Generation Interconnection
Feasibility Study Report

For

PJM Generation Interconnection Request Queue
Position AB2-047

Brokaw - Pontiac Midpoint

August 2016

Network Impacts

The Queue Project AB2-047 was evaluated as a 250.0 MW (Capacity 32.5 MW) injection tapping the Brokaw-Z2-087 Tap 345kV line in the ComEd area. Project AB2-047 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-047 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)

None

Multiple Facility Contingency

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

None

Contribution to Previously Identified Overloads

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

1. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 127.8% to 128.66% (**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 27.94 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
```

2. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 119.39% to 120.18% (**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 22.88 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
```

3. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 126.09% to 127.38% (**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 15.17 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
```

4. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 114.26% to 118.38% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 32.86 MW to the thermal violation.

```
CONTINGENCY '080-45-BT5-6__'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTIAC ; B 345 BLUEMOUND; B 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

5. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 107.48% to 113.7% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT7-8__A'. This project contributes approximately 49.52 MW to the thermal violation.

```
CONTINGENCY '080-45-BT7-8__A'
 TRIP BRANCH FROM BUS 270853 TO BUS 920791 CKT 1          / PONTIAC ; R 345 Z2-087 TAP 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

6. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 110.09% to 114.13% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT4-5__'. This project contributes approximately 32.22 MW to the thermal violation.

```
CONTINGENCY '080-45-BT4-5__'
 TRIP BRANCH FROM BUS 270852 TO BUS 270668 CKT 1          / PONTI; B 345 BLUEM; B 345
 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1          / PONTI; B 345 LORET; B 345
 END
```

7. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 103.34% to 104.49% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of 'LAN-45-BT1-3__'. This project contributes approximately 20.21 MW to the thermal violation.

```
CONTINGENCY 'LAN-45-BT1-3__'
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```
 TRIP BRANCH FROM BUS 270673 TO BUS 348847 CKT 1          / BROKAW ; T 345 7BROKAW T1 345
 TRIP BRANCH FROM BUS 270673 TO BUS 276150 CKT 1          / BROKAW ; T 345 7LANSVLAM 345
 TRIP BRANCH FROM BUS 349700 TO BUS 349701 CKT 1          / 7LANSVLAM 345 4LANVL AM 138
 END
```

8. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 129.31% to 129.7% (**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 38.02 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
```

9. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 132.11% to 132.51% (**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 38.76 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
```

10. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 126.03% to 127.32% (**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 15.17 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
```

11. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 105.67% to 106.97% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT2-3__'. This project contributes approximately 15.31 MW to the thermal violation.

```
CONTINGENCY '900-45-BT2-3__'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESD; R 345 ELWOO; R 345
 TRIP BRANCH FROM BUS 270737 TO BUS 274757 CKT 1          / ELWOO; R 345 ELWOO;1P 345
 TRIP BRANCH FROM BUS 274757 TO BUS 274729 CKT 1          / ELWOO;1P 345 ELWOO;1P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274731 CKT 1          / ELWOO;1P 345 ELWOO;2P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274733 CKT 1          / ELWOO;1P 345 ELWOO;3P 18
```

```
TRIP BRANCH FROM BUS 274757 TO BUS 274735 CKT 1          / ELWOO;1P 345 ELWOO;4P 18
REMOVE UNIT 1 FROM BUS 274729                  / ELWOO;1P 18
REMOVE UNIT 2 FROM BUS 274731                  / ELWOO;2P 18
REMOVE UNIT 3 FROM BUS 274733                  / ELWOO;3P 18
REMOVE UNIT 4 FROM BUS 274735                  / ELWOO;4P 18
END
```

12. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 107.26% to 107.65% (**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 38.02 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
```

13. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 109.5% to 109.9% (**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 38.76 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
```

14. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 107.12% to 109.18% (**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 30.22 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
```

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. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 123.5% to 124.36% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 27.82 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 BLUEMOUND; B-PONTIAC ; B 345 kV line (from bus 270668 to bus 270852 ckt 1) loads from 99.0% to 101.67% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8001___-S_A'. This project contributes approximately 40.74 MW to the thermal violation.

