

Feasibility Study Report

For

***PJM Generation Interconnection Request
Queue Position AC1-153***

Kendall Tazewell Dresden Mole Creek

June 1, 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

Queue AC1-153 is a proposal to install a two 1x1 natural gas fired single shaft combined cycle units approximately 7 miles east of Morris, Grundy County, Illinois, at the proposed Point of Interconnection associated with the AB1-122 queue request. This Attachment N requests an MFO of 1300 MWs, 1250 of which is to be considered as Capacity. The IC had proposed an in service date for this project of June 1, 2021. The study year for the AC1 queue is 2020, so interim studies would not be required for this service date.

Impacts on the MISO member transmission systems are not included in this analysis.

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.

Attachment Facilities

The IC AC1-153 generator leads will interconnect to the new 345kV interconnection substation associated with the AB1-122 queue request. This interconnection would require two 345kV line MODs, two dead-end structures and two sets of revenue metering including line relays as shown in the one line diagram below.

The cost for the attachment facilities is estimated at \$2M.

Scope of Work	Cost Estimate
Installation of two 345kV line MODs, two dead-end structures and two sets of revenue metering (see notes below on cost estimate)	\$2.0M

Direct Connection Network Upgrades

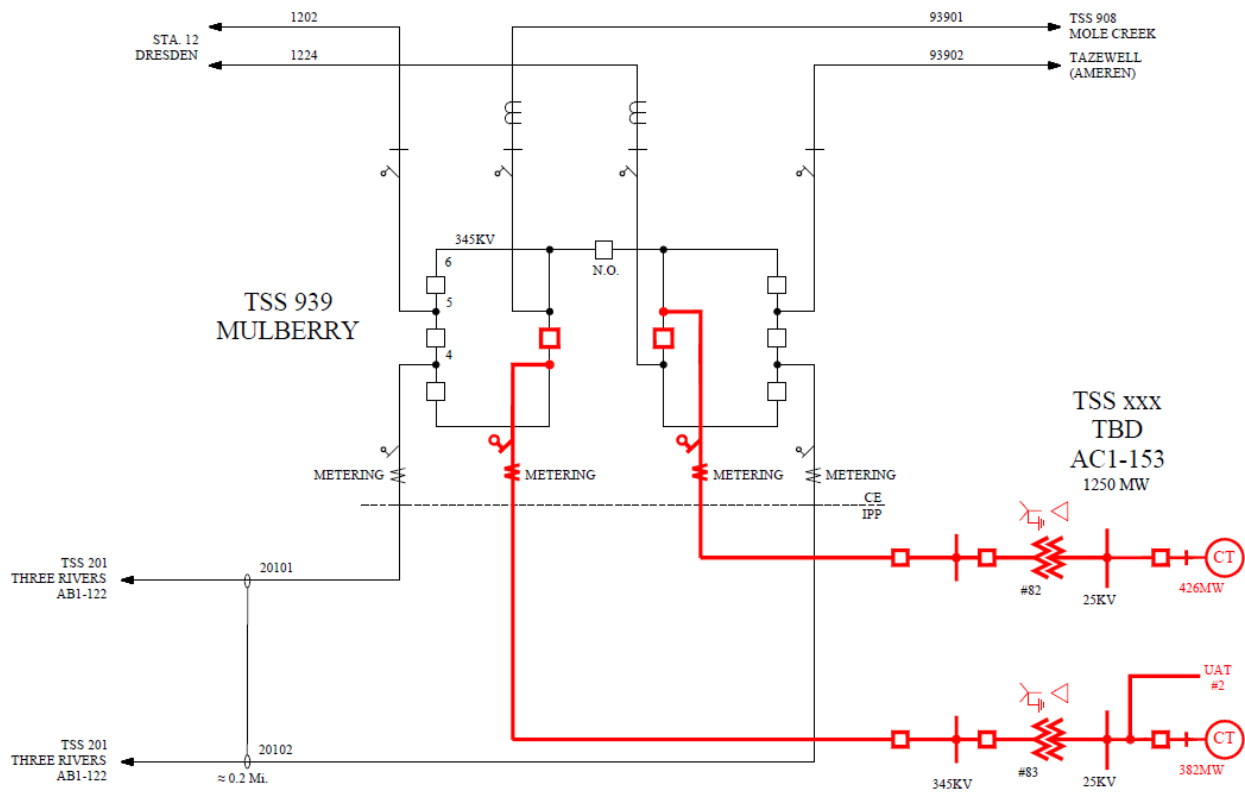
In order to accommodate interconnection of AC1-153, the proposed 345kV Interconnection Substation for AB1-122 will be modified to interconnect developer's generator leads. The scope of work includes installation of two 345kV circuit breakers, bus work and protective relaying/SCADA at the proposed 345kV Interconnection Substation for AB1-122, as shown in the one line diagram below.

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

The preliminary cost estimate for Direct Connection Network Upgrade is given in the following table.

Scope of Work	Cost Estimate
Installation of two 345kV circuit breakers, bus work and protective relaying/SCADA at the proposed 345kV Interconnection Substation for AB1-122 as described above	\$8,000,000
Total Cost Estimate (see notes below on cost estimate)	\$8,000,000

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



Note on Timeline:

Normally it takes about 24-months to engineer, design, procure material and construct 345kV facilities. However, Dresden Station is a nuclear station, and it is anticipated that the construction would need to be coordinated and scheduled with Dresden Station per NERC Standard NUC-001 requirements – for the expected bus outages at TSS 939 Mulberry – this may prolong this construction.

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

The Queue Project AC1-153 was evaluated as a 1300.0 MW (Capacity 1250.0 MW) injection at the AB1-122 project double tapping the Dresden Red-Tazewell 345kV and Dresden Blue-Mole Creek 345kV lines in the ComEd area. Project AC1-153 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-153 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis - 2020

Generator Deliverability

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

1. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 91.48% to 97.23% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 155.31 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

2. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 92.96% to 104.95% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 177.33 MW to the thermal violation.

CONTINGENCY '345-L11620_B-S' / CONTINGENCY # 222
TRIP BRANCH FROM BUS 270736 TO BUS 270770 CKT 1 / ELWOOD ; B 345 GOODINGS ;3B 345
END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

3. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 80.67% to 91.79% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 133.58 MW to the thermal violation.

4. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 80.56% to 90.78% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 151.28 MW to the thermal violation.

CONTINGENCY '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

5. (CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.6% to 113.14% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1221__B-S'. This project contributes approximately 200.34 MW to the thermal violation.

CONTINGENCY '345-L1221__B-S'
TRIP BRANCH FROM BUS 270716 TO BUS 270928 CKT 1 / DRES; B 345 WOLFS; B 345
END

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

6. (CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.32% to 112.87% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L14321TB-N'. This project contributes approximately 200.36 MW to the thermal violation.

CONTINGENCY '345-L14321TB-N'
TRIP BRANCH FROM BUS 270928 TO BUS 270730 CKT 1 / WOLFS; B 345 ELECT; B 345
TRIP BRANCH FROM BUS 270928 TO BUS 272794 TO BUS 275334 CKT 1 / WOLFS; B 345 WOLFS; B 138 WOLFS;1C 34.5
END

7. (CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.32% to 112.22% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 155.01 MW to the thermal violation.

8. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 76.58% to 124.02% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 569.8 MW to the thermal violation.

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

9. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 76.06% to 122.38% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93901_B-S_A'. This project contributes approximately 685.12 MW to the thermal violation.

CONTINGENCY '345-L93901_B-S_A'
TRIP BRANCH FROM BUS 930770 TO BUS 270716 CKT 1 / AB1-122 TAP; 345 DRESDEN B; 345
END

10. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 78.01% to 116.57% (**DC power flow**) of its emergency rating (1479 MVA) for

the single line contingency outage of 'SPS-0303&BT___A'. This project contributes approximately 570.29 MW to the thermal violation.

CONTINGENCY 'SPS-0303&BT___A'
TRIP BRANCH FROM BUS 270854 TO BUS 270855 CKT 1 / POWERTON ; B 345 POWERTON ; R 345
TRIP BRANCH FROM BUS 270855 TO BUS 920931 CKT 1 / POWERTON ; R 345 AA1-018 TAP
END

11. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 92.74% to 134.83% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'SPS-0301&BT___'. This project contributes approximately 622.42 MW to the thermal violation.

CONTINGENCY 'SPS-0301&BT___'
TRIP BRANCH FROM BUS 270854 TO BUS 270790 CKT 1 / POWER; B 345 KATYD; B 345
TRIP BRANCH FROM BUS 270854 TO BUS 270855 CKT 1 / POWER; B 345 POWER; R 345
END

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

12. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 81.5% to 128.53% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 564.85 MW to the thermal violation.

13. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 78.08% to 123.51% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93902_B-S_A'. This project contributes approximately 671.86 MW to the thermal violation.

CONTINGENCY '345-L93902_B-S_A'
TRIP BRANCH FROM BUS 930760 TO BUS 270717 CKT 1 / AB1-122 TAP 345 DRESDEN R; 345
END

Multiple Facility Contingency

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

1. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 77.16% to 110.73% (**DC power flow**) of its emergency rating (1768 MVA) for the tower line contingency outage of '345-L19601_B-S+_345-L0303__R-S_B'. This project contributes approximately 593.5 MW to the thermal violation.

CONTINGENCY '345-L19601_B-S+_345-L0303__R-S_B'
TRIP BRANCH FROM BUS 270790 TO BUS 270770 CKT 1 / KATYD; B 345 GOODI;4B 345
TRIP BRANCH FROM BUS 920931 TO BUS 270769 CKT 1 / AA1-018 TAP 345 GOODINGS ;2R 345
END

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. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 113.12% to 113.3% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 95.22 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1      / 243206 05DUMONT 765 920251 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
```

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

2. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 105.51% to 105.78% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 103.08 MW to the thermal violation.

```
CONTINGENCY '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
```

3. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 105.5% to 105.77% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 103.08 MW to the thermal violation.

```
CONTINGENCY '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
```

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1      / 243206 05DUMONT 765 920251 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1      / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
```

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

5. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 100.7% to 101.2% (**DC power flow**) of its emergency rating (1091

MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 125.09 MW to the thermal violation.

```
CONTINGENCY '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
```

6. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 100.67% to 101.16% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 125.07 MW to the thermal violation.

```
CONTINGENCY '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
```

7. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 154.23% to 155.78% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 192.22 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'  
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1 / 243206 05DUMONT 765 920251 X1-020 TAP 765 1  
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1  
END
```

Please refer to Appendix 7 for a table containing the generators having contribution to this flowgate.

8. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 118.22% to 124.28% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 189.47 MW to the thermal violation.

```
CONTINGENCY '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 BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 124.17% to 126.58% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 160.58 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'  
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1 / 243206 05DUMONT 765 920251 X1-020 TAP 765 1  
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1  
END
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Please refer to Appendix 8 for a table containing the generators having contribution to this flowgate.

10. (CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 101.73% to 129.12% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

```
CONTINGENCY '012-45-BT5-6__'  
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  
TRIP BRANCH FROM BUS 274702 TO BUS 270716 CKT 1      / KENDA; R 345 DRES; B 345  
END
```

Please refer to Appendix 9 for a table containing the generators having contribution to this flowgate.

11. (CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 104.18% to 119.61% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 68.19 MW to the thermal violation.

```
CONTINGENCY '345-L10805_B-S'  
TRIP BRANCH FROM BUS 270810 TO BUS 274702 CKT 1      / LOCKP; B 345 KENDA;BU 345  
END
```

12. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 113.27% to 125.2% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 211.34 MW to the thermal violation.

```
CONTINGENCY '023-65-BT2-3__'  
TRIP BRANCH FROM BUS 270607 TO BUS 270644 CKT 1      / COLLINS; 765  
WILTON 765  
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1      / COLLI; 765  
PLANO; 765  
END
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Please refer to Appendix 10 for a table containing the generators having contribution to this flowgate.

13. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 104.85% to 121.03% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 239.32 MW to the thermal violation.

```
CONTINGENCY '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
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END

14. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 108.63% to 120.93% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 65.2 MW to the thermal violation.

```
CONTINGENCY '900-45-BT4-5__' / CONTINGENCY # 771
TRIP BRANCH FROM BUS 270737 TO BUS 270769 CKT 1 / ELWOOD ; R 345 GOODINGS ;1R 345
TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1 / ELWOOD ; B 345 ELWOOD ; R 345
END
```

Please refer to Appendix 11 for a table containing the generators having contribution to this flowgate.

15. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 107.35% to 120.46% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 62.94 MW to the thermal violation.

```
CONTINGENCY '345-L1222__R-S'
TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 / DRES; R 345 ELWOOD; R 345
END
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16. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 103.41% to 112.6% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L10806_R-S'. This project contributes approximately 44.09 MW to the thermal violation.

```
CONTINGENCY '345-L10806_R-S'
TRIP BRANCH FROM BUS 274703 TO BUS 270811 CKT 1 / KENDA;RU 345 LOCKP; R 345
END
```

17. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1 / 243206 05DUMONT 765 920251 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END
```

Please refer to Appendix 12 for a table containing the generators having contribution to this flowgate.

18. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 100.7% to 101.19% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 125.09 MW to the thermal violation.

```
CONTINGENCY '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

19. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 100.66% to 101.16% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 125.07 MW to the thermal violation.

CONTINGENCY '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

20. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 123.71% to 124.6% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT5-6__'. This project contributes approximately 198.55 MW to the thermal violation.

CONTINGENCY '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

Please refer to Appendix 13 for a table containing the generators having contribution to this flowgate.

21. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 127.79% to 128.7% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT2-3__'. This project contributes approximately 202.75 MW to the thermal violation.

CONTINGENCY '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

Please refer to Appendix 14 for a table containing the generators having contribution to this flowgate.

22. (CE - CE) The KENDALL ;RU-LOCKPORT ; R 345 kV line (from bus 274703 to bus 270811 ckt 1) loads from 130.31% to 134.64% (**DC power flow**) of its emergency rating (1912 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 84.68 MW to the thermal violation.

CONTINGENCY '023-65-BT2-3__'

TRIP BRANCH FROM BUS 270607 TO BUS 270644 CKT 1 / COLLINS; 765 WILTON 765
TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1 / COLLI; 765 PLANO; 765
END

Please refer to Appendix 15 for a table containing the generators having contribution to this flowgate.

23. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.62% to 129.18% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 175.38 MW to the thermal violation.

CONTINGENCY '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

Please refer to Appendix 16 for a table containing the generators having contribution to this flowgate.

24. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.56% to 129.12% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 175.35 MW to the thermal violation.

CONTINGENCY '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 - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.47% to 129.02% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 174.38 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1 / 243206 05DUMONT 765 920251 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

26. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 103.64% to 108.8% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 168.32 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

27. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.98% to 126.84% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 134.84 MW to the thermal violation.

```
CONTINGENCY '2978_C2_05DUMONT 765-B_A'  
OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1 / 243206 05DUMONT 765 920251 X1-020 TAP 765 1  
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1  
END
```

Please refer to Appendix 17 for a table containing the generators having contribution to this flowgate.

28. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.38% to 126.27% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 135.93 MW to the thermal violation.

```
CONTINGENCY '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
```

29. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.35% to 126.25% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 135.93 MW to the thermal violation.

```
CONTINGENCY '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
```

30. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 101.17% to 107.23% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 130.56 MW to the thermal violation.

```
CONTINGENCY '695_B2'  
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1  
END
```

31. (CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 101.71% to 129.1% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

