Same as Contribution to Previously Identified #7

18. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.76% to 125.83% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.42 MW to the thermal violation.

Same as Contribution to Previously Identified #7

19. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.71% to 125.78% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.42 MW to the thermal violation.

Same as Contribution to Previously Identified #7

20. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.7% to 125.77% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.42 MW to the thermal violation.

Same as Contribution to Previously Identified #7

21. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 132.75% to 132.88% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 15.35 MW to the thermal violation.

COMED:

ComEd 345kV L97008 SSTE rating is 1134 MVA. The post contingency flow exceeds the rating therefore an upgrade is required. The upgrade will be to mitigate the sag on the line. A preliminary estimate for this upgrade is \$ 22.6 million with a construction timeline of 30 months. Upon completion of the upgrade the ratings will be 1334/1334/1391/1523 MVA (SN/SLTE/SSTE/SLD).

22. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT4-5__'. This project contributes approximately 15.45 MW to the thermal violation.

Same as Contribution to Previously Identified #21

23. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 15.45 MW to the thermal violation.

Same as Contribution to Previously Identified #21

24. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.72% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 15.45 MW to the thermal violation.

Same as Contribution to Previously Identified #21

25. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.58% to 131.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 15.45 MW to the thermal violation.

Same as Contribution to Previously Identified #21

26. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 144.41% to 144.68% (**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 22.26 MW to the thermal violation.

Same as Contribution to Previously Identified #15

27. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 147.47% to 147.7% (**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 22.74 MW to the thermal violation.

Same as Contribution to Previously Identified #15

28. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 121.74% to 125.24% (**DC power flow**) of its load dump rating (1768 MVA) for the tower line contingency outage of 'COMED_P7_345-L0301__B-S+_345-L0303__R-S_W3-046-FSA_B'. This project contributes approximately 39.13 MW to the thermal violation.

COMED:

ComEd 345kV L1202 SLD/ALDR ratings are 1768/2033 MVA. The post contingency flow for this event exceeds the ALDR rating therefore an upgrade is required. The upgrade will be to mitigate and re-conductoring on segments of the line. Station conductor upgrade at Dresden is also required. A preliminary estimate

for this upgrade is \$20.3 million with an estimated construction timeline of 30 months. Upon completion the ratings will be 1334/1726/2084 MVA (SN/SE/SLD).

Secondary Point of Interconnection (Option-2)

The Interconnection Customer (IC) AD2-038 proposes to interconnect 150 MW windfarm to ComEd transmission system by looping in the ‘Dresden Station 12 – Tazewell Substation’ 345kV line 1227, approximately 55 miles from Station 12 Dresden.

Attachment Facilities

The IC AD2-038 generator lead will interconnect to a new 345kV Interconnection Substation. This interconnection would require one 345kV line MOD, a dead-end structure and revenue metering as shown in the one-line diagram.

The estimated cost for the attachment facilities is given below.

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

Direct Connection Network Upgrades

To accommodate interconnection of AD2-038, a new 345kV Interconnection Substation would be built looping in the 345kV line 1227 between Station 12 Dresden and Tazewell Substation, to interconnect developer’s generator lead.