```
CONTINGENCY '345-L8001___-S_A'
 TRIP BRANCH FROM BUS 270853 TO BUS 920791 CKT 1              / PONTI; R 345 Z2-087 TAP
 END
```

3. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 118.47% to 119.26% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 22.86 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 LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 145.05% to 151.31% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 95.68 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

5. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 110.2% to 114.9% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 64.05 MW to the thermal violation.

6. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 128.24% to 131.96% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 55.07 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
```

7. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 114.3% to 115.74% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 15.34 MW to the thermal violation.

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

8. (CE - CE) The ELWOOD ; B-GOODINGS ;4B 345 kV line (from bus 270736 to bus 270770 ckt 1) loads from 103.33% to 103.82% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11622_R-S'. This project contributes approximately 16.06 MW to the thermal violation.

```
CONTINGENCY '345-L11622_R-S'                    / CONTINGENCY # 223
 TRIP BRANCH FROM BUS 270737 TO BUS 270769 CKT 1          / ELWOOD ; R 345 GOODINGS ;1R 345
```

```
END
```

9. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 102.59% to 103.08% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 15.95 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
```

10. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 114.31% to 114.87% (**DC power flow**) of its emergency rating (1802 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 22.32 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
```

11. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 103.79% to 108.6% (**DC power flow**) of its emergency rating (797 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 38.31 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

12. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 148.14% to 154.61% (**DC power flow**) of its emergency rating (1481 MVA) for the single line contingency outage of '345-L11212_B-S'. This project contributes approximately 95.84 MW to the thermal violation.

```
CONTINGENCY '345-L11212_B-S'
 TRIP BRANCH FROM BUS 270926 TO BUS 270704 CKT 1          / WILTO; B 345 LORET; B 345
 END
```

13. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 107.04% to 111.79% (**DC power flow**) of its normal rating (1334 MVA) for non-contingency condition. This project contributes approximately 63.32 MW to the thermal violation.

14. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 114.24% to 115.68% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 15.34 MW to the thermal violation.

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

15. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 111.62% to 113.87% (**DC power flow**) of its normal rating (1334 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 30.06 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
```

16. (CE - CE) The W4-005 TAP-BLUEMOUND; B 345 kV line (from bus 905080 to bus 270668 ckt 1) loads from 95.2% to 98.26% (**DC power flow**) of its emergency rating (1334 MVA) for the single line contingency outage of '345-L8001___-S_A'. This project contributes approximately 40.84 MW to the thermal violation.