```
CONTINGENCY '012-45-BT5-6__'  
TRIP BRANCH FROM BUS 270716 TO BUS 270736 CKT 1 / DRESD; B 345 ELWOO; B 345  
TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1 / ELWOO; B 345 ELWOO; R 345
```

TRIP BRANCH FROM BUS 274702 TO BUS 270716 CKT 1 / KENDA; R 345 DRES; B 345
END

Please refer to Appendix 18 for a table containing the generators having contribution to this flowgate.

32. (CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 104.16% to 119.58% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 68.19 MW to the thermal violation.

CONTINGENCY '345-L10805_B-S'
TRIP BRANCH FROM BUS 270810 TO BUS 274702 CKT 1 / LOCKP; B 345 KENDA;BU 345
END

33. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 107.3% to 120.42% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 62.94 MW to the thermal violation.

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

34. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 103.35% to 112.53% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L10806_R-S'. This project contributes approximately 44.09 MW to the thermal violation.

CONTINGENCY '345-L10806_R-S'
TRIP BRANCH FROM BUS 274703 TO BUS 270811 CKT 1 / KENDA;RU 345 LOCKP; R 345
END

35. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 120.8% to 122.06% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of '3128_C2_05EUGENE 345-A2'. This project contributes approximately 41.03 MW to the thermal violation.

CONTINGENCY '3128_C2_05EUGENE 345-A2'
OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1 / 243221 05EUGENE 345 249504 08CAYSUB 345 1
OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
END

Please refer to Appendix 19 for a table containing the generators having contribution to this flowgate.

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)

No issues identified.

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. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 105.37% to 105.65% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 103.02 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 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 100.34% to 100.83% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 124.94 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

3. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 149.74% to 150.94% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 197.05 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

4. (CE - CE) The BLUE ISL ;RT-BLUE ISL ; R 345 kV line (from bus 270667 to bus 270665 ckt 1) loads from 102.21% to 102.73% (**DC power flow**) of its emergency rating (1479 MVA)

for the single line contingency outage of '695_B2'. This project contributes approximately 93.63 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

5. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 123.38% to 125.81% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 161.52 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

6. (CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 106.93% to 122.63% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 70.92 MW to the thermal violation.

CONTINGENCY '345-L10805_B-S'
TRIP BRANCH FROM BUS 270810 TO BUS 274702 CKT 1 / LOCKP; B 345 KENDA;BU 345
END

7. (CE - CE) The DRESDEN ; R-COLLINS ; R 345 kV line (from bus 270717 to bus 270697 ckt 1) loads from 84.06% to 97.47% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 233.54 MW to the thermal violation.

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

8. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 120.55% to 137.38% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 248.9 MW to the thermal violation.

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

9. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 106.18% to 119.82% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 65.46 MW to the thermal violation.

CONTINGENCY '345-L1222__R-S'
TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 / DRES; R 345 ELWOOD; R 345
END

10. (CE - CE) The E FRANKFO; B-CRETE EC ;BP 345 kV line (from bus 270728 to bus 274750 ckt 1) loads from 110.74% to 111.31% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 177.05 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

11. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 92.59% to 101.39% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 184.42 MW to the thermal violation.

CONTINGENCY '345-L11620_B-S' / CONTINGENCY # 222
TRIP BRANCH FROM BUS 270736 TO BUS 270770 CKT 1 / ELWOOD ; B 345 GOODINGS ;3B 345
END

12. (CE - MISO AMIL) The POWERTON ; R-7TZWL-TX01 345 kV line (from bus 270855 to bus 349662 ckt 1) loads from 84.8% to 112.07% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93901_B-S_A'. This project contributes approximately 403.24 MW to the thermal violation.

CONTINGENCY '345-L93901_B-S_A'
TRIP BRANCH FROM BUS 930770 TO BUS 270716 CKT 1 / AB1-122 TAP; 345 DRESDEN B; 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 100.33% to 100.82% (**DC power flow**) of its emergency rating (1091 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 124.94 MW to the thermal violation.

CONTINGENCY '695_B2'
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTO; 765 1
END

14. (CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.26% to 112.88% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1221__B-S'. This project contributes approximately 208.36 MW to the thermal violation.

CONTINGENCY '345-L1221__B-S'
TRIP BRANCH FROM BUS 270716 TO BUS 270928 CKT 1 / DRES; B 345 WOLFS; B 345
END

15. (CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.59% to 112.56% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 161.21 MW to the thermal violation.

16. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 127.96% to 128.52% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 175.06 MW to the thermal violation.

CONTINGENCY '695_B2'

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

17. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 124.95% to 125.85% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 135.78 MW to the thermal violation.

CONTINGENCY '695_B2'

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

18. (CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 106.9% to 122.61% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 70.92 MW to the thermal violation.

CONTINGENCY '345-L10805_B-S'

TRIP BRANCH FROM BUS 270810 TO BUS 274702 CKT 1 / LOCKP; B 345 KENDA;BU 345
END

19. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 106.14% to 119.77% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 65.46 MW to the thermal violation.

CONTINGENCY '345-L1222__R-S'

TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1 / DRES; R 345 ELWOO; R 345
END

20. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 129.23% to 130.65% (**DC power flow**) of its normal rating (1334 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 42.02 MW to the thermal violation.

CONTINGENCY '286_B2_TOR1687'

OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1
END

21. (AEP - AEP) The AC1-225 TAP-05MARYSV 765 kV line (from bus 927280 to bus 242928 ckt 1) loads from 98.39% to 99.36% (**DC power flow**) of its normal rating (4249 MVA) for the single line contingency outage of '8649_B2_TOR546'. This project contributes approximately 338.3 MW to the thermal violation.

CONTINGENCY '8649_B2_TOR546'
OPEN BRANCH FROM BUS 242924 TO BUS 243208 CKT 1 / 242924 05HANG R 765 243208 05JEFRSO 765 1
END

22. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 84.25% to 132.43% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93901_B-S_A'. This project contributes approximately 712.52 MW to the thermal violation.

CONTINGENCY '345-L93901_B-S_A'
TRIP BRANCH FROM BUS 930770 TO BUS 270716 CKT 1 / AB1-122 TAP; 345 DRESDEN B; 345
END

23. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 79.6% to 128.94% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 592.59 MW to the thermal violation.

24. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 117.49% to 161.26% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'SPS-0301&BT___'. This project contributes approximately 647.32 MW to the thermal violation.

CONTINGENCY 'SPS-0301&BT___'
TRIP BRANCH FROM BUS 270854 TO BUS 270790 CKT 1 / POWER; B 345 KATYD; B 345
TRIP BRANCH FROM BUS 270854 TO BUS 270855 CKT 1 / POWER; B 345 POWER; R 345
END

25. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 91.69% to 140.6% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 587.44 MW to the thermal violation.

Light Load Analysis - 2020

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

System Reinforcements

Short Circuit

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

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

Generator Deliverability

1. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 91.48% to 97.23% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 155.31 MW to the thermal violation.

ComEd: ComEd Transmission Planning Comments-ComEd 345kV L17703 SSTE rating is 1251 MVA. No upgrade is required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

2. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 92.96% to 104.95% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 177.33 MW to the thermal violation.

Reinforcement: ComEd 345kV L11620 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the applicable rating therefore an upgrade is required. The upgrade will consist of re-conductoring L11620. Upon completion of this work the line ratings will be 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$12.5M

Time: 30 months.

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

3. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 80.67% to 91.79% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 133.58 MW to the thermal violation.

Reinforcement: ComEd 345kV L11620 SN rating is 1201 MVA. The post contingency flow for this event exceeds the applicable rating therefore an upgrade is required. The upgrade will consist of sag mitigation and re-conductoring on L11620. Upgrade station conductor at Goodings Grove and upgrade 1-345kV Bus Tie Circuit Breaker. Upon completion of this work the line ratings will be 1448/1535/1770 MVA (SN/SE/SLD) respectively.

Cost: \$20.5M

Time: 30 months.

4. (CE - CE) The ELWOOD ; R-GOODINGS ; 2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 80.56% to 90.78% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 151.28 MW to the thermal violation.

Reinforcement: ComEd Transmission Planning Comments-ComEd 345kV L11620 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the applicable rating therefore an upgrade is required. The upgrade will consist of re-conductoring L11620. Upon completion of this work the line ratings will be 1448/1535/1770 MVA (SN/SE/SLD) respectively.

Cost: \$12.5M

Time: 30 months.

5. (CE - CE) The KENDALL ; BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.6% to 113.14% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1221__B-S'. This project contributes approximately 200.34 MW to the thermal violation.

Reinforcement: ComEd 345kV L10805 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the applicable rating for the line therefore an upgrade will be required. The upgrade will be to re-conductor the line. Upon completion of this work the new line ratings will be 1334/1726/1837/2084 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$8.5M

Time: 24-30 months.

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

6. (CE - CE) The KENDALL ; BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.32% to 112.87% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L14321TB-N'. This project contributes approximately 200.36 MW to the thermal violation.

Same as Generator Deliverability #5

7. (CE - CE) The KENDALL ; BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.32% to 112.22% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 155.01 MW to the thermal violation.

Reinforcement: ComEd 345kV L10805 SN rating is 1201 MVA. The post contingency flow for this event exceeds the applicable rating for the line therefore an upgrade will be required. The upgrade will be to re-conductor & re-sag the line. Upon completion of this work the new line ratings will be 1683/2068/2564 MVA (SN/SE/SLD) respectively.

Cost: \$12.5M

Time: 30 months.

8. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 76.58% to 124.02% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 569.8 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SN rating is 1201 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals, upgrade CT's on a Bus Tie Circuit Breaker at Dresden Station and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1649/1649/1676/1772 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.7M