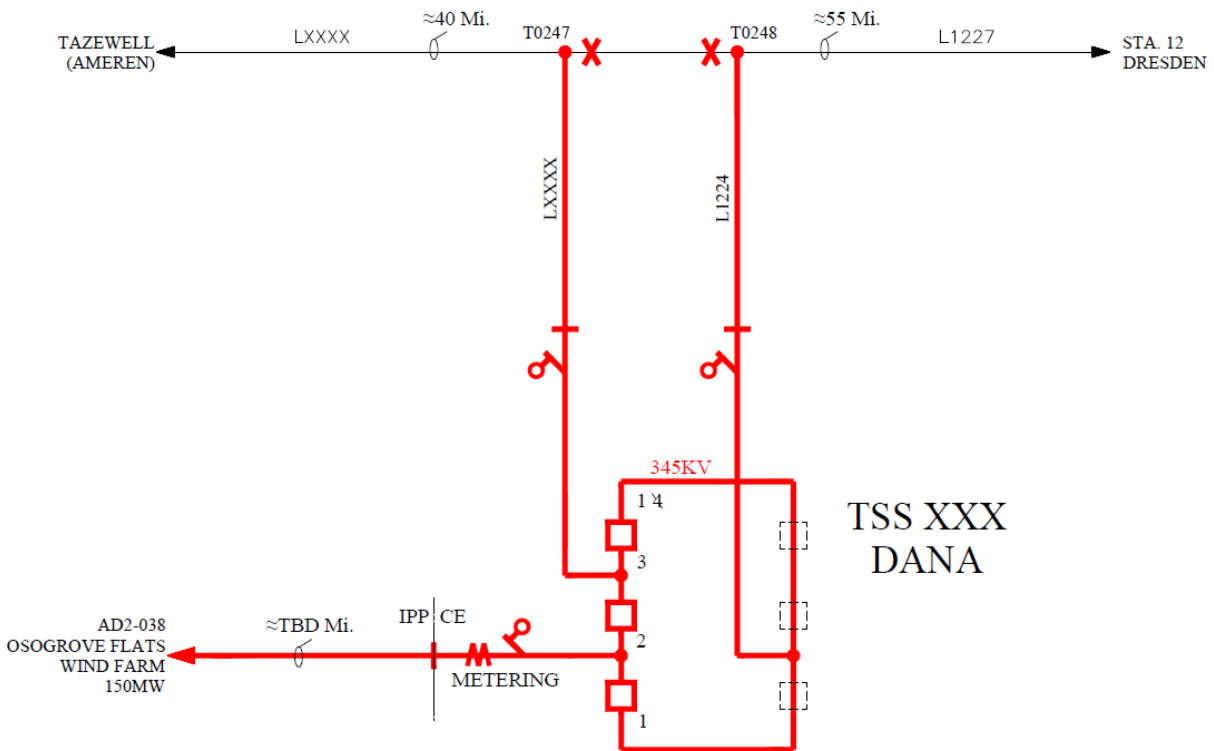
The scope of work includes installation of three 345kV circuit breakers in “breaker-and-a-half” bus configuration and tie in the Interconnection Substation to the 345kV line 1227 between Dresden Station 12 and Tazewell Substation, as shown in the one-line diagram below.

The Interconnection Customer is responsible for constructing all the facilities on the Interconnection Customer side of the point of interconnection outside of the Interconnection Substation. It is assumed for the purposes of this report that the IC will obtain the site for the Interconnection Substation and right-of-way between the Interconnection Substation and the 345kV transmission line.

In the event, that the IC exercises the option to build the interconnecting substation, the IC will be required to construct all interconnection facilities that will be turned over to ComEd in accordance with ComEd published standards and PJM Tariff.

ComEd would design, engineer and construct the tie in of the Interconnection Substation to 345kV line 1227. The estimated cost for Direct Connection Network Upgrade is given below.

AD2-038 SECONDARY POI



For Option to Build Direct Connection cost estimates:

| Scope of Work | Cost Estimate |
|---|---------------|
| Installation of a new 345kV substation as described above | N/A |
| Transmission line tie in work (foundations, structures, conductors) | \$3,000,000 |
| ComEd oversight and testing | \$1,500,000 |
| Total Cost Estimate (see notes below on cost estimate) | \$4,500,000 |

For ComEd building the interconnecting substation cost estimates:

| Scope of Work | Cost Estimate |
|---------------|---------------|
|---------------|---------------|

| | |
|---|--------------|
| Installation of a new 345kV substation as described above | \$20,000,000 |
| Transmission line tie in work (foundations, structures, conductors) | \$3,000,000 |
| Total Cost Estimate (see notes below on cost estimate) | \$23,000,000 |