```
CONTINGENCY '345-L8001___-S_A'
 TRIP BRANCH FROM BUS 270853 TO BUS 920791 CKT 1              / PONTI; R 345 Z2-087 TAP
 END
```

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)

None.

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)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 127.8% to 128.66% (**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 27.94 MW to the thermal violation.

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

AEP
Reinforcement: A sag check was conducted 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 study reesults indicated that the following upgrades are required: Replacement of tower 20 with a custom steel pole, replacement of tower 24 with a custom H-frame and the removal of swing angle brackets on 2 structures. Estimated Cost: $1,613,008. Replace the Dumont Wavetrap (2500 A): Estimated cost: $300,000. New ratings will be 1409/2045 MVA (SN/SE)

This is an AEP-NIPSCO tie line therefore, PJM is going to have to coordinate this upgrade with NIPSCO as well to make sure that their equipment will not set a limit lower than what is specified here.
Cost: $1,913,008
Time: 12-24 months

2. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 119.39% to 120.18% (**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 22.88 MW to the thermal violation.

Comed: ComEd 765kV L7703 SLD is 1768 MVA with an ALDR rating of 2033 MVA. No upgrade required. Note, the limit above is a NIPSCO tie line rating.

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

3. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 126.09% to 127.38% (**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 15.17 MW to the thermal violation.

Reinforcement: The ComEd SLD & ALDR for Tr. 93 @ Station 12 is 530 MVA & 610 MVA respectively. The post contingency flow above will exceed the ALDR rating. The resolution is a ComEd proposed plan for a cutover 345kV L93505 from TSS 935 Kendall to Dresden Station Bus 12. The plan would include a 345kV bus extension at Dresden. Note, that the rating for Tr. 93 @ Dresden will remain current however the proposed ComEd Planning Sketch will connect 345kV L1224 and L2311 to the Red 345kV Bus at Dresden Station. The connectivity of the two lines will provide overload relief for Tr. 93.
Cost: $16M
Time: 24-30 months.

4. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 114.26% to 118.38% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__'. This project contributes approximately 32.86 MW to the thermal violation.

Comed: ComEd 345kV L2106 SLD is 1494 MVA. The SLD of 797 MVA is an Ameren limit. No upgrades required.

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

5. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 107.48% to 113.7% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT7-8__A'. This project contributes approximately 49.52 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #4

6. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 110.09% to 114.13% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT4-5__'. This project contributes approximately 32.22 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #4

7. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 103.34% to 104.49% (**DC power flow**) of its emergency rating (797

MVA) for the line fault with failed breaker contingency outage of 'LAN-45-BT1-3__'. This project contributes approximately 20.21 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #4

8. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 129.31% to 129.7% (**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 38.02 MW to the thermal violation.

Reinforcement: ComEd post contingency facility overloaded by this event is Tr. 93 @ Station 112 Wilton Center. The upgrade will be to build out the 765kV ring bus at Wilton Center, installation of two 765 kV Bus Tie Circuit Breakers (BT 6-8 & 8-2) along with a relocation of 765kV L11216 from bus 6 to bus 8. Note, the rating for Tr. 93 at Wilton Center will remain current however with this upgrade the 112-65-BT5-6 contingency file will no longer include the Wilton Center Tr. 94 and will allow both transformers to remain in service eliminating the overload.
Cost: $8M
Time: 24 months.

9. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 132.11% to 132.51% (**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 38.76 MW to the thermal violation.

Reinforcement: ComEd Tr. 94 SLD is 1601 MVA with an ALDR rating of 1841 MVA. The post contingency flow for this event is exceeds the ALDR rating. The proposed upgrade will be to install a third transformer at Wilton Center. Upgrades include expansion on the 765kV & 345kV buses at Wilton Center. Upon completion of this upgrade the third transformer will have the proposed ratings, 1200/1379/1601 MVA, SN/SE/SLD respectively.
Cost: $15.2M
Time: 24-30 months.

10. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 126.03% to 127.32% (**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 15.17 MW to the thermal violation.

Reinforcement: The ComEd SLD & ALDR for Tr. 93 @ Station 12 is 530 MVA & 610 MVA respectively. The post contingency flow above will exceed the ALDR rating. The resolution is a ComEd proposed plan for a cutover 345kV L93505 from TSS 935 Kendall to Dresden Station Bus 12. The plan would include a 345kV bus extension at Dresden upon completion of this work.

Note, that the rating for Tr. 93 @ Dresden will remain current however the proposed ComEd Planning Sketch will connect 345kV L1224 and L2311 to the Red 345kV Bus at Dresden Station. The connectivity of the two lines will provide overload relief for Tr. 93.
Cost: $16M
Time: 24-30 months.

11. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 105.67% to 106.97% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT2-3__'. This project contributes approximately 15.31 MW to the thermal violation.

Same as Contribution to Previously Identified Overload #10

12. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 107.26% to 107.65% (**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 38.02 MW to the thermal violation.

Reinforcement: ComEd Tr. 93 SLD is 1601 MVA with an ALDR rating of 1841 MVA. The post contingency flow for this event is exceeds the ALDR rating. The proposed upgrade will be to construct the 765kV bus at Wilton Center to the ultimate layout. Install 2-345kV Bus Tie Circuit Breakers (BT7-8 & 1-8). Relocate 765kV L11216 from 765kV Bus 6 to Bus 8.
Cost: $15.5M
Time: 30 months

13. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 109.5% to 109.9% (**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 38.76 MW to the thermal violation.

Reinforcement: ComEd Tr. 94 SLD is 1601 MVA with an ALDR rating of 1841 MVA. The post contingency flow for this event is exceeds the ALDR rating. The proposed upgrade will be to install a third transformer at Wilton Center. Upgrades include expansion on the 765kV & 345kV buses at Wilton Center.
Cost: $15.2M
Time: 24-30 months.

14. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 107.12% to 109.18% (**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 30.22 MW to the thermal violation.

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

AEP
No upgrades required. AEP ratings are 1443/1685 MVA (SN/SE)

Network Impacts for Option 2

The Queue Project AB2-047 was evaluated as a 250.0 MW (Capacity 32.5 MW) injection tapping the Pontiac-Blue Mound 345kV line substation in the ComEd area. Project AB2-047 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AB2-047 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)

None

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 WILTON ; R-BLUE ISL ;RT 345 kV line (from bus 270927 to bus 270667 ckt 1) loads from 98.98% to 100.46% (**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 26.16 MW to the thermal violation.