Time: 24-30 months.

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

9. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 76.06% to 122.38% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93901_B-S_A'. This project contributes approximately 685.12 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1560/1802/2083/2477 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.5M

Time: 24-30 months.

10. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 78.01% to 116.57% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'SPS-0303&BT___A'. This project contributes approximately 570.29 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1560/1802/2083/2477 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.5M

Time: 24-30 months.

11. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 92.74% to 134.83% (**DC power flow**) of its emergency rating (1479 MVA) for

the single line contingency outage of 'SPS-0301&BT____'. This project contributes approximately 622.42 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1560/1802/2083/2477 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.5M

Time: 24-30 months.

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

12. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 81.5% to 128.53% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 564.85 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SN rating is 1201 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1560/1802/2083/2477 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.5M

Time: 24-30 months.

13. (CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 78.08% to 123.51% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L93902_B-S_A'. This project contributes approximately 671.86 MW to the thermal violation.

Reinforcement: ComEd 345kV L1202 SSTE rating is 1568 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to re-conductor the line, upgrade station conductor at both station line terminals and upgrade 1-345kV Circuit Breaker at Dresden Station. Upon completion of this work the new line ratings will be 1560/1802/2083/2477 MVA (SN/SLTE/SSTE/SLD) respectively.

Cost: \$10.5M

Time: 24-30 months.

Multiple Facility Contingency

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

1. (CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 77.16% to 110.73% (**DC power flow**) of its emergency rating (1768 MVA) for

the tower line contingency outage of '345-L19601_B-S+_345-L0303__R-S_B'. This project contributes approximately 593.5 MW to the thermal violation.

Reinforcement: ComEd 345kV L93902 (former L93505) SLD rating is 1284 MVA & the ALDR rating is 1477 MVA. The post contingency flow for this event exceeds the line rating therefore an upgrade will be required. The upgrade will be to mitigate the sag issue on the line. Upon completion of this work the new line ratings will be 1201/1479/1768/2033 MVA (SN/SE/SLD/ALDR) respectively.

Cost: \$3.5M

Time: 24-30 months.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 113.12% to 113.3% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 95.22 MW to the thermal violation.

Reinforcement: A sag check will be required for the ACSR ~ 954 ~ 45/7 ~ RAIL Conductor Section 1 to determine if the line section can be operated above its emergency rating of 1409 MVA. The result could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 14 mile section of line would need to be rebuilt.

Estimated Cost for the Sag Study: \$56,000. If deemed necessary to rebuild section of line, Estimated Cost: \$28,000,000. S/N: 1409 MVA S/E: 1868 MVA

Cost: \$28,056,000

Time: 6-12 months, sag study. 24-36 months, rebuild

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

2. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 105.51% to 105.78% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 103.08 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #1

3. (AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 105.5% to 105.77% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 103.08 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #1

4. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

ComEd: ComEd Transmission Planning Comments-ComEd 345kV L6617rating is 1237 MVA and the ALDR is 1423 MVA. No upgrade is required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

5. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 100.7% to 101.2% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 125.09 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #4

6. (MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 100.67% to 101.16% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 125.07 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #4

7. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 154.23% to 155.78% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 192.22 MW to the thermal violation.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

AEP

Reinforcement: Reconductor/Rebuild 9 mile section of line. Estimated Cost: \$18,000,000.

Replace the Dumont Wavetrap (2500 A): Estimated cost: \$500,000. Replace the Dumont Line Riser (2500 A): Estimated cost: \$100,000. S/N: 2387 MVA S/E: 2387 MVA

Cost: \$18,600,000

Time: 24-36 months

Please refer to Appendix 7 for a table containing the generators having contribution to this flowgate.

8. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 118.22% to 124.28% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 189.47 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #7

9. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 124.17% to 126.58% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 160.58 MW to the thermal violation.

Comed: ComEd 345kV L7703 SLD rating is 1367 MVA and the ALDR is 1572 MVA. No upgrade is required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

Please refer to Appendix 8 for a table containing the generators having contribution to this flowgate.

10. (CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 101.73% to 129.12% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

Reinforcement: ComEd Tr, 81 at Dresden Station SLD rating is 530 MVA and the ALDR is 610 MVA. The post contingency flow for this event exceeds the ratings for the line therefore an upgrade is required. The upgrade will be to install a new 345kV Circuit Breaker at TSS 900 Elwood in Bus Tie position 5-7. ComEd P.D. 0P180085 for PJM queued project W4-005 scope of work will install the Bus Tie CB 5-7.

Cost: \$2.34M

Time: 6/1/2018

Please refer to Appendix 9 for a table containing the generators having contribution to this flowgate.

11. (CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 104.18% to 119.61% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 68.19 MW to the thermal violation.

Reinforcement: ComEd Tr. 81 at Dresden Station SSTE rating is 520 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to install a 3rd transformer at Dresden Station- Tr. 82. The upgrade will require 138kV bus work and associated 138kV line transfers. Station control work and coordination within the

control room at Dresden Station will be required. Given that this work is at a nuclear station, the construction work will require coordination with the nuclear unit outages. Upon completion the Tr. 82 will alleviate the post contingency flows thru Tr. 81 at Dresden for this event. The new transformer will have similar ratings as that of Tr. 81.

Cost: \$52M

Time: 36-54 months.

12. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 113.27% to 125.2% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 211.34 MW to the thermal violation.

Reinforcement: ComEd 345kV L1222 SLD rating is 1768 MVA and the ALDR rating is 2033 MVA. The post contingency flow for this event exceeds the ratings for the line therefore an upgrade is required. The upgrade is to re-conductor a portion of the line. Upon completion of the work the new ratings will be 1334/1726/1837/2084/2397 MVA, SN/SLTE/SSTE/SLD/ALDR respectively.

Cost: \$6M

Time: 26-30 months.

Please refer to Appendix 10 for a table containing the generators having contribution to this flowgate.

13. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 104.85% to 121.03% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 239.32 MW to the thermal violation.

Reinforcement: ComEd 345kV L1222 SSTE 1568 MVA. The post contingency flow for this event exceeds the ratings for the line therefore an upgrade is required. The upgrade is to re-conductor a portion of the line. Upon completion of the work the new ratings will be 1334/1726/1837/2084/2397 MVA, SN/SLTE/SSTE/SLD/ALDR respectively.

Cost: \$6M

Time: 26-30 months.

14. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 108.63% to 120.93% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 65.2 MW to the thermal violation.

Reinforcement: ComEd Tr. @ Dresden Station SLD is 530 MVA and the ALDR is 610 MVA. The post contingency flow for this event exceeds the applicable rating therefore an upgrade is required. ComEd Project Diagram- P.D. 0P180075 (PJM ID B2732.1) will add 2-345kV lines to the 345kV Red Bus at Dresden. Pending PJM modeling for verification, this project may alleviate this post contingency overload. If the overload is still present then the upgrade will be to install a new 345kV Circuit Breaker at Elwood. The new CB will be in the future BT 5-7

position. By installing this CB the contingency file for this event will be revised by removing the trip branch of bus 270736 – 270737. This will allow post contingency flow into the blue bus at Elwood. Cost: 25.3M

Time: 36 months

Please refer to Appendix 11 for a table containing the generators having contribution to this flowgate.

15. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 107.35% to 120.46% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 62.94 MW to the thermal violation.

Reinforcement: ComEd Tr. 83 at Dresden Station SSTE rating is 520 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to install Tr. 84 at Dresden Station. The upgrade will require 138kV bus work and associated 138kV line transfers. Station control work and coordination within the control room at Dresden Station will be required. Given that this work is at a nuclear station, the construction work will require coordination with the nuclear unit outages. A highly preliminary estimate for this work is \$52M with an estimated construction timeline of 36-54 months. Upon completion the Tr. 84 (420/480/520/530 MVA, SN/SLTE/SSTE/SLD respectively). will alleviate the post contingency flows thru Tr. 83 at Dresden for this event. The new transformer will have similar ratings as that of Tr. 83. Note, if both Tr. 82 & Tr. 84 are installed at Dresden Station then the total preliminary estimate will be \$77M.

Cost: \$52M (\$77M if both Tr 82 & Tr 84 are installed)

Time: 36-54 months.

16. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 103.41% to 112.6% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L10806_R-S'. This project contributes approximately 44.09 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #15

17. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

ComEd: ComEd 345kV L6617 SLD rating is 1237 MVA & the ALDR rating is 1423MVA. No upgrade required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

Please refer to Appendix 12 for a table containing the generators having contribution to this flowgate.

18. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 100.7% to 101.19% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 125.09 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #17

19. (CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 100.66% to 101.16% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 125.07 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #17

20. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 123.71% to 124.6% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT5-6__'. This project contributes approximately 198.55 MW to the thermal violation.

Reinforcement: ComEd Tr, 94 at Wilton Center SLD rating is 1601 MVA & the ALDR is 1841 MVA. The post contingency flow for this event exceeds the applicable ratings. The upgrade will be to build out the 765kV bus at Wilton Center. Relocate L11216 to the future bus 8 position at Wilton Center. Install 2-765kV Circuit Breakers (Bus Tie CB's 6-8 & 8-2). Upon completion of this work, Tr. 94 will no longer be tripped in the contingency above and it is expected that Tr. 93 will no longer experience an overload for this event.