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

Non-Direct Connection Cost Estimate

The estimated cost for Non-Direct Connection work is given below:

| Scope of Work | Cost Estimate |
|--|---------------|
| Relay/communications/SCADA upgrades at Dresden Station 12 | \$1,000,000 |
| Relay/communications/SCADA upgrades at Tazwell Substation – to be estimated by and paid to Ameren (owner of Tazwell Substation) | \$0 |
| Total Cost Estimate (see notes below on cost estimate) | \$1,000,000 |

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) These cost estimates do not include cost of acquiring right-of-way for the transmission line and purchasing any additional land, if needed, for the line terminations. The need and cost of acquiring property and associated legal costs will be investigated during Facilities Study for this project.
- 3) 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.
- 4) 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.
- 5) 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).

Network Impacts for Secondary POI

The Queue Project AD2-038 was evaluated as a 150.0 MW (Capacity 19.5 MW) injection tapping the Tazewell to AB1-122 Tap 345kV line in the ComEd area. Project AD2-038 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-038 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2021

Generator Deliverability

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

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

1. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 109.19% to 109.26% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.1 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

2. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.17 MW to the thermal violation.

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

3. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091

MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.18 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_112-65-BT4-5__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1      / WILTO;4M 345 WILTO; 765
TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1      / WILTO;4M 345 WILTO; R 345
TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1      / WILTO;4M 345 WILTO;4C 33
END
```

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.18 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_112-65-BT3-4__'
TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1      / WILTO; 765 05DUMONT 765
TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1      / WILTO;3M 345 WILTO; 765
TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1      / WILTO;3M 345 WILTO; B 345
TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1      / WILTO;3M 345 WILTO;3C 33
END
```

5. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 163.5% to 163.62% (**DC 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 20.58 MW to the thermal violation.

```
CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206
05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206
05DUMONT 765 270644 WILTON ; 765 1
END
```

6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 129.05% to 129.17% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 17.11 MW to the thermal violation.

```
CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
```

7. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 111.79% to 112.54% (**DC power flow**) of its load dump rating (480 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_900-45-BT2-3__'. This project contributes approximately 7.99 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_900-45-BT2-3__'
```

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 | / DRES; R 345 ELWOO; R 345 |
| TRIP BRANCH FROM BUS 270737 TO BUS 274757 CKT 1 | / ELWOO; R 345 ELWOO;1P 345 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274729 CKT 1 | / ELWOO;1P 345 ELWOO;1P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274731 CKT 1 | / ELWOO;1P 345 ELWOO;2P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274733 CKT 1 | / ELWOO;1P 345 ELWOO;3P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274735 CKT 1 | / ELWOO;1P 345 ELWOO;4P 18 |
| REMOVE UNIT 1 FROM BUS 274729 | / ELWOO;1P 18 |
| REMOVE UNIT 2 FROM BUS 274731 | / ELWOO;2P 18 |
| REMOVE UNIT 3 FROM BUS 274733 | / ELWOO;3P 18 |
| REMOVE UNIT 4 FROM BUS 274735 | / ELWOO;4P 18 |
| END | |

8. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.69% to 108.76% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.59 MW to the thermal violation.

| | |
|---|---|
| CONTINGENCY 'AEP_P4_#2978_05DUMONT 765' | |
| OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 | / 243206 05DUMONT 765 X1-020 |
| OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 | / 243206 05DUMONT 765 270644 WILTON ; 765 1 |
| END | |

9. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.19% to 108.26% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.65 MW to the thermal violation.

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

10. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.14% to 108.22% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.68 MW to the thermal violation.

| | |
|---|-----------------------------|
| CONTINGENCY 'COMED_P4_112-65-BT4-5__' | |
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 | / WILTO;4M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 | / WILTO;4M 345 WILTO; R 345 |
| TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 | / WILTO;4M 345 WILTO;4C 33 |
| END | |

11. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.13% to 108.2% (**DC power flow**) of its load dump rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.68 MW to the thermal violation.

| | |
|---|-----------------------------|
| CONTINGENCY 'COMED_P4_112-65-BT3-4__' | |
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 | / WILTO;3M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 | / WILTO;3M 345 WILTO; B 345 |
| TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 | / WILTO;3M 345 WILTO;3C 33 |
| END | |

12. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 124.27% to 124.73% (**DC power flow**) of its load dump rating (1802 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_116-45-L11614_'. This project contributes approximately 18.53 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_116-45-L11614_'
TRIP BRANCH FROM BUS 270667 TO BUS 270665 CKT 1      / B ISL;RT 345 B ISL; R 345
TRIP BRANCH FROM BUS 270667 TO BUS 270927 CKT 1      / B ISL;RT 345 WILTO; R 345
TRIP BRANCH FROM BUS 270769 TO BUS 270667 CKT 1      / GOODI;2R 345 B ISL;RT 345
DISCONNECT BUS 270769                                / GOODI;2R 345
END
```

13. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 119.45% to 119.92% (**DC power flow**) of its load dump rating (1802 MVA) for the bus fault outage of 'COMED_P2-2_116_GG-345R__2'. This project contributes approximately 18.48 MW to the thermal violation.

```
CONTINGENCY 'COMED_P2-2_116_GG-345R__2'
DISCONNECT BUS 270769                                / GOODI;2R 345
END
```

14. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 119.42% to 119.89% (**DC power flow**) of its load dump rating (1802 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_116-45-TR82__'. This project contributes approximately 18.48 MW to the thermal violation.

```
CONTINGENCY 'COMED_P4_116-45-TR82__'
TRIP BRANCH FROM BUS 270769 TO BUS 271565 TO BUS 275324 CKT 1 / GOODINGS ;2R 345 GOODINGS ; R 138 GOODINGS ;2C 34.5
DISCONNECT BUS 270769                                / GOODINGS ;2R 345
END
```

15. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 109.18% to 109.25% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 13.1 MW to the thermal violation.

```
CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1      / 243206 05DUMONT 765 X1-020
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
```

16. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.4% to 108.47% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 13.17 MW to the thermal violation.

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


17. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 13.18 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 | / WILTO;4M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 | / WILTO;4M 345 WILTO; R 345 |
| TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 | / WILTO;4M 345 WILTO;4C 33 |
| END | |

18. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.36% to 108.43% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 13.18 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 | / WILTO;3M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 | / WILTO;3M 345 WILTO; B 345 |
| TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 | / WILTO;3M 345 WILTO;3C 33 |
| END | |

19. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 144.4% to 144.62% (**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 21.91 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 | |

20. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 147.46% to 147.67% (**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 22.37 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 | |

21. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 126.24% to 126.32% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 18.36 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

22. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.76% to 125.83% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 18.41 MW to the thermal violation.

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

23. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.71% to 125.79% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 18.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 / WILTO;4M 345 WILTO;4C 33
 END

24. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.7% to 125.78% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 18.45 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT3-4__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 / WILTO;3M 345 WILTO;3C 33
 END

25. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 132.75% to 132.86% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#2978_05DUMONT 765'. This project contributes approximately 14.34 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#2978_05DUMONT 765'
 OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 X1-020
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
 END

26. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT4-5__'. This project contributes approximately 14.44 MW to the thermal violation.

CONTINGENCY 'COMED_P4_112-65-BT4-5__'

| | |
|---|-----------------------------|
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1 | / WILTO;4M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1 | / WILTO;4M 345 WILTO; R 345 |
| TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1 | / WILTO;4M 345 WILTO;4C 33 |
| END | |

27. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT4-5__'. This project contributes approximately 14.44 MW to the thermal violation.

| | |
|---|-----------------------------|
| CONTINGENCY 'COMED_P4_023-65-BT4-5__' | |
| TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1 | / COLLI;2M 345 COLLI; 765 |
| TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1 | / COLLI;2M 345 COLLI; R 345 |
| TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1 | / COLLI;2M 345 COLLI;2C 33 |
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| END | |

28. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.6% to 131.71% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_112-65-BT3-4__'. This project contributes approximately 14.44 MW to the thermal violation.

| | |
|---|-----------------------------|
| CONTINGENCY 'COMED_P4_112-65-BT3-4__' | |
| TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1 | / WILTO; 765 05DUMONT 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1 | / WILTO;3M 345 WILTO; 765 |
| TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1 | / WILTO;3M 345 WILTO; B 345 |
| TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1 | / WILTO;3M 345 WILTO;3C 33 |
| END | |

29. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.57% to 131.68% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_023-65-BT2-3__'. This project contributes approximately 14.43 MW to the thermal violation.