```
CONTINGENCY '023-65-BT2-3__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1          / COLLI; 765 PLANO; 765
 END
```

Contribution to Previously Identified Overloads

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

1. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 127.82% to 128.69% (**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 28.58 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
```

2. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 123.73% to 124.61% (**DC power flow**) of its emergency rating (1409

MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 28.58 MW to the thermal violation.

```
CONTINGENCY '023-65-BT2-3__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1          / COLLI; 765 PLANO; 765
 END
```

3. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 123.65% to 124.53% (**DC power flow**) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '023-65-BT4-5__'. This project contributes approximately 28.56 MW to the thermal violation.

```
CONTINGENCY '023-65-BT4-5__'
 TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1          / COLLI;2M 345 COLLI; 765
 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1          / COLLI;2M 345 COLLI; R 345
 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1          / COLLI;2M 345 COLLI;2C 33
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 END
```

4. (CE - AEP) The WILTON ;-05DUMONT 765 kV line (from bus 270644 to bus 243206 ckt 1) loads from 110.57% to 110.79% (**DC power flow**) of its emergency rating (4444 MVA) for the tower line contingency outage of '345-L11613AB-S_+_345-L11614AR-S'. This project contributes approximately 61.92 MW to the thermal violation.

```
CONTINGENCY '345-L11613AB-S_+_345-L11614AR-S'
 TRIP BRANCH FROM BUS 270666 TO BUS 270664 CKT 1          / B ISL;BT 345 B ISL; B 345
 TRIP BRANCH FROM BUS 270666 TO BUS 270926 CKT 1          / B ISL;BT 345 WILTO; B 345
 TRIP BRANCH FROM BUS 270667 TO BUS 270665 CKT 1          / B ISL;RT 345 B ISL; R 345
 TRIP BRANCH FROM BUS 270667 TO BUS 270927 CKT 1          / B ISL;RT 345 WILTO; R 345
 TRIP BRANCH FROM BUS 270769 TO BUS 270667 CKT 1          / GOODI;2R 345 B ISL;RT 345
 TRIP BRANCH FROM BUS 270770 TO BUS 270666 CKT 1          / GOODI;4B 345 B ISL;BT 345
 TRIP BRANCH FROM BUS 270926 TO BUS 270927 CKT 1          / WILTO; B 345 WILTO; R 345
 END
```

5. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 119.45% to 120.27% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of '023-65-BT2-3__'. This project contributes approximately 23.66 MW to the thermal violation.

```
CONTINGENCY '023-65-BT2-3__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 270607 TO BUS 270630 CKT 1          / COLLI; 765 PLANO; 765
 END
```

6. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 119.39% to 120.21% (**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 23.57 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
```

7. (CE - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 119.02% to 119.84% (**DC power flow**) of its emergency rating (1195 MVA) for the line fault with failed breaker contingency outage of '023-65-BT4-5__'. This project contributes approximately 23.61 MW to the thermal violation.

```
CONTINGENCY '023-65-BT4-5__'
 TRIP BRANCH FROM BUS 275168 TO BUS 270607 CKT 1          / COLLI;2M 345 COLLI; 765
 TRIP BRANCH FROM BUS 275168 TO BUS 270697 CKT 1          / COLLI;2M 345 COLLI; R 345
 TRIP BRANCH FROM BUS 275168 TO BUS 275268 CKT 1          / COLLI;2M 345 COLLI;2C 33
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 END
```

8. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 107.29% to 110.54% (**DC power flow**) of its emergency rating (1768 MVA) for the line fault with failed breaker contingency outage of '111-45-L1223T_'. This project contributes approximately 57.46 MW to the thermal violation.