Cost: \$15M

Time: 36 months

Please refer to Appendix 13 for a table containing the generators having contribution to this flowgate.

21. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 127.79% to 128.7% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT2-3__'. This project contributes approximately 202.75 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #20

Please refer to Appendix 14 for a table containing the generators having contribution to this flowgate.

22. (CE - CE) The KENDALL ;RU-LOCKPORT ; R 345 kV line (from bus 274703 to bus 270811 ckt 1) loads from 130.31% to 134.64% (**DC power flow**) of its emergency rating (1912 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 84.68 MW to the thermal violation.

Reinforcement: ComEd Tr, 94 at Wilton Center SLD rating is 1601 MVA & the ALDR is 1841 MVA. The post contingency flow for this event exceeds the applicable ratings. The upgrade will be to build out the 765kV bus at Wilton Center. Relocate L11216 to the future bus 8 position at Wilton Center. Install 2-765kV Circuit Breakers (Bus Tie CB's 6-8 & 8-2). Upon completion of this work, Tr. 94 will no longer be tripped in the contingency above and it is expected that Tr. 93 will no longer experience an overload for this event.

Cost: \$15M

Time: 36 months

Please refer to Appendix 15 for a table containing the generators having contribution to this flowgate.

23. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.62% to 129.18% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 175.38 MW to the thermal violation.

ComEd: ComEd Comments- ComEd 345kV L94507 SLD is 1674 MVA & ALDR is 1925 MVA. No upgrade required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

Please refer to Appendix 16 for a table containing the generators having contribution to this flowgate.

24. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.56% to 129.12% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 175.35 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #23

25. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.47% to 129.02% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 174.38 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #23

26. (CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 103.64% to 108.8% (**DC power flow**) of its emergency rating (1399 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 168.32 MW to the thermal violation.

ComEd: ComEd Comments- ComEd 345kV L94507 SSTE is 1483 MVA. No upgrade required.

NIPSCO (MISO) will have to evaluate this violation during the SIS phase.

27. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.98% to 126.84% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 134.84 MW to the thermal violation.

ComEd: ComEd 345kV L97008 SLD is 1237 MVA and the ALDR is 1423 MVA. No upgrade required.

AEP

Reinforcement: A sag check will be required for the AEP owned section of the Olive - University Park (CE) 345 kV line to determine if the line section can be operated above its emergency rating of 971 MVA. The result could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 40.61 mile section of line would need to be rebuilt. Estimated Cost for the Sag Study: \$162,440. Estimated Cost to reconductor/rebuild AEP section of line: \$81,220,000. S/N: 971 MVA S/E: 1318 MVA Cost: \$81,362,440

Time: 6-12 months, sag study. 36-48 months, Reconductor/rebuild

Please refer to Appendix 17 for a table containing the generators having contribution to this flowgate.

28. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.38% to 126.27% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 135.93 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #27

29. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.35% to 126.25% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 135.93 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #27

30. (CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 101.17% to 107.23% (**DC power flow**) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 130.56 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #27

31. (CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 101.71% to 129.1% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

Reinforcement: ComEd Tr. 81 at Dresden Station SLD is 530 MVA and the ALDR rating is 610 MVA.. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to install a 3rd transformer at Dresden Station- Tr. 82. The upgrade will require 138kV bus work and associated 138kV line transfers. Station control work and coordination within the control room at Dresden Station will be required. Given that this work is at a nuclear station, the construction work will require coordination with the nuclear unit outages. A highly preliminary estimate for this work is \$52M with an estimated construction timeline of 36-54 months. Upon completion the Tr. 82 will alleviate the post contingency flows thru Tr. 81 at Dresden for this event. The new transformer will have similar ratings as that of Tr. 81.

Cost: \$52M

Time: 36-54 months

Please refer to Appendix 18 for a table containing the generators having contribution to this flowgate.

32. (CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 104.16% to 119.58% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of '345-L10805_B-S'. This project contributes approximately 68.19 MW to the thermal violation.

Reinforcement: ComEd Tr. 81 at Dresden Station SSTE rating is 520 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to install a 3rd transformer at Dresden Station- Tr. 82. The upgrade will require 138kV bus work and associated 138kV line transfers. Station control work and coordination within the control room at Dresden Station will be required. Given that this work is at a nuclear station, the construction work will require coordination with the nuclear unit outages. Upon completion the Tr. 82 will alleviate the post contingency flows thru Tr. 81 at Dresden for this event. The new transformer will have similar ratings as that of Tr. 81.

Cost: \$52M

Time: 36-54 months.

33. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 107.3% to 120.42% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 62.94 MW to the thermal violation.

Reinforcement: ComEd Tr. 83 at Dresden Station SSTE rating is 520 MVA. The post contingency flow for this event exceeds the rating therefore an upgrade is required. The upgrade will be to install Tr. 84 at Dresden Station.

The upgrade will require 138kV bus work and associated 138kV line transfers. Station control work and coordination within the control room at Dresden Station will be required. Given that

this work is at a nuclear station, the construction work will require coordination with the nuclear unit outages. A highly preliminary estimate for this work is \$52M with an estimated construction timeline of 36-54 months. Upon completion the Tr. 84 will alleviate the post contingency flows thru Tr. 83 at Dresden for this event. The new transformer will have similar ratings as that of Tr. 83. Note, if both Tr. 82 & Tr. 84 are installed at Dresden Station then the total preliminary estimate will be \$77M with an estimated construction timeline of 36-54 months subject to coordination with nuclear unit outages.

Cost: \$52M (\$77M if both Tr 82 and 84 are installed)

Time: 36-54 months.

34. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 103.35% to 112.53% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L10806_R-S'. This project contributes approximately 44.09 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #33

35. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 120.8% to 122.06% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of '3128_C2_05EUGENE 345-A2'. This project contributes approximately 41.03 MW to the thermal violation.

AMIL (MISO) will have to evaluate this violation during the SIS phase

Reinforcement: AEP owns 0.6 mile section of line between Sullivan/Breed and West Casey 345 kV stations which will need to be rebuilt to increase AEP end ratings. Per our records, AMIL's portion of the conductor also needs to be reconducted/rebuilt to mitigate this overload. S/N: 1754 S/E: 2369

Cost: \$2M

Time: 24-36 months

Please refer to Appendix 19 for a table containing the generators having contribution to this flowgate.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 92.96% to 104.95% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 177.33 MW to the thermal violation.

CONTINGENCY '345-L11620_B-S' / CONTINGENCY # 222
 TRIP BRANCH FROM BUS 270736 TO BUS 270770 CKT 1 / ELWOOD ; B 345 GOODINGS ;3B 345
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274658	DRESDEN ;2U	26.94
274659	DRESDEN ;3U	24.82
274729	ELWOOD EC;1P	9.37
274731	ELWOOD EC;2P	9.37
274733	ELWOOD EC;3P	9.37
274735	ELWOOD EC;4P	9.37
274728	ELWOOD EC;5P	9.32
274730	ELWOOD EC;6P	9.32
274732	ELWOOD EC;7P	9.32
274734	ELWOOD EC;8P	9.32
274736	ELWOOD EC;9P	9.32
274837	EQUISTAR ; B	0.71
274836	EQUISTAR ; R	1.31
274704	KENDALL ;1C	3.85
274705	KENDALL ;1S	2.57
274706	KENDALL ;2C	3.85
274707	KENDALL ;2S	2.57
274879	MINONK ;1U	0.66
904211	W3-135	0.21
905493	W4-086	0.03
920272	X1-045	2.63
915601	Y3-088	0.42
915611	Y3-089	0.42
921012	AA1-040 1	0.94
921022	AA1-040 2	0.79
921692	AA2-035	71.66
930761	AB1-122 1	84.93
930762	AB1-122 2	78.21
926701	AC1-153 C	85.01
926711	AC1-153 C2	92.32
927091	AC1-204	199.34
927092	AC1-204 2	200.6

Appendix 2

(CE - CE) The KENDALL ;BU-LOCKPORT ; B 345 kV line (from bus 274702 to bus 270810 ckt 1) loads from 99.6% to 113.14% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1221__B-S'. This project contributes approximately 200.34 MW to the thermal violation.

CONTINGENCY '345-L1221__B-S'

TRIP BRANCH FROM BUS 270716 TO BUS 270928 CKT 1

/ DRES; B 345 WOLFS; B 345

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274658	DRESDEN ;2U	58.53
274729	ELWOOD EC;1P	2.84
274731	ELWOOD EC;2P	2.84
274733	ELWOOD EC;3P	2.84
274735	ELWOOD EC;4P	2.84
274728	ELWOOD EC;5P	2.89
274730	ELWOOD EC;6P	2.89
274732	ELWOOD EC;7P	2.89
274734	ELWOOD EC;8P	2.89
274736	ELWOOD EC;9P	2.89
274836	EQUISTAR ; R	2.77
274704	KENDALL ;1C	16.69
274705	KENDALL ;1S	11.13
274706	KENDALL ;2C	16.69
274707	KENDALL ;2S	11.13
274879	MINONK ;1U	1.38
274677	POWERTON ;5U	9.58
274678	POWERTON ;6U	9.5
904211	W3-135	0.28
920272	X1-045	5.72
915601	Y3-088	1.83
915611	Y3-089	1.83
921012	AA1-040 1	1.98
930761	AB1-122 1	184.32
926711	AC1-153 C2	200.34
927091	AC1-204	61.74
927092	AC1-204 2	60.8

Appendix 3

(CE - CE) The AB1-122 TAP-DRESDEN ; R 345 kV line (from bus 930760 to bus 270717 ckt 1) loads from 76.58% to 124.02% (**DC power flow**) of its normal rating (1201 MVA) for non-contingency condition. This project contributes approximately 569.8 MW to the thermal violation.

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274877	BISHOP HL;1U	0.23
274878	BISHOP HL;2U	0.23
274848	CAMPGROVE;RU	0.35
274879	MINONK ;1U	0.61
274677	POWERTON ;5U	21.93
274678	POWERTON ;6U	22.04
274851	PROVIDENC;RU	0.17
274861	TOP CROP ;1U	0.22
274862	TOP CROP ;2U	0.43
LTF	Z1-043	13.31
916211	Z1-072	0.11
920932	AA1-018 C	1.14
921702	AA2-039 C	1.17
930762	AB1-122 2	524.22
LTF	AB2-013	22.09
925581	AC1-033 C	0.79
926701	AC1-153 C	569.8
926841	AC1-171 C OP	0.65
927201	AC1-214 C	1.18

Appendix 4

(CE - CE) The AB1-122 TAP-DRESDEN ; B 345 kV line (from bus 930770 to bus 270716 ckt 1) loads from 92.74% to 134.83% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of 'SPS-0301&BT___'. This project contributes approximately 622.42 MW to the thermal violation.

CONTINGENCY 'SPS-0301&BT___'

TRIP BRANCH FROM BUS 270854 TO BUS 270790 CKT 1

/ POWER; B 345 KATYD; B 345

TRIP BRANCH FROM BUS 270854 TO BUS 270855 CKT 1

/ POWER; B 345 POWER; R 345

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274879	MINONK ;1U	7.63
274677	POWERTON ;5U	146.72
930761	AB1-122 1	572.63
926711	AC1-153 C2	622.42

Appendix 5

(AEP - AEP) The X2-052 TAP-05DUMONT 345 kV line (from bus 247610 to bus 243219 ckt 2) loads from 113.12% to 113.3% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 95.22 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
247900	05FR-11G E	7.01
247901	05FR-12G E	6.9
247902	05FR-21G E	7.37
247903	05FR-22G E	7.06
247904	05FR-3G E	14.29
247905	05FR-4G E	10.75
246909	05MDL-1G C	0.77
247906	05MDL-1G E	16.08
246910	05MDL-2G C	0.39
247907	05MDL-2G E	7.97
246976	05MDL-3G C	0.39
247912	05MDL-3G E	8.34
246979	05MDL-4G C	0.77
247913	05MDL-4G E	7.95
290051	GSG-6; E	6.14
275149	KEMPTON ;1E	10.55
290108	LEEDK;1U E	14.19
274850	MENDOTA H;RU	3.53
275148	MILKS GRV;1E	10.55
293061	N-015 E	9.07
293644	O22 E1	5.9
293645	O22 E2	11.46