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

30. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 111.75% to 112.5% (**DC power flow**) of its load dump rating (480 MVA) for the line fault with failed breaker contingency outage of 'COMED_P4_900-45-BT2-3__'. This project contributes approximately 7.99 MW to the thermal violation.

| | |
|---|-----------------------------|
| CONTINGENCY 'COMED_P4_900-45-BT2-3__' | |
| TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 | / DRESD; R 345 ELWOO; R 345 |
| TRIP BRANCH FROM BUS 270737 TO BUS 274757 CKT 1 | / ELWOO; R 345 ELWOO;1P 345 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274729 CKT 1 | / ELWOO;1P 345 ELWOO;1P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274731 CKT 1 | / ELWOO;1P 345 ELWOO;2P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274733 CKT 1 | / ELWOO;1P 345 ELWOO;3P 18 |
| TRIP BRANCH FROM BUS 274757 TO BUS 274735 CKT 1 | / ELWOO;1P 345 ELWOO;4P 18 |
| REMOVE UNIT 1 FROM BUS 274729 | / ELWOO;1P 18 |
| REMOVE UNIT 2 FROM BUS 274731 | / ELWOO;2P 18 |
| REMOVE UNIT 3 FROM BUS 274733 | / ELWOO;3P 18 |
| REMOVE UNIT 4 FROM BUS 274735 | / ELWOO;4P 18 |
| END | |

31. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 144.4% to 144.62% (**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 21.91 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
```

32. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 147.46% to 147.67% (**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 22.37 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
```

33. (CE - MISO AMIL) The AD2-038 TAP-7TAZEWELL 345 kV line (from bus 936290 to bus 349662 ckt 1) loads from 105.54% to 107.17% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of "'270717'". This project contributes approximately 19.5 MW to the thermal violation.

```
CONTINGENCY '270717' DRESDEN ; R 345 930760 AB1-122 TAP 345 1  
OPEN BRANCH FROM BUS 270717 TO BUS 930760 CKT 1  
END
```

Steady-State Voltage Requirements

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

To be determined

Short Circuit

(Summary of impacted circuit breakers)

None

Affected System Analysis & Mitigation

MISO Impacts:

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

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.

1. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 108.32% to 108.39% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 13.18 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 160.1% to 160.23% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 21.02 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

3. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 128.09% to 128.21% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 17.2 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

4. (CE - CE) The COLLINS ; R-COLLINS ;2M 345 kV line (from bus 270697 to bus 275168 ckt 1) loads from 112.48% to 113.93% (**DC power flow**) of its emergency rating (1379 MVA) for the single line contingency outage of 'COMED_P1-2_765-L2315___-S'. This project contributes approximately 19.87 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_765-L2315___-S'
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765
END

5. (CE - CE) The COLLINS ; R-COLLINS ;2M 345 kV line (from bus 270697 to bus 275168 ckt 1) loads from 103.26% to 104.66% (**DC power flow**) of its normal rating (1200 MVA) for non-contingency condition. This project contributes approximately 16.64 MW to the thermal violation.

6. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 132.93% to 134.76% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1223_TR-S'. This project contributes approximately 29.79 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L1223_TR-S'
TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1      / DRES; R 345 ELECT;4R 345
TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1      / DRES;3M 138 DRES; R 345
TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1      / DRES;3M 138 DRES; B 138
TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1      / DRES;3M 138 DRES;3C 34.5
END
```

7. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 101.63% to 103.18% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 21.87 MW to the thermal violation.

8. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 110.05% to 110.81% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1222__R-S'. This project contributes approximately 8.0 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L1222__R-S'
TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1      / DRES; R 345 ELWOO; R 345
END
```

9. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 108.04% to 108.11% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 18.66 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTO; 765 1
END
```

10. (CE - CE) The ELWOOD ; B-GOODINGS ;4B 345 kV line (from bus 270736 to bus 270770 ckt 1) loads from 99.86% to 100.2% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'COMED_P1-2_345-L93505_B-S'. This project contributes approximately 10.95 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L93505_B-S'
TRIP BRANCH FROM BUS 274702 TO BUS 270716 CKT 1      / KENDA;BU 345 DRESDEN ; B
TRIP BRANCH FROM BUS 274702 TO BUS 274703 CKT 1      / KENDA;BU 345 KENDA;RU 345
END
```

11. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 108.59% to 109.64% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1220__B-S'. This project contributes approximately 15.52 MW to the thermal violation.

```
CONTINGENCY 'COMED_P1-2_345-L1220__B-S'
TRIP BRANCH FROM BUS 270716 TO BUS 270736 CKT 1      / DRES; B 345 ELWOO; B 345
TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1      / ELWOO; B 345 ELWOO; R 345
```


END

12. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 107.49% to 108.03% (**DC power flow**) of its emergency rating (1802 MVA) for the single line contingency outage of 'COMED_P1-2_345-L11613AB-S'. This project contributes approximately 19.2 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L11613AB-S'
TRIP BRANCH FROM BUS 270666 TO BUS 270664 CKT 1 / B ISL;BT 345 B ISL; B 345
TRIP BRANCH FROM BUS 270666 TO BUS 270926 CKT 1 / B ISL;BT 345 WILTO; B 345
TRIP BRANCH FROM BUS 270770 TO BUS 270666 CKT 1 / GOODI;4B 345 B ISL;BT 345
END

13. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 108.31% to 108.38% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 13.18 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

14. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 125.61% to 125.68% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 18.43 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206
05DUMONT 765 270644 WILTO; 765 1
END

15. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 131.55% to 131.66% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of 'COMED_P1-2_695_B2'. This project contributes approximately 14.43 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

16. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 110.01% to 110.77% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of 'COMED_P1-2_345-L1222__R-S'. This project contributes approximately 8.0 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L1222__R-S'
TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 / DRESD; R 345 ELWOO; R 345
END

17. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 172.56% to 176.45% (**DC power flow**) of its emergency rating (1195 MVA)

for the single line contingency outage of 'COMED_P1-2_345-L1202__B-S-A'. This project contributes approximately 80.42 MW to the thermal violation.

CONTINGENCY 'COMED_P1-2_345-L1202__B-S-A'
TRIP BRANCH FROM BUS 270716 TO BUS 930770 CKT 1 / DRESDEN ; B 345 AB1-122 TAP 345
END

18. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 135.62% to 142.17% (**DC power flow**) of its normal rating (1195 MVA) for non-contingency condition. This project contributes approximately 78.23 MW to the thermal violation.

19. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 143.95% to 145.69% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of "'270717'. This project contributes approximately 25.68 MW to the thermal violation.

CONTINGENCY '270717' DRESDEN ; R 345 930760 AB1-122 TAP 345 1
OPEN BRANCH FROM BUS 270717 TO BUS 930760 CKT 1
END

20. (CE - MISO AMIL) The AD2-038 TAP-7TAZEWELL 345 kV line (from bus 936290 to bus 349662 ckt 1) loads from 107.63% to 120.18% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of "'270717'. This project contributes approximately 150.0 MW to the thermal violation.

CONTINGENCY '270717' DRESDEN ; R 345 930760 AB1-122 TAP 345 1
OPEN BRANCH FROM BUS 270717 TO BUS 930760 CKT 1
END

Light Load Analysis - 2021

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).