```
CONTINGENCY '111-45-L1223T_'
 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
 TRIP BRANCH FROM BUS 270731 TO BUS 274749 CKT 1          / ELECT;4R 345 AUROR;RP 345
 DISCONNECT BUS 275184                    / ELECT;4M 138
 END
```

9. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 126.09% to 127.44% (**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 15.88 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
```

10. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 105.71% to 107.07% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT2-3__'. This project contributes approximately 16.03 MW to the thermal violation.

```
CONTINGENCY '900-45-BT2-3__'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1          / DRESD; R 345 ELWOO; R 345
 TRIP BRANCH FROM BUS 270737 TO BUS 274757 CKT 1          / ELWOO; R 345 ELWOO;1P 345
 TRIP BRANCH FROM BUS 274757 TO BUS 274729 CKT 1          / ELWOO;1P 345 ELWOO;1P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274731 CKT 1          / ELWOO;1P 345 ELWOO;2P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274733 CKT 1          / ELWOO;1P 345 ELWOO;3P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274735 CKT 1          / ELWOO;1P 345 ELWOO;4P 18
 REMOVE UNIT 1 FROM BUS 274729                  / ELWOO;1P 18
 REMOVE UNIT 2 FROM BUS 274731                  / ELWOO;2P 18
 REMOVE UNIT 3 FROM BUS 274733                  / ELWOO;3P 18
 REMOVE UNIT 4 FROM BUS 274735                  / ELWOO;4P 18
 END
```

11. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 114.22% to 122.56% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT5-6__A'. This project contributes approximately 66.47 MW to the thermal violation.

```
CONTINGENCY '080-45-BT5-6__A'
 TRIP BRANCH FROM BUS 270852 TO BUS 924040 CKT 1          / PONTIAC ; B 345 AB2-047 TAP OP2 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

12. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 110.05% to 118.38% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT4-5__A'. This project contributes approximately 66.43 MW to the thermal violation.

```
CONTINGENCY '080-45-BT4-5__A'
 TRIP BRANCH FROM BUS 270852 TO BUS 924040 CKT 1          / PONTI; B 345 AB2-047 TAP OP2 345
 TRIP BRANCH FROM BUS 270852 TO BUS 270704 CKT 1          / PONTI; B 345 LORET; B 345
 END
```

13. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 107.48% to 111.8% (**DC power flow**) of its emergency rating (797 MVA) for the line fault with failed breaker contingency outage of '080-45-BT7-8__A'. This project contributes approximately 34.38 MW to the thermal violation.

```
CONTINGENCY '080-45-BT7-8__A'
 TRIP BRANCH FROM BUS 270853 TO BUS 920791 CKT 1          / PONTIAC ; R 345 Z2-087 TAP 345
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

14. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 119.48% to 120.54% (**DC power flow**) of its emergency rating (1241 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 13.05 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1          / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1          / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1          / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1          / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

15. (CE - CE) The WILTON ; B-WILTON ;3M 345 kV line (from bus 270926 to bus 275232 ckt 1) loads from 129.26% to 130.04% (**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 39.35 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
```

16. (CE - CE) The WILTON ; R-WILTON ;4M 345 kV line (from bus 270927 to bus 275233 ckt 1) loads from 132.06% to 132.86% (**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 40.11 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
```

17. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 126.05% to 127.4% (**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 15.88 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
```

18. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 105.67% to 107.03% (**DC power flow**) of its emergency rating (530 MVA) for the line fault with failed breaker contingency outage of '900-45-BT2-3__'. This project contributes approximately 16.03 MW to the thermal violation.