290021	O50 E	11.42
294392	P-010 E	11.52
274830	PWR VTREC;1U	3.57
274831	PWR VTREC;2U	3.57
274722	S-055 E	6.53
884780	S-058 C	25.39
884782	S-058 C1	25.39
884781	S-058 E	73.57
884783	S-058 E1	73.57
295111	SUBLETTE E	1.6

247556	<i>T-127 C</i>	2.04
247943	<i>T-127 E</i>	8.16
890570	<i>U3-026 C1</i>	17.85
890571	<i>U3-026 C2</i>	17.85
291984	<i>U4-033</i>	0.78
274814	<i>UNIV PK N;0U</i>	0.63
274805	<i>UNIV PK N;1U</i>	0.63
274806	<i>UNIV PK N;2U</i>	0.63
274807	<i>UNIV PK N;3U</i>	0.63
274808	<i>UNIV PK N;4U</i>	0.63
274809	<i>UNIV PK N;5U</i>	0.63
274810	<i>UNIV PK N;6U</i>	0.63
274811	<i>UNIV PK N;7U</i>	0.63
274812	<i>UNIV PK N;8U</i>	0.63
274813	<i>UNIV PK N;9U</i>	0.63
274815	<i>UNIV PK N;XU</i>	0.63
274816	<i>UNIV PK N;YU</i>	0.63
295109	<i>WESTBROOK E</i>	3.29
274687	<i>WILL CNTY;4U</i>	37.93
247611	<i>X2-052</i>	72.23
920462	<i>Y2-103</i>	26.11
920472	<i>Y3-013 1</i>	2.18
920482	<i>Y3-013 2</i>	2.18
920492	<i>Y3-013 3</i>	2.18
<i>LTF</i>	<i>Z1-043</i>	17.6
247634	<i>Z1-051 E</i>	-1.72
916502	<i>Z1-106 E1</i>	0.73
916504	<i>Z1-106 E2</i>	0.73
916512	<i>Z1-107 E</i>	1.51
916522	<i>Z1-108 E</i>	1.45
<i>LTF</i>	<i>Z1-112</i>	6.12
916651	<i>Z1-127 1</i>	0.96
916652	<i>Z1-127 2</i>	0.57
920782	<i>Z2-081</i>	0.96
920882	<i>Z2-114 C</i>	0.39
920883	<i>Z2-114 E</i>	0.39
920932	<i>AA1-018 C</i>	1.46
920933	<i>AA1-018 E</i>	9.8
921012	<i>AA1-040 1</i>	0.74
921022	<i>AA1-040 2</i>	0.74
<i>LTF</i>	<i>AA1-071</i>	4.08
921222	<i>AA1-078</i>	2.26
918972	<i>AA1-116 E</i>	1.51
918982	<i>AA1-117 E</i>	1.51
921692	<i>AA2-035</i>	74.81

922053	AA2-107 E	1.43
922183	AA2-123 E	1.43
922592	ABI-006 C	2.62
922593	ABI-006 E	17.52
922912	ABI-080	22.34
923002	ABI-089 C	39.2
923003	ABI-089 E	1.78
923012	ABI-090 C	39.2
923013	ABI-090 E	1.78
923022	ABI-091 C OP	41.15
923023	ABI-091 E OP	1.87
930751	ABI-121	33.85
930752	ABI-121 E	32.11
930761	ABI-122 1	42.57
930762	ABI-122 2	41.67
923363	ABI-146 E	0.14
923562	ABI-172	0.47
LTF	AB2-013	9.94
924471	AB2-096	24.81
925301	AB2-191 C	0.74
925302	AB2-191 E	0.66
926311	AC1-109	2.2
926321	AC1-109 2	2.2
926331	AC1-110	2.2
926341	AC1-110 2	2.2
926351	AC1-111	2.64
926361	AC1-111 2	2.64
926371	AC1-111 3	2.64
926381	AC1-111 4	2.64
926391	AC1-111 5	2.64
926401	AC1-111 6	2.64
926421	AC1-113 1	0.7
926422	AC1-113 2	0.7
926431	AC1-114	1.4
926601	AC1-142A	2.42
926602	AC1-142A 2	2.42
926701	AC1-153 C	45.29
926711	AC1-153 C2	46.27
926702	AC1-153 E	1.81
926712	AC1-153 E2	1.85
926821	AC1-168 C OP	0.72
926822	AC1-168 E OP	4.83
927091	AC1-204	46.04
927092	AC1-204 2	46.05

Appendix 6

(MISO NIPS - CE) The 17STJOHN-ST JOHN ; T 345 kV line (from bus 255112 to bus 270886 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274654	BRAIDWOOD;1U	24.76
274655	BRAIDWOOD;2U	24.09
274751	CRETE EC ;1U	4.23
274752	CRETE EC ;2U	4.23
274753	CRETE EC ;3U	4.23
274754	CRETE EC ;4U	4.23
290051	GSG-6; E	7.81
275149	KEMPTON ;1E	13.41
274704	KENDALL ;1C	3.54
274705	KENDALL ;1S	2.36
274706	KENDALL ;2C	3.54
274707	KENDALL ;2S	2.36
274660	LASCO STA;1U	22.78
274661	LASCO STA;2U	22.82
290108	LEEDK;1U E	18.17
274850	MENDOTA H;RU	4.49
275148	MILKS GRV;1E	13.41
293061	N-015 E	11.99
293644	O22 E1	8.62
293645	O22 E2	16.73
290021	O50 E	14.78
294392	P-010 E	15.23
274830	PWR VTREC;1U	4.58
274831	PWR VTREC;2U	4.58
274722	S-055 E	8.49
884780	S-058 C	32.55
884782	S-058 C1	32.55
884781	S-058 E	94.29
884783	S-058 E1	94.29
295111	SUBLETTE E	2.03
274861	TOP CROP ;1U	0.41
274862	TOP CROP ;2U	0.8

890570	<i>U3-026 C1</i>	22.88
890571	<i>U3-026 C2</i>	22.88
295109	<i>WESTBROOK E</i>	4.18
274687	<i>WILL CNTY;4U</i>	53.
920462	<i>Y2-103</i>	33.96
920472	<i>Y3-013 1</i>	2.83
920482	<i>Y3-013 2</i>	2.83
920492	<i>Y3-013 3</i>	2.83
915611	<i>Y3-089</i>	0.39
701621	<i>Y4-063</i>	1.2
701641	<i>Y4-065</i>	40.78
701682	<i>Y4-069 E</i>	5.06
<i>LTF</i>	<i>Z1-043</i>	21.28
916502	<i>Z1-106 E1</i>	0.95
916504	<i>Z1-106 E2</i>	0.95
916512	<i>Z1-107 E</i>	1.88
916522	<i>Z1-108 E</i>	1.87
<i>LTF</i>	<i>Z1-112</i>	6.99
916651	<i>Z1-127 1</i>	1.19
920782	<i>Z2-081</i>	1.23
920932	<i>AA1-018 C</i>	1.74
920933	<i>AA1-018 E</i>	11.66
921012	<i>AA1-040 1</i>	0.95
921022	<i>AA1-040 2</i>	0.94
<i>LTF</i>	<i>AA1-071</i>	4.66
918972	<i>AA1-116 E</i>	1.92
918982	<i>AA1-117 E</i>	1.92
921692	<i>AA2-035</i>	94.95
922053	<i>AA2-107 E</i>	1.84
922183	<i>AA2-123 E</i>	1.84
923002	<i>AB1-089 C</i>	50.42
923003	<i>AB1-089 E</i>	2.29
923012	<i>AB1-090 C</i>	50.42
923013	<i>AB1-090 E</i>	2.29
923022	<i>AB1-091 C OP</i>	54.09
923023	<i>AB1-091 E OP</i>	2.46
930751	<i>AB1-121</i>	47.02
930752	<i>AB1-121 E</i>	44.59
930761	<i>AB1-122 1</i>	56.87
930762	<i>AB1-122 2</i>	52.97
923363	<i>AB1-146 E</i>	0.18
923562	<i>AB1-172</i>	0.58
<i>LTF</i>	<i>AB2-013</i>	11.97
924471	<i>AB2-096</i>	31.82
925301	<i>AB2-191 C</i>	0.94

925302	<i>AB2-191 E</i>	0.84
926311	<i>AC1-109</i>	2.86
926321	<i>AC1-109 2</i>	2.86
926331	<i>AC1-110</i>	2.87
926341	<i>AC1-110 2</i>	2.87
926351	<i>AC1-111</i>	3.43
926361	<i>AC1-111 2</i>	3.43
926371	<i>AC1-111 3</i>	3.43
926381	<i>AC1-111 4</i>	3.43
926391	<i>AC1-111 5</i>	3.43
926401	<i>AC1-111 6</i>	3.43
926421	<i>AC1-113 1</i>	0.89
926422	<i>AC1-113 2</i>	0.89
926431	<i>AC1-114</i>	1.78
926601	<i>AC1-142A</i>	3.22
926602	<i>AC1-142A 2</i>	3.23
926701	<i>AC1-153 C</i>	57.57
926711	<i>AC1-153 C2</i>	61.82
926702	<i>AC1-153 E</i>	2.3
926712	<i>AC1-153 E2</i>	2.47
927091	<i>AC1-204</i>	61.22
927092	<i>AC1-204 2</i>	61.13

Appendix 7

(MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 154.23% to 155.78% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 192.22 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
290051	GSG-6; E	12.22
998100	J351	435.75
275149	KEMPTON ;1E	23.06
290108	LEEDK;1U E	28.39
274850	MENDOTA H;RU	7.03
275148	MILKS GRV;1E	23.06
293061	N-015 E	18.09
293644	O22 E1	12.17
293645	O22 E2	23.63
290021	O50 E	22.71
294392	P-010 E	22.97
274830	PWR VTREC;1U	7.14
274831	PWR VTREC;2U	7.14
274724	RIVER EC ;11	6.04
274723	RIVER EC ;12	6.08
274722	S-055 E	13.16
884780	S-058 C	53.28
884782	S-058 C1	53.28
884781	S-058 E	154.36
884783	S-058 E1	154.36
274793	SE CHICAG;0U	1.43
274794	SE CHICAG;1U	1.43
274795	SE CHICAG;2U	1.43
274788	SE CHICAG;5U	1.44
274789	SE CHICAG;6U	1.44
274790	SE CHICAG;7U	1.44
274791	SE CHICAG;8U	1.44
274792	SE CHICAG;9U	1.43
295111	SUBLETTE E	3.18
890570	U3-026 C1	37.45
890571	U3-026 C2	37.45
295109	WESTBROOK E	6.54

274687	WILL CNTY;4U	80.22
910541	X3-005 C	0.12
910542	X3-005 E	1.01
920462	Y2-103	52.65
920472	Y3-013 1	4.39
920482	Y3-013 2	4.39
920492	Y3-013 3	4.39
701221	Y4-023 C	0.4
701222	Y4-023 E	1.58
701231	Y4-024 C	0.42
701232	Y4-024 E	1.66
701412	Y4-042 E	3.
701562	Y4-057 E	3.65
701621	Y4-063	1.65
701631	Y4-064	5.54
701641	Y4-065	56.36
701682	Y4-069 E	6.97
701721	Y4-073	10.35
701761	Y4-077	10.43
701951	Y4-096	15.65
702031	Y4-104	2.3
702041	Y4-105	2.2
702042	Y4-105 E	8.91
LTF	Z1-043	33.63
916502	Z1-106 E1	1.48
916504	Z1-106 E2	1.48
916512	Z1-107 E	3.09
916522	Z1-108 E	2.91
LTF	Z1-112	11.29
916651	Z1-127 1	2.23
916652	Z1-127 2	1.03
920782	Z2-081	1.88
LTF	AA1-001	4.08
920932	AA1-018 C	2.85
920933	AA1-018 E	19.05
921012	AA1-040 1	1.5
921022	AA1-040 2	1.49
LTF	AA1-071	7.53
918972	AA1-116 E	3.29
918982	AA1-117 E	3.29
921692	AA2-035	151.48
922053	AA2-107 E	2.87
922183	AA2-123 E	2.86
923002	AB1-089 C	78.51
923003	AB1-089 E	3.57

923012	ABI-090 C	78.51
923013	ABI-090 E	3.57
923022	ABI-091 C OP	91.39
923023	ABI-091 E OP	4.15
930751	ABI-121	131.75
930752	ABI-121 E	124.96
930761	ABI-122 1	86.53
930762	ABI-122 2	83.52
923363	ABI-146 E	0.28
923562	ABI-172	0.96
LTF	AB2-013	18.92
924471	AB2-096	49.58
925301	AB2-191 C	1.48
925302	AB2-191 E	1.31
LTF	AC1-002	29.18
925891	AC1-067 C2	41.86
925901	AC1-067 C3	55.92
925911	AC1-067 C4	41.86
925892	AC1-067 E2	6.21
925902	AC1-067 E3	8.3
925912	AC1-067 E4	6.21
925881	AC1-067 C1	55.92
925882	AC1-067 E1	8.3
926311	AC1-109	4.46
926321	AC1-109 2	4.46
926331	AC1-110	4.45
926341	AC1-110 2	4.45
926351	AC1-111	5.35
926361	AC1-111 2	5.35
926371	AC1-111 3	5.35
926381	AC1-111 4	5.35
926391	AC1-111 5	5.35
926401	AC1-111 6	5.35
926421	AC1-113 1	1.39
926422	AC1-113 2	1.39
926431	AC1-114	2.79
926601	AC1-142A	4.92
926602	AC1-142A 2	4.92
926701	AC1-153 C	90.78
926711	AC1-153 C2	94.05
926702	AC1-153 E	3.63
926712	AC1-153 E2	3.76
927091	AC1-204	93.31
927092	AC1-204 2	93.28

Appendix 8

(CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 124.17% to 126.58% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 160.58 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
290051	GSG-6; E	10.19
275149	KEMPTON ;1E	21.42
290108	LEEDK;1U E	23.74
274850	MENDOTA H;RU	5.86
275148	MILKS GRV;1E	21.42
293061	N-015 E	15.08
290021	O50 E	18.73
294392	P-010 E	19.15
274830	PWR VTREC;1U	5.97
274831	PWR VTREC;2U	5.97
274723	RIVER EC ;12	5.37
274722	S-055 E	11.03
884780	S-058 C	46.33
884782	S-058 C1	46.33
884781	S-058 E	134.23
884783	S-058 E1	134.23
274793	SE CHICAG;0U	1.19
274794	SE CHICAG;1U	1.19
274795	SE CHICAG;2U	1.19
295111	SUBLETTE E	2.65
890570	U3-026 C1	32.57
890571	U3-026 C2	32.57
295109	WESTBROOK E	5.46
274687	WILL CNTY;4U	64.68
910541	X3-005 C	0.11
910542	X3-005 E	0.91
920462	Y2-103	44.14
920472	Y3-013 1	3.68
920482	Y3-013 2	3.68
920492	Y3-013 3	3.68
701221	Y4-023 C	0.39
701222	Y4-023 E	1.57

701231	Y4-024 C	0.41
701232	Y4-024 E	1.65
701412	Y4-042 E	2.96
701621	Y4-063	1.59
701631	Y4-064	5.47
701641	Y4-065	54.27
701682	Y4-069 E	6.75
701721	Y4-073	10.25
701761	Y4-077	10.31
701951	Y4-096	15.46
702031	Y4-104	2.26
702041	Y4-105	2.17
702042	Y4-105 E	8.78
LTF	Z1-043	27.66
916502	Z1-106 E1	1.24
916504	Z1-106 E2	1.24
916512	Z1-107 E	2.62
916522	Z1-108 E	2.44
LTF	Z1-112	9.14
916651	Z1-127 1	1.81
916652	Z1-127 2	0.89
920782	Z2-081	1.56
920932	AA1-018 C	2.54
920933	AA1-018 E	17.03
921012	AA1-040 1	1.26
921022	AA1-040 2	1.26
LTF	AA1-071	6.09
921222	AA1-078	2.35
918972	AA1-116 E	3.06
918982	AA1-117 E	3.06
921692	AA2-035	129.91
922053	AA2-107 E	2.4
922183	AA2-123 E	2.39
923002	AB1-089 C	65.68
923003	AB1-089 E	2.99
923012	AB1-090 C	65.68
923013	AB1-090 E	2.99
923022	AB1-091 C OP	72.58
923023	AB1-091 E OP	3.3
930751	AB1-121	85.49
930752	AB1-121 E	81.08
930761	AB1-122 1	71.59
930762	AB1-122 2	70.46
923363	AB1-146 E	0.23
923562	AB1-172	0.81

<i>LTF</i>	<i>AB2-013</i>	<i>15.48</i>
<i>924471</i>	<i>AB2-096</i>	<i>41.45</i>
<i>925301</i>	<i>AB2-191 C</i>	<i>1.23</i>
<i>925302</i>	<i>AB2-191 E</i>	<i>1.09</i>
<i>925891</i>	<i>AC1-067 C2</i>	<i>57.33</i>
<i>925901</i>	<i>AC1-067 C3</i>	<i>76.59</i>
<i>925911</i>	<i>AC1-067 C4</i>	<i>57.33</i>
<i>925892</i>	<i>AC1-067 E2</i>	<i>8.5</i>
<i>925902</i>	<i>AC1-067 E3</i>	<i>11.36</i>
<i>925912</i>	<i>AC1-067 E4</i>	<i>8.5</i>
<i>925881</i>	<i>AC1-067 C1</i>	<i>76.59</i>
<i>925882</i>	<i>AC1-067 E1</i>	<i>11.36</i>
<i>926311</i>	<i>AC1-109</i>	<i>3.76</i>
<i>926321</i>	<i>AC1-109 2</i>	<i>3.76</i>
<i>926331</i>	<i>AC1-110</i>	<i>3.73</i>
<i>926341</i>	<i>AC1-110 2</i>	<i>3.73</i>
<i>926351</i>	<i>AC1-111</i>	<i>4.51</i>
<i>926361</i>	<i>AC1-111 2</i>	<i>4.51</i>
<i>926371</i>	<i>AC1-111 3</i>	<i>4.51</i>
<i>926381</i>	<i>AC1-111 4</i>	<i>4.51</i>
<i>926391</i>	<i>AC1-111 5</i>	<i>4.51</i>
<i>926401</i>	<i>AC1-111 6</i>	<i>4.51</i>
<i>926421</i>	<i>AC1-113 1</i>	<i>1.16</i>
<i>926422</i>	<i>AC1-113 2</i>	<i>1.16</i>
<i>926431</i>	<i>AC1-114</i>	<i>2.32</i>
<i>926601</i>	<i>AC1-142A</i>	<i>4.13</i>
<i>926602</i>	<i>AC1-142A 2</i>	<i>4.13</i>
<i>926701</i>	<i>AC1-153 C</i>	<i>76.59</i>
<i>926711</i>	<i>AC1-153 C2</i>	<i>77.81</i>
<i>926702</i>	<i>AC1-153 E</i>	<i>3.06</i>
<i>926712</i>	<i>AC1-153 E2</i>	<i>3.11</i>
<i>927091</i>	<i>AC1-204</i>	<i>77.84</i>
<i>927092</i>	<i>AC1-204 2</i>	<i>77.91</i>

Appendix 9

(CE - CE) The DRESDEN ; B 345/138 kV transformer (from bus 270716 to bus 275179 ckt 1) loads from 101.73% to 129.12% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

CONTINGENCY '012-45-BT5-6__'

TRIP BRANCH FROM BUS 270716 TO BUS 270736 CKT 1 / DRESD; B 345 ELWOO; B 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1 / ELWOO; B 345 ELWOO; R 345
 TRIP BRANCH FROM BUS 274702 TO BUS 270716 CKT 1 / KENDA; R 345 DRESD; B 345
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274658	DRESDEN ;2U	40.79
274879	MINONK ;1U	0.94
290021	O50 E	19.59
920272	X1-045	3.99
916512	ZI-107 E	1.93
918972	AA1-116 E	1.03
918982	AA1-117 E	1.03
930761	AB1-122 1	128.39
926711	AC1-153 C2	139.56
926712	AC1-153 E2	5.58

Appendix 10

(CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 113.27% to 125.2% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 211.34 MW to the thermal violation.

CONTINGENCY '023-65-BT2-3__'

TRIP BRANCH FROM BUS 270607 TO BUS 270644 CKT 1

/ COLLINS; 765 WILTON 765

TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1

/ COLLI; 765 PLANO; 765

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274890	CAYUG;1U E	11.3
274891	CAYUG;2U E	11.3
274659	DRESDEN ;3U	59.56
274837	EQUISTAR ; B	1.46
274708	KENDALL ;3C	4.25
274709	KENDALL ;3S	2.83
274710	KENDALL ;4C	4.25
274711	KENDALL ;4S	2.83
296308	R-030 C1	4.16
296271	R-030 C2	4.16
296125	R-030 C3	4.21
296309	R-030 E1	16.63
296272	R-030 E2	16.63
296128	R-030 E3	16.83
884780	S-058 C	83.74
884782	S-058 C1	83.74
884781	S-058 E	242.6
884783	S-058 E1	242.6
274853	TWINGROVE;U1	16.46
274854	TWINGROVE;U2	16.46
890570	U3-026 C1	58.86
890571	U3-026 C2	58.86
276150	W2-048 E	4.65
905081	W4-005 C	4.03
905082	W4-005 E	27.02
905493	W4-086	0.07
920272	X1-045	2.22
909052	X2-022 E	14.07
920792	Z2-087 C	3.25
920793	Z2-087 E	21.74
921022	AA1-040 2	1.62
921692	AA2-035	244.15

922972	<i>ABI-086 C</i>	68.87
922973	<i>ABI-086 E</i>	3.13
930762	<i>ABI-122 2</i>	186.96
924041	<i>AB2-047 C OP</i>	3.99
924042	<i>AB2-047 E OP</i>	26.73
924261	<i>AB2-070 C OP</i>	2.03
924262	<i>AB2-070 E OP</i>	13.61
925771	<i>AC1-053 C</i>	2.03
925772	<i>AC1-053 E</i>	13.61
926701	<i>AC1-153 C</i>	203.21
926702	<i>AC1-153 E</i>	8.13

Appendix 11

(CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 108.63% to 120.93% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT4-5__'. This project contributes approximately 65.2 MW to the thermal violation.

CONTINGENCY '900-45-BT4-5__' / CONTINGENCY # 771
 TRIP BRANCH FROM BUS 270737 TO BUS 270769 CKT 1 / ELWOOD ; R 345 GOODINGS ; 1R 345
 TRIP BRANCH FROM BUS 270736 TO BUS 270737 CKT 1 / ELWOOD ; B 345 ELWOOD ; R 345
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274659	DRESDEN ;3U	18.38
274729	ELWOOD EC;1P	2.93
274731	ELWOOD EC;2P	2.93
274733	ELWOOD EC;3P	2.93
274735	ELWOOD EC;4P	2.93
916512	Z1-107 E	3.37
921692	AA2-035	59.5
930762	AB1-122 2	57.68
926701	AC1-153 C	62.69
926702	AC1-153 E	2.51
927092	AC1-204 2	62.78

Appendix 12

(CE - MISO NIPS) The ST JOHN ; T-17GREEN_ACRE 345 kV line (from bus 270886 to bus 255104 ckt 1) loads from 101.06% to 101.55% (**DC power flow**) of its emergency rating (1091 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 124.17 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274654	BRAIDWOOD;1U	24.76
274655	BRAIDWOOD;2U	24.09
274751	CRETE EC ;1U	4.23
274752	CRETE EC ;2U	4.23
274753	CRETE EC ;3U	4.23
274754	CRETE EC ;4U	4.23
290051	GSG-6; E	7.81
275149	KEMPTON ;1E	13.41
274704	KENDALL ;1C	3.54
274705	KENDALL ;1S	2.36
274706	KENDALL ;2C	3.54
274707	KENDALL ;2S	2.36
274660	LASCO STA;1U	22.78
274661	LASCO STA;2U	22.82
290108	LEEDK;1U E	18.17
274850	MENDOTA H;RU	4.49
275148	MILKS GRV;1E	13.41
293061	N-015 E	11.99
293644	O22 E1	8.62
293645	O22 E2	16.73
290021	O50 E	14.78
294392	P-010 E	15.23
274830	PWR VTREC;1U	4.58
274831	PWR VTREC;2U	4.58
274722	S-055 E	8.49
884780	S-058 C	32.55
884782	S-058 C1	32.55
884781	S-058 E	94.29
884783	S-058 E1	94.29
295111	SUBLETTE E	2.03
274861	TOP CROP ;1U	0.41
274862	TOP CROP ;2U	0.8

890570	<i>U3-026 C1</i>	22.88
890571	<i>U3-026 C2</i>	22.88
295109	<i>WESTBROOK E</i>	4.18
274687	<i>WILL CNTY;4U</i>	53.
920462	<i>Y2-103</i>	33.96
920472	<i>Y3-013 1</i>	2.83
920482	<i>Y3-013 2</i>	2.83
920492	<i>Y3-013 3</i>	2.83
915611	<i>Y3-089</i>	0.39
701621	<i>Y4-063</i>	1.2
701641	<i>Y4-065</i>	40.78
701682	<i>Y4-069 E</i>	5.06
<i>LTF</i>	<i>Z1-043</i>	21.28
916502	<i>Z1-106 E1</i>	0.95
916504	<i>Z1-106 E2</i>	0.95
916512	<i>Z1-107 E</i>	1.88
916522	<i>Z1-108 E</i>	1.87
<i>LTF</i>	<i>Z1-112</i>	6.99
916651	<i>Z1-127 1</i>	1.19
920782	<i>Z2-081</i>	1.23
920932	<i>AA1-018 C</i>	1.74
920933	<i>AA1-018 E</i>	11.66
921012	<i>AA1-040 1</i>	0.95
921022	<i>AA1-040 2</i>	0.94
<i>LTF</i>	<i>AA1-071</i>	4.66
918972	<i>AA1-116 E</i>	1.92
918982	<i>AA1-117 E</i>	1.92
921692	<i>AA2-035</i>	94.95
922053	<i>AA2-107 E</i>	1.84
922183	<i>AA2-123 E</i>	1.84
923002	<i>AB1-089 C</i>	50.42
923003	<i>AB1-089 E</i>	2.29
923012	<i>AB1-090 C</i>	50.42
923013	<i>AB1-090 E</i>	2.29
923022	<i>AB1-091 C OP</i>	54.09
923023	<i>AB1-091 E OP</i>	2.46
930751	<i>AB1-121</i>	47.02
930752	<i>AB1-121 E</i>	44.59
930761	<i>AB1-122 1</i>	56.87
930762	<i>AB1-122 2</i>	52.97
923363	<i>AB1-146 E</i>	0.18
923562	<i>AB1-172</i>	0.58
<i>LTF</i>	<i>AB2-013</i>	11.97
924471	<i>AB2-096</i>	31.82
925301	<i>AB2-191 C</i>	0.94

925302	<i>AB2-191 E</i>	0.84
926311	<i>AC1-109</i>	2.86
926321	<i>AC1-109 2</i>	2.86
926331	<i>AC1-110</i>	2.87
926341	<i>AC1-110 2</i>	2.87
926351	<i>AC1-111</i>	3.43
926361	<i>AC1-111 2</i>	3.43
926371	<i>AC1-111 3</i>	3.43
926381	<i>AC1-111 4</i>	3.43
926391	<i>AC1-111 5</i>	3.43
926401	<i>AC1-111 6</i>	3.43
926421	<i>AC1-113 1</i>	0.89
926422	<i>AC1-113 2</i>	0.89
926431	<i>AC1-114</i>	1.78
926601	<i>AC1-142A</i>	3.22
926602	<i>AC1-142A 2</i>	3.23
926701	<i>AC1-153 C</i>	57.57
926711	<i>AC1-153 C2</i>	61.82
926702	<i>AC1-153 E</i>	2.3
926712	<i>AC1-153 E2</i>	2.47
927091	<i>AC1-204</i>	61.22
927092	<i>AC1-204 2</i>	61.13

Appendix 13

(CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 123.71% to 124.6% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT5-6__'. This project contributes approximately 198.55 MW to the thermal violation.

CONTINGENCY '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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274890	CAYUG;1U E	23.79
274891	CAYUG;2U E	23.79
274863	CAYUGA RI;1U	1.14
274864	CAYUGA RI;2U	1.14
290051	GSG-6; E	12.27
275149	KEMPTON ;1E	20.41
290108	LEEDK;1U E	28.44
274770	LINCOLN ;1U	4.46
274771	LINCOLN ;2U	4.46
274772	LINCOLN ;3U	4.46
274773	LINCOLN ;4U	4.46
274774	LINCOLN ;5U	4.46
274775	LINCOLN ;6U	4.46
274776	LINCOLN ;7U	4.46
274777	LINCOLN ;8U	4.46
274850	MENDOTA H;RU	5.83
275148	MILKS GRV;1E	20.41
293061	N-015 E	17.4
293644	O22 E1	12.23
293645	O22 E2	23.75
290021	O50 E	23.18
294392	P-010 E	22.09
274830	PWR VTREC;1U	7.18
274831	PWR VTREC;2U	7.18
296308	R-030 C1	5.57
296271	R-030 C2	5.57
296125	R-030 C3	5.64
296309	R-030 E1	22.3
296272	R-030 E2	22.3
296128	R-030 E3	22.56
274722	S-055 E	13.21

884780	<i>S-058 C</i>	52.43
884782	<i>S-058 C1</i>	52.43
884781	<i>S-058 E</i>	151.9
884783	<i>S-058 E1</i>	151.9
295111	<i>SUBLETTE E</i>	3.19
274853	<i>TWINGROVE;U1</i>	22.97
274854	<i>TWINGROVE;U2</i>	22.97
890570	<i>U3-026 C1</i>	36.85
890571	<i>U3-026 C2</i>	36.85
295109	<i>WESTBROOK E</i>	6.57
274687	<i>WILL CNTY;4U</i>	78.86
910542	<i>X3-005 E</i>	0.87
920462	<i>Y2-103</i>	52.83
920472	<i>Y3-013 1</i>	4.4
920482	<i>Y3-013 2</i>	4.4
920492	<i>Y3-013 3</i>	4.4
701031	<i>Y4-004 C</i>	1.
701032	<i>Y4-004 E</i>	3.98
701221	<i>Y4-023 C</i>	0.42
701222	<i>Y4-023 E</i>	1.66
701231	<i>Y4-024 C</i>	0.44
701232	<i>Y4-024 E</i>	1.75
701401	<i>Y4-041 C</i>	1.51
701402	<i>Y4-041 E</i>	4.54
701412	<i>Y4-042 E</i>	3.14
701542	<i>Y4-055 E</i>	10.11
701562	<i>Y4-057 E</i>	3.85
701621	<i>Y4-063</i>	1.7
701631	<i>Y4-064</i>	5.8
701641	<i>Y4-065</i>	57.84
701651	<i>Y4-066</i>	2.57
701682	<i>Y4-069 E</i>	7.22
701691	<i>Y4-070</i>	3.22
701721	<i>Y4-073</i>	10.91
701761	<i>Y4-077</i>	11.03
701941	<i>Y4-095</i>	4.57
701951	<i>Y4-096</i>	16.61
701992	<i>Y4-100 E</i>	7.55
702002	<i>Y4-101 E</i>	7.55
702021	<i>Y4-103</i>	10.1
702031	<i>Y4-104</i>	2.43
702041	<i>Y4-105</i>	2.32
702042	<i>Y4-105 E</i>	9.38
<i>LTF</i>	<i>Z1-043</i>	34.64
916502	<i>Z1-106 E1</i>	1.48

916504	Z1-106 E2	1.48
916512	Z1-107 E	3.
916522	Z1-108 E	2.92
LTF	Z1-112	11.44
916651	Z1-127 1	1.97
916652	Z1-127 2	0.97
920792	Z2-087 C	4.36
920793	Z2-087 E	29.16
LTF	AA1-001	4.07
920932	AA1-018 C	2.93
920933	AA1-018 E	19.64
921012	AA1-040 1	1.49
921022	AA1-040 2	1.51
LTF	AA1-071	7.63
918972	AA1-116 E	2.92
918982	AA1-117 E	2.92
921692	AA2-035	156.22
922053	AA2-107 E	2.87
922183	AA2-123 E	2.87
922972	AB1-086 C	92.34
922973	AB1-086 E	4.2
923002	AB1-089 C	78.88
923003	AB1-089 E	3.59
923012	AB1-090 C	78.88
923013	AB1-090 E	3.59
923022	AB1-091 C OP	80.24
923023	AB1-091 E OP	3.65
930761	AB1-122 1	87.29
930762	AB1-122 2	88.35
923363	AB1-146 E	0.28
923562	AB1-172	0.93
LTF	AB2-013	19.72
924041	AB2-047 C OP	5.37
924042	AB2-047 E OP	35.96
924471	AB2-096	49.84
925301	AB2-191 C	1.48
925302	AB2-191 E	1.32
LTF	AC1-002	29.12
925891	AC1-067 C2	33.88
925901	AC1-067 C3	45.26
925911	AC1-067 C4	33.88
925892	AC1-067 E2	5.03
925902	AC1-067 E3	6.71
925912	AC1-067 E4	5.03
925881	AC1-067 C1	45.26

925882	<i>ACI-067 E1</i>	6.71
926311	<i>ACI-109</i>	4.48
926321	<i>ACI-109 2</i>	4.48
926331	<i>ACI-110</i>	4.44
926341	<i>ACI-110 2</i>	4.44
926351	<i>ACI-111</i>	5.36
926361	<i>ACI-111 2</i>	5.36
926371	<i>ACI-111 3</i>	5.36
926381	<i>ACI-111 4</i>	5.36
926391	<i>ACI-111 5</i>	5.36
926401	<i>ACI-111 6</i>	5.36
926421	<i>ACI-113 1</i>	1.4
926422	<i>ACI-113 2</i>	1.4
926431	<i>ACI-114</i>	2.8
926601	<i>ACI-142A</i>	4.95
926602	<i>ACI-142A 2</i>	4.95
926701	<i>ACI-153 C</i>	96.04
926711	<i>ACI-153 C2</i>	94.88
926702	<i>ACI-153 E</i>	3.84
926712	<i>ACI-153 E2</i>	3.79
927091	<i>ACI-204</i>	95.46
927092	<i>ACI-204 2</i>	95.47

Appendix 14

(CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 127.79% to 128.7% (**DC power flow**) of its emergency rating (1601 MVA) for the line fault with failed breaker contingency outage of '112-65-BT2-3__'. This project contributes approximately 202.75 MW to the thermal violation.

CONTINGENCY '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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274890	CAYUG;1U E	24.24
274891	CAYUG;2U E	24.24
274863	CAYUGA RI;1U	1.16
274864	CAYUGA RI;2U	1.16
290051	GSG-6; E	12.53
275149	KEMPTON ;1E	20.85
290108	LEEDK;1U E	29.05
274770	LINCOLN ;1U	4.57
274771	LINCOLN ;2U	4.57
274772	LINCOLN ;3U	4.57
274773	LINCOLN ;4U	4.57
274774	LINCOLN ;5U	4.57
274775	LINCOLN ;6U	4.57
274776	LINCOLN ;7U	4.57
274777	LINCOLN ;8U	4.57
274850	MENDOTA H;RU	5.95
275148	MILKS GRV;1E	20.85
293061	N-015 E	17.77
293644	O22 E1	12.49
293645	O22 E2	24.25
290021	O50 E	23.67
294392	P-010 E	22.57
274830	PWR VTREC;1U	7.33
274831	PWR VTREC;2U	7.33
296308	R-030 C1	5.68
296271	R-030 C2	5.68
296125	R-030 C3	5.75
296309	R-030 E1	22.73
296272	R-030 E2	22.73
296128	R-030 E3	23.
274722	S-055 E	13.49

884780	S-058 C	53.55
884782	S-058 C1	53.55
884781	S-058 E	155.14
884783	S-058 E1	155.14
295111	SUBLETTE E	3.26
274853	TWINGROVE;U1	23.41
274854	TWINGROVE;U2	23.41
890570	U3-026 C1	37.64
890571	U3-026 C2	37.64
295109	WESTBROOK E	6.71
274687	WILL CNTY;4U	80.54
910542	X3-005 E	0.89
920462	Y2-103	53.96
920472	Y3-013 1	4.5
920482	Y3-013 2	4.5
920492	Y3-013 3	4.5
701031	Y4-004 C	1.02
701032	Y4-004 E	4.07
701091	Y4-010 C	2.04
701092	Y4-010 E	8.16
701221	Y4-023 C	0.42
701222	Y4-023 E	1.7
701231	Y4-024 C	0.45
701232	Y4-024 E	1.78
701401	Y4-041 C	1.55
701402	Y4-041 E	4.64
701412	Y4-042 E	3.21
701542	Y4-055 E	10.32
701562	Y4-057 E	3.93
701621	Y4-063	1.73
701631	Y4-064	5.93
701641	Y4-065	59.09
701651	Y4-066	2.63
701682	Y4-069 E	7.37
701691	Y4-070	3.29
701721	Y4-073	11.14
701761	Y4-077	11.27
701801	Y4-081	5.06
701941	Y4-095	4.67
701951	Y4-096	16.96
701992	Y4-100 E	7.71
702002	Y4-101 E	7.71
702011	Y4-102	8.6
702021	Y4-103	10.32
702031	Y4-104	2.49

702041	Y4-105	2.37
702042	Y4-105 E	9.58
LTF	Z1-043	35.37
916502	Z1-106 E1	1.51
916504	Z1-106 E2	1.51
916512	Z1-107 E	3.06
916522	Z1-108 E	2.98
LTF	Z1-112	11.68
916651	Z1-127 1	2.01
916652	Z1-127 2	0.99
920792	Z2-087 C	4.44
920793	Z2-087 E	29.72
LTF	AA1-001	4.15
920932	AA1-018 C	3.
920933	AA1-018 E	20.06
921012	AA1-040 1	1.52
921022	AA1-040 2	1.54
LTF	AA1-071	7.79
918972	AA1-116 E	2.98
918982	AA1-117 E	2.98
921692	AA2-035	159.54
922053	AA2-107 E	2.93
922183	AA2-123 E	2.94
922972	AB1-086 C	94.12
922973	AB1-086 E	4.28
923002	AB1-089 C	80.56
923003	AB1-089 E	3.66
923012	AB1-090 C	80.56
923013	AB1-090 E	3.66
923022	AB1-091 C OP	81.96
923023	AB1-091 E OP	3.73
930761	AB1-122 1	89.15
930762	AB1-122 2	90.21
923363	AB1-146 E	0.29
923562	AB1-172	0.95
LTF	AB2-013	20.13
924041	AB2-047 C OP	5.48
924042	AB2-047 E OP	36.65
924471	AB2-096	50.9
925301	AB2-191 C	1.52
925302	AB2-191 E	1.34
LTF	AC1-002	29.71
925891	AC1-067 C2	34.63
925901	AC1-067 C3	46.27
925911	AC1-067 C4	34.63

925892	<i>ACI-067 E2</i>	5.14
925902	<i>ACI-067 E3</i>	6.86
925912	<i>ACI-067 E4</i>	5.14
925881	<i>ACI-067 C1</i>	46.27
925882	<i>ACI-067 E1</i>	6.86
926311	<i>ACI-109</i>	4.58
926321	<i>ACI-109 2</i>	4.58
926331	<i>ACI-110</i>	4.54
926341	<i>ACI-110 2</i>	4.54
926351	<i>ACI-111</i>	5.48
926361	<i>ACI-111 2</i>	5.48
926371	<i>ACI-111 3</i>	5.48
926381	<i>ACI-111 4</i>	5.48
926391	<i>ACI-111 5</i>	5.48
926401	<i>ACI-111 6</i>	5.48
926421	<i>ACI-113 1</i>	1.43
926422	<i>ACI-113 2</i>	1.43
926431	<i>ACI-114</i>	2.86
926601	<i>ACI-142A</i>	5.06
926602	<i>ACI-142A 2</i>	5.06
926701	<i>ACI-153 C</i>	98.06
926711	<i>ACI-153 C2</i>	96.9
926702	<i>ACI-153 E</i>	3.92
926712	<i>ACI-153 E2</i>	3.88
927091	<i>ACI-204</i>	97.5
927092	<i>ACI-204 2</i>	97.51

Appendix 15

(CE - CE) The KENDALL ;RU-LOCKPORT ; R 345 kV line (from bus 274703 to bus 270811 ckt 1) loads from 130.31% to 134.64% (**DC power flow**) of its emergency rating (1912 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 84.68 MW to the thermal violation.