```
CONTINGENCY '900-45-BT2-3__'
 TRIP BRANCH FROM BUS 270717 TO BUS 270737 CKT 1        / DRESD; R 345 ELWOO; R 345
 TRIP BRANCH FROM BUS 270737 TO BUS 274757 CKT 1        / ELWOO; R 345 ELWOO;1P 345
 TRIP BRANCH FROM BUS 274757 TO BUS 274729 CKT 1        / ELWOO;1P 345 ELWOO;1P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274731 CKT 1        / ELWOO;1P 345 ELWOO;2P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274733 CKT 1        / ELWOO;1P 345 ELWOO;3P 18
 TRIP BRANCH FROM BUS 274757 TO BUS 274735 CKT 1        / ELWOO;1P 345 ELWOO;4P 18
 REMOVE UNIT 1 FROM BUS 274729                  / ELWOO;1P 18
 REMOVE UNIT 2 FROM BUS 274731                  / ELWOO;2P 18
 REMOVE UNIT 3 FROM BUS 274733                  / ELWOO;3P 18
 REMOVE UNIT 4 FROM BUS 274735                  / ELWOO;4P 18
 END
```

19. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275232 to bus 270644 ckt 1) loads from 107.21% to 108.0% (**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 39.35 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
```

20. (CE - CE) The WILTON ; 765/345 kV transformer (from bus 275233 to bus 270644 ckt 1) loads from 109.45% to 110.24% (**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 40.11 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
```

21. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 107.48% to 109.48% (**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 29.31 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
```

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)

To be determined

Affected System Analysis & Mitigation

MISO Impacts:

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

Delivery of Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 123.51% to 124.39% (**DC power flow**) of its normal rating (1409 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 28.55 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 - MISO NIPS) The BURNHAM ;0R-17MUNSTER 345 kV line (from bus 270677 to bus 255109 ckt 1) loads from 118.47% to 119.29% (**DC power flow**) of its emergency rating (1195 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 23.56 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
```

3. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 145.05% to 151.61% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 100.3 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1              / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1              / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1              / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1              / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1              / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

4. (CE - CE) The LORETTO ; B-WILTON ; B 345 kV line (from bus 270704 to bus 270926 ckt 1) loads from 110.21% to 115.15% (**DC power flow**) of its normal rating (1364 MVA) for non-contingency condition. This project contributes approximately 67.32 MW to the thermal violation.

5. (CE - CE) The DRESDEN ; R-ELWOOD ; R 345 kV line (from bus 270717 to bus 270737 ckt 1) loads from 128.24% to 132.12% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L1223_TR-S'. This project contributes approximately 57.46 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
```

6. (CE - CE) The DRESDEN ; R 345/138 kV transformer (from bus 270717 to bus 275180 ckt 1) loads from 114.3% to 115.81% (**DC power flow**) of its emergency rating (480 MVA) for the

single line contingency outage of '345-L1222__R-S'. This project contributes approximately 16.05 MW to the thermal violation.

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

7. (CE - CE) The ELWOOD ; B-GOODINGS ;4B 345 kV line (from bus 270736 to bus 270770 ckt 1) loads from 103.33% to 103.84% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11622_R-S'. This project contributes approximately 16.63 MW to the thermal violation.

```
CONTINGENCY '345-L11622_R-S'                          / CONTINGENCY # 223
 TRIP BRANCH FROM BUS 270737 TO BUS 270769 CKT 1              / ELWOOD ; R 345 GOODINGS ;1R 345
 END
```

8. (CE - CE) The ELWOOD ; R-GOODINGS ;2R 345 kV line (from bus 270737 to bus 270769 ckt 1) loads from 102.59% to 103.1% (**DC power flow**) of its emergency rating (1479 MVA) for the single line contingency outage of '345-L11620_B-S'. This project contributes approximately 16.51 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
```

9. (CE - CE) The GOODINGS ;4B-GOODINGS ;3B 345 kV line (from bus 270770 to bus 270766 ckt 1) loads from 114.31% to 114.89% (**DC power flow**) of its emergency rating (1802 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 22.96 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
```

10. (CE - MISO AMIL) The KINCAID ; B-7AUSTIN 345 kV line (from bus 270796 to bus 347955 ckt 1) loads from 103.78% to 108.83% (**DC power flow**) of its emergency rating (797 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 40.24 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1              / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1              / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1              / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1              / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1              / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

11. (CE - MISO AMIL) The LATHAM ; T-7LATHAM 345 kV line (from bus 270804 to bus 348856 ckt 1) loads from 85.42% to 100.65% (**DC power flow**) of its emergency rating (908 MVA) for the single line contingency outage of '345-L8002___-S_A'. This project contributes approximately 138.34 MW to the thermal violation.

```
CONTINGENCY '345-L8002___-S_A'
 TRIP BRANCH FROM BUS 270852 TO BUS 924040 CKT 1            / PONTI; B 345 AB2-047 TAP OP2 345
 END
```

12. (CE - CE) The PONTIAC ; B-LORETTO ; B 345 kV line (from bus 270852 to bus 270704 ckt 1) loads from 164.11% to 172.2% (**DC power flow**) of its emergency rating (1241 MVA) for the single line contingency outage of '345-L8014_T_-S'. This project contributes approximately 100.38 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'
 TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1            / PONTIAC ; R 345 DRESDEN ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1            / PONTIAC ;2M 138 PONTIAC ; R 345
 TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1            / PONTIAC ;2M 138 PONTIAC ; R 138
 TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1            / PONTIAC ;2M 138 PONTIAC ;2C 34.5
 CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1            / PONTIAC ; B 138 PONTIAC ; R 138
 END
```

13. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 148.14% to 154.91% (**DC power flow**) of its emergency rating (1481 MVA) for the single line contingency outage of '345-L11212_B-S'. This project contributes approximately 100.21 MW to the thermal violation.

```
CONTINGENCY '345-L11212_B-S'
 TRIP BRANCH FROM BUS 270926 TO BUS 270704 CKT 1            / WILTO; B 345 LORET; B 345
 END
```

14. (CE - CE) The PONTIAC ; R-DRESDEN ; R 345 kV line (from bus 270853 to bus 270717 ckt 1) loads from 107.05% to 112.0% (**DC power flow**) of its normal rating (1334 MVA) for non-contingency condition. This project contributes approximately 66.02 MW to the thermal violation.

15. (CE - CE) The DRESDEN ;3M-DRESDEN ; B 138 kV line (from bus 275180 to bus 271336 ckt 1) loads from 114.24% to 115.75% (**DC power flow**) of its emergency rating (480 MVA) for the single line contingency outage of '345-L1222__R-S'. This project contributes approximately 16.05 MW to the thermal violation.

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

16. (MISO AMIL - AEP) The 7CASEY-05SULLIVAN 345 kV line (from bus 346809 to bus 247712 ckt 1) loads from 111.75% to 113.94% (**DC power flow**) of its normal rating (1334 MVA) for the single line contingency outage of '286_B2_TOR1687'. This project contributes approximately 29.2 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
```

17. (MISO AMIL - CE) The 7BROKAW-Z2-087 TAP 345 kV line (from bus 348847 to bus 920791 ckt 1) loads from 104.44% to 107.97% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8002___-S_A'. This project contributes approximately 54.07 MW to the thermal violation.

```
CONTINGENCY '345-L8002___-S_A'
 TRIP BRANCH FROM BUS 270852 TO BUS 924040 CKT 1              / PONTI; B 345 AB2-047 TAP OP2 345
 END
```

18. (CE - CE) The Z2-087 TAP-PONTIAC ; R 345 kV line (from bus 920791 to bus 270853 ckt 1) loads from 112.36% to 115.9% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8002___-S_A'. This project contributes approximately 54.07 MW to the thermal violation.

```
CONTINGENCY '345-L8002___-S_A'
 TRIP BRANCH FROM BUS 270852 TO BUS 924040 CKT 1              / PONTI; B 345 AB2-047 TAP OP2 345
 END
```

19. (CE - CE) The AB2-047 TAP-PONTIAC ; B 345 kV line (from bus 924040 to bus 270852 ckt 1) loads from 98.88% to 109.39% (**DC power flow**) of its emergency rating (1528 MVA) for the single line contingency outage of '345-L8001___-S_A'. This project contributes approximately 160.62 MW to the thermal violation.

```
CONTINGENCY '345-L8001___-S_A'
 TRIP BRANCH FROM BUS 270853 TO BUS 920791 CKT 1              / PONTI; R 345 Z2-087 TAP
 END
```

Light Load Analysis - 2020

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