CONTINGENCY '023-65-BT2-3__'

TRIP BRANCH FROM BUS 270607 TO BUS 270644 CKT 1

/ COLLINS; 765 WILTON 765

TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1

/ COLLI; 765 PLANO; 765

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274659	DRESDEN ;3U	23.84
274708	KENDALL ;3C	21.13
274709	KENDALL ;3S	14.09
274710	KENDALL ;4C	21.13
274711	KENDALL ;4S	14.09
884780	S-058 C	118.42
884782	S-058 C1	118.42
884781	S-058 E	343.09
884783	S-058 E1	343.09
890570	U3-026 C1	83.23
890571	U3-026 C2	83.23
915621	Y3-090	2.31
915631	Y3-091	2.31
921692	AA2-035	344.65
930762	AB1-122 2	74.91
926701	AC1-153 C	81.42
926702	AC1-153 E	3.26

Appendix 16

(CE - MISO NIPS) The CRETE EC ;BP-17STJOHN 345 kV line (from bus 274750 to bus 255112 ckt 1) loads from 128.62% to 129.18% (**DC power flow**) of its emergency rating (1399 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 175.38 MW to the thermal violation.

CONTINGENCY '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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274654	BRAIDWOOD;1U	35.81
274655	BRAIDWOOD;2U	34.82
274751	CRETE EC ;1U	7.25
274752	CRETE EC ;2U	7.25
274753	CRETE EC ;3U	7.25
274754	CRETE EC ;4U	7.25
290051	GSG-6; E	11.01
275149	KEMPTON ;1E	18.09
274704	KENDALL ;1C	5.04
274705	KENDALL ;1S	3.36
274706	KENDALL ;2C	5.04
274707	KENDALL ;2S	3.36
274660	LASCO STA;1U	32.66
274661	LASCO STA;2U	32.72
290108	LEEDK;1U E	25.63
274850	MENDOTA H;RU	6.33
275148	MILKS GRV;1E	18.09
293061	N-015 E	17.12
293644	O22 E1	12.51
293645	O22 E2	24.28
290021	O50 E	20.92
294392	P-010 E	21.74
274830	PWR VTREC;1U	6.46
274831	PWR VTREC;2U	6.46
274722	S-055 E	11.99
884780	S-058 C	45.53
884782	S-058 C1	45.53
884781	S-058 E	131.91
884783	S-058 E1	131.91
295111	SUBLETTE E	2.86
274861	TOP CROP ;1U	0.6

274862	<i>TOP CROP ;2U</i>	<i>1.16</i>
890570	<i>U3-026 C1</i>	<i>32.</i>
890571	<i>U3-026 C2</i>	<i>32.</i>
295109	<i>WESTBROOK E</i>	<i>5.89</i>
274687	<i>WILL CNTY;4U</i>	<i>75.21</i>
920462	<i>Y2-103</i>	<i>47.96</i>
920472	<i>Y3-013 1</i>	<i>4.</i>
920482	<i>Y3-013 2</i>	<i>4.</i>
920492	<i>Y3-013 3</i>	<i>4.</i>
915611	<i>Y3-089</i>	<i>0.55</i>
701031	<i>Y4-004 C</i>	<i>1.02</i>
701032	<i>Y4-004 E</i>	<i>4.09</i>
701091	<i>Y4-010 C</i>	<i>2.05</i>
701092	<i>Y4-010 E</i>	<i>8.19</i>
701221	<i>Y4-023 C</i>	<i>0.42</i>
701222	<i>Y4-023 E</i>	<i>1.7</i>
701231	<i>Y4-024 C</i>	<i>0.45</i>
701232	<i>Y4-024 E</i>	<i>1.79</i>
701401	<i>Y4-041 C</i>	<i>1.55</i>
701402	<i>Y4-041 E</i>	<i>4.65</i>
701412	<i>Y4-042 E</i>	<i>3.21</i>
701542	<i>Y4-055 E</i>	<i>10.36</i>
701562	<i>Y4-057 E</i>	<i>3.93</i>
701621	<i>Y4-063</i>	<i>1.75</i>
701631	<i>Y4-064</i>	<i>5.94</i>
701641	<i>Y4-065</i>	<i>59.53</i>
701651	<i>Y4-066</i>	<i>2.63</i>
701682	<i>Y4-069 E</i>	<i>7.39</i>
701691	<i>Y4-070</i>	<i>3.3</i>
701721	<i>Y4-073</i>	<i>11.11</i>
701761	<i>Y4-077</i>	<i>11.17</i>
701801	<i>Y4-081</i>	<i>5.07</i>
701941	<i>Y4-095</i>	<i>4.62</i>
701951	<i>Y4-096</i>	<i>16.75</i>
701992	<i>Y4-100 E</i>	<i>7.73</i>
702002	<i>Y4-101 E</i>	<i>7.73</i>
702021	<i>Y4-103</i>	<i>10.35</i>
702031	<i>Y4-104</i>	<i>2.46</i>
702041	<i>Y4-105</i>	<i>2.36</i>
702042	<i>Y4-105 E</i>	<i>9.54</i>
<i>LTF</i>	<i>Z1-043</i>	<i>29.91</i>
916502	<i>Z1-106 E1</i>	<i>1.34</i>
916504	<i>Z1-106 E2</i>	<i>1.34</i>
916512	<i>Z1-107 E</i>	<i>2.59</i>
916522	<i>Z1-108 E</i>	<i>2.65</i>

<i>LTF</i>	<i>Z1-112</i>	9.76
920782	<i>Z2-081</i>	1.74
921012	<i>AA1-040 1</i>	1.34
921022	<i>AA1-040 2</i>	1.33
<i>LTF</i>	<i>AA1-071</i>	6.51
918972	<i>AA1-116 E</i>	2.58
918982	<i>AA1-117 E</i>	2.58
921692	<i>AA2-035</i>	133.08
922053	<i>AA2-107 E</i>	2.59
922183	<i>AA2-123 E</i>	2.59
923002	<i>AB1-089 C</i>	71.14
923003	<i>AB1-089 E</i>	3.23
923012	<i>AB1-090 C</i>	71.14
923013	<i>AB1-090 E</i>	3.23
923022	<i>AB1-091 C OP</i>	73.9
923023	<i>AB1-091 E OP</i>	3.36
930751	<i>AB1-121</i>	75.2
930752	<i>AB1-121 E</i>	71.32
930761	<i>AB1-122 1</i>	80.74
930762	<i>AB1-122 2</i>	74.41
923363	<i>AB1-146 E</i>	0.25
923562	<i>AB1-172</i>	0.8
<i>LTF</i>	<i>AB2-013</i>	16.83
924471	<i>AB2-096</i>	44.88
925301	<i>AB2-191 C</i>	1.33
925302	<i>AB2-191 E</i>	1.18
926311	<i>AC1-109</i>	4.04
926321	<i>AC1-109 2</i>	4.04
926331	<i>AC1-110</i>	4.05
926341	<i>AC1-110 2</i>	4.05
926351	<i>AC1-111</i>	4.84
926361	<i>AC1-111 2</i>	4.84
926371	<i>AC1-111 3</i>	4.84
926381	<i>AC1-111 4</i>	4.84
926391	<i>AC1-111 5</i>	4.84
926401	<i>AC1-111 6</i>	4.84
926421	<i>AC1-113 1</i>	1.26
926422	<i>AC1-113 2</i>	1.26
926431	<i>AC1-114</i>	2.52
926601	<i>AC1-142A</i>	4.57
926602	<i>AC1-142A 2</i>	4.57
926701	<i>AC1-153 C</i>	80.88
926711	<i>AC1-153 C2</i>	87.76
926702	<i>AC1-153 E</i>	3.24
926712	<i>AC1-153 E2</i>	3.51

<i>927091</i>	<i>ACI-204</i>	<i>86.85</i>
<i>927092</i>	<i>ACI-204 2</i>	<i>86.68</i>

Appendix 17

(CE - AEP) The UNIV PK N;RP-05OLIVE 345 kV line (from bus 274804 to bus 243229 ckt 1) loads from 125.98% to 126.84% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 134.84 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'

OPEN BRANCH FROM BUS 243206 TO BUS 920251 CKT 1

/ 243206 05DUMONT 765 920251 X1-020 TAP 765 1

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1

/ 243206 05DUMONT 765 270644 WILTON ; 765 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
290051	GSG-6; E	8.55
275149	KEMPTON ;1E	15.74
290108	LEEDK;1U E	19.91
274850	MENDOTA H;RU	4.92
275148	MILKS GRV;1E	15.74
293061	N-015 E	13.14
293644	O22 E1	7.96
293645	O22 E2	15.46
290021	O50 E	15.85
294392	P-010 E	16.69
274830	PWR VTREC;1U	5.01
274831	PWR VTREC;2U	5.01
274722	S-055 E	9.29
884780	S-058 C	36.17
884782	S-058 C1	36.17
884781	S-058 E	104.79
884783	S-058 E1	104.79
295111	SUBLETTE E	2.22
890570	U3-026 C1	25.42
890571	U3-026 C2	25.42
291984	U4-033	1.58
274802	UNIV PARK;5U	1.47
274803	UNIV PARK;6U	1.47
274814	UNIV PK N;0U	1.28
274805	UNIV PK N;1U	1.28
274806	UNIV PK N;2U	1.28
274807	UNIV PK N;3U	1.28
274808	UNIV PK N;4U	1.28
274809	UNIV PK N;5U	1.28
274810	UNIV PK N;6U	1.28
274811	UNIV PK N;7U	1.28
274812	UNIV PK N;8U	1.28

274813	UNIV PK N;9U	1.28
274815	UNIV PK N;XU	1.28
274816	UNIV PK N;YU	1.28
900381	V4-047	1.94
295109	WESTBROOK E	4.58
274687	WILL CNTY;4U	53.8
920462	Y2-103	37.14
920472	Y3-013 1	3.1
920482	Y3-013 2	3.1
920492	Y3-013 3	3.1
701621	Y4-063	1.29
701641	Y4-065	44.14
701682	Y4-069 E	5.46
LTF	Z1-043	23.32
916502	Z1-106 E1	1.04
916504	Z1-106 E2	1.04
916512	Z1-107 E	2.25
916522	Z1-108 E	2.05
LTF	Z1-112	7.64
916651	Z1-127 1	1.43
916652	Z1-127 2	0.96
920782	Z2-081	1.34
920932	AA1-018 C	2.18
920933	AA1-018 E	14.58
921012	AA1-040 1	1.06
921022	AA1-040 2	1.06
LTF	AA1-071	5.09
921222	AA1-078	4.59
918972	AA1-116 E	2.25
918982	AA1-117 E	2.25
921692	AA2-035	107.07
922053	AA2-107 E	2.02
922183	AA2-123 E	2.01
923002	AB1-089 C	55.15
923003	AB1-089 E	2.51
923012	AB1-090 C	55.15
923013	AB1-090 E	2.51
923022	AB1-091 C OP	60.85
923023	AB1-091 E OP	2.77
930751	AB1-121	91.89
930752	AB1-121 E	87.15
930761	AB1-122 1	60.63
930762	AB1-122 2	58.65
923363	AB1-146 E	0.2
923562	AB1-172	0.7

<i>LTF</i>	<i>AB2-013</i>	<i>13.</i>
<i>924471</i>	<i>AB2-096</i>	<i>34.82</i>
<i>925301</i>	<i>AB2-191 C</i>	<i>1.03</i>
<i>925302</i>	<i>AB2-191 E</i>	<i>0.92</i>
<i>925891</i>	<i>AC1-067 C2</i>	<i>22.99</i>
<i>925901</i>	<i>AC1-067 C3</i>	<i>30.72</i>
<i>925911</i>	<i>AC1-067 C4</i>	<i>22.99</i>
<i>925892</i>	<i>AC1-067 E2</i>	<i>3.41</i>
<i>925902</i>	<i>AC1-067 E3</i>	<i>4.56</i>
<i>925912</i>	<i>AC1-067 E4</i>	<i>3.41</i>
<i>925881</i>	<i>AC1-067 C1</i>	<i>30.72</i>
<i>925882</i>	<i>AC1-067 E1</i>	<i>4.56</i>
<i>926311</i>	<i>AC1-109</i>	<i>3.16</i>
<i>926321</i>	<i>AC1-109 2</i>	<i>3.16</i>
<i>926331</i>	<i>AC1-110</i>	<i>3.13</i>
<i>926341</i>	<i>AC1-110 2</i>	<i>3.13</i>
<i>926351</i>	<i>AC1-111</i>	<i>3.79</i>
<i>926361</i>	<i>AC1-111 2</i>	<i>3.79</i>
<i>926371</i>	<i>AC1-111 3</i>	<i>3.79</i>
<i>926381</i>	<i>AC1-111 4</i>	<i>3.79</i>
<i>926391</i>	<i>AC1-111 5</i>	<i>3.79</i>
<i>926401</i>	<i>AC1-111 6</i>	<i>3.79</i>
<i>926421</i>	<i>AC1-113 1</i>	<i>0.98</i>
<i>926422</i>	<i>AC1-113 2</i>	<i>0.98</i>
<i>926431</i>	<i>AC1-114</i>	<i>1.95</i>
<i>926601</i>	<i>AC1-142A</i>	<i>3.51</i>
<i>926602</i>	<i>AC1-142A 2</i>	<i>3.51</i>
<i>926701</i>	<i>AC1-153 C</i>	<i>63.75</i>
<i>926711</i>	<i>AC1-153 C2</i>	<i>65.9</i>
<i>926702</i>	<i>AC1-153 E</i>	<i>2.55</i>
<i>926712</i>	<i>AC1-153 E2</i>	<i>2.64</i>
<i>927091</i>	<i>AC1-204</i>	<i>66.13</i>
<i>927092</i>	<i>AC1-204 2</i>	<i>66.18</i>

Appendix 18

(CE - CE) The DRESDEN ;1M-DRESDEN ; R 138 kV line (from bus 275179 to bus 271337 ckt 1) loads from 101.71% to 129.1% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '012-45-BT5-6__'. This project contributes approximately 145.14 MW to the thermal violation.

CONTINGENCY '012-45-BT5-6__'

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

TRIP BRANCH FROM BUS 274702 TO BUS 270716 CKT 1

/ KENDA; R 345 DRES; B 345

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274658	DRESDEN ;2U	40.79
274879	MINONK ;1U	0.94
290021	O50 E	19.59
920272	X1-045	3.99
916512	ZI-107 E	1.93
918972	AA1-116 E	1.03
918982	AA1-117 E	1.03
930761	AB1-122 1	128.39
926711	AC1-153 C2	139.56
926712	AC1-153 E2	5.58

Appendix 19

(MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 120.8% to 122.06% (**DC power flow**) of its emergency rating (1466 MVA) for the line fault with failed breaker contingency outage of '3128_C2_05EUGENE 345-A2'. This project contributes approximately 41.03 MW to the thermal violation.

CONTINGENCY '3128_C2_05EUGENE 345-A2'

OPEN BRANCH FROM BUS 243221 TO BUS 249504 CKT 1

/ 243221 05EUGENE 345 249504 08CAYSUB 345 1

OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1

/ 243221 05EUGENE 345 348885 7BUNSONVILLE 345 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
274832	ANNAWAN ; 1U	8.77
294401	BSHIL;1U E	7.15
294410	BSHIL;2U E	7.15
274890	CAYUG;1U E	11.2
274891	CAYUG;2U E	11.2
274849	CRESCENT ;1U	4.86
274859	EASYR;U1 E	6.9
274860	EASYR;U2 E	6.9
290051	GSG-6; E	5.8
998111	J468	5.4
998112	J468 E	30.58
274650	KINCAID ;1U	19.41
274651	KINCAID ;2U	19.4
990901	L-005 E	11.27
290108	LEEDK;1U E	12.66
274850	MENDOTA H;RU	3.34
293516	O-009 E1	6.56
293517	O-009 E2	3.33
293518	O-009 E3	3.67
293715	O-029 E	7.01
293716	O-029 E	3.84
293717	O-029 E	3.53
293771	O-035 E	5.29
290021	O50 E	10.97
294763	P-046 E	5.45
274830	PWR VTREC;1U	3.2
274831	PWR VTREC;2U	3.2
296308	R-030 C1	3.52
296271	R-030 C2	3.52
296125	R-030 C3	3.56
296309	R-030 E1	14.07
296272	R-030 E2	14.07

296128	<i>R-030 E3</i>	14.24
290261	<i>S-027 C</i>	0.97
290265	<i>S-028 C</i>	0.97
295111	<i>SUBLETTE E</i>	1.51
274853	<i>TWINGROVE;U1</i>	20.26
274854	<i>TWINGROVE;U2</i>	20.26
900371	<i>V4-046</i>	1.34
900381	<i>V4-047</i>	1.34
276150	<i>W2-048 E</i>	9.75
920173	<i>W3-046 E</i>	16.21
905081	<i>W4-005 C</i>	6.58
905082	<i>W4-005 E</i>	44.1
295109	<i>WESTBROOK E</i>	3.11
909052	<i>X2-022 E</i>	29.48
<i>LTF</i>	<i>Y2-006</i>	14.51
701171	<i>Y4-018 C</i>	1.37
701172	<i>Y4-018 E</i>	5.47
701481	<i>Y4-049</i>	6.4
701831	<i>Y4-084</i>	3.29
<i>LTF</i>	<i>Z1-043</i>	22.27
<i>LTF</i>	<i>Z1-112</i>	9.86
920782	<i>Z2-081</i>	0.9
920792	<i>Z2-087 C</i>	2.76
920793	<i>Z2-087 E</i>	18.49
<i>LTF</i>	<i>AA1-001</i>	13.2
<i>LTF</i>	<i>AA1-004</i>	13.78
<i>LTF</i>	<i>AA1-071</i>	6.57
921632	<i>AA1-146</i>	11.81
921682	<i>AA2-030</i>	11.81
921702	<i>AA2-039 C</i>	1.74
921703	<i>AA2-039 E</i>	11.66
922972	<i>AB1-086 C</i>	58.28
922973	<i>AB1-086 E</i>	2.65
923002	<i>AB1-089 C</i>	34.25
923003	<i>AB1-089 E</i>	1.56
923012	<i>AB1-090 C</i>	34.25
923013	<i>AB1-090 E</i>	1.56
930751	<i>AB1-121</i>	66.03
930752	<i>AB1-121 E</i>	62.62
930762	<i>AB1-122 2</i>	36.3
923363	<i>AB1-146 E</i>	0.13
<i>LTF</i>	<i>AB2-005</i>	8.
<i>LTF</i>	<i>AB2-013</i>	13.53
924041	<i>AB2-047 C OP</i>	3.52
924042	<i>AB2-047 E OP</i>	23.54

924261	<i>AB2-070 C OP</i>	3.95
924262	<i>AB2-070 E OP</i>	26.44
924471	<i>AB2-096</i>	22.2
925161	<i>AB2-173 C</i>	2.11
925301	<i>AB2-191 C</i>	0.7
925302	<i>AB2-191 E</i>	0.62
<i>LTF</i>	<i>ACI-002</i>	90.66
925581	<i>ACI-033 C</i>	1.17
925582	<i>ACI-033 E</i>	7.83
925771	<i>ACI-053 C</i>	3.95
925772	<i>ACI-053 E</i>	26.44
926421	<i>ACI-113 1</i>	0.66
926422	<i>ACI-113 2</i>	0.66
926431	<i>ACI-114</i>	1.32
926701	<i>ACI-153 C</i>	39.46
926702	<i>ACI-153 E</i>	1.58
926821	<i>ACI-168 C OP</i>	0.79
926822	<i>ACI-168 E OP</i>	5.29
926841	<i>ACI-171 C OP</i>	1.14
926842	<i>ACI-171 E OP</i>	7.67
926981	<i>ACI-185 1</i>	0.43
926982	<i>ACI-185 2</i>	0.43
926983	<i>ACI-185 3</i>	0.43
926984	<i>ACI-185 4</i>	0.43
926985	<i>ACI-185 5</i>	0.43
926986	<i>ACI-185 6</i>	0.43
926987	<i>ACI-185 7</i>	0.43
926988	<i>ACI-185 8</i>	0.43
927201	<i>ACI-214 C</i>	1.76
927202	<i>ACI-214 E</i>	5.33